**Designation: D 4119 – 01**

# Standard Performance Specification for Men's and Boys' Knitted Dress Shirt Fabrics[1]

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## 1. Scope

1.1 This performance specification covers knitted fabrics comprised of any textile fiber or mixture of fibers, used in men's and boy's dress shirts.

1.2 This performance specification is not applicable to knitted fabrics used for interlinings.

1.3 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[2]

D 2594 Test Methods for Stretch Properties of Knitted Fabrics Having Low Power[2]

D 2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens for Textiles[2]

D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[3]

D 3787 Test Method for Bursting Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

2.2 *AATCC Methods:*[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16 Colorfastness to Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics after Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics

172 Colorfastness to Non-chlorine Bleach in Home Laundering

188 Colorfastness to Chlorine Bleach in Home Laundering

Evaluation Procedure No. 1 Gray Scale For Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

2.3 *Federal Standard:*[5]

16 CFR, Chapter II—Consumer Product Safety Commission Subchapter D—Flammable Fabrics Act Regulations

2.4 *Military Standard:*[6]

MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes

NOTE 1—Reference to test methods in this specification give only the permanent part of the designation of ASTM, AATCC, or other test methods. The current editions of each test method cited shall prevail.

## 3. Terminology

3.1 *Definitions:*

3.1.1 *dimensional change, n— in pressing and finishing of textiles,* the change in dimensions of a fabric caused by pressing and finishing during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Terminology D 123.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No method is available for reproducing on a laboratory level the results of industrial press or finishing treatments, or both, used in the manufacture of garments.[7]

3.3 Definitions of terms found in a dictionary of common

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

[3] Discontinued; see *1997 Annual Book of ASTM Standards,* Vol 07.02.

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

[5] Available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

[6] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[7] The development of a method has been referred to Subcommittee D13.59.

terms are suitable for this performance specification.

## 4. Specification Requirements

4.1 The properties of fabrics for men's and boy's knitted dress shirts shall conform to the specification requirements in Table 1.

## 5. Significance and Use

5.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

5.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

5.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4119 except for the following characteristic(s)."

5.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 5.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

5.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

**TABLE 1 Specification Requirements**

NOTE 1—Class in a,b,c and DP is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

| Characteristic | Requirements | Section |
|---|---|---|
| *Bursting strength (load)* (ball burst) | 222 N (50 lbf) | 7.1 |
| *Dimensional change:* | | |
| Pressing and finishing | 2 % max | 7.2.1 |
| After 5 launderings (see 7.2.2.2 if shrinkage exceeds 3%) | 3 % max | 7.2.2 |
| After 3 drycleanings | 3 % max | 7.2.3 |
| Growth | 3 % max | 7.2.4 |
| *Colorfastness:* | | |
| Burnt gas fumes—2 cycles: | | |
| Shade change, original fabric | Class 4[A], min | 7.3.1 |
| Shade change after 1 laundering or 1 drycleaning | Class 4[A], min | |
| Laundering: | | |
| Shade change | Class 4[A], min | 7.3.2 |
| Staining | Class 3[B], min | |
| Drycleaning: | | |
| Shade change | Class 4[A], min | 7.3.3 |
| Crocking: | | |
| Dry | Class 4[C], min | 7.3.4 |
| Wet | Class 3[C], min | |
| Perspiration: | | |
| Shade change | Class 4[A], min | 7.3.5 |
| Staining | Class 3[B], min | |
| Light (20 AATCC FU) (xenon-arc) | Step 4[A], min | 7.3.6 |
| Chlorine Bleach | Class 4[A], min | 7.3.7 |
| Non-Chlorine Bleach | Class 4[A], min | 7.3.8 |
| *Fabric appearance* (see 7.4.1.1) | DP 3.5[D], min | 7.4 |
| *Flammability* | Pass | 7.5 |

[A] A AATCC Gray Scale for Color Change.
[B] AATCC Gray Scale for Staining.
[C] AATCC Chromatic Transference Scale.
[D] For durable press fabrics only.

## 6. Sampling

6.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls as directed in an applicable specification or other agreement between the purchaser and the supplier, such as an agreement to use MIL-STD-105D.

6.2 *Laboratory Sample*—From each roll or piece in the lot sample, cut two laboratory samples the full width of the fabric and at least 375 mm (15 in.) along the selvage.

## 7. Test Method (See Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Test Method D 3787 using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or Test Method D 3786 using an approved type of diaphragm bursting tester as agreed upon between the purchaser and the seller.

NOTE 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers should not be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in 5.4 of AATCC Method 135. Press and finish specimen(s) as agreed upon between the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 4 and 7 of AATCC Method 135 (see Note 2).

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press and using a cycle as directed in 10.1.4.1 through 10.1.4.5 of Test Methods D 2724.

7.2.2 *Laundering*—Determine the maximum-dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135 (Notes 5 and 6).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.2.2 When the dimensional change after five launderings exceeds 3 %, determine the stretch of the fabric after five launderings as directed in Test Methods D 2594 using a 2.2-N (0.5-lbf) load. If the difference between the percent stretch of the laundered fabric and the percent shrinkage due to laundering does not exceed 3 % shrinkage, then the fabric meets the specification requirements in Table 1.

7.2.3 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings as directed in 10.1.1 through 10.1.4 of Test Methods D 2724 (Notes 5 and 6).

7.2.4 *Growth*—Determine the growth of the fabric as directed in Test Methods D 2594.

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. Goods labeled "Dry-cleanable" are to be drycleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done, subtract the pressing and curing dimensional change from the total dimensional change to obtain that portion due to laundering or drycleaning. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not to be added to the dimensional change due to laundering or drycleaning of the fabric as it will reach the consumer (see 6.1).

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23.

NOTE 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61. The test conditions shall be as directed in AATCC Method 135 (Note 5).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132 (Note 5).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8 for solid shades and AATCC Method 116 for prints, or as agreed upon between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16.

NOTE 8—There are distinct differences in spectral distribution between the various types of machines listed in AATCC Method 16, with no overall correlations between them. Consequently, these machines cannot be used interchangeably. In case of controversy, results obtained with the Water Cooled Xenon Arc machine listed in Option E shall prevail.

7.3.7 *Colorfastness to Chlorine Bleach*—Determine colorfastness to light as directed in AATCC Method 16.

7.3.8 *Colorfastness to Non-chlorine Bleach*—Determine colorfastness to light as directed in AATCC Method 16.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and seller as specified in 7.2.2.1 for washable fabrics or as specified in 7.2.3 for dry-cleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in 5.12 of AATCC Method 96.

7.4.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, provided they meet or exceed those of Part 1610 of the Flammable Fabrics Act Regulations.

## 8. Keywords

8.1 shirt