Standard Method of Test for

Frictional Properties of Paved Surfaces Using a Full-Scale Tire

AASHTO Designation: T 242-18¹ Technical Subcommittee: 5a, Pavement Measurement Release: Group 1 (April) ASTM Designation: E274/E274M-15



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1. SCOPE

- 1.1. This method covers the measurement of the frictional properties of paved surfaces with a specified full-scale automotive tire.
- 1.2. This method utilizes a measurement representing the steady-state friction force on a locked test wheel as it is dragged over a wetted-pavement surface under constant load and at a constant speed while its major plane is parallel to its direction of motion and perpendicular to the pavement.
- 1.3. The values measured represent the frictional properties obtained with the equipment and procedures stated herein and do not necessarily agree or correlate directly with those obtained by other pavement friction measuring methods. The values are intended for use in comparing certain frictional properties of a pavement relative to those of other pavements or for evaluating changes in these frictional properties of a pavement with the passage of time. The values are insufficient to determine the distance required to stop a vehicle on either a wet or a dry pavement. They are also insufficient for determining the speed at which control of a vehicle would be lost, because peak and side-force friction are also required for these determinations.
- 1.4. The values stated in SI units are to be regarded as the standard.
- **1.5.** This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards*:
 - M 261, Rib-Tread Standard Tire for Special-Purpose Pavement Frictional-Property Tests
 - M 286, Smooth-Tread Standard Tire for Special-Purpose Pavement Frictional-Property Tests
 - T 282, Calibrating a Wheel Force or Torque Transducer Using a Calibration Platform (User Level)

2.2. *ASTM Standards*:

■ E178, Standard Practice for Dealing with Outlying Observations

- E501, Standard Specification for Standard Rib Tire for Pavement Skid-Resistance Tests
- E1136, Standard Specification for P195/75R14 Radial Standard Reference Test Tire
- F457, Standard Test Method for Speed and Distance Calibration of Fifth Wheel Equipped with Either Analog or Digital Instrumentation

3. SUMMARY OF METHOD

- 3.1. The test apparatus consists of an automotive vehicle with one or more test wheels incorporated into it or forming part of a suitable trailer towed by a vehicle. The apparatus contains a transducer, instrumentation, a water supply and proper dispensing system, and actuation controls for the brake of the test wheel. The test wheel is equipped with a standard pavement test tire, as specified in M 261 or M 286.
- **3.2.** The test apparatus is brought to the desired test speed. Water is delivered ahead of the test tire and the braking system is actuated to lock the test tire. The resulting friction force acting between the test tire and the pavement surface (or some other quantity that is directly related to this force) and the speed of the test vehicle are recorded with the aid of suitable instrumentation.
- **3.3.** Frictional properties of the paved surface are determined from the resulting force or torque recorded and reported as friction numbers (FN), which are determined from the force required to slide the locked test tire at a stated speed, divided by the effective wheel load and multiplied by 100.

4. APPARATUS

- 4.1. *Vehicle*—The vehicle with one test tire locked shall be capable of maintaining test speeds of 65 to 100 km/h (40 to 60 mph) within ± 1.5 km/h (± 1.0 mph) during a test on a level pavement having an FN of 50.
- 4.2. *Braking System*—The test wheel shall be equipped with a suitable brake. The brake system shall be capable of locking the wheel at the condition specified in Section 4.1 and maintaining the locked-wheel condition throughout the test.
- 4.3. Wheel Load—The apparatus shall be of such a design as to provide an equal static load of $4800 \pm 65 \text{ N} (1085 \pm 15 \text{ lbf})$ to each test wheel and, on detachable trailers, a static download of 450 to 900 N (100 to 200 lbf) at the hitch point.
- 4.4. *Tire and Rim*—The test tire shall be one of the standard tires for the pavement test, as specified in M 261 or M 286, and it shall be mounted on a suitable 15-by-6-in. rim. Since all rims do not have the same offset from the hub, replacement rims must be of the same offset to ensure consistent alignment of the tire with the water path. The data from the two tires are not interchangeable. Alternative testing for special purposes may be performed with other tires, such as ASTM E1136.
- 4.5. *Instrumentation*:
- 4.5.1. *General Requirements for Measuring System*—The instrumentation system shall conform to the following overall requirements at ambient temperatures between 4 and 40°C (40 and 100°F):
- 4.5.1.1. Overall System Accuracy— $\pm 1^{1/2}$ percent of applied load from 900 N (200 lbf) to full scale; for example, at 900 N (200 lbf), applied calibration force of the system output shall be determinable within ± 14 N (± 3 lbf).
- 4.5.1.2. *Time Stability of Calibration*—10-h minimum.

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