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## Standard Test Method for BURSTING STRENGTH (LOAD) AND ELONGATION OF SEWN SEAMS OF KNIT OR WOVEN STRETCH TEXTILE FABRICS<sup>1</sup>

This standard is issued under the fixed designation D 3940; 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 test method covers the determination of the bursting strength and elongation of sewn seams in knit or stretch fabrics. The sewn seams may be obtained from previously fabricated articles such as garments or may be prepared from fabric samples.

1.2 This test method requires a straight seam line, and is not applicable if the seam line is curved.

1.3 Preparation of test specimens from fabric samples requires prior specification of sewing details as agreed upon by the purchaser and seller.

NOTE 1—If the breaking force of the fabric alone is also required, test as directed in Method D 3787.

### 2. Applicable Documents

#### 2.1 ASTM Standards:

D 76 Specification for Tensile Testing Machines for Textiles<sup>2</sup>

D 123 Definitions of Terms Relating to Textiles<sup>2</sup>

D 204 Testing Sewing Threads<sup>3</sup>

D 1683 Test for Breaking Strength (Load) and Slippage of Yarns of Sewn Seams in Woven Textile Fabrics<sup>3</sup>

D 1776 Practice for Conditioning Textiles for Testing<sup>2</sup>

D 3787 Test for Bursting Strength of Knitted Goods: Constant-Rate-of-Traversal (CRT), Ball Burst Test<sup>3</sup>

D 3823 Practice for Determining Ticket Numbers for Sewing Threads<sup>3</sup>

#### 2.2 Federal Standards:

Fed. Std. No. 751a Standard for Stitches, Seams, and Stitching<sup>4</sup>

### 3. Definitions

3.1 *failure, n.*—in sewn fabric seams, fabric or sewing thread rupture or seam-yarn slippage.

3.1.1 *Discussion*—A seam in knit or stretch fabric is considered to have failed when the sewing thread ruptures due to low longitudinal elongation of the seam.

3.2 *seam allowance, n.*—in sewn fabrics, the distance from the edge of a fabric to the parallel stitch line furthest from that edge.

3.3 *seam assembly, n.*—the composite structure obtained when fabric(s) are joined by means of a seam.

3.3.1 *Discussion*—A seam assembly may be described in terms of the fabric orientation, seam direction, seam type, stitch type, seam allowance, sewing thread tex ticket number(s) and type(s), stitch density, and stitch gage.

3.4 *seam type, n.*—in sewn fabrics, an alphanumeric designation relating to the essential characteristics of fabric positioning and rows of stitching in a specified sewn fabric seam.

3.4.1 *Discussion*—seam types are described in Fed. Std. No. 751a.

3.5 *sewn seam, n.*—in sewn fabrics, a juncture of which two or more planar structures such as textile fabrics, are joined by sewing, usually near the edge.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.54 on Consumer Product Performance.

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<sup>2</sup> 1983 Annual Book of ASTM Standards, Vols 07.01 and 07.02.

<sup>3</sup> 1983 Annual Book of ASTM Standards, Vol 07.01.

<sup>4</sup> Available from Naval Publications and Forms Center, 5801 Tabor Ave., Philadelphia, Pa. 19120.



3.6 *stitch, n.*—in sewn seams, the repeated unit formed by the sewing thread(s) in the production of seams.

3.7 *stitch density, n.*—in sewn seams, the number of stitches per unit length in one row of stitching in the seam.

3.7.1 Determine stitch density as directed in Part II Section 4, Stitches Per Unit Length, of Federal Standard No. 751a.

3.8 *stitch gage, n.*—in sewn fabrics, the perpendicular distance between adjacent parallel rows of stitching.

3.9 *stitch type, n.*—in sewn seams, a numerical designation relating to the essential characteristics of the interlacing of sewing thread(s) in a specified stitch.

3.9.1 *Discussion*—Stitch types are described in Fed. Std. No. 751a.

3.10 *strength, bursting, n.*—the force or pressure required to rupture a textile by distending it with a force, applied at right angles to the plane of the fabric, under specified conditions.

3.11 For definitions of other textile terms used in this method, refer to Definitions D 123.

#### 4. Summary of Method

4.1 Prescribed sewn seams taken from an already sewn item or prepared in accordance with a specification are tested for force to rupture and for extensibility using the ball burst procedure.

#### 5. Significance and Uses

5.1 This test method is useful for determining the rupture force and extensibility of seams in knit or woven stretch fabrics. A knowledge of required seam extensibility is important because many seams in items made of knit or woven stretch fabric must be capable of being extended in use.

5.2 This method is useful for determining optimum seam construction considering seam type, stitch type, stitch density, thread Tex ticket number and type.

5.3 The evaluation of seams prepared for testing requires prior knowledge and duplication of acceptable trade practice because the tests(s) are influenced by the sewing conditions. It is advisable for the parties interested in the test results to come to a prior agreement on the seam assembly details such as seam and stitch type, stitch density, needle size and type, sewing thread size and type, seam allowance, fabric description and direction of seam.

5.4 Seams prepared for this test must be made by competent technicians not only familiar with trade equipment and practice, but also alert to details of the sewing conditions that can affect the test result. The seam breaking force and slippage may otherwise be higher or lower than the representative value.

5.5 This method is not recommended for acceptance testing of commercial shipments since correlation of the test results with actual wear performance has not been established. In some cases, the purchaser and the seller may have to test a commercial shipment of one or more specific materials by the best available method, even though the method has not been recommended for acceptance testing of commercial shipments. In such a case, if there is a disagreement arising from differences in values reported by the purchaser and the seller when using this method for acceptance testing, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller should be determined with each comparison being based on testing specimens randomly drawn from one sample of material of the type being evaluated.

#### 6. Apparatus

6.1 *Tensile Testing Machine (CRE or CRT)*, one of the two types of testing machines described in Specification D 76.

6.2 *Ball Burst Device*,<sup>5</sup> consisting of a ring clamp having an internal diameter of  $1.750 \pm 0.001$  in. ( $44.5 \pm 0.025$  mm) and a steel polished ball having a diameter of  $1.0000 \pm 0.0002$  in. ( $25.4000 \pm 0.0051$  mm), spherical to within 0.0002 in. (0.0051 mm). The mechanism shall be so constructed that when placed in the tensile testing machine the ring clamp shall be attached to and activated by one clamp and the ball by the opposite clamp in such a manner that the ball penetrates the plane of the ring clamp when the tensile machine is operated (see Fig. 1).

NOTE 2—The described equipment is in common use in textile laboratories. Other equipment can be used such as a compression tester in place of the tensile tester or a 25-mm ball in place of the 1-in. ball.

6.3 *Sewing Machine*, with necessary accessories to prepare a prescribed seam.

<sup>5</sup> Available from Scott Tester Co., Inc., Div. of GCA/Precision Scientific, 3737 West Cortland St., Chicago, Ill. 60647; and from Tensile Testers Inc., 73 Maplehurst Ave., Providence, R.I. 02908.