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Standard Test Method for Measuring Rut-Depth of Pavement Surfaces Using a Straightedge[1]

This standard is issued under the fixed designation E1703/E1703M; 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 describes the procedure for the measurement of the depth of the rut at a chosen location in a pavement surface using a straightedge and a gauge.

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

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E867 Terminology Relating to Vehicle-Pavement Systems

E2133 Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

3. Terminology

3.1 *Definitions:*—For definitions of terms used in this test method, refer to Terminology E867.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *rut-depth, n*—the maximum measured perpendicular distance between the bottom surface of the straightedge and the contact area of the gauge with the pavement surface at a specific location.

3.2.2 *trueness, n*—the lack of significant curvature, inclination, noteworthy elevations, or depressions.

4. Significance and Use

4.1 Rutted pavement surfaces may have an adverse influence on vehicle handling characteristics and may impede surface drainage, which may reduce friction properties and contribute to hydroplaning. Rutting indicates deformation or wear of materials in the pavement and may be indicative of problems such as asphalt flow, consolidation, shear, or loss of pavement materials.

4.2 The rut-depth value obtained using this test method may not correlate well with values obtained using other methods.

5. Apparatus

5.1 *Straightedge:*

5.1.1 *Width*—The bottom rectangular surface of the straightedge shall be at least 19 mm (0.75 in.) but not more than 75 mm (3.0 in.) wide in the measurement plane.

5.1.2 *Length*—The preferred lengths of the straightedge are either 1.83 metres (6 ft), 2 metres (6.56 ft), 3 metres (9.84 ft), 3.05 metres (10 ft), 3.66 metres (12 ft) or 4.88 metres (16 ft). The length shall ensure that the straightedge spans the two highest points on either side of the rut. The minimum length shall be at least 1.73 metres (5.67 ft).

5.1.3 *Trueness*—The maximum out-of-trueness of the bottom surface of the straightedge in the measurement plane shall be less than± 0.40 mm/m (±0.005 in./ft) of length and less than ±2.5 mm/m (±0.03 in./ft) of width. The straightedge must be rigid enough so that it always meets this trueness.

5.2 *Gauge:*

5.2.1 The rut-depth measuring gauge shall be graduated to 1 mm (1⁄16 in.) or finer. The bottom surface of the gauge shall be at least 19 mm (0.75 in.) but not more than 75 mm (3.0 in.) wide and span areas of aggregate loss and texture. The gauge shall have sufficient range to accommodate the measurement.

NOTE 1—The straightedge is not mounted on wheels like a rolling inclinometer, refer to Test Method E2133.

6. Procedure

6.1 *Straightedge Placement:*

[1] This test method is under the jurisdiction of ASTM Committee E17 on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee E17.31 on Methods for Measuring Profile and Roughness.

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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.

6.1.1 Place the straightedge across the rut. Allow the straightedge to rest upon the pavement at two contact areas, such that sliding the straightedge along its length in both directions will not change the contact areas on the pavement. Avoid locating the contact area at discontinuities that are wider than the straightedge bottom.

6.1.2 Place the straightedge in a plane perpendicular to the direction of traffic movement. The bottom surface of the straightedge shall be parallel to the longitudinal slope of the pavement. Do not place the straightedge on any discontinuities on the pavement surface, for example, potholes or loose debris.

6.1.3 The longitudinal interval between successive straightedge placement should be related to the precision required for the use of the data.

6.2 *Gauge Placement:*

6.2.1 Place the gauge between the two contact areas perpendicular to the reference plane created by the bottom of the straightedge and perpendicular to the longitudinal slope of the pavement. The bottom of the gauge shall be in contact with the pavement at the time of the measurement. Do not place the gauge on any discontinuities on the pavement surface, for example, potholes or loose debris (see Fig. 1).

6.3 *Rut-Depth Measurement:*

6.3.1 Measure the distance between the bottom surface of the straightedge and the pavement after the gauge has been placed as described in 6.1 and 6.2.

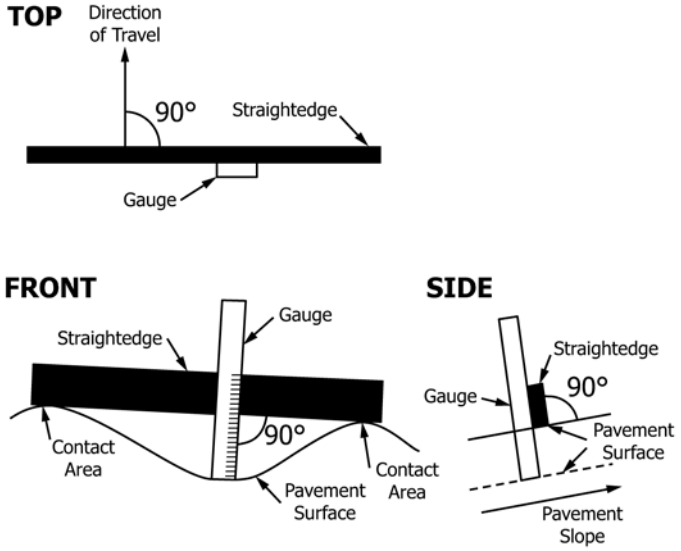
6.3.2 Measurements should be made to the nearest graduation of the gauge. A sufficient number of measurements should be made along the straightedge to determine the greatest distance between the straightedge and the pavement. The greatest distance can be measured between the two contact areas or along the full straightedge length.

7. Report

7.1 Report at least the following information:

7.1.1 Date,

7.1.2 Test location to uniquely identify the data reported (such as: Road number, Station, Offset, Wheelpath, or Lane),



NOTE 1—Fig. 1 represents only one type of rut configuration.

FIG. 1 Rut Configuration

7.1.3 Dimensions of the bottom surface of the straightedge,

7.1.4 Dimensions of the bottom surface of the gauge, and

7.1.5 Greatest rut-depth measurement (see 3.2.2) to the nearest graduation of the gauge specified in 5.2.1.

8. Precision and Bias

8.1 At this time no precision estimate from a statistically designed series of tests at different locations has been obtained.

8.2 Since there is no accepted reference material suitable for determining the bias for the procedure for measuring the rut-depth of pavement surfaces using a straightedge, no statement on bias is being made.

NOTE 2—The precision of each rut-depth measurement depends on the design of the depth gauge, surface texture, and operator skill. The precision for the selected equipment should be determined by the user through a statistically-designed series of tests.

9. Keywords

9.1 gauge ; rut; rut-depth; straightedge