Standard Method of Test for

Determination of Maximum Theoretical Specific Gravity

SCDOT Designation: SC-T-83 (rev. 06/2021)

SCOPE

1. This method covers the determination of the maximum specific gravity of un-compacted asphalt paving mixtures.

2. REFERENCED DOCUMENTS

South Carolina Test Methods
SC-T 62
SC-T 72
SC-T 80

3. SIGNIFICANCE AND USE

3.1. The purpose of this procedure is to determine the maximum compacted state of a loose asphalt mixture. This value is used to determine the percent air voids in compacted laboratory samples and percent compaction of asphalt mixtures on the roadway.

4. APPARATUS

4.1. All equipment shall be calibrated at appropriate intervals and records kept in laboratory for review.

4.1.1. Timer – digital or analog capable of measuring to the nearest second.

4.1.2. Balance – 8kg electronic balance or larger with a suitable suspension apparatus. Suspension wire should be the smallest practical size to minimize any possible effects of a variable immersed length.

4.1.3. Metal container or a volumetric metal flask having a capacity of at least 1000-ml. The container must have a cover fitted with a rubber gasket and a hose connection. The hose opening shall be covered with a small piece of No. 200 wire mesh to minimize the possibility of loss of fine material.

4.1.4. Thermometer – calibrated liquid-in-glass, total immersion type, 77 °F mercury or spirit filled thermometer with gradations at every 0.2 °F minimum.

4.1.5. Vacuum pump capable of pulling a minimum vacuum of 30.0 mm Hg absolute pressure continuously for at least 15 minutes.

4.1.6 Auto-Rice Controller to show actual pressure at the end of the vacuum set-up closest to the metal vacuum container. This controller also controls and measures the time of the test during vacuum pressure in section 6.5.

4.1.7 Water Bath – capable of maintaining a constant temperature of 77 $\pm$ 1.8°F (25 $\pm$ 1 °C) throughout the entire area of the bath. The bath shall have a method of continuously circulating the water and controlling water temperature.

5. TEST SPECIMEN

For Field Testing - The sample should be obtained in accordance with SC-T-62, Methods of Sampling Asphalt Mixture, and reduced to testing size according to SC-T-72, Method of Quartering Asphalt Mixtures. The size will be governed by the nominal maximum aggregate size of the mixture and conform to the table below. Samples prepared by the contractor and placed in sample boxes will be tested using the entire sample. Any sample that does not meet the sample requirements in the table below will be noted on the sample test report. Boxed samples may be preheated at 257 ± 9 °F to remove any potential moisture and assist with sample removal.

Nominal Maximum Aggregate Size	Sample Size, g
1.0 in.	3000 - 3400
3/4 in.	2000 – 2400
1/2 in.	1500 – 1900
3/8 in.	1200 – 1600
No. 4	1200 – 1600

Figure SC-T-83-A: Nominal aggregate size

*NOTE – Nominal Maximum Aggregate Size is defined as one sieve size larger than the first sieve to retain more than 10%

For Laboratory Testing – weigh and mix Maximum Theoretical Specific Gravity samples as per SC-T-80.

6. PROCEDURE

6.1. Before obtaining the sample, determine which metal container will be used and obtain a dry weight (A) to the nearest 0.1 g. Submerge the container in the 77 °F water bath for 10 min. and record the submerged weight (D) to the nearest 0.1 g. Thoroughly dry the container when finished weighing.

6.2. Separate the particles of the sample, taking care not to fracture the mineral particles, so that the particles of fine aggregate portion are not larger than 1/4 in. (6.5 mm). If needed, slightly heat material in a heating oven at 257 ± 9°F in a flat pan to ensure separation.

6.3. Cool the samples to room temperature and place in the metal container. Determine the mass of the sample and the metal container (B) to the nearest 0.1 g.

6.4. Add sufficient 77 ± 1.8 °F (25 ± 1 °C) potable water to cover the sample. To aid in the release of entrapped air, add a suitable wetting agent such as Aerosol OT in concentration of 0.01 percent.

6.5. Remove entrapped air by subjecting the contents to a vacuum of at least 30.0 mm Hg absolute pressure continuously for 15 ± 2 minutes. Ensure the Auto-Rice controller is targeting a set point of 27.5mm Hg. Agitate the container and contents by mechanical device or manually by vigorous shaking at minimum intervals of 2 minutes.

6.6. Suspend the container and sample in water at 77 ± 1.8 °F (25 ± 1 °C) and record its mass (E) to the nearest 0.1 g after 10 ± 1 minutes.

7. CALCULATIONS

7.1. Wt. of sample (C) = Wt. of sample and container (B) – Wt. of container (A)

7.2. Wt. of submerged sample (F) = Wt. of sample and container in water (D) – Wt. of container in water (E)

7.3. Maximum Theoretical Specific Gravity = C/(C - F)

8. REPORT

8.1. Record the Maximum Theoretical Specific Gravity (to the nearest 0.001), which will be used in the calculation of the percent air voids after the Bulk Specific Gravity is obtained. Field data and calculations are shown on Form 400.03, and reported on Forms 400.05, and 400.09. Field verification results are shown on Form MD 418, and reported on Forms SC-T-75I and SC-T-75S. Asphalt Mix Design calculations are shown on Form MD 410 and reported on MD 416.