



Designation: D 7113 – 05

# Standard Test Method for Density of Bituminous Paving Mixtures in Place by the Electromagnetic Surface Contact Methods<sup>1</sup>

This standard is issued under the fixed designation D 7113; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope

1.1 This test method covers the procedures for determining the in-place density and relative compaction of bituminous concrete pavement paving mixtures by an electromagnetic surface contact device by measuring changes in the electromagnetic field resulting from the compaction process.

1.2 The equipment referenced in this method is a surface contact device, which must accommodate surface moisture and temperature variation in the range typically encountered in paving applications. This can be accomplished by design parameters that reduce the device's sensitivity to surface moisture and temperature variation or by measurements and algorithms to account for surface moisture and temperature variance in the rolling pattern.

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 prior to use.*

1.4 The values stated in SI units are to be regarded as the standard.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

**D 1188** Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens

**D 2726** Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

**D 3665** Practice for Random Sampling of Construction Materials

**D 3666** Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

**D 5361** Practice for Sampling Compacted Bituminous Mixtures for Laboratory Testing

**D 6752** Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

## 3. Significance and Use

3.1 The test method described is useful as a rapid, nondestructive technique for determining the in-place density or relative compaction of compacted bituminous mixtures.

3.2 The test method can be used to establish the proper rolling effort and pattern to achieve the required density.

3.3 The non-destructive nature of the test allows repetitive measurements to be made at a single test location between roller passes or at multiple locations across the mat to monitor changes in density.

3.4 The density results obtained by this test method are relative. Device calibration (correlation with other test methods) is required to convert the results obtained using this method to actual density. Section 6 of this test method describes a method that has proven to be acceptable for correlation.

NOTE 1—The personnel and equipment used in performing this test can be evaluated in accordance with Specification **D 3666**.

NOTE 2—Research and evaluation of devices used in this test method has been conducted. Reference is made to "Evaluation of Non-Nuclear Gauges to Measure Density of Hot-Mixed Asphalt Pavements," a pooled fund study, Pedro Romero, Ph.D., P.E., July 2002.

## 4. Interferences

4.1 Electromagnetic force fields such as high-tension power lines, or large metal objects in close proximity may interfere with the device reading.

4.2 The chemical composition of the material being tested may significantly affect the measurement and adjustments may be necessary. The device can be calibrated to the specific mix design being used in the field.

4.3 The test method exhibits spatial bias in that the device is most sensitive to the density of the material in closest proximity to the sensor.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.21 on Specific Gravity and Density of Bituminous Mixtures.

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<sup>2</sup> 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.