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Designation: D2726/D2726M – 13

StandardTest 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 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

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 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

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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

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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 *Temperature Measuring Device,* Thermometers of suitable range with subdivisions and maximum scale error of 0.5°C [1.0°F], or any other thermometric device of equal accuracy, precision, and sensitivity shall be used. Thermometers shall conform to the requirements of Specification E1.

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 4—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.

9.4 If desired, specimens may be separated from other pavement layers by sawing or other satisfactory means.

10. Procedure

10.1 *For Cores and for Other Specimens that May Contain Moisture or Solvent*—Only specimens that are known to be thoroughly dry (that is, laboratory-prepared dried specimens), are to be tested in accordance with 10.2. All others are assumed to contain moisture or solvent and are to be tested in accordance with 10.1. The sequence of testing for 10.1 is: in water, saturated-surface dry, dry.

10.1.1 *Mass of Specimen in Water*—Completely submerge the specimen in the water bath at 25 ± 1°C [77 ± 1.8°F] for 3 to 5 min then determine the mass by weighing in water. Designate this mass as *C*. If the temperature of the specimen differs from the temperature of the water bath by more than 2°C [3.6°F], the specimen shall be immersed in the water bath for 10 to 15 min, instead of 3 to 5 min.

10.1.2 *Mass of Saturated Surface-Dry Specimen in Air*—Surface dry the specimen by blotting quickly with a damp cloth towel and then determine the mass by weighing in air. Designate this mass as *B*.

10.1.3 After determining the mass in water and in a saturated-surface dry condition, thoroughly dry the specimen to a constant mass at 110 ± 5°C [230 ± 9°F]. Allow the specimen to cool and weigh in air. Designate this mass as *A*. Other methods may be used to dry the specimen as long as a constant mass is achieved (mass repeats within 0.1 %).

NOTE 5—Drying the specimen at the required temperature of 110°C [230°F] will change the characteristics and shape of the specimen. This will make the specimen unsuitable for further testing. Drying the specimen at a reduced temperature such as 52°C [125°F], in order to keep it intact, will not meet the requirements of this test method.

10.1.3.1 Practice D7227, microwave drying or other approved methods may be used to dry the specimen if the specimen is not over-heated and documentation exists showing that the results are equivalent to oven drying. The interval of time between readings to determine constant mass must be sufficient to ensure that all moisture and solvent has been

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