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Standard Specification for Labeling of UV-Protective Textiles¹

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1. Scope

1.1 This standard describes labeling requirements for textile products intended for the protection of humans from UVA and UVB radiation.

1.2 This standard is not intended to be used for the labeling of medical-device sun protective fabrics and clothing whose labeling is specified in the U.S. Food and Drug Administration's Draft Guidance for the Preparation of a Premarket Notification document.

1.3 The label requirements are in addition to those required by the Care Labeling Rule and fiber content (composition) labeling acts (Wool Products Labeling Act of 1939, and The Textile Fiber Products Identification Act).

1.4 This document contains terminology to be used in the labeling of UV-protective textiles.

1.5 Labeling recommended in this specification will be based on UV-protection data collected by instrumental methods.

1.6 *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](#)

[D3938 Guide for Determining or Confirming Care Instructions for Apparel and Other Textile Products](#)

[D6544 Practice for Preparation of Textiles Prior to Ultraviolet \(UV\) Transmission Testing](#)

¹ This specification is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.65 on UV Protective Fabrics and Clothing.

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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.

2.2 AATCC Standards:³

[AATCC LP1 Home Laundering: Washing Machine](#)

[AATCC LP2 Home Laundering: Hand Washing](#)

[AATCC TM16.3 Colorfastness to Light: Xenon Arc](#)

[AATCC TM162 Colorfastness to Water: Chlorinated Pool](#)

[AATCC TM172 Colorfastness to Powdered Non-chlorine Bleach in Home Laundering](#)

[AATCC TM183 Transmittance or Blocking of Erythemally Weighted Ultraviolet Radiation through Fabrics](#)

[AATCC TM188 Colorfastness to Sodium Hypochlorite Bleach in Home Laundering](#)

2.3 Other Standards:

[15 U.S.C., Chapter 2, Subchapter V, The Textile Fiber Products Identification Act⁴](#)

[15 U.S.C., Chapter 2, Subchapter III, et. seq., Wool Products Labeling Act of 1939⁴](#)

[16 C.F.R. Part 303, Rules and Regulations Under the Textile Fiber Products Identification Act⁴](#)

[16 C.F.R. Part 300, Rules and Regulations Under the Wool Products Identification Act⁴](#)

[16 C.F.R. Part 423, Care Labeling of Wearing Apparel and Certain Piece Goods⁴](#)

[AS/NZS 4399: 1996, Australian/New Zealand Standard Sun Protective Clothing – Evaluation and Classification⁴](#)

[FDA Office of Device Evaluation, Draft Guidance for the Preparation of a Premarket Notification \(510\(K\)\) Submission for Sun Protective Clothing, August 10, 1994⁵](#)

3. Terminology

3.1 For definitions of terms relating to UV-protective textiles refer to Terminology [D123](#).

3.2 The following terms are relevant to this standard: *UV-protective textile*, *ultraviolet protection factor (UPF)*, and *UV-protection categories*.

³ Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, <http://www.aatcc.org>.

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁵ Available from Standards Australia, 1 the Crescent, Homebush NSW 2140 Australia and Standards New Zealand, Level 10, Standards House, 155 The Terrace, Wellington 0001, New Zealand.

3.3 For definition of other terms related to textiles, refer to Terminology **D123**.

4. Significance and Use

4.1 This specification to labeling provides a uniform system of labeling on UV-protective textiles that informs consumers about the amount of UV-protection provided.

4.2 UV-protective textiles labeled according to this standard will permit consumers to compare the amount of protection provided by various textiles and purchase the product that best meets their sun protection needs.

4.3 UV-labeling is in addition to other required labeling of garments including Permanent Care Labels and fiber content (composition) labels.

4.4 Manufacturers are encouraged to provide information to consumers that aids in selecting products that provide the amount of UV-protection desired.

4.5 UV-protective textiles labeled according to this standard specification will be labeled with a UPF value. AATCC TM183 must be used to determine the mean UPF values of unprepared specimens, of specimens prepared using Practice **D6544** (prepared-for-testing specimens), and of specimens taken from garments labeled, “Wash once before wearing,” these specimens being taken after the garment is laundered once according to label directions. The latter specimens are referred to as laundered-once specimens in this document. A label UPF will be calculated for the various types of specimens following directions provided in this document. Usually, the value to be placed on the product label will be the label UPF calculated for the prepared-for-testing specimens or the label UPF calculated for the unprepared specimens, whichever is the lower value. In the case of products to be labeled, “Wash once before wearing,” or similar wording, the UPF value to be placed on the product label will be either the UPF calculated for the prepared-for-testing specimens or the laundered-once specimens, whichever value is the lower one.

4.5.1 *Discussion*—The UPF value to be placed on a garment label needs to be the lowest protection value expected during consumer use over a two-year period. Usually, this UPF value will be that obtained for the prepared-for-testing specimens because they have been laundered 40 times and exposed to UV-radiation to simulate conditions expected to lower the UPF during consumer use. However, for certain fabrics, knits in particular, the fabric manufacturer must tenter (stretch) the fabric to standard width for the garment manufacturer. This process decreases the UPF of the fabric dramatically because the optical porosity, which has a significant influence on UPF, is increased and does not represent the lowest UPF provided to the consumer because after the first laundering shrinkage may restore the lost protection by reducing the optical porosity of the fabric. In these cases, the value to compare to the prepared-for-testing value is logically that of laundered once specimens.

4.6 UV-protective labeling is intended to be used on textile products whose design or styling provides purposeful protection to covered skin.

4.7 UV-protective labeling should be used on any, and all, fabrics or garments, or both, if those products make a UV-protective claim as determined by this specification.

5. Determination of Mean UPF of Prepared-for-Testing Specimens

5.1 The determination of Mean UPF (UPF_m) of prepared-for-testing specimens is based on measurements on specimens that have been exposed to environments that may alter the transmittance of ultraviolet radiation through them. Fabric specimens shall have been prepared for UV transmittance testing according to Practice **D6544**. All specimens shall be tested in the dry state. For materials that are intended to be used where there is a likelihood that the garment will be worn wet, specimens may also be tested in the wet state according to AATCC TM183. If the end use product/garment is expected to be worn wet the purchaser and supplier should agree upon whether a material should or should not be tested in the wet state.

5.2 The measurement site UPF (MS_{UPF}) is the arithmetic average of the UPFs obtained when a prepared-for-testing specimen, is rotated in spectrophotometric equipment as directed in AATCC TM183. The MS_{UPF} shall be calculated for the dry specimen, MS_{UPF} dry using **Eq 1**. Additionally the MS_{UPF} may also be calculated for the wet specimen, MS_{UPF} wet.

$$MS_{UPF} = \frac{UPF = UPF_1 + UPF_2 + \dots + UPF_N}{N} \quad (1)$$

where:

N = the number of measurements at a site on the prepared-for-testing test specimen.

5.3 The test specimen UPF (TS_{UPF}) is the arithmetic average of the measurement site UPFs. Using **Eq 2** Calculate MS_{UPF} for the dry specimen, TS_{UPF} dry and as needed the wet specimen, TS_{UPF} wet.

$$TS_{UPF} = \frac{UPF_1 + UPF_2 + \dots + UPF_N}{N} \quad (2)$$

where:

N = the number of measurement sites.

5.4 The mean UPF (UPF_m) is the arithmetic average of the prepared for testing test specimen UPFs. Using **Eq 3** Calculate UPF_m for the dry specimen, UPF_m -dry and as needed the wet specimen, UPF_m -wet.

$$UPF_m = \frac{UPF_1 + UPF_2 + \dots + UPF_N}{N} \quad (3)$$

where:

N = the number of prepared-for-testing test specimens.

6. Determination of Mean UPF of Unprepared and Laundered-once Specimens

6.1 The Mean UPF (UPF_m) must be calculated using the UPF specimen values of the unprepared specimens or the UPF values of the laundered-once specimens. Proper sampling procedures as stated in Practice **D6544** should have been