

Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures

ASTM D2726/D2726M – 19

5. Significance and Use

5.1 The results obtained from this test method can be used to determine the unit weight of compacted dense asphalt mixtures and in conjunction with Test Method **D3203/D3203M**, 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 quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of Specification **D3666** are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification **D3666** alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification **D3666** or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

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 (**Notes 4 and 5**)

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

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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 in accordance with one the methods in Test Method E77 or verify its original calibration at the ice point (Notes 4 and 5)

6.4.3 A platinum resistance thermometer (PRT) with a probe which conforms to the requirements of Specification E1137/E1137M.....

The PRT shall have a three- or four-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 (Notes 4 and 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 (Notes 4 and 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 twelve months.....

7.2 *Temperature-Measuring Devices*—Standardize at least once every twelve months.....

7.3 *Drying Oven*—Standardize thermometric devices at least once every twelve months.....

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

8. Sampling

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

8.2 Obtain field samples in accordance with Practice D979/D979M.....

8.3 Pavement specimens shall be taken from pavements with a core drill, diamond or carborundum saw, or by other suitable means, in accordance with Practice D5361/D5361M.....

9. Test Specimens

9.1 *Size of Specimens*—It is recommended (1) that the diameter of cylindrically 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.....

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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 is visually evident, it 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 and are to be tested in accordance with 10.1. The sequence of testing for 10.1 is: in water, saturated surface-dry, dry....._____

NOTE 7—Laboratory-prepared dried specimens include dry plant-produced, laboratory-compacted samples.

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 2.0 °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*— Within 15 s of removing the sample from the water bath, 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 *Mass of Dry Specimens:*

10.1.3.1 For cores and other specimens that are not used for further resting and evaluations, 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 such as Practice D7227/D7227M may be used to dry the specimen as long as a constant mass is achieved (mass repeats within 0.1 %)......_____

NOTE 8—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.

10.1.3.2 For specimens used to conduct performance or additional tests and in the absence of drying procedure provided by the specified test method, use the Practice D7227/D7227M method to dry the specimen....._____

10.2 *For Laboratory-Prepared Thoroughly Dry Specimens:*

10.2.1 *Mass of Dry Specimen in Air*—Determine the mass by weighing the specimen after it has been standing in air at room temperature for at least 1 h. Designate this mass as A....._____

10.2.2 *Mass of Specimen in Water*—Use the same procedure as described in 10.1.1....._____

10.2.3 *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_____

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11. Calculation

11.1 Calculate the bulk specific gravity of the specimen as follows:
Bulk sp gr = $A/(B - C)$ (1)

where:

A = mass of the dry specimen in air, g [lb],

(B - C) = mass of the volume of water for the volume of the specimen at 25 °C [77 °F],

B = mass of the saturated surface-dry specimen in air, g [lb], and

C = mass of the specimen in water, g [lb].

11.2 Calculate the density of the specimen as follows:
Density = Bulk sp gr X 997.0 (or 62.24) (2)

where:

997.0 (0.997 g/cm³) = density of water in kg/m³ at 25 °C [77 °F].

11.3 Calculate the percent water absorbed by the specimen (on volume basis) as follows:
Percent water absorbed by volume = $\frac{B - A}{B - C} \times 100$ (3)

11.4 If the percent water absorbed by the specimen in 11.3 exceeds 2.0 %, dry the specimen using 10.1.3.1 and determine bulk specific gravity using Test Method D1188 or D6752/D6752M.....

11.5 This test method has been written expressing density in kilograms per cubic metre. Conversion to express the density in pounds per cubic foot is acceptable.....

12. Report

12.1 Report the following:

12.1.1 Bulk specific gravity of the mixture to the third decimal place as: bulk specific gravity at 25 °C [77 °F].....

12.1.2 Density of the mixture with four significant figures in kg/m³ or lb/ft³ as: density at 25 °C [77 °F],
.....

12.1.3 Type of mixture.....

12.1.4 Size of sample, and.....

12.1.5 Water absorption, to the nearest 0.1 %.....

Comments