



Designation: **D 5433 – 9300**

## Standard Performance Specification for Towel Products for Institutional and Household Use<sup>1</sup>

This standard is issued under the fixed designation D 5433; 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 specification covers the evaluation of specific performance characteristics of importance in woven and knitted kitchen towel, dishcloth, crash towel, huck towel, washcloth, hand towel, bath towel, and bath 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 Tables 1 and 2 apply to the length and width directions for those properties where fabric direction is pertinent.

1.4 This specification is not applicable for coated and laminated products, nonwoven products, or terry fabrics used for apparel.

1.5 *This standard does not purport to address all of the safety problems, 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:*

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<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.63 on Home Furnishings. Current edition approved ~~Aug. 15, 1993~~; May 10, 2000. Published ~~October 1993~~; July 2000. Originally published as D 5433-93. Last previous edition D 5433-93.

**TABLE 1 Woven or Knitted Terry Fabric Specification Requirements**

	Terry Requirements			Section
	Kitchen Towels	Dishcloths	Bath, Hand, Washcloths, Bath Sheets	
Breaking Force (CRT)				7.1
Length	178 N (40 lbf) min	220 N (50 lbf) min	178 N (40 lbf) min	
Width	133 N (30 lbf) min	178 N (40 lbf) min	133 N (30 lbf) min	
Bursting Force (knits only)				
—Diaphragm	<u>222 N (50 lbf) min</u>	<u>222 N (50 lbf) min</u>	<u>—222 N (50 lbf) min</u>	7.1.2
Diaphragm	<u>222 N (50 lbf) min</u>	<u>222 N (50 lbf) min</u>	<u>222 N (50 lbf) min</u>	7.1.3
Nonfibrous material	<u>3% max</u>	<u>5% max</u>	<u>—3% max</u>	7.1.3
Nonfibrous material	<u>3% max</u>	<u>5% max</u>	<u>3% max</u>	7.1.4
Dimensional Change:				7.1.4
Dimensional Change:				7.1.5
—Length	<u>10% max</u>	<u>15% max</u>	<u>—10% max</u>	
Length	<u>10% max</u>	<u>10% max</u>	<u>10% max</u>	
—Width	<u>6% max</u>	<u>5% max</u>	<u>—4% max</u>	
Width	<u>5% max</u>	<u>5% max</u>	<u>4% max</u>	
Bow and Skewness	<u>6% max</u>	<u>6% max</u>	<u>—6% max</u>	7.1.5
Bow and Skew	<u>6% max</u>	<u>6% max</u>	<u>6% max</u>	7.1.6
Colorfastness: <sup>A</sup>				
—Laundering:				7.1.6.1
Laundering:				7.1.7.1
Shade Change	Class 4 <sup>B</sup> min	Class 4 <sup>B</sup> min	Class 4 <sup>B</sup> min	
Staining	Class 3 <sup>C</sup> min	Class 3 <sup>C</sup> min	Class 3 <sup>C</sup> min	
—Crocking:				7.1.6.2
Crocking:				7.1.7.2
Dry	Class 4 <sup>D</sup> min	Class 4 <sup>D</sup> min	Class 4 <sup>D</sup> min	
Wet	Class 3 <sup>D</sup> min	Class 3 <sup>D</sup> min	Class 3 <sup>D</sup> min	
—Light (20 AATCC FU)	<u>Step 4<sup>B</sup> min</u>	<u>Step 4<sup>B</sup> min</u>	<u>—Step 4<sup>B</sup> min</u>	7.1.6.3
Light (20 AATCC FU)	<u>Step 4<sup>B</sup> min</u>	<u>Step 4<sup>B</sup> min</u>	<u>Step 4<sup>B</sup> min</u>	7.1.7.3
Absorbency	Pass	Pass	<u>—Pass</u>	7.1.7
Absorbency	Pass	Pass	Pass	7.1.8
Flammability	Class I	Class I	<u>—Class I</u>	7.1.8
Flammability	Class I	Class I	Class I	7.1.9
Laundered Appearance	Acceptable	Acceptable	Acceptable	7.2.1

<sup>A</sup> Class for color change and color transfer is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for severe color change or color transfer. The numerical rating in Table 1 or higher is acceptable.

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

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

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

D 123 Terminology Relating to Textiles<sup>2</sup>

D 629 Test Methods for Quantitative Analysis of Textiles<sup>2</sup>

D 1230 Flammability of Apparel Textiles<sup>2</sup>

D 1424 Test Method for Tearing Strength of Fabrics by the Falling-Pendulum Type (Elmendor) Apparatus<sup>2</sup>

D 2261 Test Method for Tearing Strength of Fabrics by The Tongue (Single Rip) Procedure (Constant-Rate-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>3</sup>

D 2905 Practice for Statements on Number of Specimens for Textiles<sup>2</sup>

D 3136 Terminology for Permanent Care Labels for Consumer Textile and Leather Products Other Than Carpets and Upholstery<sup>2</sup>

D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method<sup>4</sup>

D 3787 Test Method for Bursting Strength of Knitted Goods—Constant-Rate-of Traverse (CRT) Ball Burst Test<sup>4</sup>

D 3882 Test Method for Bow and Skewness (Bias) in Woven and Knitted Fabrics<sup>4</sup>

D 3938 Guide for Evaluation of Textile Products in Relation to Refurbishing Described on Care Labels<sup>4</sup>

D 4390 Practice for Evaluation of the Performance of Terry Bathroom Products for Household Use<sup>4</sup>

D 4772 Test Method for Surface Water Absorption of Terry Fabrics (Water Flow Test Method)<sup>4</sup>

D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)<sup>4</sup>

<sup>2</sup> Annual Book of ASTM Standards, Vol 07.01.

<sup>3</sup> Discontinued- See 1995 Annual Book of ASTM Standards, Vol 07.021.

<sup>4</sup> Available from American Association

<sup>4</sup> Annual Book of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709; ASTM Standards, Vol 07.02.

**TABLE 2 Non Terry Fabric Requirements**

	Dishcloths	Huck & Crash Towels	Section
Breaking Force (CRT)			7.1
Length	220 N (50 lbf) min	178 N (40 lbf) min	
Width	178 N (40 lbf) min	133 N (30 lbf) min	
Bursting Force (knits only)			
<del>Diaphragm</del>	<del>222 N (50 lbf) min</del>	<del>222 N (50 lbf) min</del>	<del>7.1.2</del>
Diaphragm	222 N (50 lbf) min	222 N (50 lbf) min	7.1.3
<del>Nonfibrous material</del>	<del>5% max</del>	<del>5% max</del>	<del>7.1.3</del>
Nonfibrous material	5 % max	5 % max	7.1.4
<del>Dimensional Change:</del>			<del>7.1.4</del>
Dimensional Change:			7.1.5
<del>Length</del>	<del>15% max</del>	<del>15% max</del>	
Length	10 % max	15 % max	
Width	5 % max	5 % max	
<del>Bow and Skewness</del>	<del>6% Acceptable</del>	<del>6% Acceptable</del>	<del>7.1.5</del>
Bow and Skew	6 % Acceptable	6 % Acceptable	7.1.6
Colorfastness: <sup>A</sup>			
<del>Laundrying:</del>			<del>7.1.6.1</del>
Laundrying:			7.1.7.1
Shade Change	Class 4 <sup>B</sup> min	Class 4 <sup>B</sup> min	
Staining	Class 3 <sup>C</sup> min	Class 3 <sup>C</sup> min	
<del>Croeking:</del>			<del>7.1.6.2</del>
Croeking:			7.1.7.2
Dry	Class 4 <sup>D</sup> min	Class 4 <sup>D</sup> min	
Wet	Class 3 <sup>D</sup> min	Class 3 <sup>D</sup> min	
<del>Light (20 AATCC FU)</del>	<del>Step 4<sup>B</sup> min</del>	<del>Step 4<sup>B</sup> min</del>	<del>7.1.6.3</del>
Light (20 AATCC FU)	Step 4 <sup>B</sup> min	Step 4 <sup>B</sup> min	7.1.7.3
Absorbency	Pass	Pass	7.1.7
Absorbency	Pass	Pass	7.1.8
Flammability	Pass	Pass	7.1.8
Flammability	Class 1	Pass	
Laundered Appearance	Acceptable	Acceptable	7.2.1

<sup>A</sup> Class for color change and color transfer is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for severe color change or color transfer. The numerical rating in Table 1 or higher is acceptable.

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

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

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

## 2.2 AATCC Methods:<sup>5</sup>

### 8 Colorfastness to Crocking

#### 16A Colorfastness to Light: Carbon Arc Lamp Continuous Light

#### 16E Colorfastness to Light: Water Cooled Xenon-Arc Lamp, Continuous Light

#### 61 Colorfastness to Washing, Domestic and Laundering Commercial, Accelerated

#### 88B Appearance of Seams in Wash and Wear Items After Home Laundering

#### 135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

#### 96 Dimensional Changes in Laundering of Woven and Knitted Fabrics Except Wool

#### 97 Non-Cotton Content of Bleached Cotton Textiles

#### 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

#### Evaluation Procedure 1 Gray Scale for Color Change

#### Evaluation Procedure 2 Gray Scale for Staining

#### 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 *bath sheet, n*—a textile terry product with end hems or fringes and side hems or selvages that is generally much larger than a bath towel.

3.1.2 *bath towel, n*—a textile terry product with end hems or fringes and side hems or selvages, which is used to dry a person's body after bathing or swimming.

3.1.3 *crash towel, n*—a plain weave nonterry product with hems or selvages which has a rough texture caused by uneven yarns.

<sup>5</sup> Multifiber Test Fabric, No. 10 is available

<sup>5</sup> Available from Test Fabrics, Inc., American Association of Textile Chemists and Colorists (AATCC), P.O. Box 420, Middlesex, NJ 08841-12215, Research Triangle Park, NC 27709.

3.1.4 *finger tip towel, n*—a textile product with fringes and side hems or selvages which is smaller than a hand towel, generally used as decoration and to dry hands.

3.1.5 *huck towel, n*—a plain weave nonterry foundation product constructed with small warp and filling floats, having hems or selvages, which is used to dry a person’s hands and utensils such as glasses, plates, bowls, and flatware.

3.1.6 *terry towel, n*—a textile product with end hems or fringes and side hems or selvages which is made with loop pile on one or both sides generally covering the entire surface or forming strips, checks, or other patterns.

3.1.7 *towel, n*—an absorbent textile product used for drying or wiping.

3.1.8 For definitions of other textile terms used in this specification, refer to individual ASTM Standards and AATCC Test Methods, Terminology D 123 and Terminology D 3136, or your dictionary.

#### 4. Specification Requirements

4.1 *Product*—The properties to be evaluated and the acceptance criteria assigned to these areas shall be set by mutual agreement between the purchaser and the supplier.

4.2 *Fabrics*—The properties of fabrics for institutional and household kitchen towels, dishcloths, huck towels, crash towels, washcloths, hand towels, bath towels, and bath sheets shall conform to the specification requirements in Tables 1 and 2.

#### 5. Significance and Use

5.1 Upon mutual agreement between the purchaser and the supplier, woven or knitted products intended for this end use should meet all of the requirements listed in Table 1 of this specification for terry products and Table 2 for non terry products.

5.2 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 or Table 2. Therefore, one or more of the requirements listed in Table 1 or Table 2 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 product meets ASTM Specification 63-707 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 or Table 2 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.

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 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 *Specimens*—Take the number of specimens directed in each of the applicable test methods. Perform the tests on the product as it reaches the customer. Any “partially finished” or “ post-finish” 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 D 2905 to determine the number of specimens per laboratory sample unit.

6.4.1 Use a reliable estimate of the variability of individual observations on similar materials in the user’s laboratory,

6.4.2 A 95 % probability level, and

6.4.3 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. Testing for Household and Institutional Use

7.1 *Test Methods—Fabric Testing*— The physical and colorfastness properties of the fabric in the products shall be evaluated as directed in the following:

7.1.1 *Breaking Force*—Determine the breaking force as directed in the grab test procedure of Test Method D 5034, using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at  $300 \pm 10$  mm/min ( $12 \pm 0.5$ ) in./min.

NOTE 2—If preferred, a constant-rate-of-extension (CRE) tensile testing machine may be used. The crosshead speed should be as agreed upon between the purchaser and the supplier. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy the CRT method shall prevail.

7.1.2 *Tear Strength*— Determine the tear strength as directed in Test Method D 1424.

NOTE 3—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.

**7.1.3 *Bursting Force (Knit Fabrics Only)***— Determine the bursting force of knit fabrics as directed in Method D 3787 using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or as directed in Method D 3786 using an approved type of diaphragm bursting tester as agreed upon between the purchaser and the supplier.

**7.1.34 *Nonfibrous Material***—Determine the nonfibrous material as directed in AATCC Method 97.

NOTE 34—Determine only the water-soluble and enzyme-extractable material.

**7.1.45 *Dimensional Change***—Determine the maximum dimensional change after five launderings following permanently attached care label instructions, or as directed in AATCC Method 135 for household use or AATCC Method 96 for institutional use as agreed upon between the purchaser and the supplier.

**7.1.45.1** The wash conditions and drying procedure shall be as specified by the seller when using AATCC Method 135 for household products or AATCC Method 96 for institutional products.

**7.1.45.2** When chlorine bleach is to be used, introduce one cup of any liquid chlorine household bleach containing 5.25 % sodium-hypochlorite (5.0 % available chlorine) into the washer in the manner directed on the bleach container. When non-chlorine bleach is to be used, introduce it into the washer in the amount and manner directed on the bleach container.

~~**7.1.5 *Bow and Skewness***—Before and after laundering, determine the bias of the fabrics as directed in Method D 3882. Applicable tolerances for bow and bias should be agreed upon between the purchaser and the supplier.~~

~~**7.1.6 *Bow and Skew***—Before and after laundering, determine the bias of the fabrics as directed in Method D 3882. Applicable tolerances for bow and bias should be agreed upon between the purchaser and the supplier.~~

**7.1.7 *Colorfastness:***

**7.1.67.1 *Laundering***—Determine the colorfastness to laundering as directed in Test 4-A of AATCC Method 61 unless otherwise agreed upon between the purchaser and the supplier. Use Multifiber Test Fabric No. 10

to<sup>6</sup> to determine the staining characteristics:

NOTE 45—For all unbleachable items, Test 3-A will be used.

**7.1.67.2 *Crocking***—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8 for solid shades and AATCC Method 116 for prints or as agreed upon between the purchaser and the supplier.

**7.1.67.3 *Light***—Determine colorfastness to light as directed in AATCC Method 16A or AATCC Method 16E.

NOTE 56—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading apparatus cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E shall prevail.

**7.1.78 *Absorbency***—Determine the absorbency for terry products as directed in Test Method D 4772. For other products in this specification, the absorbency test method shall be as agreed upon between the purchaser and the supplier. Acceptable absorbency shall be as agreed upon between the purchaser and the supplier.

**7.1.89 *Flammability***—The flammability requirements shall be as agreed upon between the purchaser and the supplier, except when regulated by applicable Government mandatory standard. If flammability is to be tested, Test Method D 1230 can be used as the method of evaluation only as received and not washed.

**7.2 *Product***—The physical characteristics of the product shall be evaluated as directed in the following:

**7.2.1 *Appearance***—Before and after laundering, determine the appearance of selvages, hems, seams and dobby border, and hem failure or such other appearance characteristics as are agreed upon between the purchaser and the supplier.

## **8. Report**

8.1 State that the specimen(s) were tested as directed in Performance Specification D 5433. Describe the fiber content, the type of fabric, the type(s) of product tested, and identify the components.

8.2 The report shall include the following additional information:

8.2.1 Objective of the test,

8.2.2 Description and identification of product(s),

8.2.3 Description of the method of sampling used,

8.2.4 List of performance characteristics evaluated, the test method used for each, and the results of each,

8.2.5 Number of laundering cycles and the wash conditions used, and

8.2.6 Conclusion(s), if appropriate.

## **9. Conformance**

9.1 When the purchaser and the supplier have agreed upon specific requirements for the characteristics that are to be considered, products that fail to meet these requirements may be rejected. Rejection should be reported to the supplier in writing. In case of disagreement with the results of the test, the supplier may make claim for a retest.

## **10. Keywords**

10.1 bath products; household; institutional; kitchen products; towelings

<sup>6</sup> Multifiber Test Fabric, No. 10 is available from Test Fabrics, Inc., P.O. Box 420, Middlesex, NJ 08841.

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