Designation: D1630 – 06 (Reapproved 2012)

Standard Test Method for Rubber Property—Abrasion Resistance (Footwear Abrader)[1]

This standard is issued under the fixed designation D1630; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of the resistance to abrasion of vulcanized rubber, or other rubber materials that are similar to the standard reference compound, used for the soles and heels of footwear. It is not recommended for materials less than 2.5 mm (0.1 in.) in thickness.

1.2 The values stated in SI units are to be regarded as 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:*[2]

D1349 Practice for Rubber—Standard Temperatures for Testing

D2240 Test Method for Rubber Property—Durometer Hardness

D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries

3. Significance and Use

3.1 It is recognized that when comparing different types of rubber materials, the service performance may not correlate to the results of this predictive test.

3.2 This test method should not be used as a measure of abrasion resistance for compositions that differ markedly from the standard reference compound. Misleading results, for example, are obtained from polyurethane compositions when compared with the standard reference compound.

3.3 Some specimens may bounce (chatter) against the abrasive paper, producing inaccurate results. These should be interpreted with care and the condition reported.

3.4 If test results are inconsistent, the specimens should be cut, after the test is run, and inspected for voids. If any voids are present, the results should be disregarded and the test repeated using test specimens that are free from voids.

4. Test Conditions

4.1 Unless otherwise specified, the standard temperature for testing shall be 23 ± 2°C (73.4 ± 3.6°F), or the standard test temperature according to Practice D1349.

4.2 Humidity affects the abrasive paper; therefore, the relative humidity shall be controlled at 50 ± 5 % for at least 24 h prior to and during testing.

4.3 The specimens shall be conditioned at this temperature and humidity for no less than 24 h prior to testing.

5. Apparatus

5.1 *Abrasion Machine*—The footwear abrader, often referred to as the National Bureau of Standards (NBS) model, is shown in Fig. 1 and consists of the following components:

5.1.1 *Metal Drum,* rubber-coated or metal-surfaced, 150 mm (6 in.) in diameter. The drum is rotated at a rate of 5.7 ± 0.6 rad/s (45 ± 5 rpm) by means of an electric motor. The number of revolutions of the drum is indicated by either a digital or analog counter.

5.1.2 *Arms,* three, each pivoted at one end and having a mass suspended from the other end. The mass is attached so that a force of 22 N (5 lbf) is exerted directly on the specimen in contact with the abrasive paper.

5.1.3 *Thickness Gauges,* three, either digital or analog and graduated to indicate in increments of no more than 0.02 mm (0.001 in.), attached to a bridge so that each gauge contacts each arm at a point directly over the specimen. The bridge is hinged at one end to allow the arms to swing back for mounting the specimen.

5.1.4 *Compressed Air,* filtered to be free of moisture and contaminants, for cleaning the surface of the abrasive paper.

[1] This test method is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.15 on Degradation Tests.

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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.

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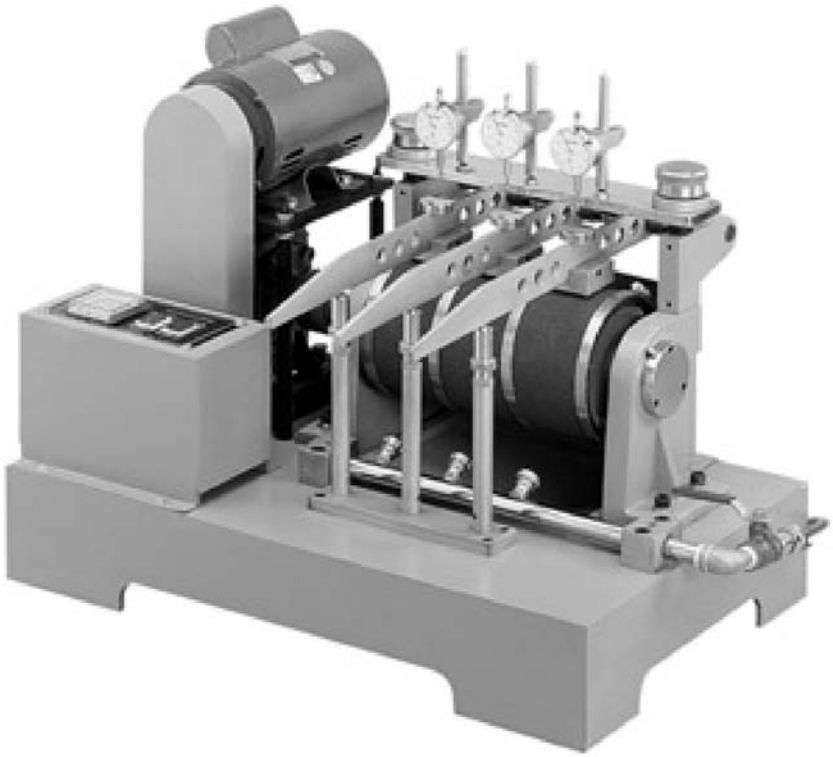

FIG. 1 NBS Abrasion Test Machine

The air is delivered to a manifold or nozzle where the pressure shall be maintained at 210 ± 35 kPa (30 ± 5 psi).

5.1.5 It is recommended to use a suitable suction or vacuum device to remove abraded particles during the test.

5.1.6 *Arm Stop,* one for each arm.

5.1.7 *Rubber Bands or Metal Clamps,* for holding the strip of abrasive paper in position around the rotating drum. The ends of the abrasive paper are cut at an angle of about 80° to the length of the paper and, when in place, permit a clearance (gap) of about 1.5 mm (0.063 in.) with no overlap.

5.2 *Abrasive Paper*—A controlled abrasive consisting of 425 µm 40 grit, No. 1½ garnet paper 150 mm (6 in.) in width.[3,4] (**Warning—** Use of abrasive paper different than that recommended will lead to incorrect results.)

6. Reference Compound

6.1 The standard reference compound[4,5] shall conform to the following formula and cure specifications.

Materials	Parts by Mass
Natsyn 2200[4,6]	100.0
Pliolite S6B[4,7]	2.5
Stearic Acid	2.0
N762 Black (SRF)	40.0
N330 Black (HAF)	5.0
Octylated diphenylamine	1.0
2-(Morpholinothio)benzothiazole	0.8
Zinc Oxide	20.0
Sulfur	2.0

NOTE 1—RMA Standard Reference Compound[4,5] shall be provided in the form of a strip 200 mm (8 in.) long and 25 mm (1 in.) wide with one face concaved to the contour of the abrasive wheel.

NOTE 2—Levels of carbon black can be adjusted to provide a reference compound that meets the specifications listed in 7.1.

6.2 *Cure*—The standard reference compound shall be cured at 160 ± 1°C (320 ± 2°F). The time of cure may be varied with each individual lot of compounds to give the proper state of cure and uniform abrasion.

6.3 *Hardness*—The durometer hardness of properly cured standard reference compounds shall be A/62 ± 3/1, as determined by Test Method D2240.

6.4 *Uniformity:*

6.4.1 Comparison of a newly prepared (D) reference compound with previous reference compounds (A, B, and C) shall be made as follows:

[3] The sole source of supply of the abrasive paper known to the committee at this time is CCSI, Inc., 221 Beaver Street, Akron, OH 44304. When ordering paper, the order should state the following: D1630 NBS Belt Paper, Roll 6 in.

[4] If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[5] The sole source of supply of the compound known to the committee at this time is Smithers Scientific Services, 425 W. Market St., Akron OH 44303. The minimum amount which may be ordered is one standard package containing 20 strips.

[6] The sole source of supply of Natsyn 2200 known to the committee at this time is Americas International, Inc., 1680 Akron-Peninsula Road, Suite 101, Akron, OH 44313.

[7] The sole source of supply of Pliolite S6B known to the committee at this time is Eliokem, Inc., 1452 East Archwood Avenue, Suite [illegible]

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