Designation: D 2821 – 00

Standard Test Method for Measuring the Relative Stiffness of Leather by Means of a Torsional Wire Apparatus[1]

This standard is issued under the fixed designation D 2821; 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 describes the use of a torsional apparatus for measuring the relative stiffness of gloving leathers. This test method does not apply to wet blue.

1.2 The values stated in SI units are to be regarded as the standard. The values shown in parentheses are provided 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 1053 Test Method for Rubber Property-Stiffening at Low Temperatures: Flexible Polymers and Coated Fabrics[2]

D 1610 Practice for Conditioning Leather and Leather Products for Testing[3]

3. Significance and Use

3.1 This test method is designed to measure the apparent torsional modulus of a leather specimen. Experience has shown that the torsion modulus of leather is directly related to the characteristic known as stiffness when felt in a glove.[4]

4. Apparatus

4.1 *Torsion Apparatus*[5]—The torsional apparatus, Fig. 1, shall consist of a torsion head, *A*, capable of being turned through a complete circle in a plane normal to the torsion wire. The torsion head is equipped with an upper dial or protractor, *K*, graduated from 0 to 360° in increments not greater than 5°, and a fixed index pointer, *L*. The protractor is attached to the torsion head by means of a friction bearing to permit movement for adjusting the zero point. The top of the torsion wire is attached to the torsion head at knob *H* by set screw *B* and passes through the center of a loosely fitting sleeve gripped by the friction bearing. The torsion head support carries a split bearing which can be activated by knob *G*, thus locking the sleeve carrying the wire and permitting adjustment of the zero point of the protractor without disturbing the position of the torsion wire. The bottom of the wire shall be fastened to the test specimen clamp, *C*, by means of a set screw connector, *D*. A pointer, *I*, mounted above a fixed dial, *J*, shall be provided to indicate the twist applied to the specimen. Torsion is applied by manually turning knob *H* or the remote control knob *M*.

4.2 *Stand*—The torsion apparatus shall be mounted on a rigid supporting stand.

4.3 *Torsion Wires*[6]—Torsion wires shall be made of tempered spring wire 315 mm (12.5 in.) long, with each end firmly affixed within a rod measuring 5 mm (3⁄16 in.) in diameter and

[1] This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.04 on Apparel and Upholstery. This test method was developed in cooperation with the American Leather Chemists Assn.

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[2] *Annual Book of ASTM Standards*, Vol 09.01.

[3] *Annual Book of ASTM Standards*, Vol 15.04.

[4] Gloves were made from the neck and butt areas of cattlehide work-glove leather selected for 3° of softness varying from soft to firm. These were ranked from softest to firmest by 20 individuals. Since there was some overlapping of rank as assigned by individual observers, the final rank was assigned according to highest number of selections. Specimens of leather cut from the sides in the area from which each glove was cut were tested for stiffness according to this test method. At 90° of twist, the stiffness values gave a ranking similar to that obtained by feel. Specimens cut parallel to the backbone gave more consistant ranking than specimens cut perpendicular to the backbone. This undoubtedly reflects the fact that work gloves are cut from a side with the fingers parallel to the backbone. A report of these experiments and data used for calculation of precision and accuracy are on file at ASTM Headquarters.

[5] The method is similar to Test Method D 1053. The original apparatus was described by Williamson, I., *British Plastics*, Vol 23, 1950, pp. 87–90, 102; and typical examples of the results of its use on leather were given in a paper by Witnauer, L. PA, and Palm, W. E., *Journal*, American Leather Chemist's Assn., JALCA, Vol 59, 1964, pp. 246–258. Working drawings for construction of the apparatus are available at nominal cost from ASTM Headquarters, 100 Barr Harbor Drive, W. Conshohocken, PA 19428-2959. Request Adjunct ADJD282102. There is no known source of supply of the equipment. The former producer, Fulton County Machine and Supply Co., Inc. is no longer in business. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

[6] Lengths of the standard wire can be obtained at nominal cost from ASTM, 100 Barr Harbor Drive, W. Conshohocken, PA 19428-2959. Request Adjunct ADJD282101. A stainless steel rocket wire, Type NS-302, 0.010 ± 0.0025 in. (0.025 ± 0.06 mm) in diameter, bright finish, with chemical composition of 0.08 to 0.12 % carbon, 8 to 10 % nickel, and 17 to 19 % chromium, available from National Standard Co., 1618-T Terminal Road, Niles, MI 49120; telephone: (616) 683-8100; fax: (616) 683-6249; has proved satisfactory. If other wire is used, it should be calibrated as described in Test Method D 1053 and have a constant of 0.0182 g·cm/deg.