Designation: F 489 – 96

Standard Test Method for Using a James Machine[1]

This standard is issued under the fixed designation F 489; 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 laboratory measurement of the dry static coefficient of friction of shoe sole and heel materials on controlled walking surfaces and under controlled conditions. It is recognized that certain contaminants and conditions may alter results.

NOTE 1—See Test Method D 2047 for information on measurement of the static coefficient of friction of floor surfaces for the James Machine.

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:*

D 2047 Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine[2]

3. Terminology

3.1 *Definitions:*

3.1.1 *coefficient of friction*—the ratio of the frictional force 3.1.2) to the force, usually gravitational, acting perpendicular to the two surfaces in contact. This coefficient is a measure of the relative difficulty with which the surface of one material will slide over an adjoining surface of itself, or of another material. The static or starting coefficient of friction (μ_s) is related to the force measured to begin movement of the surfaces relative to each other. The kinetic or sliding coefficient of friction (μ_k) is related to the force measured in sustaining this movement.

3.1.2 *friction*—the resisting force that arises when a surface of one substance slides, or tends to slide, over an adjoining surface of itself or another substance. Between surfaces of solids in contact there may be two kinds of friction: (*1*) the resistance opposing the force required to start to move one surface over another, and (*2*) the resistance opposing the force required to move one surface over another at a variable, fixed, or predetermined speed.

3.1.3 *slip*—a term denoting lubricity of two surfaces sliding in contact with each other. In a sense, it is the antithesis of friction in that high coefficient of friction denotes low slip and low coefficient of friction high slip.

4. Significance and Use

4.1 The James Machine is a laboratory instrument intended to measure the slip resistance characteristics of shoe sole and heel materials. However, the tendency to slip may be influenced by foreign materials or lubricants on the shoe materials or on the walking surfaces. Consequently, acceptable levels of slip resistance as determined by this test method may not predict an individual's resistance to slipping while walking or running on various surfaces.

5. Apparatus

5.1 *James Machine* (Fig. 1),[3] with three weights of 25 lb (11.4 kg) each, plus supporting members (80 lb (36.3 kg) total).

5.2 *Shoe*, faced with the specimen under test.

6. Walking Surfaces

6.1 A 12 by 12-in. (305 by 305-mm) square of surface shall be used for testing.

6.2 The surfaces to be used shall be OVCT tiles[4] or a surface agreed upon between laboratories.

[1] This test method is under the jurisdiction of ASTM Committee F-13 on Safety and Traction for Footwearand is the direct responsibility of Subcommittee F13.10on Traction.

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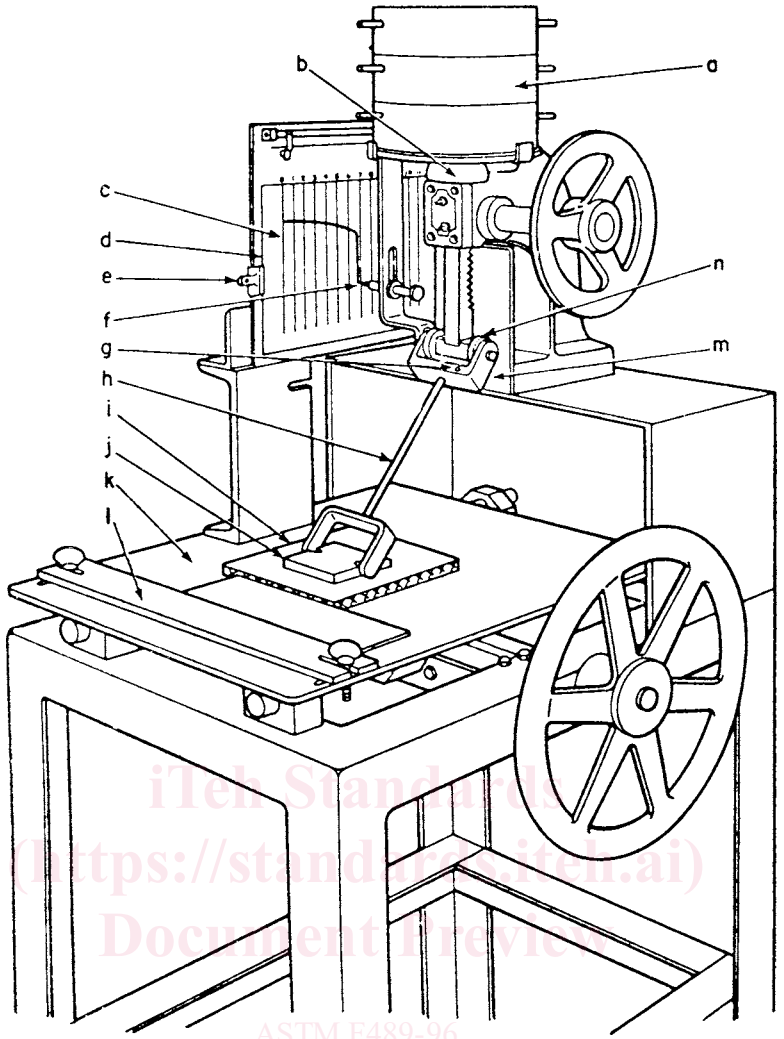
[2] *Annual Book of ASTM Standards*, Vol 15.04.

[3] This machine was developed by S. V. James of the Underwriters Laboratories, Inc. The machine is available from Quadra, Inc., 1833 Oakdale Ave., Racine, WI 53405. Phone (414) 637-6525.

[4] OVCT is official vinyl composition tile and is available from the Chemical Specialties Manufacturers Assn., 1901 I St., N.W., Washington, DC 20006. These tiles may be used and reused for testing. Tiles should be discarded when they show excessive wear or when erratic results are obtained.



a—Weights
b—Cushion
c—Chart
d—Chart Board
e—Spring Clip
f—Recording Pencil
g—Set Screw
h—Strut
i—Walking Surface
j—Shoe and Specimen
k—Test Table
l—Retaining Bar
m—Back Plate
n—Ball Bearing Rollers

FIG. 1 The James Machine

6.3 The surfaces are prepared by thoroughly wiping with a 3 % ammoniacal solution using a clean cloth prior to conditioning.

7. Preparation of Shoe Sole and Heel Materials Samples

7.1 Sand the sample using a 60-grit silicon carbide abrasive paper[5] to remove finish or mold characteristics, or both.

7.2 Again sand the sample using 400A wet or dry silicon carbide abrasive paper.[6]

7.3 Brush the sanded sample to remove loose particles.

8. Test Specimens

8.1 Specimens, 3 by 3 in. (76 by 76 mm), prepared in accordance with 6.1 and 6.2, and 6.3 shall be applied to the shoe by use of double-faced tape[7] or a suitable adhesive.

8.2 The specimen shall be wiped with a clean, dry cloth to remove dust or foreign matter from the surface after conditioning.

9. Conditions for Testing

9.1 Run the specimens under the following conditions:

9.1.1 Both surfaces dry and conditioned 18 h at 73 ± 3.6°F (22.8 ± 2°C).

[5] 60-grit silicon carbide abrasive paper is available from the 3M Corp., St. Paul, MN.

[6] 400A wet or dry Tri-M-Ite is available from the 3M Corp., St. Paul, MN.

[7] Suitable tape is available from the 3M Corp., St. Paul, MN.