Designation: F551/F551M – 16

Standard Practice for Using a 1.707-m [67.23-in.] Diameter Laboratory Test Roadwheel in Testing Tires[1]

This standard is issued under the fixed designation F551/F551M; 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 practice covers the requirements for a 1.707-m [67.23-in.] diameter laboratory roadwheel for durability and endurance testing of tires under controlled operating and environmental conditions.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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.* For specific precautionary statements, see Section 7 and Note 1.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F538 Terminology Relating to the Characteristics and Performance of Tires

3. Terminology

3.1 *Definitions*—Definitions given in Terminology F538 are regarded as standard.

4. Summary of Practice

4.1 This practice describes the specifications and dimensions of a 1.707-m [67.23-in.] diameter laboratory roadwheel system for testing of one or more tire assemblies under controlled conditions. It also describes the calibration procedures for the standard operation of the wheel.

5. Significance and Use

5.1 The 1.707-m [67.23-in.] diameter laboratory test roadwheel is one of the most extensively employed testing devices for tire durability and endurance testing.

5.2 This test apparatus operating in the laboratory at controlled surface speeds, loads, and ambient temperatures simulates, to a degree, tire-operating conditions resembling actual service. Because of the roadwheel curvature, the test tire is fatigued more rapidly than a tire operating on a road.

5.3 The laboratory roadwheel described in this practice is suitable for comparative evaluation of tires under controlled operating and environmental conditions.

5.4 While the laboratory roadwheel may not reproduce structural fatigue exactly as it occurs in service, the laboratory wheel can be used to produce fatigue under controlled conditions.

6. Apparatus

6.1 *Laboratory Test Roadwheel*—A laboratory test roadwheel consists of a large steel wheel against which one or more tire-wheel assemblies are pressed at specific loads (see Fig. 1).

6.1.1 The roadwheel shall have an outside diameter of 1.707 m [67.23 in.] ± 0.5 %. This dimension originated from the choice of the circumference of the roadwheel as being 1/300 mile.

6.1.2 The width of the roadwheel shall be such that the edges are not in contact with the tire under test.

6.1.3 The surface roughness of the roadwheel that is in contact with the tire shall not be in excess of 3.18 µm [125 µin.] and must be continuous and without holes or projections. Where it is necessary to provide for the affixing of special test accessories such as cleats, the empty bolt holes in the path of the tire contact width should be plugged, so as to match the wheel curvature and be within the maximum specified surface roughness.

6.1.4 The total indicated radial runout of the wheel shall not exceed 0.25 mm [0.01 in.].

6.2 *Loading System:*

[1] This practice is under the jurisdiction of ASTM Committee F09 on Tires and is the direct responsibility of Subcommittee F09.10 on Equipment, Facilities and Calibration.

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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.

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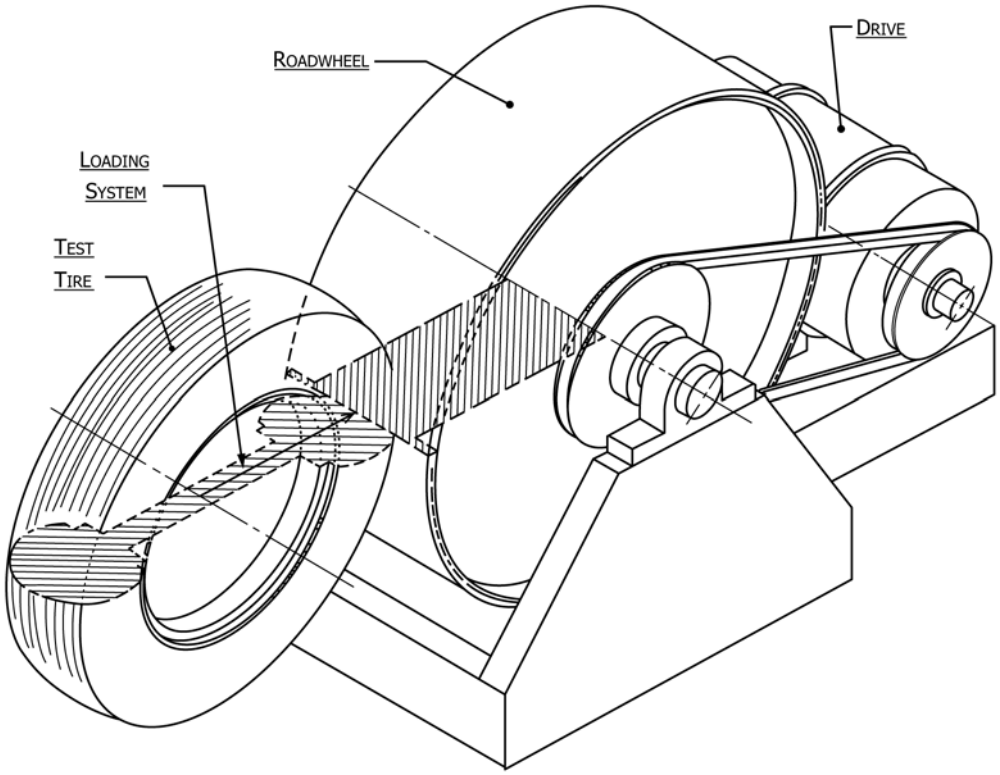

FIG. 1 Laboratory Tire Test Roadwheel

6.2.1 The loading system shall be capable of applying and controlling the tire loading force to the desired level.

6.2.2 The tire loading force shall pass through the axis of the tire under test and the axis of the roadwheel at all times.

6.2.3 The axis of rotation of the roadwheel and the axis of rotation of the tire undergoing test shall be parallel within 10 min of arc for camber and slip angle.

6.2.4 Each tire-loading system should be equipped with a device that causes the tire to be retracted from the roadwheel immediately upon its reaching a preset deflection indicative of tire failure or air loss.

6.3 *Drive*—The drive shall be capable of rotating the roadwheel and maintaining the desired surface speed under all load conditions.

6.4 *Ambient Temperature Conditions*—Please refer to the test method used for specifics regarding ambient temperature and measuring distance requirements. If there is no referenced test method, ambient temperature surrounding the tires shall be controlled at 38 ± 3ºC [100 ± 5ºF] measured at a point located 305 ± 37 mm [12 ± 1.5 in.] from any point of the edge of the rim flange for all operating conditions.

6.5 *Instrumentation:*

6.5.1 Equipment shall be provided to indicate roadwheel surface speed and to provide a measure of the linear equivalent distance traveled.

6.5.2 Optional equipment may be provided to indicate or record, or both, the load, ambient temperature, and inflation pressure, and to record the roadwheel speed.

6.6 *Control Tolerances on Speed, Load, and Distance:*

Wheel Speed	Tolerance
Up to 80 km/h [50 mph]	±0.8 km/h [±0.5 mph]
80 to 400 km/h [50 to 250 mph]	±1.6 km/h [±1.0 mph]
Normal Force	**Tolerance**
At Specified Load	±1 %
Linear Travel of the Test	**Tolerance**
Wheel Surface	±0.5 %

7. Safety Precautions

7.1 The tire, rim, and wheel must be free of obvious defects, as judged by visual inspection. In particular, the bolt holes, the valve, and the base of the rim flange must not be worn excessively.

7.2 *Hazards During Roadwheel Tire Testing*—A tire is a pressure vessel that experiences changes due to the conditions of the test. Laboratory roadwheel test conditions, including load, inflation, speed, pressure, and temperature, are intended to generate end of test conditions. Therefore, a rapid loss of air pressure shall be anticipated at every stage of the test. Such an event may be accompanied by fragments having a high energy level being thrown from the tire being tested. Appropriate machine safeguards and fire and personal protection equipment shall be provided at all times.

8. Calibration

8.1 Use a system calibration.

8.2 Calibration standards shall be comprised of instrumentation and measuring apparatus that are used for the purpose of

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