



Designation: D 5431 – 93 (Reapproved 2001)<sup>e1</sup>

## Standard Performance Specification for Woven and Knitted Sheeting Products for Institutional and Household Use<sup>1</sup>

This standard is issued under the fixed designation D 5431; 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.

<sup>e1</sup> NOTE—Editorial corrections were made throughout in February 2001.

### 1. Scope

1.1 This specification covers the evaluation of specific performance characteristics of importance in woven and knit flat, fitted, and waterbed sheet products for use in institutional and household environments.

1.2 This specification may be used by mutual agreement between the purchaser and the supplier to establish purchasing specification requirements.

1.3 The requirements in Table 1 apply to the length and width directions for those properties where fabric direction is pertinent.

1.4 This specification is not applicable to woven and knit products used for sheet blankets or to woven and knitted sheet products used for apparel.

1.5 *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 629 Test Methods for Quantitative Analysis of Textiles<sup>2</sup>
- D 1230 Test Method for Flammability of Textiles<sup>2</sup>
- D 1424 Test Method for Tear Resistance of Woven Fabrics by Falling Pendulum (Elmendorf) Apparatus<sup>2</sup>
- D 1776 Practice for Conditioning Textiles for Testing<sup>2</sup>
- D 2262 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traversal Tensile Testing Machine)<sup>2</sup>
- D 2905 Practice for Statements on Number of Specimens for Textiles<sup>2</sup>
- D 3136 Terminology Relating to Care Labeling for Apparel, Textile, Home Furnishing, and Leather Products<sup>2</sup>

- D 3512 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Random Tumble Pilling Tester Method<sup>3</sup>
- D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method<sup>3</sup>
- D 3787 Test Method for Bursting Strength of Knitted Goods: Constant-Rate-of-Traversal (CRT) Ball Burst Test<sup>3</sup>
- D 3882 Test Method for Bow and Skew in Woven and Knitted Fabrics<sup>3</sup>
- D 3938 Guide for Determining or Confirming Care Instructions for Apparel and Other Textile Products<sup>3</sup>
- D 5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)<sup>3</sup>
- 2.2 AATCC Methods:<sup>4</sup>
  - 8 Colorfastness to Crocking: AATCC Crockmeter Method
  - 15 Colorfastness to Perspiration
  - 16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
  - 16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
  - 61 Colorfastness to Laundering, Home, and Commercial: Accelerated
  - 88B Appearance of Seams in Durable Press Items After Repeated Home Launderings
  - 96 Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool
  - 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
  - 124 Appearance of Fabrics After Repeated Home Laundering
  - 135 Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics
  - 143 Appearance of Apparel and Other Textile End Products After Repeated Home Launderings
  - Evaluation Procedure 1 Gray Scale for Color Change
  - Evaluation Procedure 2 Gray Scale for Staining

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.63 on Home Furnishings.

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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 (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709.

**TABLE 1 Specification Requirements**

| Characteristics                             | Requirements             |                          |                          |                                | Section |
|---|--------------------------|--------------------------|--------------------------|--------------------------------|---------|
|   | Non-flannel              |                          | Woven                    |                                |         |
|   | Polyester/Cotton         | 100 % Cotton             | Flannel                  | Knitted<br>Flannel/Non-flannel |         |
| Breaking Force                              |                          |                          |                          |                                | 7.1     |
| CRT Method Each Direction <sup>A</sup>      | 222 N (50 lbf) min       | 178 N (40 lbf) min       | 156 N (35 lbf) min       |                                |         |
| Bursting Force <sup>A</sup>                 |                          |                          |                          | 222 N (50 lbf) min             | 7.1.2   |
| Tear Resistance, Elmendorf <sup>A</sup>     |                          |                          |                          |                                | 7.1.3   |
| Each Direction                              | 7 N (1.5 lbf) min        | 7 N (1.5 lbf) min        | 7 N (1.5 lbf) min        |                                |         |
| Pilling                                     | 4.0                      | NA                       | NA                       | 4.0                            | 7.1.4   |
| Dimensional Change:                         |                          |                          |                          |                                | 7.1.5   |
| Durable Press (In Each Direction)           | 2 % max                  | 3 % max                  | 3.5 % max                | 4 % max                        |         |
| Nondurable Press (Nonpreshrunk)             |                          |                          |                          |                                |         |
| Length                                      | 8 % max                  | 8 % max                  | 8 % max                  |                                |         |
| Width                                       | 6 % max                  | 6 % max                  | 6 % max                  |                                |         |
| Preshrunk (In Each Direction)               | 2 % max                  | 3 % max                  | 3.5 % max                |                                |         |
| Laundered Appearance                        | Acceptable               | Acceptable               | Acceptable               | Acceptable                     | 7.2.1   |
| Fabric Appearance                           | SA 3.0 min               | SA 2.2 min <sup>B</sup>  | NA                       | SA 3.0 min                     | 7.1.6   |
| Bow and Skewness                            | 3 % max                  | 3 % max                  | 3 % max                  | 3 % max                        | 7.1.7   |
| Colorfastness To: <sup>C</sup>              |                          |                          |                          |                                |         |
| Laundering:                                 |                          |                          |                          |                                | 7.1.8.1 |
| Alteration In Shade                         | Class 4 min <sup>D</sup> | Class 4 min <sup>D</sup> | Class 4 min <sup>D</sup> | Class 4 min <sup>D</sup>       |         |
| Staining                                    | Class 3 min <sup>E</sup> | Class 3 min <sup>E</sup> | Class 3 min <sup>E</sup> | Class 3 min <sup>E</sup>       |         |
| Crocking:                                   |                          |                          |                          |                                | 7.1.8.2 |
| Dry   | Class 4 min <sup>F</sup> | Class 4 min <sup>F</sup> | Class 4 min <sup>F</sup> | Class 4 min <sup>F</sup>       |         |
| Wet   | Class 3 min <sup>F</sup> | Class 3 min <sup>F</sup> | Class 3 min <sup>F</sup> | Class 3 min <sup>F</sup>       |         |
| Light (20 AATCC FU), Xenon-Arc <sup>E</sup> | Step 4 min <sup>D</sup>  | Step 4 min <sup>D</sup>  | Step 4 min <sup>D</sup>  | Step 4 min <sup>D</sup>        | 7.1.8.3 |
| Perspiration                                |                          |                          |                          |                                | 7.1.8.4 |
| Alteration In Shade                         | Class 4 min <sup>D</sup> | Class 4 min <sup>D</sup> | Class 4 min <sup>D</sup> | Class 4 min <sup>D</sup>       |         |
| Staining                                    | Class 3 min <sup>E</sup> | Class 3 min <sup>E</sup> | Class 3 min <sup>E</sup> | Class 3 min <sup>E</sup>       |         |
| Flammability                                | Class I                  | Class I                  | Class I                  | Class I                        | 7.1.9   |

<sup>A</sup>There is more than one standard method that can be used to measure breaking force, bursting force, tear resistance, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them. See Notes 2-5 and Note 8.

<sup>B</sup>Recommended requirement for Easy Care Products which must be ironed.

<sup>C</sup>Class in colorfastness and 5A rating is based on a numerical scale of 5.0 for negligible color change, color transfer, or wrinkling to 1.0 for very severe color change, color transfer or wrinkling. The numerical rating in Table 1 or higher is acceptable.

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

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

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

### Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—Reference to test methods in this specification give only the pertinent part of the designation of ASTM, AATCC, or other test methods. The current edition of each test method shall prevail.

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *fitted sheet, n—in textiles*, a product usually made with boxed corners, sometimes elasticized with shape and size to conform to the contours of the mattress and used for covering the mattress on a bed.

3.1.2 *flannel, n—as applied to bed sheeting*, a napped fabric used in the fabrication of sheeting products.

3.1.3 *flat sheet, n—in textiles*, a flat, hemmed product, usually rectangular, used for covering the mattress on a bed and used for sleeping on or under.

3.1.4 *muslin, n—as applied to bed sheeting*, a plain weave fabric with not fewer than 128 yarns/in.<sup>2</sup> (128 yarns/645 mm<sup>2</sup>).

3.1.5 *percale, n—as applied to bed sheeting*, a plain weave fabric with not fewer than 180 yarns/in.<sup>2</sup> (180 yarns/645 mm<sup>2</sup>).

3.1.6 *sheet, n—in textiles*, a large rectangular fabricated product which is used over a mattress on a bed. The product may be carded or combed yarn in a wide range of fabric constructions.

3.1.7 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods, Terminology D 123 and Terminology D 3136, or your dictionary.

### 4. Significance and Use

4.1 Upon mutual agreement between the purchaser and the supplier, woven and knitted products intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable products 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.

4.2.1 In such cases, any references to the specification shall specify that: “This product meets ASTM Specification \_\_\_\_\_ except for the following characteristic(s).”

4.3 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 4.2, ultimate consumer demands dictate varying performance parameters for any particular product.