



Designation: D 2047 – 99

## Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine<sup>1</sup>

This standard is issued under the fixed designation D 2047; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This laboratory test method covers the use of the James Machine for the measurement of the static coefficient of friction of polish-coated flooring surfaces with respect to human locomotion safety. The test method is not intended for use on wet surfaces.

1.2 *This standard does not purport to address all of the safety problems, 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 1630 Test Method for Rubber Property—Abrasion Resistance (Footwear Abrader)<sup>2</sup>

D 2825 Terminology Relating to Polishes and Related Materials<sup>3</sup>

D 4103 Practice for Preparation of Substrate Surfaces for Coefficient of Friction Testing<sup>3</sup>

#### 2.2 Federal Specification:

KK-L-165C Leather, Cattlehide, Vegetable Tanned and Chrome Retanned, Impregnated, and Soles<sup>4</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *friction*—the resistance developed between the physical contacting surface of two bodies when there is movement or tendency for movement of one body relative to the other parallel to the plane of contact.

3.1.2 *coefficient of friction*—the ratio of the horizontal component of force required to overcome or have a tendency to overcome friction, to the vertical component of the object weight or normal force applied through the object, which tends to cause the friction.

3.1.3 *static coefficient of friction*—the ratio of the horizontal component of force applied to a body that just overcomes the friction or resistance to slipping to the vertical component of the weight of the object or force applied to it. The vertical component shall result in a contact pressure of not less than 1 psi (6.9 kPa) nor more than 13 psi (90 kPa) applied uniformly over the area in mutual contact.

3.1.4 *dynamic coefficient of friction*—the ratio of the horizontal component of force required to cause a body to slide at a relatively constant velocity to the vertical component of the weight of the object or force applied to it. The relatively constant velocity used to cause the body to slide over the surface is to be not less than 1/8 nor more than 1/2 ft/s (38 to 152 mm/s). The vertical component shall result in a constant pressure of not less than 1 psi (6.9 kPa) nor more than 13 psi (90 kPa) applied uniformly over the area in mutual contact.

3.1.5 *slip resistance*—that property of a floor surface which is designed to prevent slipping. A surface having a static coefficient of friction of 0.5 or greater as measured in accordance with this test method is considered to be a slip-resistant surface. (See also Definitions D 2825.)

### 4. Significance and Use

4.1 This test method is generally accepted for the measurement of static coefficient of friction between test surfaces or walkway surfaces and applied materials; such as, a shoe sole or heel material. The measurements made by this apparatus are related to the slip resistance of surface to shoe material tested.

4.2 Floor polishes having a coefficient of static friction, as measured by this test method, and specified for interlaboratory and specification testing of not less than 0.5, traditionally have been recognized as providing nonhazardous walkway surfaces.

NOTE 1—This value of not less than 0.5 meets the requirements for compliance to Rule 5 on “The use of terms slip retardant, slip resistant, or terms of similar import,” of the Proposed Trade Practice Rules for the Floor Wax and Floor Polish Industry as issued by the Federal Trade Commission on March 17, 1953.

### 5. Apparatus

5.1 *James Machine*<sup>5</sup>—See Fig. 1.

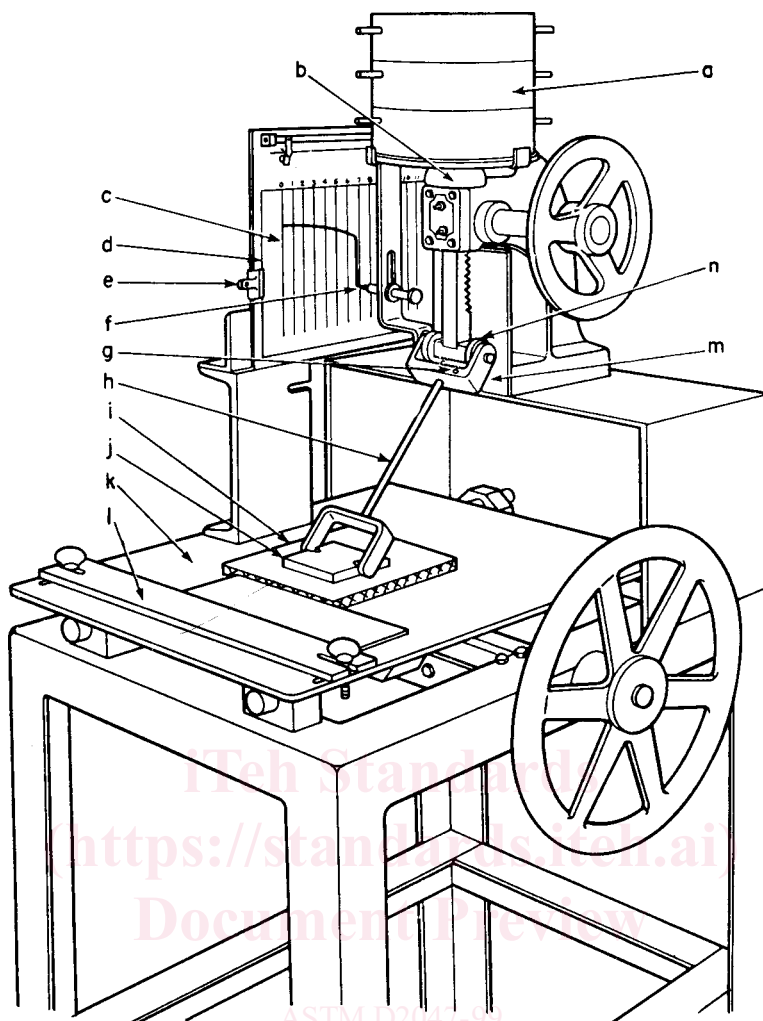
<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-21 on Polishes and is the direct responsibility of Subcommittee D21.06 on Slip Resistance. Current edition approved Dec. 10, 1999. Published March 2000. Originally published as D 2047–64T. Last previous edition D 2047–93.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 09.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 15.04.

<sup>4</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

<sup>5</sup> Available from AIDE Inc., 1833 Oakdale Ave., Racine, WI 53405, and T.M.I., 400 Bayview Ave., Amityville, NY 11701.



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

**FIG. 1 James Machine**

**5.2 Shoe Material<sup>6</sup>**—For interlaboratory testing the shoe material shall be leather, conforming to Federal Specification KK-L-165C. Other materials commonly employed as footwear sole or heel material may be used. If a standard rubber shoe material is required the test rubber in accordance with Test Method D 1630 is suggested.

**5.3 Substrate**—For interlaboratory and specification testing, tiles of OTVAT or wood panels shall be used.

<sup>6</sup> Available from Chemical Specialties Manufacturing Assn., 1913 Eye St., N.W., Washington, DC 20006, and Parsons Tanning Co., 333 Skokie Blvd., Suite 105, Northbrook, IL. 60062, request Type I, Class 6. For pre-cut ready to mount on shoe (3 by 3 in. square), available from Measurement Products, 1826 E. Midwick Dr., Altadena, CA 91001.

## 6. Test Surfaces

6.1 For interlaboratory and specification testing, the OTVAT tiles or wood panels shall be prepared in accordance with Practice D 4103.

## 7. Test Shoe Material

7.1 The size of the shoe material used by the apparatus is 3 by 3 in. square by 0.25 in. thick (76.2 by 76.2 by 6.4 mm).

7.2 For interlaboratory and specification testing, the shoe material shall be leather manufactured in accordance with Federal Specification KK-L-165C. Cut the 3 by 3-in. square specimen from the center portion of the hide by any suitable method. The alignment of the sides of the test specimen shall