

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

ASTM D6752/6752M - 11

4. Apparatus

4.1 *Balance*, shall conform to Specification D4753 as a class GP2 balance (0.1g sensitivity)..... _____

4.2 *Water Bath*, with minimum dim. (LxWxD) of 610 x 460 x 460 mm or a large cylindrical container for completely submerging the specimen in water while suspended, equipped with an overflow outlet for maintain a constant water level..... _____

4.3 *Cushioned holder*, for water displacement of the sample having no sharp edges..... _____

4.4 *Vacuum Chamber*, with a 0.93 kW (1.25 hp) pump capable of evacuating a sealed and enclosed chamber to a min. pressure of 10 mm Hg in less than 60 s, when at sea level..... _____

The chamber shall be large enough to seal samples of 150 mm wide x 350 mm long x 150 mm thick _____

The air exhaust should be calibrated to bring the chamber to atmospheric pressure in 80 to 120 s _____

4.5 A *Vacuum Measurement Gauge*, independent of the vacuum sealing device that could be directly inside the chamber to verify vacuum performance and the chamber door sealing the unit..... _____

The gauge shall be capable of reading 3 mm Hg pressure..... _____

4.6 *Plastic bags*, used with the vacuum device shall be 1 of 2 following sizes

The smaller bags shall have a minimum opening of 241 mm and a max. opening of 260 mm..... _____

The larger bags shall have a min. of 375 mm and a max. opening of 394 mm..... _____

The bags shall be of plastic material that will not adhere to the asphalt film, is puncture resistance, is capable of withstanding sample temp. up to 70°C, is impermeable to water, and contains no air channels for evacuation of air from the bag. _____

The bags shall have a min. thickness of 0.100 mm and max. thickness of 0.152 mm..... _____

The apparent S.G. for the bags shall be provided for by the manufacturer..... _____

The apparent S.G. provided for each bag shall account for the different sample weights and bag weight used during testing..... _____

4.7 *Specimen Sliding Plate*, used within the chamber for reduction of friction on the plastic bags... _____

4.8 *Bag Cutting Knife*, or scissors..... _____

5. Sampling

5.1 Test specimens may be molded from the lab. or taken from bituminous pavement in the field. _____

Field sample should follow D5361..... _____

6. Test Specimens

6.1 It is recommended

(1) That the dia. Of cylindrically molded or cored specimens, or the length of the sides of sawed specimens be at least equal to 4 times the max. size of the aggregate..... _____

(2) That the thickness of the specimens be at least 1 and ½ times the max. size of the aggregate... _____

6.2 Take care to avoid distortion, bending, or cracking of specimens..... _____

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- 6.3 Specimens shall be free of foreign materials, such as sealcoat, foundation material, etc..... _____
- 6.4 Specimens may be separated from other pavement layers..... _____
- 6.5 Use a brush or a soft sanding block to break sharp edges around the corners of the sample..... _____

7. Procedure

7.1 This procedure can be used for compacted field and lab. specimens..... _____
 Specifically use this procedure as determined by D2726 and for SMA, porous friction course, etc... _____

7.2 Mass of Unsealed Specimens:

7.2.1 *Lab. Prepared Specimens*, determine the mass of the specimen after it has cooled to room temp. Designate this mass as A..... _____

7.2.2 *Cores and Specimens Containing Moisture*, dry the specimen and designate this as mass A. Vacuum drying D7227 or other approved methods may be used..... _____

7.3 Mass of sealed Specimen:

7.3.1 Select an appropriate size bag..... _____

For all 100 mm dia. samples and 150 mm dia. samples with less than 75 mm thickness, use the bag with smaller opening size as specified in 4.6..... _____

For 150 mm samples with greater than 50 mm thickness, use the larger opening size bags as in 4.6 _____

For samples that weigh more than 5500 g or abnormally shaped samples, use manufacturer’s recommendation for appropriate bag size and configuration..... _____

7.3.2 Inspect the bag for holes, etc..... _____

Record the bags mass and place a bag inside the vacuum chamber on top of the specimen sliding plate _____

7.3.3 Gently open the bag and place the specimen in the bag on top of the specimen sliding plate. _____

7.3.4 Allow vacuum chamber to remove the air from the chamber and plastic bag. The vacuum chamber shall automatically seal the bag once air is removed..... _____

7.3.5 Exhaust air into the chamber until the chamber door open indicating atmospheric pressure within the chamber..... _____

7.3.6 Remove the sealed sample with extreme care to prevent puncture of the bag..... _____

Gently pull on the bag and if the bag easily separates from the sample, the bag may be punctured; repeat the sealing process with a new bag..... _____

7.3.7 Immediately place the sample in the water tank on top of the weighing mechanism and determine the mass of the sealed specimen in a water bath at $25 \pm 1^\circ\text{C}$. Designate this as E..... _____

7.3.8 To ensure tight seal in the bag, remove the sample from water and cut the bag open. Remove the sample from the bag and determine it’s mass. Designate this mass as C..... _____

Compare this mass with the initial dry mass in 7.2.1 (mass A)..... _____

If the mass C is greater than mass A by 5 g then dry and retest the sample..... _____

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7.3.9 Calculate the mass of the sealed specimen in air by summing the masses in either 7.2.1 or 7.2.2 and 7.3.2. Designate this mass as B.....

8. Calculations

8.1 Calculate the B.S.G. of the sealed specimen as follows:

$$\text{Bulk Specific Gravity} = \frac{A}{[C + (B - A)] - E - \frac{B - A}{F_T}}$$

Where:

- A = initial mass of dry specimen in air, g
- B = mass of dry, sealed specimen, g (A + mass of plastic bag from 7.3.2)
- C = final mass of specimen after removal from sealed bag, g
- E = mass of sealed specimen underwater, g
- F_T = apparent S.G of plastic sealing material at 25°C, provide by manufacturer

8.2 Calculate the density of the specimen as follows:

$$\text{Density} = (\text{Bulk Specific Gravity}) \gamma$$

Where:

γ = density of water at 25°C (997.0 kg/m³)

9. Verification

9.1 System Verification:

- 9.1.1 The vacuum setting of the device shall be verified once every 3 months, after major repairs, after each shipment or relocation.....
- 9.1.2 Verification shall be performed with a vacuum gauge capable of being placed inside the chamber and reading the vacuum setting of the sealing device.....
- 9.1.3 Place the gauge inside the chamber and record the setting. the gauge should indicate a reading of 10 mm Hg or less. The unit shall not be used if the gauge reading is above 10 mm Hg.....
- 9.1.4 Vacuum gauge used for verification shall be standardized once every 12 months.....

9.2 Plastic Bag Verification:

- 9.2.1 The plastic bag apparent S.G. provided by the manufacturer shall be verified periodically.....
- 9.2.2 Compact a 4.75 mm mixture sample of asphalt in a Marshall compactor or a Gyratory compactor to a min. dimension of 100 mm dia. by 60 mm thickness.....
The sample should be compacted to produce air voids in the range of 4% to 8% at 6% asphalt content. Refer to AASTHO M323 for more information regarding preparation of 4.75 mm mixtures.....
- 9.2.3 Take 3 bags from each size and use the procedure in Section 7 to measure the B.S.G. of the compacted 4.75 mm mixture sample, for each individual bag.....

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- 9.2.4 Ave. The sample B.S.G. (or densities) obtained with each bag..... _____
- 9.2.5 Using D2726, measure the B.S.G. of the sample..... _____
- 9.2.6 The ave., B.S.G. (or density) calculated for the asphalt sample shall be within $\pm 0.010 \text{ g/cm}^3$ of the B.S.G. (or density) determined by D2726..... _
- 9.2.7 This section shall be repeated for each bag size..... _____

Comments