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An American National Standard

Standard Test Method for Using a Portable Inclineable Articulated Strut Slip Tester (PIAST)[1]

This standard is issued under the fixed designation F 1677; 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 covers the operational procedures for using a portable inclinable articulated strut slip tester (PIAST) 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[2]

3. Terminology

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

4. Significance and Use

4.1 The PIAST[3] is a tribometer 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 measurements made by this apparatus relate 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 *Portable Inclined Articulated Strut Tribometer*—See Fig. 1.

5.2 *Main Frame*—A ¾-in. (1.9-cm) thick aluminum plate having a piece of skid-resistant surfacing on the front end of it. Either operators foot can be placed in this area to help hold the tester in place during use.

5.3 *Handle*—A tubular assembly extending upward near the center of the main frame. This can be used to lift and carry the tester and also to hold the tester in place during use.

5.4 *Indicating Quadrant*—With the skid-resistant foot pad to the left when facing the tester, the indicating quadrant is on the front edge of the tester and is graduated in terms of slip resistance.

[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.

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

[3] The portable inclined articulated strut slip tester (PIAST or Mark II) was developed by Dr. Robert Brungraber of Bucknell University, Lewisburg, PA. The Mark II is covered by a patent held by Slip-Test and is available from P.O. Box 387, Spring Lake, NJ 07762. 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.

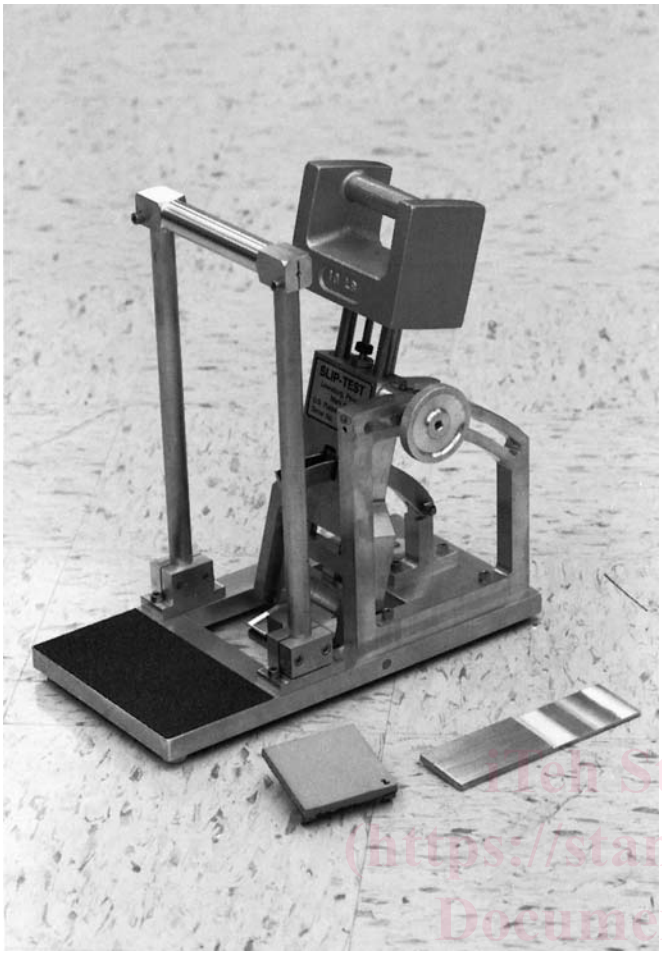

FIG. 1 Portable Inclineable Articulated Strut Slip Tester

5.5 *Rotating Support*—A 1¼-in. (3.18-cm) thick aluminum piece pivoted to the main frame by a pair of pins near the center of the main frame. This support is able to rotate from a vertical position to an angle from vertical of slightly more than 45°. The angled position of this support is controlled by either of two methods: (*1*) a knurled hand wheel that tightens against the indicating quadrant and (*2*) a rubber pad that engages a control quadrant that has the cross section of a V belt pulley and is attached near the rear of the frame. The rubber pad is disengaged from the control quadrant, permitting free rotation of the rotating support by lifting the 10-lb (4.5-kg) weight to the end of its travel.

5.6 *Weight*—A 10-lb (4.5-kg) weight of cast iron, incorporating a handle that is used to operate the tester and that can also be used to lift and carry the tester. Extending from the bottom of this weight are three ½-in. (1.27-mm) round stainless steel rods. Two of these extend through the rotating support and control the relative motion of the weight and support. A third rod extends into the trigger mechanism.

5.7 *Trigger Mechanism*—An aluminum assembly located on the right-hand face of the rotating support. This can be operated by pinching with either hand and releases the weight so that it can move with respect to the rotating support.

5.8 *Articulated Strut*—A ladder-shaped aluminum piece pivoted at the bottom of the pair of stainless steel rods and also pivoted to the test foot holder on the bottom of the tester. This articulated strut indicates the occurrence of slip by permitting the test foot holder/clip assembly to slide forward.

5.9 *Test Foot Holder*—An assembly composed of aluminum or stainless steel, with a thin piece of stainless steel riveted loosely to it to permit a modest amount of lateral articulation of the test foot. The bottom of the test foot holder has magnetic tape attached to it. The magnetic tape serves to hold the test foot in place.

5.10 *Test Foot Clip*—The test foot is 3 in.^{2} (7.62 cm^2) light gage mild steel. This clip is retained against the magnetic tape on the bottom of the test foot holder. The test foot material is affixed to the clip by means of double-stick tape or contact cement.

5.11 *Spring Steel Retainer*, made of light gage steel.

5.12 *Thickness Gage*—A special thickness gage used to check the height of the bottom of the test foot, in the set position, above the floor surface. The thin end of this gage is ⅛-in. (3.17-mm) thick. The thick end of this gage is ¼-in. (6.34-mm) thick.

5.13 *Spacers*—If height adjustments are required, spacers shall be inserted or removed between the tester bottom and the rubber feet.

5.14 *Rubber Feet*—Three rubber feet are connected by removable machine screws to the underside of the tester.

5.15 *Test Foot Material*—A specimen of sole, heel, or other material.

6. Test Foot and Test Surface

6.1 *Test Foot*:

6.1.1 The test foot[4] is prepared by fastening a sample, typically 3 by 3 in.^{2} (76.2 by 76.2 mm^2), of the test foot material, appropriate side exposed, using a suitable adhesive, such as double-stick tape.

6.1.2 The test foot is placed on the test foot holder, where it is held in place by magnetic attraction. If needed, the spring steel retainer can be pushed onto the test foot's vertical extension to fasten the test foot positively to the test foot holder.

6.2 *Test Surface*—The floor surface specimens[5] shall not be less than 4 by 4 in. (10.16 by 10.16 cm) 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.

7. Reagents and Materials

7.1 *Double-Stick Tape*.

8. Tribometer Operational Check

8.1 Place the tester on a flat and level surface.

[4] The most convenient test foot material shape is a 3 in.^{2} (7.62 cm^2), but if a different shape is desired it must be symmetrical with respect to the center line in the direction of testing and have some material at the front and rear edges of the clip. This allows testing at various contact pressures.

[5] Floor surface materials of sizes smaller than 4 by 4 in. (100 by 100 mm) may be combined in a matrix to create a surface area at least 4 by 4 in. (100 by 100 mm) in size.