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## Standard Specification for Performance of Bonded, Fused, and Laminated Apparel Fabrics<sup>1</sup>

This standard is issued under the fixed designation D 3135; 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 requirements for performance properties of bonded, fused, and laminated apparel fabrics.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

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

D 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics<sup>2</sup>

D 3512 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Random Tumble Pilling Tester Method<sup>3</sup>

#### 2.2 AATCC Standards:

AATCC Evaluation Procedure 1 (1954), Gray Scale for Color Change<sup>4</sup>

AATCC Test Method 124, Appearance of Durable-Press Fabrics After Repeated Home Launderings<sup>4</sup>

### 3. Terminology

3.1 *blister*, *n*—in bonded, fused, or laminated fabrics, a bulge, swelling, or similar surface condition on either the face fabric or the backing fabric characterized by the fabric being raised from the plane of the underlying component over a limited area to give a puffy appearance.

3.2 *bonded fabric*, *n*—a layered fabric structure wherein a face or shell fabric is joined to a backing fabric, such as tricot, with an adhesive that does not significantly add to the thickness of the combined fabrics.

3.2.1 *Discussion*—In this context, a thin layer of foam is considered an adhesive when the cell structure is completely collapsed by a flame.

3.3 *bond strength*, *n*—of bonded, fused, or laminated fabrics, the tensile force expressed in ounces per 1 in. (25 mm) of width, required to separate the component layers under specified conditions.

3.4 *bubble*—see preferred term *blister*.

3.5 *closed-face fabric*, *n*—a face or shell fabric of closed construction so that no open-face areas appear.

3.6 *crack mark*, *n*—Crack marks are usually the result of combining tight fabric constructions at least one of which does not have sufficient residual stretch to allow the combined fabrics to be bent in an arc without producing crack marks on the concave side of the arc. Crack marks also occur when bonded fabrics are allowed to remain in a creased or wrinkled state before full adhesive cure has taken place. Other causes include the use of excessive adhesive in bonding, or excessive foam thicknesses and excessive foam collapse in flame lamination. sharp break or crease in the surface contour of either the face fabric or the backing fabric that becomes evident when the bonded or laminated composite is rolled, bent, draped, or folded.

3.6.1 *Discussion*—Crack marks are usually the result of combining tight fabric constructions at least one of which does not have sufficient residual stretch to allow the combined fabrics to be bent in an arc without producing crack marks on the concave side of the arc. Crack marks also occur when bonded fabrics are allowed to remain in a creased or wrinkled state before full adhesive cure has taken place. Other causes include the use of excessive adhesive in bonding, or excessive foam thicknesses and excessive foam collapse in flame lamination.

3.7 *foam tear*, *n*—a condition wherein the foam portion of a laminated fabric ruptures prior to the failure of the bond.

3.8 *fused fabric*, *n*—a type of bonded fabric made by adhering a fusible fabric to another fabric, such as for use as an interlining.

3.9 *fusible fabric*, *n*—a utilitarian fabric which has a thermoplastic adhesive applied to one side, usually in a pattern of dots, so that the surface can be bonded to another fabric surface by the use of heat and pressure.

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

<sup>3</sup> Annual Book of ASTM Standards, Vol 07.02.

<sup>4</sup> Technical Manual of the American Association of Textile Chemists and Colorists, available from the AATCC, P. O. Box 12215, Research Triangle Park, NC 27709.

3.10 *interlining, n*—any textile which is intended for incorporation into an article of wearing apparel as a layer between an outer shell and an inner lining.

3.11 *laminated fabric, n*—a layered fabric structure wherein a face or outer fabric is joined to a continuous sheet material, such as a polyurethane foam, in such a way that the identity of the continuous sheet material is retained, either by the flame method or by an adhesive, and this in turn normally but not always, is joined on the back with a backing fabric such as tricot.

3.12 *open-face fabric, n*—a face or shell fabric constructed with specifically designed open areas to show the substrate when joined to another material.

3.13 *puckering, n—in bonded, fused, or laminated fabric, a wavy, three-dimensional effect typified by closely spaced wrinkles, on either the face fabric or the backing fabric or both.*

3.13.1 *Discussion*—Puckering may be due to: (1) differential shrinkage of the component layers, (2) differences in tension when the component layers are combined, or (3) selective lineal delamination.

3.14 For definitions of other textile terms used in this specification, refer to Terminology D 123.

#### 4. Delamination

4.1 *After Drycleaning*—When the front and the back of the bonded, fused, or laminated fabric are mounted without tensioning or stretching and viewed separately as directed in Sections 7.2 and 7.3 on Evaluation in AATCC Method 124, there shall be no visible evidence of separation of the component layers after three cycles in a coin-operated drycleaning machine, without steam pressing.

4.2 *After Laundering*—When the front and the back of the bonded, fused, or laminated fabric are mounted without tensioning or stretching and viewed separately as directed in Sections 7.2 and 7.3 on Evaluation in AATCC Method 124, there shall be no visible evidence of separation of the component layers after five cycles of laundering and five cycles of drying.

#### 5. Shrinkage (or Growth)

##### 5.1 *After Drycleaning:*

5.1.1 The average shrinkage of four test specimens after three cycles in a coin-operated drycleaning machine, followed by one steam pressing, shall be used to assign the observed fabric shrinkage to Class I, Class II, or Class III, which have the following shrinkage limits:

Class	Average Fabric Shrinkage Limits,%	
	Length	Width
I	3.0 or less	3.0 or less
II	3.1 to 6.0	3.1 to 6.0
III	6.1 or more	6.1 or more

5.1.1.1 If the shrinkage of a fabric falls within the allowable limits for width for a specific class but does not meet the limits for length or vice versa, the fabric shall be assigned to the drycleaning class in which the higher shrinkage occurs.

5.1.2 Growth of the fabric shall not exceed 2.5 % in the length direction or 2.5 % in the width direction after three cycles in a coin-operated drycleaning machine, followed by one steam pressing.

5.1.2.1 If a fabric shrinks in drycleaning, for example, less than 3.0 % in length but at the same time grows less than 2.5 % in width or vice versa, it shall be assigned to Class I.

5.1.2.2 If the fabric grows in drycleaning more than 2.5 % in either length or width, it shall be considered unacceptable, regardless of the shrinkage or growth in the other direction.

##### 5.2 *After Laundering:*

5.2.1 The average shrinkage of four test specimens after five cycles of laundering without hand ironing if the fabric is intended for use in a garment which does not require ironing or after hand ironing following the fifth laundering cycle only if the fabric is intended for use in a garment which requires ironing, shall be used to assign the observed fabric shrinkage to Class I, Class II, or Class III as listed in 5.1.1.

5.2.1.1 If the shrinkage of a fabric falls within the allowable limits for width for a specific class but does not meet the limits for length or vice versa, the fabric shall be assigned to the laundering shrinkage class in which the higher shrinkage occurs.

5.2.2 Growth of the fabric shall not exceed 2.5 % in the length direction and 2.5 % in the width direction after five cycles of laundering without hand ironing if the fabric is intended for use in a garment that does not require ironing or after hand ironing following the fifth laundering cycle only if the fabric is intended for use in a garment that requires ironing.

5.2.2.1 If a fabric shrinks in laundering, for example, less than 3.0 % in length but at the same time grows less than 2.5 % in width or vice versa, it shall be assigned to Class I.

5.2.2.2 If the fabric grows in laundering more than 2.5 % in either length or width, it shall be considered unacceptable, regardless of the shrinkage or growth in the other direction.

NOTE 1—Normally, the dimensional stability of a garment is better in laundering or drycleaning than the principal fabric from which it was made due to the stabilizing effect of sewing and seaming and to the preshrinkage obtained in garment pressing.

NOTE 2—Class shrinkage limits are provided because fabrics intended for various end uses do not all require the same shrinkage control to perform in a satisfactory manner after refurbishment.

NOTE 3—If the fabric is intended for over-the-counter sales for home sewing, the fabric should be accompanied by instructions to prestabilize the fabric by using one cycle of the appropriate refurbishment described in 9.1 or 9.2 before converting the fabric into a garment.

#### 6. Appearance and Aesthetics

##### 6.1 *After Drycleaning:*

6.1.1 *Puckering, Crack Marks, Bubbles, or Blisters*—When the front and the back of the bonded, fused, or laminated fabric are mounted without tensioning or stretching and viewed separately as directed in Sections 7.2 and 7.3 on Evaluation in AATCC Method 124, there shall be no visible evidence of puckering, crack marks, bubbles, or blisters of the component layers after three cycles in a coin-operated drycleaning machine, followed by one steam pressing.

NOTE 4—The acceptable change in stiffness shall be determined by agreement between the purchaser and the seller.