Designation: D3882 – 08 (Reapproved 2020)

Standard Test Method for Bow and Skew in Woven and Knitted Fabrics[1]

This standard is issued under the fixed designation D3882; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of bow and skew of filling yarns in woven fabrics and the courses in knitted fabrics.

1.2 This test method can also be used to measure the bow and skew of printed geometric designs.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles

D1776 Practice for Conditioning and Testing Textiles

D2904 Practice for Interlaboratory Testing of a Textile Test Method that Produces Normally Distributed Data (Withdrawn 2008)[3]

D2906 Practice for Statements on Precision and Bias for Textiles (Withdrawn 2008)[3]

D3990 Terminology Relating to Fabric Defects

3. Terminology

3.1 For all terminology related to Fabric Defects see Terminology D3990.

3.2 The following terms are relevant to this standard: bow, double bow, double hooked bow, double reverse bow, hooked bow, knitted fabric, skew, standard atmosphere for testing textiles.

3.3 For definitions of all other textile terms see Terminology D123.

4. Summary of Test Method

4.1 *Bow*—A straightedge is placed across the fabric between two points at which a marked filling yarn, knitting course, designated printed line, or designated design meets the two selvages or edges. The greatest distance between the straightedge and the marked filling line, knitting course, designated printed line, or designated design is measured parallel to the selvage.

4.2 *Skew*—The straight-line distortion of a marked filling yarn, knitting course, designated printed line, or designated design is measured from its normal perpendicular to the selvage or edge.

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments.

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, the test samples to be used are as homogeneous as possible, are drawn from the material from which the disparate test results were obtained, and are randomly assigned in equal numbers to each laboratory for testing. Other fabrics with established test values may be used for this purpose. The test results from the two laboratories should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If a bias is

[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.60 on Fabric Test Methods, Specific.

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[2] 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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

found, either its cause must be found and corrected, or future test results must be adjusted in consideration of the known bias.

5.2 Individual rolls are normally accepted or rejected on the basis of the maximum amount of bow or skew in a specific roll of fabric. The average bow or skew in a roll or lot or the range of bow or skew in a roll may be determined but are not normally used in the trade for acceptance or rejection.

5.3 Bow or skew can be induced during fabric manufacturing, dyeing, tentering, finishing, or other operations where a potential exists for uneven distribution of tensions across the fabric width. Bow and skew are more visually displeasing in colored, patterned fabrics such as plaids and horizontal stripes rather than in solid colors because the contrast makes the distortion more prominent. These defects may cause sewing problems in such fabrics and draping problems in finished products. In some cases, a specified amount of skew is needed, for example, to prevent twisting of pant legs made of twill fabric. Matching plaids from distorted patterns may create serious problems for the garment manufacturer or home sewer. Wavy or sharp breaks in the bow line are more detrimental to the appearance of small parts of a garment (such as collars, pockets, and so forth) than a gradual slope from a straight line.

5.3.1 Automotive interior textiles used for seat bolsters, cushions, headrests and door panels may be susceptible to bow and skew, especially when visually patterned fabrics are joined or mated to a straight edge surface.

6. Apparatus

6.1 *Measuring Stick or Steel Tape,* graduated in 1-mm (1⁄16-in.) divisions and longer than the width of the fabric that is to be measured.

6.2 *Rigid Straightedge or t-square,* longer than the width of the fabric that is to be measured.

6.3 *Flat Surface,* of sufficient length to unroll or unfold the fabric (see 6.4).

6.4 *Fabric Inspection Table* (Optional), to unroll and roll fabric rolls or unfold and fold fabric bolts with sufficient lighting that provides transmitted light from underneath the fabric to make the defect more clearly visible.

7. Sampling and Test Specimens

7.1 *Primary Sampling Unit*—Consider rolls or bolts of fabric or fabric components of fabricated systems to be the primary sampling unit, as applicable.

7.2 *Laboratory Sampling Unit*—As a laboratory sampling unit take the entire roll or bolt after removing a first 1-mm (1-yd) length. For fabric components of fabricated systems, use the entire system.

7.3 *Test Specimens*—As test specimens, select 3 test areas from each laboratory sampling unit. Exclude the first and last fifth of the roll or bolt or piece length. Select test areas at random but no closer to one another than one fifth of the roll or bolt or piece length.

7.3.1 *Optical test specimens*—Select 3 test areas from each sampling unit. Exclude the first and last 10 m (11 yd) of a roll and test random areas within the roll.

7.3.1.1 Cut pieces that are at least 400 mm (16 in.) in width can be measured for bow and skew.

8. Conditioning

8.1 Condition the test specimens to moisture equilibrium for testing in the standard atmosphere for testing textiles in accordance with Practice D1776 or, if applicable, in the specified atmosphere in which the testing is to be performed.

8.1.1 When full rolls or bolts of fabric cannot be properly conditioned in a reasonable time with available facilities, perform the test without conditioning and report the actual condition prevailing at the time of the test. Such results may not correspond with the results obtained when testing conditioned specimens at the standard atmosphere for testing textiles.

9. Procedure

9.1 Test the test specimens in the standard atmosphere for testing textiles in accordance with Section 8.

9.2 Handle the test specimens carefully to avoid altering the natural state of the material.

9.3 Lay the fabric on a smooth, horizontal surface without tension in any direction or use the optional fabric inspection table.

9.4 *Bow:*

9.4.1 Measure the bow in three places spaced as widely as possible along the length of the fabric or along a minimum of 1 m (1 yd). If possible, make no measurement closer to the ends of the roll or piece of fabric than 1 m (1 yd).

9.4.2 Follow a distinctive color yarn or pattern line across the width of the fabric. Trace one filling yarn, knitting course, or printed line across the full width of the fabric using a soft pencil or suitable marker.

9.4.3 Place a rigid straightedge across the fabric connecting the points at which the distinctive color yarn or pattern line, or marked yarn meets the two selvages or edges.

9.4.4 Measure the distance along the straightedge between the two selvages or edges to the nearest 1 mm (1⁄16 in.) and record as the baseline distance (BL).

9.4.4.1 For certain end uses where several narrow panels are sewn in a garment, it will be necessary to measure the bow across a narrower distance than the total width of the fabric, for example, a width of 38 cm (15 in.). This distance is used as the fabric width when calculating the bow.

9.4.4.2 For automotive or other applications where narrow panels or cut pieces are used, it will be necessary to measure bow across a narrower distance than across the full width of the fabric, for example, a width of 400 mm (16 in.). Use this distance as the fabric width when calculating bow.

9.4.5 Measure the greatest distance parallel to the selvages or edges between the straightedge and the distinctive color yarn or pattern line, or marked yarn to the nearest 1 mm (1⁄16 in.) and record as the bow distance (*D*) including the type. (See Fig. 1).

9.4.5.1 If double bow is evident, measure and record both distances.

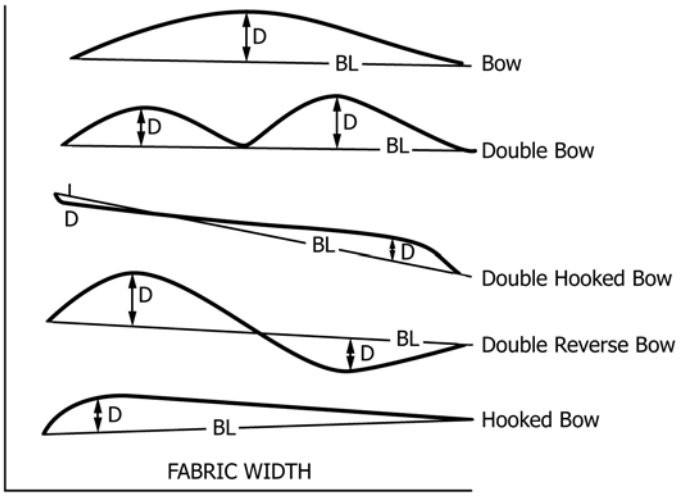

FIG. 1 Typical Bow Conditions

NOTE 1—Fig. 1 represents typical examples of bows in a fabric that do not have any skew. Many variations in the shape or deepest portion of the arc can occur in actual fabrics. No provision is made to measure bow in the presence of skew.

9.4.5.2 When measuring narrow panels, for example, 400 mm (16 in.), measure the bow across the width from left to right in 400 mm (16 in.) increments. For example, measure full width units, 400 mm (16 in.). On the right side align with the right selvage and measure a 400 mm (16 in.) section. These measurements may overlap with some of the previously measured sections.

9.5 *Skew:*

9.5.1 Measure the skew in three places spaced as widely as possible along the length of the fabric or along a minimum of 1 m (1 yd). If possible, make no measurement closer to the ends of the roll or piece of fabric than 1 m.

9.5.2 Follow a distinctive color yarn or pattern line across the width of the fabric. Trace one filling yarn, knitting course, or printed line across the full width of the fabric using a soft pencil or suitable marker (Line AC if right-hand skew, Line DC if left-hand skew).

9.5.3 Place a rigid straight edge or t-square across the fabric width perpendicular to the selvage or edge such that it coincides with the lower point on the fabric at which the distinctive color yarn or pattern line, or marked yarn meets one of the selvages or edges (Line BC).

9.5.4 Measure the distance along the straightedge or t-square between the two selvages or edges (Line BC) to the nearest 1 mm (1/16 in.) and record as the fabric width (*W*). (See Fig. 2.)

9.5.4.1 For automotive or other applications where narrow panels or cut pieces are used, it will be necessary to measure skew across a narrower distance than across the full width of

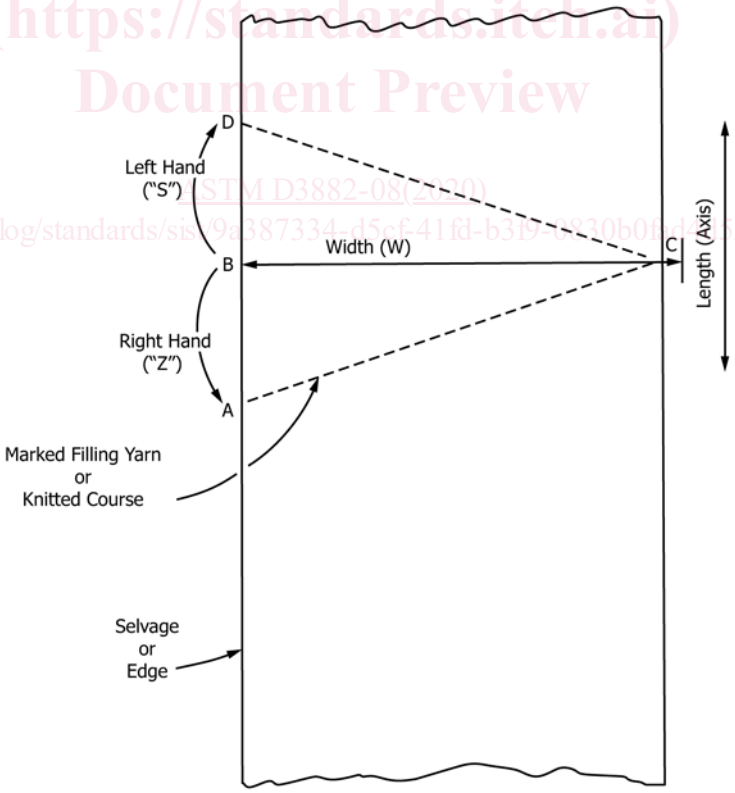

FIG. 2 Typical Skew Conditions