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An American National Standard

Standard Test Method for Archery Bow Component—Cord Material[1]

This standard is issued under the fixed designation F1752; 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 establishes the classification and testing of cord as a component material used in the fashioning of bowstrings.

1.2 This test method is not intended to provide information beyond any evaluation of the cord material that would determine its fitness for use other than in the fabrication of completed bowstrings.

1.3 *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:*[2]

D76 Specification for Tensile Testing Machines for Textiles
D123 Terminology Relating to Textiles
D204 Test Methods for Sewing Threads
D1776 Practice for Conditioning and Testing Textiles
D1907 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method
D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method

3. Terminology

3.1 *bowstring, n*—completed assembly constructed in part from multiple strands of cord material lashed at the center and loop ends with serving string materials and used to connect the limbs of a bow by which to launch an arrow.

3.2 *cord material, n*—applied to a variety of natural or manmade textile materials. Cord material may be of monocord, twisted, cable, or braided construction.

3.3 *denier, tex, n*—direct yarn numbering systems expressing size of cord material in terms of mass (weight) of unit length per 9000 m (9842 yd) for denier or 1000 m (1094 yd) for tex.

3.4 *diameter, n*—measure of the thickness of the cord material.

3.5 *EASL, n*—elongation at a set load.

3.6 *elongation, n*—amount that a cord material stretches measured as a percentage of the original length either at the point of rupture or at some other interval of applied load.

3.7 *free gage length, n*—length of unsupported test specimen between holding clamps and free from contact with any snubbing or other sources that could result in nonuniform gage length measurement.

3.8 *static load stretch/relaxation, n*—measure of the amount a cord material moves while under static load and with load subsequently removed, measured as a percentage of the prestressed original length.

3.9 *standard condition, n*—condition reached by cord material when in moisture equilibrium with a standard atmosphere of a given temperature and relative humidity.

3.10 *strength, n*—maximum force applied to a cord material causing it to break.

4. Significance and Use

4.1 This test method is intended to provide the user of cord materials for bowstrings the basic information for evaluation and procurement.

4.2 This test method is not meant to be all inclusive since special circumstances may occur that will dictate the use of nonconforming procedures for evaluation. Special circumstances and the requirements they establish cannot be anticipated totally and, therefore, must be considered on an individual basis.

5. Test Methods

5.1 *Standard Condition*—Refer to Practice D1776 for standard condition requirements:

$$70 \pm 2°F\ (21 \pm 1°C),\ 65 \pm 2\ \%\ \text{relative humidity.} \quad (1)$$

5.2 *Denier, Tex*—Refer to Test Method D1907, Option 1:

[1] This test method is under the jurisdiction of ASTM Committee F08 on Sports Equipment and Facilitiesand is the direct responsibility of Subcommittee F08.16 on Archery Products.

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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.

TABLE 1 Cord Material Strength Requirements

	Cord Material Strength, lb[A]						
	15–39	40–64	65–89	90–114	115–139	140–164	165–189
Specified weight, lb	5	10	15	20	25	30	35

[A] Multiply by 4.448 for conversion to newtons.

5.2.1 Wind 12–yd reeling using 1.5–yd perimeter reel. Do not tie reeling ends; rather, cut at overlap of stated yardage. Weigh reeling to the nearest 1 mg.

5.2.2 *Calculation*—Report test results as one test specimen/sample and average of three samples:

$$(C \times W)/L = (1)\ \text{Denier or}\ (2)\ \text{Tex} \quad (2)$$

where:

C = (1) 9842 (denier constant) or (2) 1094 (tex constant),
W = weight of reeled yardage, g,
L = length of reeled yardage.

5.3 *Diameter*—Refer to Test Methods D204: 0.375 ± 0.001 in. (9.52 ± 0.02 mm) anvil, weighted to apply 6 ± ozf (1.67 ± 0.03 N)

5.3.1 Report test results as average of five test specimens sample and average of three samples.

5.4 *Static Load Stretch/Relaxation:*

5.4.1 From a lot, select three samples. From each sample, take two test specimens, approximately 1200 mm in length. To each test specimen hang 1-lb (4.448-N) prestress hook weight for 15 min. Mark off index marks 800 mm apart on each test specimen with a marker. Record as "L1 Original Length."

5.4.2 After marking the prestressed test specimen, add specified weight (see Table 1) to each hook weight in addition to 1-lb (4.448-N) prestress weight. Measure index mark distance to nearest 1 mm and record as "L2 Original Stretch."

5.4.3 After 24 h, measure the index mark distance to nearest 1 mm and record as "L3 24-h Stretch."

5.4.4 After 48 h, measure the index mark distance to the nearest 1 mm and record as "L4 48-h Stretch."

5.4.5 Remove specified weight from hook weight leaving 1-lb (4.448-N) original prestress weight for 15 min. Measure index mark distance after 15 min to nearest 1 mm and record as "L5 Permanent Stretch/Relaxation." Report as Stretch or Relaxation.

5.4.6 *Calculation*—Report as average of two test specimens/sample, average of three samples, and specified weight used.

5.4.6.1 *Initial Stretch:*

$$(L2 - L1)/L1 \times 100 = \%\ \text{Initial Stretch} \quad (3)$$

5.4.6.2 *24-h Stretch:*

$$(L3 - L1)/L1 \times 100 = \%\ 24 - \text{h Stretch} \quad (4)$$

5.4.6.3 *48-h Stretch:*

$$(L4 - L1)/L1 \times 100 = \%\ 48 - \text{h Stretch} \quad (5)$$

5.4.6.4 *Stretch/Relaxation:*

$$(L5 - L1)/L1 \times 100 = \%\ \text{Stretch Relaxation} \quad (6)$$

5.5 *Strength, Elongation*—Follow Test Method D2256.

5.5.1 CRE-type testing machine set at 12 ± 0.5 in. (305 ± 10 mm)/min with a gage length of (1) 10 ± 0.1 in. (250 ± 3 mm) from nip to nip for pneumatic flat faced jaws, or (2) 5 ± 0.1-in. (125 ± 3-mm) free gage length (tangent point to tangent point) for capstan clamps. If the specimen breaks within ⅛ in. (3.0 mm) of either pneumatic jaws or capstan clamp tangent points, disregard the result and test another specimen from the same sample. Report test results as average of five test specimens/sample and average of three samples.

5.5.2 Elongation tests using capstan clamps are measured at 80 % of test specimen average breaking load using 100-mm index marks arbitrarily marked along the free gage length due to possible stretching of the test specimen length around the surface of the capstans. Measure the change in length of the index marks after applying a load to test specimen equal to 80 % of sample average breaking strength. Report test results entitled EASL 80 % as the average of five test specimens/sample and the average of three samples.

6. Precision and Bias

6.1 *Precision*—The precision for the procedures in this test method are being determined.

6.2 *Bias*—Since there is no accepted reference material for determining the bias for the procedures used in this test method, no statement is being made.

7. Keywords

7.1 bowstring; cord material; denier; gage length; stretch