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Standard Test Method for Elongation of Leather¹

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¹ This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.07 on Physical Properties—General. This test method was developed in cooperation with the American Leather Chemists Assn.

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1. Scope

1.1 This test method covers the measurement of the elongation or stretch characteristics of leather produced by a tensile load. This test method is intended for use on all types of leather and with all of the breaking load tests. This test method does not apply to wet blue.

1.2 The values given in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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:*

D 1610 Practice for Conditioning Leather and Leather Products for Testing²

D 2209 Test Method for Tensile Strength of Leather²

3. Terminology

3.1 *Definitions:*

3.1.1 *elongation, or stretch*—the increase in length of a span of specimen under tension.

4. Significance and Use

4.1 The elongation measurement may be made at any designated load and is expressed as a percentage of the original distance between the jaws or between bench marks of the unstretched specimen. The speed of the machine is important. Speeds under or more than 10 ± 2 in./min (4.2 ± 0.8 mm/s) will give variables in the results, thus affecting the reproducibility of the method. The direction relative to the backbone and the width of the test specimen determines the magnitude of the elongation. This test method is excellent for development, control, specification acceptance, and service evaluation of leather. This test method may not apply when the conditions of the test employed differ widely from those specified in the test method.

5. Apparatus

5.1 *Testing Machine*, as described in Test Method D 2209.

5.2 *Dividers*, having legs at least 4 in. (102 mm) long and an adjustable screw arrangement for fixing the distance between them.

5.3 *Steel Scale*, graduated to read in 0.02 in. (0.5 mm).

6. Test Specimen

6.1 The specimen shall be dumbbell in shape when the test is made with the tension test. It shall be cut from the test unit of leather by means of a die as shown in Fig. 1 of Test Method D 2209. The direction of the long axis relative to the backbone shall be noted.

6.2 The specimen for narrow strap, welting, lace, and round belting leathers shall be a piece of leather uniform in width and 6 in. (152 mm) long.

6.3 The specimen for the grab method of determining breaking load shall be 6 in. (152 mm) long and 3 in. (76 mm) wide.

² *Annual Book of ASTM Standards*, Vol 15.04.

7. Conditioning

7.1 All specimens shall be conditioned as prescribed in Practice D 1610. Conditioning other than as prescribed shall be noted in the results.

8. Procedure

8.1 Mount the specimen symmetrically with the jaws separated a distance of 4 in. (102 mm).

8.2 Operate the machine so that the movable grip travels at a speed of 10 ± 2 in./min (4.2 ± 0.8 mm/s).

8.3 Follow the distance between the jaws or the difference between bench marks with the dividers until the load at which the elongation is desired has been reached. Take all measurements between the inner edges of the jaws or between the inner edges of the bench marks. Measure the distance between the points of the legs of the dividers to the nearest 0.02 in. (0.5 mm). An autographic attachment is preferred for determining the elongation. With this arrangement the elongation may be obtained from the chart at any desired load.

8.4 If the elongation is determined as a span shorter than the distance between the jaws, use a 2-in. (51-mm) bench marker or its equivalent, as shown in Fig. 1. Mark the specimen over the span at which it is desired to make the elongation measurement.

NOTE 1—In general, results obtained for elongation over a 2-in. (51-mm) span marked by the bench marker on the narrow section of the tension test specimen will be greater than that obtained by determining the average elongation over the entire span between the jaws.

8.5 If an autographic recorder is used, read the elongation to the nearest 0.1 in. (2.5 mm).

9. Calculation

9.1 Calculate the elongation to the nearest 0.1 % of the original distance over the span as follows:

$$\text{Elongation, \%} = [(D_2 - D_1)/D_1] \times 100 \tag{1}$$

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where:

D_1 = span of the original unstretched specimen, in. (mm), and

D_2 = span of the stretched specimen, in. (mm), when the required load has been applied.

10. Report

10.1 The report shall include the following:

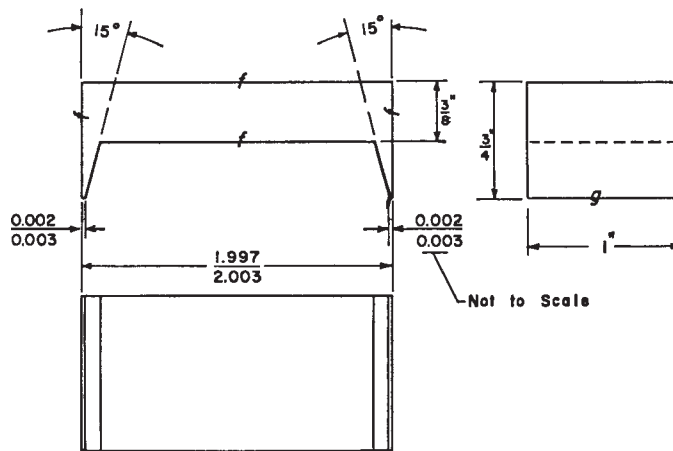
10.1.1 Percentage elongation reported for each specimen or average and reported as the elongation of the sample, and

10.1.2 Direction of the long axis of the specimen relative to the backbone.

11. Precision and Bias

11.1 The following criteria may be used to judge the acceptability of the results if at least 15 units have been tested:

11.1.1 *One Operator, Duplicate Specimens, Same Skin or Same Unit*—Results by the same operator on duplicate adjacent specimens in a skin taken from the official sampling position or from the same unit in another form should not be considered suspect unless the coefficient of variations exceeds:



Metric Equivalents							
in.	0.002	0.003	3/8	3/4	1	1.997	2.003
(mm)	(0.05)	(0.08)	(9.5)	(19)	(25.4)	(50.72)	(50.88)

FIG. 1 Bench Marker

Shoe upper	9 %
Calfskin ^A	7 %
Upholstery	10 %
Garment	8 %
Laces (Note 2)	14 %
Welting (Note 3)	17 %

^A 3 ± 1 oz, 0.0468 ± 0.0156 in. (1.189 ± 0.396 mm).

NOTE 2—Lace samples were taken at random from the bundles of finished laces. The location on side and direction of testing is unknown so the comparison should be between and within bundles.

NOTE 3—Welting samples were taken at random from the finished welting. The location on the side and direction of testing is unknown, so the comparisons should be between and within hanks.

11.1.2 *Two Laboratories, Duplicate Specimens, Same Skin or Same Unit*—Results submitted on leather of the type listed in 11.1.1 by each of two laboratories on duplicate adjacent specimens in a skin taken from the official sampling position or from a unit in a different form should not be considered suspect unless the averages of the two results differ by more than 5 %. (See Notes 4-6).

NOTE 4—The reproducibility reported in 11.1.2 is based on data obtained at two laboratories, each with a different type of testing machine and a different operator. One machine is a load-cell type and the other a pendulum type. The results show very close correlation between laboratories.

NOTE 5—The results are based on tests on 30 sides of leather and do not apply to findings and cut parts except for laces and welting.

NOTE 6—The precision data for between skins are not given because the results were based on different skins of several production lots. The variables in leather for between skins will give higher variation of the results, but this factor should not affect the precision of the method.

12. Keywords

12.1 elongation; leather; stretch

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