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Standard Guide for
Labeling of UV-Protective Textiles[1]

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sun protective fabrics and clothing whose labeling is specified in the U.S. Food and Drug Administration's Draft Guidance for the Preparation of a Premarket Notification document.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

2. Referenced Documents

2.1 *ASTM Standards:*
D 123 Terminology Related to Textiles[2]
D 3938 Guide for Determining or Confirming Care Instructions for Apparel and Other Textile Consumer Products[3]
D 5489 Guide for Care Symbols for Care Instructions on Textile Products[3]
D 6544 Practice for the Preparation of Textiles Prior to UV Transmission Testing[3]

2.2 *AATCC Standards:*
183 Transmittance or Blocking of Erythemally Weighted Ultraviolet Radiation through Fabrics[4]

2.3 *Other Standards:*
15 U.S.C., Chapter 2, Subchapter V, The Textile Fiber Products Identification Act[5]
16 C.F.R. Part 303, Rules and Regulations Under the Textile

Fiber Products Identification Act[5]
15 U.S.C., Chapter 2, Subchapter III, et. seq., Wool Products Labeling Act of 1939[5]
16 C.F.R. Part 300, Rules and Regulations Under the Wool Products Identification Act[5]
16 C.F.R Part 423, Care Labeling of Wearing Apparel and Certain Piece Goods[5]
AS/NZS 4399: 1996, Australian/New Zealand Standard Sun Protective Clothing - Evaluation and Classification [5]
FDA Office of Device Evaluation, Draft Guidance for the Preparation of a Premarket Notification (510(K)) Submission for Sun Protective Clothing, August 10, 1994[6]

3. Terminology

3.1 *Definitions:*

3.1.1 *UV-protective textile, n*—any textile whose manufacturer and/or seller claims that it protects consumers from ultraviolet (UV) light, claims the reduction of risk of skin injury associated with UV exposure, and/or uses a rating system that quantifies the amount of UV protection afforded.

3.1.1.1 *Discussion*—UV-protective textiles include various articles of apparel, accessories such as hats and shoes, shade devices such as umbrellas, awnings, and baby-carrier covers, and the fabric/materials used to produce these items.

3.1.1.2 *Discussion*—UV-protective textiles are sometimes referred to as sun-protective textiles.

3.1.2 *ultraviolet protection factor (UPF), n*—the ratio of the average effective ultraviolet radiation (UV-R) irradiance transmitted and calculated through air to the average effective ultraviolet radiation (UV-R) irradiance transmitted and calculated through fabric.

3.1.2.1 *Discussion*—A UPF value is a relative ranking of the UV protective capabilities of a textile fabric and should not be construed as a determination of time to sunburn.

3.1.3 *UV-protection categories, n*—a means to indicate the relative amount of protection provided by UV-protective textiles.

3.1.3.1 *Discussion*—Fabrics determined to have UPF values of 15 to 24 are classified in and labeled as having Good UV Protection, fabrics determined to have UPF values between 25

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[1] 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.
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[2] *Annual Book of ASTM Standards*, Vol 07.01.
[3] *Annual Book of ASTM Standards*, Vol 07.02.
[4] Available from American Association of Textile Chemists and Colorists, PO Box 12215, Research Triangle Park, NC 27709.
[5] Available from Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

[6] 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.

and 39 are classed in and labeled as having Very Good UV-Protection, and fabrics determined to have UPF values greater than 39 are classed in and labeled as having Excellent UV Protection.

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 ASTM D 6544 (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 the protection lost is restored as the fabric is likely to shrinkage 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 and/or garments 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 ASTM D 6544.

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.

$$MS_{UPF} = \frac{UPF = UPF_1 + UPF_2 + ... + UPF_N}{N}$$

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. The formula for calculating it is:

$$TS_{UPF} = \frac{UPF_1 + UPF_2 + ... + UPF_N}{N}$$

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. The formula for calculating it is:

$$UPF_m = \frac{UPF_1 + UPF_2 + ... + UPF_N}{N}$$

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 ASTM D 6544 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.