



Designation: E3304 – 22

Standard Test Method for Measuring the Skid Resistance of Pavements and Other Trafficked Surfaces Using a Walking Speed Continuous Friction-Measuring Equipment (CFME) Fixed-Slip Technique¹

This standard is issued under the fixed designation E3304; 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 is used to measure skid resistance on a wide range of trafficked surfaces and for a wide variety of circumstances using a walking speed continuous friction-measuring equipment (CFME) fixed-slip measuring equipment. The fixed-slip ratio is typically 12 to 20 % but may vary between CFME manufacturers.

1.2 Walking speed CFME enables surface friction surveys to be conducted where high-speed CFME is not able to measure because of safety reasons or due to limited operating space. Walking speed CFME is battery operated and pushed forward at a normal walking pace by the operator.

1.3 Walking speed CFME enables friction surveys to be undertaken over short lengths with precise survey lines such as friction (μ) values for every 100 mm along a survey line.

1.4 Friction surveys can be conducted on dry surfaces, wet surfaces, contaminated surfaces, or with a self-wetting feature.

1.5 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee E17 on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee E17.21 on Field Methods for Measuring Tire Pavement Friction.

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2. Referenced Documents

2.1 *ASTM Standards*:²

E1844 Specification for a Size 10 $\times$ 4–5 Smooth-Tread Friction Test Tire

3. Terminology

3.1 *Definitions*:

3.1.1 *braking force coefficient (BFC), coefficient of friction (COF), n* —value derived by an appropriately filtered mean of the instantaneous friction readings over a defined distance, commonly referred to as a μ value.

3.1.2 *continuous reading fixed-slip measuring equipment (CFME), n* —device that can be moved over the test surface at the chosen test speed and includes a test wheel, a system for braking the test wheel, and instrumentation for measuring the resulting frictional force between the test tire and test surface.

3.1.3 *field calibration, n* —primary force calibration/check or equivalent carried out before each test or series of tests by a trained operator using calibration equipment supplied by the manufacturer; this equipment may also be built into the CFME.

3.1.4 *fixed slip, n* —braking system that forces the test wheel to roll at a constant slip or fixed reduction of its free rolling speed.

3.1.5 *frictional force, n* —resistance generated when one surface moves relative to another with which it is in contact; μ value derived from the horizontal and vertical force components applied to the measuring axle/friction sensor.

3.1.6 *friction μ value, n* —friction data calculation, force normally described between 0.00 and 1.00 μ , which may exceed 1.00 μ when the horizontal force exceeds the vertical force on the test wheel.

3.1.7 *operator, n* —trained CFME operator that is responsible for the proper inspection, calibration, and operation of the walking speed CFME device.

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.

3.1.8 *test speed, n*—consistent test speed associated with walking speed CFME measurements with consideration to both personal safety and machine reliability that is typically around 0.4 m/s to 1 m/s.

3.1.9 *water film thickness, n*—depth of the film that the water application system is designed to create ahead of the test tire on an entirely smooth test surface, typically 0.25/0.50/1.00 mm.

4. Summary of Test Method

4.1 The friction measurement settings are determined by the CFME operator before the start based on surface conditions and the required data for the surface friction test.

4.2 The CFME friction Mu value is continuously measured and recorded based on the distance interval setting, such as every 100 mm, during the friction measurement.

4.3 The CFME computer system will continuously record the friction Mu value, test speed, and other essential supporting data and display the data during and on completion of the surface friction test.

5. Significance and Use

5.1 Walking speed CFME is used to measure skid resistance on pavements/sidewalks, roads, repaired pavements, horizontal pavement markings, helidecks, and other trafficked surfaces.

5.2 Walking speed CFME is designed for low-speed surface friction surveys.

5.3 Walking speed CFME does not require acceleration or deceleration areas. Friction surveys begin from a standing or rolling start.

5.4 Walking speed CFME can work in very close proximity to people and obstacles.

5.5 The Specification E1844 measure tire is a smooth tire that is mounted on walking speed CFME. A new ASTM tire standard is required for alternate tires designed for use on walking speed CFME. ASTM tire standards shall be entered in the referenced documents section of this standard.

5.6 Walking speed CFME can be specialized to operate in specific areas, such as helidecks, with a specialized software application for a specific surface area. See Fig. 1.

5.7 The field calibration/field test equipment, if required, should be contained within a transport case, readily available for field use. See Fig. 2.

6. Apparatus

6.1 The CFME may be configured with two inline wheels, one of which is the measuring tire, or with three wheels, one of which is the measuring tire. See Fig. 3.

6.2 The CFME shall be configured with a friction-measuring system and a computer system for data recording and presentation. The computer may be attached or built into the CFME or connected directly via a cable or wireless connection. See Figs. 4 and 5.

6.3 The friction cell shall be able to measure 10 kg of force at a minimum.

6.4 Sensors may be added to supplement the CFME, for example, air temperature, surface temperature, and relative humidity (RH). (Not a requirement for friction survey reports.)

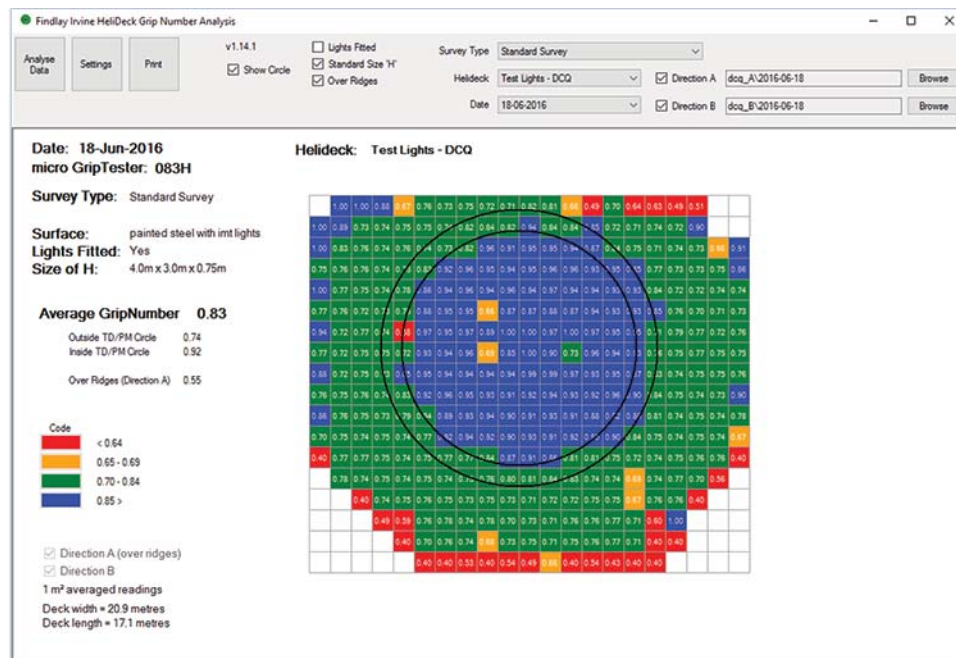


FIG. 1 Software Program for Helidecks