



Standard Specification for Performance of Bonded, Fused, and Laminated Apparel Fabrics¹

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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 Textiles²

D 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics²

D 3512 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Random Tumble Pilling Tester Method³

2.2 AATCC Standards:

AATCC Evaluation Procedure 1 (1954), Gray Scale for Color Change⁴

AATCC Test Method 124, Appearance of Durable-Press Fabrics After Repeated Home Launderings⁴

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.

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

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² *Annual Book of ASTM Standards*, Vol 07.01.

³ *Annual Book of ASTM Standards*, Vol 07.02.

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

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.

6.1.2 *Pilling Due to Drycleaning*—After three cycles in a coin-operated drycleaning machine, followed by one steam pressing, the pilling rating of the fabric shall be at least 4 when rated as directed in Test Method D 3512.

6.1.3 *Color Change*—After three cycles in a coin-operated drycleaning machine, followed by one steam pressing, the depth of shade change from the original color of the face fabric, the backing fabric, and the foam, if present and visible, shall not be less than a rating of 4 to 5 when evaluated by

AATCC Evaluation Procedure 1, Gray Scale for Color Change.

NOTE 5—Color change should be reported only when fabrics of the same color and lot with or without a white dummy load are used in a washload or drycleaning load.

6.2 After Laundering:

6.2.1 *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 6.2 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 five cycles of laundering and five cycles of drying (Note 4).

6.2.2 *Pilling Due to Laundering and Drying*—After five cycles of laundering and five cycles of drying, the pilling rating of the fabric shall be at least 4 when rated as directed in Test Method D 3512.

6.2.3 Color Change:

6.2.3.1 *Face Fabric*—After five cycles of laundering and five cycles of drying, the depth of shade change from the original color of the face side of the fabric shall not be less than a rating of 3 to 4 when evaluated by AATCC Evaluation Procedure 1, Gray Scale for Color Change (Note 5).

6.2.3.2 *Backing Fabric*—After five cycles of laundering and five cycles of drying, the depth of shade change from the original color of the backing fabric shall not be less than a rating of 3 when evaluated by AATCC Evaluation Procedure 1, Gray Scale for Color Change (Note 5).

6.2.4 *Wrinkles*—If the fabric is designated as “durable press,” the unpressed fabric shall have a minimum smoothness rating of 4 after five cycles of laundering and five cycles of drying without ironing when rated as directed in Section 6 on Evaluation and Table II in AATCC Method 124.

7. Strength of Bond

7.1 *Types of Fabric*—Strength of bond shall be specified only on closed face fabrics. Fabrics with open-face areas, such as laces or open-face knitted fabrics designed specifically to show the substrate, may not have enough fabric area available for bonding to give a useful indication of bond durability.

7.2 *After Drycleaning*—After three cycles in a coin-operated drycleaning machine, the minimum wet (in perchlorethylene) bond strength of the fabric shall be 1.5 ozf/in. (16 N/m) of width when tested as directed in Section 13.3 of Test Methods D 2724.

7.3 *After Laundering*—After five cycles of laundering and five cycles of drying, the minimum wet (in water) bond strength of the fabric shall be 1.5 ozf/in. (16 N/m) of width when tested as directed in Section 13.3 of Test Methods D 2724.

8. Test Method

8.1 Test all specimens as directed in Test Methods D 2724.

9. General Requirements

9.1 *Drycleanable Fabrics*—For bonded, fused, or laminated fabrics designated as drycleanable only, determine conformance to this specification after three cycles in a coin-operated

drycleaning machine, followed by one steam pressing after the third cycle only.

NOTE 6—This specification requires the use of a coin-operated type of drycleaning machine, because available evidence shows that the action of this type of drycleaning machine is more severe than commercial drycleaning machines or various small-scale laboratory-type drycleaning machines.

9.2 *Launderable Fabrics*—For bonded, fused, or laminated fabrics designated as launderable, determine conformance to this specification after (1) five cycles of laundering and five cycles of drying by methods selected from the alternative procedures included in Section 11 in Test Methods D 2724; and (2) three cycles in a coin-operated drycleaning machine, followed by one steam pressing after the third cycle only, unless the fabric is designated expressly as unsuitable for drycleaning.

10. Report

10.1 State that the fabric was evaluated as directed in ASTM Specification D 3135. Describe the material or product sampled, and state the method of sampling used.

10.2 State that the fabric was tested as directed in ASTM Test Methods D 2724.

10.3 Report the following information:

10.3.1 State whether the fabric was tested as drycleanable or as launderable and drycleanable, including the laundering and the drying procedures used.

10.3.2 State whether all parameters specified in ASTM Specification D 3135 were evaluated.

10.3.3 State whether the fabric passed or failed each of the parameters evaluated in ASTM Specification D 3135.

11. Conformance

11.1 If the fabric passed each of the parameters evaluated, consider the lot a valid delivery.

11.2 Laminated fabrics show a relatively wide variation in bond strength and shrinkage (in Methods D 2724, see Note 9 and the data presented in Table 1 through Table 4). These data show that it is possible for two laboratories to report shrinkage of separate samples of the same fabric ranging from Shrinkage Class I to Shrinkage Class III. Similarly, wet bond strength on borderline fabrics may be classed as acceptable or unacceptable by different laboratories or even within a laboratory when retesting.

11.3 In view of the inherent variability characteristically present within a piece of a bonded, fused, or laminated fabric, if test results for one or more characteristics do not conform to the specifications, the purchaser and the seller should give consideration to taking for a retest a new laboratory sample from either the original lot or a new lot sample. Under these circumstances, the purchaser and the seller must also decide at the same time whether the lot shall be evaluated on the combined test results from both samples or solely on the test results from the second sample, to be considered a valid delivery.

NOTE 7—Levels of performance for specific parameters other than those covered in this specification may be acceptable when agreed upon by the purchaser and the seller. When such fabrics are acceptable to both

the purchaser and the seller, state in the report which properties conformed to this specification.

12. Keywords

12.1 apparel; appearance; bonded fabric; delamination strength; dimensional change

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