Designation: F 1679 – ~~96~~00

An American National Standard

Standard Test Method for Using a Variable Incidence Tribometer (VIT)[1]

This standard is issued under the fixed designation F 1679; 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] This test method is under the jurisdiction of ASTM Committee F~~-~~13 on Safety and Traction for Footwear and is the direct responsibility of Subcommittee F13.10 on Traction.

Current edition approved ~~February~~ March 10, ~~1996.~~ 2000. Published ~~M~~ June 2000. Originally published as F 1679–96. Last previous edition F 1679–96.

1. Scope

1.1 This test method covers the operational procedures for using a variable incidence tribometer[2] (VIT) for determining the slip resistance of footwear sole, heel, or related materials (test feet) against planar walkway surfaces or walkway surrogates (test surfaces) in either the laboratory or field under dry, wet, or contaminated conditions. This test method does not address all methodological issues (for example, test surface and test foot material selection and preparation, experimental design, or report preparation).

1.2 The values stated 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:*

F 1646 Terminology Relating to Safety and Traction for Footwear[3]

3. Terminology

3.1 *Definitions*—For definitions of terms, refer to Terminology F 1646.

4. Significance and Use

4.1 The VIT is designed to determine the slip resistance of footwear materials, walkway surfaces, or surrogates under field or laboratory conditions so that their slip-resistant qualities may be evaluated.

4.2 The measurement made by this apparatus relates to slip resistance. Other factors can affect slip resistance. When this test method is used in field tests, relevant factors shall be described.

5. Apparatus

5.1 *Mast Assembly*—A rigid metal frame attached to the chassis with a hinge joint permitting its inclination to any angle from vertical to 45°.

5.2 *Handle*—A round metal grip at the top of the mast assembly that can be used to lift and carry the tester and is grasped by the operator to apply a downward force to the tester to hold it stationary while operating it.

5.3 *Actuating Cylinder*—A pneumatic cylinder mounted to the mast assembly by a hinged joint to permit swinging motion of the foot.

5.4 *Test Foot Assembly*—The test foot is affixed to the end of the actuating cylinder piston rod by means of a ball joint to permit application of the operating force of the test foot against the test surface. A coil spring brings the foot to approximate neutral alignment following each power stroke.

5.5 *Strut*—The actuating cylinder and test foot assembly comprise the strut. It is the angular displacement of this assembly about its hinge pin at the top that permits the slippage motion of the foot.

5.6 *Control Valve*—The valve is actuated by pressing the palm button. A pneumatic spindle valve attached to the mast will actuate the cylinder, causing it to stroke.

5.7 *Pressure System*—The pressure operation of the tester is powered by a compressed gas source mounted on the rear of the chassis. This controlled pressure is piped to the control valve by tubing that flexes to accommodate mast inclination variations. The operating pressure may be regulated by the hex-key wrench adjustment.

5.8 *Hex-Key Wrench*, 3⁄16-in. (5-mm) size.

6. Test Foot and Test Surface

6.1 *Test Foot*:

6.1.1 The test foot material on the bottom of the test foot is prepared by gluing a 1.25-in. (3.2-cm) diameter disk of the test foot material, sheen side exposed, using a suitable adhesive, such as epoxy.

6.1.2 If the test foot is removed from the ball joint for sanding, it is then screwed into the nut on the ball joint until snug and then backed off one-fourth turn to prevent binding.

6.2 *Test Surface*—The test surface shall not be less than 2 in.^{2} (5 cm^2) and should be surrounded by enough material of similar thickness or placed in a suitable fixture so that the tribometer feet will be at the same elevation as the top of the specimen. The test foot material shall fit within the area of the test surface.

---

[2] The English XL is covered by a patent held by William English and is available from William English, Inc., 20500 North River Rd., Alva, FL 33920. It has been found suitable for this use. Interested parties are invited to submit information regarding the identification of acceptable alternatives to this patented item to the Committee on Standards, ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

[3] *Annual Book of ASTM Standards*, Vol 15.07.

7. Reagents and Materials

7.1 *Gas Cartridge*[4]—Carbon dioxide cylinder, 12 g.

7.2 *Epoxy Adhesive*, or equivalent.

8. Operational Check

8.1 Place the tester on a clean, flat surface.

8.2 Insert a pressurized gas cartridge into the holder on the chassis, and tighten the clamp screw until the pressure registers on the gage. Adjust the operating pressure to 25.0 ± 1.5 psi (172 ± 10 kPa).

8.3 Cycle the tester by pressing the operating button to stabilize the working pressure, and verify that the piston rod moves freely. Upon activation, the heel of the test foot should contact the test surface first.

9. Operational Procedure

9.1 Install an appropriately prepared test foot ~~i~~ onto the actuator rod.

9.2 If wet-surface testing is to be accomplished, apply water to the test surface so as to provide an unbroken film across the test surface prior to each stroke.

9.3 Place the tester onto the test surface. The test surface must be in the same plane as the tribometer's feet. The tester must be positioned so that its test foot will contact the test surface at the desired spot when the tester is actuated.

9.4 Actuate the tester by grasping the handle and pressing the valve, simultaneously pressing downward on the handle to prevent movement of the chassis. At the beginning of every power stroke, it is necessary for the pneumatic cylinder to be resting against the little rubber dot on the cross member of the mast. Release of the control valve will cause the piston to retract fully, ready for its next stroke.

9.5 In the course of performing the steps described in 9.4, cycle the tester quickly each time. After actuation of the valve button, do not apply the force to the test foot for more than approximately 1 s. A slip occurs when the strut "kicks out" in an arc, with the pneumatic cylinder extending to its full stroke.

9.6 Increase the inclination of the mast after each stroke progressively by turning the hand wheel, increasing the strut angle until a slip occurs. By experimentation, determine that angle at which slippage begins to occur, and then read and record the slip index from the protractor scale.

9.7 *Operational Considerations*:

9.7.1 Sloped surfaces such as ramps are tested in the same manner as level surfaces, except that measurements shall not be taken in a "downhill" direction.

9.7.2 When testing stairs, affix the stair fixture to the underside of the chassis. Adjust its height to the approximate dimension of the riser height so that the tester is supported in the same plane as the tread when its front soft feet are positioned on the nosing of the tread. The tester will then be in a "head-on" position so that the actuation thrust will be parallel to the direction of pedestrian travel on stairs.

10. Precision and Bias

10.1 The precision and bias of the tester is being determined.

11. Keywords

11.1 dry surface testing; environmental contaminants; field testing; slip resistance; tribometers; wet surface testing

---

[4] Crossman 231B 231–520 (12 g small neck size), available from Crossman Airguns, East Bloomfield, NY 14443 or Daisey 12 g cartridge, available from Daisey Manufacturing Co., Inc., Box 220, Rogers, AR 72757, Phone: (501) 636-1200, or equivalent, has been found suitable for this purpose.