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Standard Guide for Conducting Wear Tests on Textiles[1]

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ε[1] NOTE—Section 5.1 was revised editorially in October 2015.

1. Scope

1.1 This guide is intended to provide guidance for the design of an experiment for the purpose of developing a prediction of expected wear performance of apparel and textile products when exposed to actual use conditions.

1.2 This guide recommends the use of a product for which a history of its performance is known from laboratory testing and consumer use as the basis for statistical significance of new product's performance, however, other design or experimental approaches may be used.

1.3 The wide variety of textile products and the conditions under which consumers will use products prevents the inclusion of all types of wear trial experiments for research and development, product innovation studies, and special needs such as those for healthcare industry or military.

1.4 *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]

2.1.1 *Fabric and Apparel Tests:*

D2051 Test Method for Durability of Finish of Zippers to Laundering
D2052 Test Method for Colorfastness of Zippers to Drycleaning
D2057 Test Method for Colorfastness of Zippers to Laundering
D2058 Test Method for Durability of Finish of Zippers to Drycleaning
D2261 Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)
D2594 Test Method for Stretch Properties of Knitted Fabrics Having Low Power
D3107 Test Methods for Stretch Properties of Fabrics Woven from Stretch Yarns
D3511 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Brush Pilling Tester
D3512 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Random Tumble Pilling Tester
D3514 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Elastomeric Pad
D3884 Guide for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
D3885 Test Method for Abrasion Resistance of Textile Fabrics (Flexing and Abrasion Method)
D3886 Test Method for Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Apparatus)
D3938 Guide for Determining or Confirming Care Instructions for Apparel and Other Textile Products
D3939 Test Method for Snagging Resistance of Fabrics (Mace)
D4157 Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)
D4231 Practice for Evaluation of Launderable Woven Dress Shirts and Sports Shirts
D4390 Practice for Evaluation of the Performance of Terry Bathroom Products for Household Use (Withdrawn 1994)[3]
D4966 Test Method for Abrasion Resistance of Textile Fabrics (Martindale Abrasion Tester Method)

[1] This guide is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.60 on Fabric Test Methods, Specific.
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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.

D4970 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Martindale Tester
D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
D5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
D6321 Practice for the Evaluation of Machine Washable T-Shirts
D6797 Test Method for Bursting Strength of Fabrics Constant-Rate-of-Extension (CRE) Ball Burst Test
D6828 Test Method for Stiffness of Fabric by Blade/Slot Procedure

2.1.2 *Other ASTM Standards:*
D123 Terminology Relating to Textiles
D4850 Terminology Relating to Fabrics and Fabric Test Methods
D7022 Terminology Relating to Apparel

2.2 *AATCC Standards:*[4]

2.2.1 *Colorfastness and Physical Properties:*
8 Colorfastness to Crocking: AATCC Crockmeter Method
15 Colorfastness to Perspiration
16 Colorfastness to Light
61 Colorfastness to Laundering: Accelerated
88B Smoothness of Seams in Fabrics After Repeated Home Laundering
88C Appearance of Creases in Wash-and-Wear Items After Home Laundering
96 Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool)
116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
117 Colorfastness to Heat: Dry (Excluding Pressing)
124 Appearance of Fabrics After Repeated Home Laundering
125 Colorfastness to Perspiration and Light
128 Wrinkle Recovery of Fabrics: Appearance Method
130 Soil Release: Oily Stain Release Method
135 Dimensional Changes of Fabric after Home Laundering
143 Appearance of Apparel and Other Textile End Products after Repeated Home Laundering
150 Dimensional Changes of Garments after Home Laundering
179 Skewness Change in Fabric Resulting from Home Laundering
183 Transmittance or Blocking of Erythemally Weighted Ultraviolet Radiation through Fabrics
186 Weather Resistance: UV Light and Moisture Exposure
192 Weather Resistance of Textiles: Sunshine-Arc Lamp Exposure With and Without Wetting
202 Relative Hand Value of Textiles: Instrumental Method

2.2.2 *Vapor, Water and Moisture Management Tests:*
22 Water Repellency: Spray Test
35 Water Resistance: Rain Test
42 Water Resistance: Impact Penetration
70 Water Repellency: Tumble Jar Dynamic Absorption Test
79 Absorbency of Textiles
127 Water Resistance: Hydrostatic Pressure Test
193 Aqueous Liquid Repellency: Water/Alcohol Solution Resistance Test
195 Liquid Moisture Management Properties of Textiles Fabrics
197 Vertical Wicking of Textiles
198 Horizontal Wicking Textiles
199 Drying Time of Textiles: Moisture Analyzer Method
200 Drying Rate of Textiles at their Absorbant Capacity: Air Flow Method
201 Drying Rate of Fabrics: Heated Hot Plate Method

2.2.3 *Evaluation Procedures:*
EP1 Gray Scale for Color Change
EP2 Gray Scale for Staining
EP5 Fabric Hand: Guidelines for Subjective Evaluation
EP6 Instrumental Color Measurement
EP7 Instrumental Assessment of the Change in Color of a Test Specimen
EP8 AATCC 9–Step Chromatic Transference Scale
EP9 Visual Assessment of Color Difference of Textiles

[4] *Annual AATCC Technical Manual*, available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709, www.aatcc.org.

EP12 Instrumental Assessment of Degree of Staining
2.2.4 *AATCC Monographs:*
M5 Standardization of Hand Laundering for Fabrics and Textiles
M6 Standardization of Home Laundering Test Conditions

3. Terminology

3.1 For all terms relating to D13.60 Fabric Test Methods, Specific, refer to Terminology D4850; for terms related to D13.61 Apparel, refer to Terminology D7022.

3.1.1 The following terms are relevant to this standard: *control textile*,*end-use*,*evaluation period*, *grade*,*participant*, *performance property*,*rating*, *wear level*,*wear-refurbishing cycle*,*wear-service condition*,*wear test*.

3.2 For all other terminology related to textiles, see Terminology D123.

4. Summary of Guide

4.1 Textiles are subjected to actual wear under service conditions. This practice recommends a control textile having a known wear performance history to be included with other items being tested. Statistical methods for design of test and analysis of data are included that are applicable to all wear tests. Standard procedures for evaluation of textiles are provided.

5. Significance and Use

5.1 This guide may be used to evaluate textiles used in apparel. ~~Earlier publications contained information for use in trials for upholstered furniture products, floor coverings, window treatments, and bed, bath, and table linens. That information is now located in Appendix X1.~~

5.2 This guide may be used for several purposes:
5.2.1 To determine the comparative performance of new or existing products,
5.2.2 To determine the suitability of current products in different end-uses, and
5.2.3 To evaluate and compare the effect of wear of construction details as well as specific fabrics, fibers, dyeings, finishing, fabrication techniques, etc.

5.3 This guide provides for flexibility in design and evaluation since the information sought from each wear test will vary (see Appendix X1).

5.4 This guide may be used to compare the wear performance of two or more textiles when these are included in the same test, or to compare a textile whose properties have not been evaluated with one having a known performance history.

5.5 The standard test methods and guides listed in 2.1 and 2.2 are not to be considered as limited to only those cited. It is recognized that textile innovations of chemistries on fibers and fabrics may require the use of other standards methods or modifications to existing standards. Further, product development efforts within companies may call for the use of internal procedures when investigation of worthiness of the innovation or prediction of consumer preference or satisfaction is questioned.

6. Apparatus and Facilities

6.1 *Laboratory Equipment,* to perform designed tests.

6.2 *Facilities for Conditioning Textiles.*
6.2.1 *Environmental Chambers,* if required.
6.2.2 *Facilities*—for participants to be interviewed, fill out worksheets, change clothes, etc.

6.3 *Work Sheets,* to record data (see Fig. 1).

7. Sampling, Selection, and Number of Specimens

7.1 *Division into Lots*—For acceptance testing, divide the product into lots as agreed upon between the purchaser and the supplier.

7.2 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping cartons directed in an applicable material specification or other agreement between the purchaser and the supplier.

NOTE 1—A realistic specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping cartons, between items within a carton, and between specimens within an item so as to provide a sampling plan which has a meaningful producer's risk, meaningful consumer's risk, acceptable quality level, and limiting quality level.

7.3 *Laboratory Sample*—As a laboratory sample for acceptance testing, take at least two items from each shipping carton in the lot sample.

7.4 *Test Specimens*—Take test specimens from each item in the laboratory sample as directed in the individual test methods or as agreed upon between the purchaser and the supplier. Perform each test on the product as it will reach the consumer.

Wear Test Identification Number _____
Wear Level _____
Fabric Identification _____

	PARTICIPANTS										
	1	2	3	4	5	6	7	8	9	10	etc.
Evaluation Date											
Times Worn											
Hours Worn											
Times Refurbished											
Abrasion											
Bagging											
Color Change											
Crease Retention											
Dimensional Stability											
Fabric Smoothness											
Holes											
% Length Change											
% Width Change											
Pilling											
Seam Puckering											
Snagging											
Washdown (Hand)											
Wear Wrinkling											
Etc.											

FIG. 1 Example of a Wear Test Work Sheet

7.5 For some wear trials where two elements of a textile are being evaluated for specific benefits, a laboratory specimen might require a test garment to be made with one full side from fabric with one application (fiber content, or other element under consideration) and the other full side having the untreated (fiber content or other element) to be compared by a study participant.

8. Procedure

8.1 Define the objectives of the test.

8.2 List the information to be obtained from the test.

8.3 Determine the type and design of the textile product(s) to be tested.

8.4 Select the performance properties to be evaluated to obtain the necessary information. See Table 1.

TABLE 1 Properties That May Be Examined After Each Wear-Refurbishing Cycle or Evaluation Period

Property	Existing Test Methods or Other Standards
Possibilities for Apparel Evaluation	
Abrasion Resistance	D3884,D3885,D3886, D4157
Appearance of collar	D4231
Appearance of creases	AATCC 88C
Appearance of pocket	D4231
Appearance of placket	D4231
Appearance of seams	AATCC 88B,
Appearance of zippers	D2051,D2052,D2057, D2058
Color change, crocking	AATCC 8,116
Dimensional changes, fabric, garments & textile products	AATCC 135 & 150
Smoothness appearance, fabric, garments & textile products	AATCC 124 & 143
Fabric hand	AATCC Eval. 5
Pilling resistance	D3511, D3512,D3514