



Designation: D6603 – 10

## Standard Guide for Labeling of UV-Protective Textiles<sup>1</sup>

This standard is issued under the fixed designation D6603; 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 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sun protective fabrics and clothing whose labeling is specified in the U.S. Food and Drug Administration's Draft Guidance for the Preparation of a Premarket Notification document.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 guide will be based on UV protection data collected by instrumental methods.

### 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

D123 Terminology Relating to Textiles

D6544 Practice for Preparation of Textiles Prior to Ultraviolet (UV) Transmission Testing

2.2 *AATCC Standards*:

183 Transmittance or Blocking of Erythemally Weighted Ultraviolet Radiation through Fabrics<sup>3</sup>

2.3 *Other Standards*:

15 U.S.C., Chapter 2, Subchapter V, The Textile Fiber Products Identification Act<sup>4</sup>

16 C.F.R. Part 303, Rules and Regulations Under the Textile

Fiber Products Identification Act<sup>4</sup>

15 U.S.C., Chapter 2, Subchapter III, et. seq., Wool Products Labeling Act of 1939<sup>4</sup>

16 C.F.R. Part 300, Rules and Regulations Under the Wool Products Identification Act<sup>4</sup>

16 C.F.R. Part 423, Care Labeling of Wearing Apparel and Certain Piece Goods<sup>4</sup>

AS/NZS 4399: 1996, Australian/New Zealand Standard Sun Protective Clothing – Evaluation and Classification<sup>4</sup>

FDA Office of Device Evaluation, Draft Guidance for the Preparation of a Premarket Notification (510(K)) Submission for Sun Protective Clothing, August 10, 1994<sup>5</sup>

### 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*.

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

### 4. Significance and Use

4.1 This guide 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 guide will be labeled with a UPF value. AATCC Test Method 183 must be used to determine the mean UPF values of unprepared specimens, of specimens prepared using Practice

<sup>1</sup> This guide 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.

Current edition approved June 1, 2010. Published July 2010. Originally approved in 2000. Last previous edition approved in 2007 as D6603-07. DOI: 10.1520/D6603-10.

<sup>2</sup> 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.

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

<sup>4</sup> 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.

<sup>5</sup> 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.

**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 Guide.

## 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 183. 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 183. 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 followed in selecting the yardage from which the unprepared specimens are taken and likewise proper sampling procedures should be followed in selecting the garments to be laundered and from which the laundered-once specimens are taken.

**6.2** The measurement site UPF ( $MS_{UPF}$ ) is the arithmetic average of the UPFs obtained when an unprepared specimen or laundered-once specimen, is rotated in spectrophotometric equipment as directed in AATCC 183. The formula to use is that in 5.2 except that  $N$  = the number of measurements at a site on the unprepared or laundered-once specimen.

**6.3** The test specimen UPF ( $TS_{UPF}$ ) is the arithmetic average of the measurement site UPFs. The formula to be used is that in 5.3.

**6.4** The mean UPF ( $UPF_m$ ) is the arithmetic average of the test specimen UPFs. The formula for calculating it is in Eq 3 except that  $N$  = the number of unprepared or laundered-once test specimens.

## 7. Determination of the Standard Error in the Mean UPF

**7.1** The standard deviation (SD) of the mean UPF should be calculated for the dry specimen,  $SD_{dry}$  and as needed the wet specimen,  $SD_{wet}$  as follows in Eq 4:

$$SD = \sqrt{\frac{\sum_{i=1}^N (UPF_i - meanUPF)^2}{N - 1}} \quad (4)$$