Designation: D2726/D2726M – 14

Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures[1]

This standard is issued under the fixed designation D2726/D2726M; 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.

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

1. Scope*

1.1 This test method covers the determination of bulk specific gravity and density of specimens of compacted bituminous mixtures.

1.2 This test method should not be used with samples that contain open or interconnecting voids or absorb more than 2 % of water by volume, or both, as determined in 11.3.

1.3 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.

1.4 *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]

D979 Practice for Sampling Bituminous Paving Mixtures

D1188 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

D3203 Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing

D5361 Practice for Sampling Compacted Bituminous Mixtures for Laboratory Testing

D6752 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

D7227 Practice for Rapid Drying of Compacted Asphalt Specimens Using Vacuum Drying Apparatus

E1 Specification for ASTM Liquid-in-Glass Thermometers

E77 Test Method for Inspection and Verification of Thermometers

E563 Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature

E644 Test Methods for Testing Industrial Resistance Thermometers

E1137 Specification for Industrial Platinum Resistance Thermometers

E2251 Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *bulk density*—as determined by this test method, the mass of a metre cubed (or foot cubed) of the material at 25°C [77°F].

3.1.2 *bulk specific gravity*—as determined by this test method, the ratio of the mass of a given volume of material at 25°C [77°F] to the mass of an equal volume of water at the same temperature.

4. Summary of Test Method

4.1 The specimen is immersed in a water bath at 25°C [77°F]. The mass under water is recorded, and the specimen is taken out of the water, blotted quickly with a damp cloth towel, and weighed in air. The difference between the two masses is used to measure the mass of an equal volume of water at 25°C [77°F].

4.2 This test method provides guidance for determination of the oven dry or thoroughly dry mass of the specimen. The bulk specific gravity is calculated from these masses. Then the

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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.

***A Summary of Changes section appears at the end of this standard**

density is obtained by multiplying the specific gravity of the specimen by the density of the water.

5. Significance and Use

5.1 The results obtained from this test method can be used to determine the unit weight of compacted dense bituminous mixtures and in conjunction with Test Method D3203, to obtain percent air voids. These values in turn may be used in determining the relative degree of compaction.

5.2 Since specific gravity has no units, it must be converted to density in order to do calculations that require units. This conversion is made by multiplying the specific gravity at a given temperature by the density of water at the same temperature.

NOTE 1—The personnel and equipment used in performing this test can be evaluated in accordance with Practice D3666.

6. Apparatus

6.1 *Balance,* with ample capacity, and with sufficient sensitivity to enable bulk specific gravities of the specimens to be calculated to at least four significant figures, that is, to at least three decimal places. It shall be equipped with a suitable apparatus to permit weighing the specimen while suspended in water. To avoid erroneous readings by undue displacement of water, use wire or fish line of the smallest practical size to suspend the specimen and holder. Do not use chains, strings, or sash cords. The balance shall conform to Guide D4753 as a Class GP2 balance.

NOTE 2—Since there are no more significant figures in the quotient (bulk specific gravity) than appear in either the dividend (the mass of the specimen in air) or in the divisor (the mass of the volume of water equal to the volume of the specimen, obtained from the difference in weight of the saturated surface-dry specimen in air and in water), this means that the balance must have a sensitivity capable of providing both mass values to at least four figures. For example, a sensitivity of 0.1 g [0.0002 lb] would provide four significant figures for mass in the range from 100.1 to 999.9 g [0.221 to 2.204 lb].

6.2 *Water Bath,* capable of maintaining a temperature of 25 ± 1°C [77 ± 1.8°F] for immersing the specimen in water while suspended, equipped with an overflow outlet for maintaining a constant water level. The use of an overflow outlet is mandatory.

NOTE 3—The water bath does not need to be a sophisticated device. Any method that maintains 25 ± 1°C [77 ± 1.8°F] can be used including tempering, aquarium heaters, stirrers, or other devices.

6.3 *Drying Oven,* capable of maintaining a temperature of 110 ± 5°C [230 ± 9°F].

6.4 *Thermometer*—The thermometer shall be one of the following:

6.4.1 A liquid-in-glass partial immersion thermometer of suitable range with subdivisions and maximum scale error of 0.5°C [1.0°F] which conforms to the requirements of Specification E1. Calibrate the thermometer in accordance with one of the methods in Test Method E77 or verify its original calibration at the ice point (Note 4 and Note 5).

NOTE 4—Practice E563 provides instructions on the preparation and use of an ice-point bath as a reference temperature.

NOTE 5—If the thermometer does not read 0.0 ± 0.5°C [32.0 ± 1.0°F] at the ice point then the thermometer should be recalibrated.

6.4.2 A liquid-in-glass partial immersion thermometer of suitable range with subdivisions and maximum scale error of 0.5°C [1.0°F] which conforms to the requirements of Specification E2251. Calibrate the thermometer is accordance with one the methods in Test Method E77 or verify its original calibration at the ice point (Note 4 and Note 5).

6.4.3 A platinum resistance thermometer (PRT) with a probe which conforms to the requirements of Specification E1137. The PRT shall have a 3- or 4-wire connection configuration and the overall sheath length shall be at least 50 mm (2 in.) greater than the immersion depth. Calibrate the PRT system (probe and readout) in accordance with Test Methods E644 or verify its original calibration at the ice point (Note 4 and Note 5). Corrections shall be applied to ensure accurate measurements within 0.5°C [1.0°F].

6.4.4 A metal-sheathed thermistor with a sensor substantially-similar in construction to the PRT probe described in 6.4.3. Calibrate the thermistor system (sensor and readout) in accordance with Test Methods E644 or verify its original calibration at the ice point (Note 4 and Note 5). Corrections shall be applied to ensure accurate measurements within 0.5°C [1.0°F].

7. Standardization

7.1 *Balance,* Standardize at least once each 12 months

7.2 *Temperature measuring devices,* standardize at least once every 12 months.

7.3 *Drying Oven,* standardize thermometric devices at least once every 12 months.

NOTE 6—The terms of standardization, verification, calibration, check, are defined in D3666 Section 3.

8. Sampling

8.1 Specimens may be either laboratory-molded bituminous mixtures or from bituminous pavements.

8.2 Obtain field samples in accordance with Practice D979.

8.3 Pavement specimens shall be taken from pavements with a core drill, diamond or a carborundum saw, or by other suitable means, in accordance with Practice D5361.

9. Test Specimens

9.1 *Size of Specimens*—It is recommended (*1*) that the diameter of cyclindrically molded or cored specimens, or the length of the sides of sawed specimens, be at least equal to four times the maximum size of the aggregate; and (*2*) that the thickness of specimens be at least one and one half times the maximum size of the aggregate.

9.2 Care shall be taken to avoid distortion, bending, or cracking of specimens during and after removal from pavements or mold. Specimens shall be stored in a safe, cool place.

9.3 Specimens shall be free of foreign materials such as seal coat, tack coat, foundation material, soil, paper, or foil. When any of these materials are visually evident, they shall be removed by sawing. Wire brushing to remove paper, soil, and foil is acceptable if all traces of the materials are eliminated.