



Designation: D3996 – 23

Standard Performance Specification for Knit Swimwear Fabrics¹

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, 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:*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D2905 Practice for Statements on Number of Specimens for Textiles (Withdrawn 2008)³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

D6797 Test Method for Bursting Strength of Fabrics Constant-Rate-of-Extension (CRE) Ball Burst Test

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.

Current edition approved Jan. 1, 2023. Published August 2023. Originally approved in 1981. Last previous edition approved in 2014 as D3996 – 14. DOI: 10.1520/D3996-23.

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.

D7022 Terminology Relating to Apparel (Withdrawn 2022)³

2.2 *AATCC Methods:*⁴

TM8 Colorfastness to Crocking: Crockmeter Method

TM15 Colorfastness to Perspiration

TM16.3 Colorfastness to Light

TM23 Colorfastness to Burnt Gas Fumes

TM61 Colorfastness to Laundering: Accelerated

TM106 Colorfastness to Water: Sea

TM107 Colorfastness to Water

TM116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

TM129 Colorfastness to Ozone in the Atmosphere Under High Humidities

TM135 Dimensional Changes of Fabrics After Home Laundering

TM162 Colorfastness to Water Chlorinated Pool

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 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.

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.

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.

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).”

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 AFUs)	Grade 4 min ^A	7.3.9
Flammability	Class 1	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 6.
^E See Note 5.

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 D3786, Test Method D3787, or Test Method D6797 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 or CRE 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.

7.2 Dimensional Change:

7.2.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC TM135 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 TM23.

NOTE 4—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 TM61. The test conditions shall be as agreed upon between the purchaser and the seller.

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.

7.3.3 *Colorfastness to Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC TM8 for solid color fabrics or AATCC TM116 for printed fabrics or as agreed upon between the purchaser and the seller (see Note 5).

7.3.4 *Colorfastness to Water*—Determine the colorfastness to water as directed in AATCC TM107 (see Note 5).

7.3.5 *Colorfastness to Perspiration*—Determine the colorfastness to perspiration as directed in AATCC TM15 (see Note 5).

7.3.6 *Colorfastness to Water-Chlorinated Pool*—Determine colorfastness as directed in AATCC TM162.

NOTE 6—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 TM106 (see Note 5).

7.3.8 *Ozone*—Determine the colorfastness to ozone as directed in AATCC TM129.

7.3.9 *Colorfastness to Light*—Determine the colorfastness to light as directed in AATCC TM16.3 option 3.

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

7.3.11 *Colorfastness to Powdered Non-Chlorine Bleach*—Determine the colorfastness to non-chlorine bleach as directed in AATCC TM172.

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

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