



Designation: E 1911 – 07

Standard Test Method for Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester¹

This standard is issued under the fixed designation E 1911; 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 procedure for measuring paved surface frictional properties as a function of speed using the Dynamic Friction Tester (DF-Tester).

1.2 The DF Tester consists of a horizontal spinning disk fitted with three spring loaded rubber sliders which contact the paved surface as the disk rotational speed decreases due to the friction generated between the sliders and the paved surface. A water supply unit delivers water to the paved surface being tested. The torque generated by the slider forces measured during the spin down is then used to calculate the friction as a function of speed.

1.3 The DF Tester can be used for laboratory investigations and in the field on actual paved surfaces.

1.4 The values stated in SI (metric) units are to be regarded as standard. The inch-pound equivalents are rationalized, rather than exact mathematical conversions.

1.5 *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:*²

E 274 Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire

E 501 Specification for Rib Tire for Pavement Skid-Resistance Tests

E 867 Terminology Relating to Vehicle-Pavement Systems
E 1845 Practice for Calculating Pavement Macrotexture Mean Profile Depth

3. Terminology

3.1 Definitions:

¹ This test method is under the jurisdiction of 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 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.

For Definitions of terms pertaining to this standard, see Terminology E 867.

4. Summary of Test Method

4.1 This test method uses a disk that spins with its plane parallel to the test surface. Three rubber sliders are mounted on the lower surface of the disk. The disk work pavement is brought to the desired rotational velocity, corresponding to the maximum tangential velocity of the sliders. The DF Tester is capable of providing a maximum tangential velocity of 90 km/h (55 mph).

4.2 Water is introduced in front of the sliders and the disk is lowered to contact the test surface so that it bears the full velocity of the disk and model assembly.

4.3 The torque is monitored continuously as the disk rotational velocity reduces due to the friction between the sliders and the test surface.

4.4 The torque signal is reduced to a measurement of friction by converting the torque to the force on the sliders and dividing by the weight of the disk and motor assembly.

4.5 The friction at 20, 40, 60, and 80 km/h (12, 24, 36, and 48 mph) is recorded and the friction-speed relationship may be plotted.

5. Significance and Use

5.1 This test method provides a measure of surface friction as a function of sliding speed, either in the field or in a laboratory.

5.2 This test method may be used to determine the relative effects of various polishing techniques on materials or material combinations.

5.3 The values measured in accordance with this method do not necessarily agree or directly correlate with those obtained utilizing other methods of determining friction properties or skid resistance.

6. Apparatus

6.1 *DF Tester* (see Fig. 1)—The measuring instrument consists of a main body and a control unit. A portable personal computer or an X-Y plotter can be used to record the data. Fig.

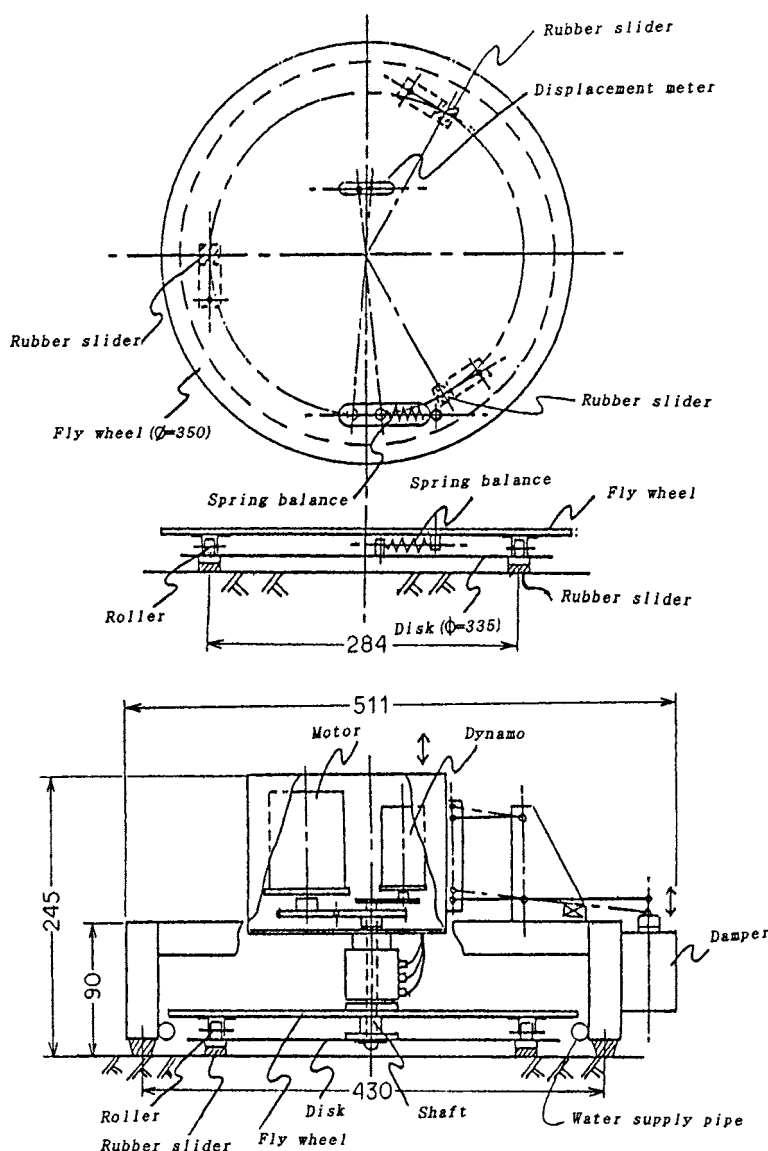


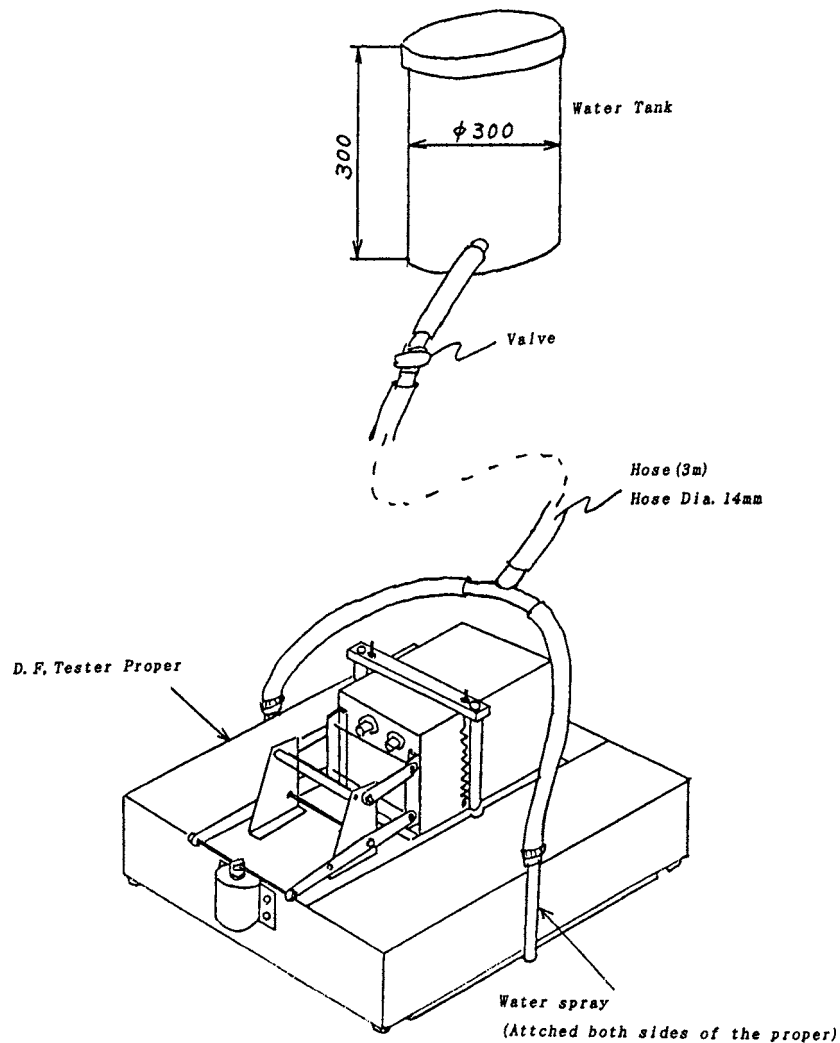
FIG. 1 The DF Testers (Dimensions in mm: 25.4 mm = 1 in.)

1 shows the DF Tester measuring unit, consisting of a fly wheel and disc which is driven by a motor. Three rubber sliders are attached to the disc by leaf springs. The sliders are pressed on the test surface by the weight of the device through three rollers. Each slider is loaded to 11.8 N (2.65 lbf) by the leaf springs. The disc and the fly wheel are connected by a spring balance mounted along a circle on which the rubber sliders are fixed. Due to the forces on the rubber sliders, displacement occurs in a spring balance. This displacement is converted to an electrical signal through a displacement transducer with an accuracy of $\pm 1\%$ of full scale attached to the opposite side of the disc. This signal is output through a slip ring and brush, both of which are mounted on a driving shaft. The speed of rubber sliders is measured from the output of a rotational speed dynamo.

6.2 Water Supply (see Fig. 2)—A water supply unit is provided to maintain a wet condition of the test surface. When the tank is 0.6 m above the tester a water flow of 3.6 l/min

(0.95 gal/min) is maintained. If the flow is initiated when the rotation corresponds to a tangential velocity of 85 km/h (50 mph) the water thickness will be 1 mm (0.04 in) by the time that the velocity reaches 90 km/h (55 mph) and the measurement is initiated.

6.3 Slider (see Fig. 3)—The slider assembly shall consist of a steel backing plate to which is bonded a 6 by 16 by 20 mm (0.25 by 0.63 by 0.79 in.) rubber shaped as shown in Fig. 3. This shape provides a contact pressure of 150 kPa (21.5 lbf/in.²). The rubber compound shall be synthetic rubber as specified in Specification E 501 and shall have a shore hardness of 58 ± 2 . The sliders shall be replaced due to waves after twelve runs. The slider production date is given on the plastic bag in which they are shipped. The sliders must be used within twelve months of the production date to avoid effects of passive deterioration.



Tank must be placed 60cms higher than road surface. The amount of spraying water at the height is 60 cc/min.

FIG. 2 The Watering Apparatus

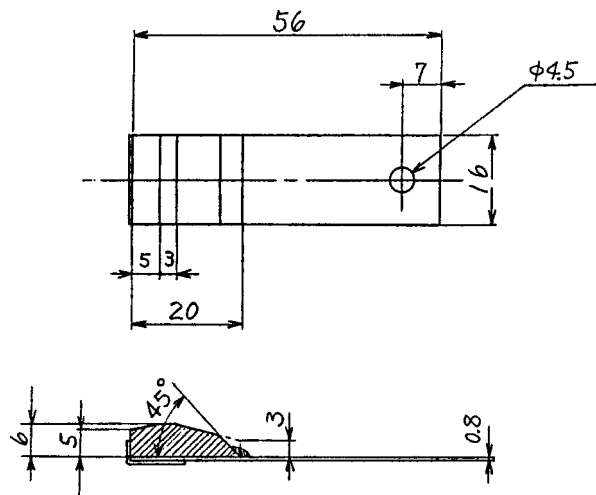


FIG. 3 The Rubber Slider (Dimensions in mm: 25.4 mm = 1 in.)