

Standard Method of Test for
Determining Asphalt Pavement Compaction
Using Maximum Specific Gravity
SCDOT Designation: SC-T-87 (Revised 7/2019)

1. **SCOPE**

This method applies to situations where the asphalt roadway compaction is to be determined as a percentage of the asphalt mixture's daily maximum specific gravity. The *Maximum Specific Gravity* is often referred to as the *Maximum Theoretical Specific Gravity*, the *Maximum Rice Specific Gravity*, or *MSG*.

2. **REFERENCE DOCUMENT**

- 2.1 South Carolina Test Methods:
SC-T 101
SC-T 68

3. **SUMMARY OF TEST METHOD**

- 3.1 This test method covers proper sampling, transporting, trimming, weighing, and calculations involving core samples taken from asphalt pavement. Asphalt pavement compaction is determined from the average maximum specific gravity (MSG) of the asphalt mixture based on the daily average of the contractor's field lab results. This MSG value is compared with the bulk specific gravity of each roadway core sample to determine the percent roadway compaction.

4. **SIGNIFICANCE AND USE**

- 4.1 The purpose of this procedure is to ensure that the proper amount of field compaction is achieved according to SCDOT specifications.

5. **APPARATUS**

- 5.1 Diamond-bit 1 (6 ¼ in. outside diameter) circular drill (water cooled)
5.2 Masonry wet-saw (to cut roadway core into layers)
5.3 See equipment list in SC-T-68 for density determination

6. **TEST SPECIMEN**

- 6.1 6 in. diameter roadway cores obtained from the freshly paved layer of asphalt. Each core shall be well marked to identify the location from which it was obtained.

7. PROCEDURE

- 7.1. The SCDOT roadway inspector will identify in accordance with SC-T-101 one 6 in. core at each randomly selected coring location once all rolling has been completed for the subplot and will instruct the contractor to obtain the acceptance density core.
- 7.2. Obtain an undamaged⁽¹⁾ roadway core from each of the locations identified by SCDOT. These locations should be clearly marked for future reference. The drill is to cut into the pavement to the full depth of asphalt, and the top layer removed with a masonry wet saw. *In no case should a screwdriver or other sharp device be used to pry the top layer from the existing roadway. The use of a screwdriver may damage the core and result in inaccurate density readings.* If the roadway is too hot to obtain a core, ice or water may be placed over the location to assist with the cooling. Excessive saturation should be avoided to assist later in the core drying process.
- 7.3. Allow the SCDOT Roadway Inspector to label core with project number, the lot number, and core number. After obtaining all of the cores from the roadway, SCDOT roadway inspector will pack the cores into a sample bag or cooler and seal the samples with a tamper resistant tag (Securneck 1NH or similar, to be approved by the Asphalt Materials Manager). The two-part tamper resistant seal will have two identical numbers on the tamper resistant tag. One part of the tag will be retained by the SCDOT Roadway Inspector for future reference, while the second part will remain intact with the tamper resistant seal. The secured samples will be given to the contractor for transport to the contractor's asphalt plant field laboratory. Use extreme caution in handling cores during transport. The sample bags, coolers, and tamper resistant tags will be supplied by the asphalt contractor for the SCDOT to use for securing core samples.
- 7.4. The cores will remain in the contractor's field laboratory until the DAM or SCDOT representative identifies and cuts off the security seal and allows for the cores to be trimmed and dried prior to testing. Core samples can be trimmed by the contractor on the roadway site prior to transport back to the contractor's field laboratory. The SCDOT will perform core testing with the Contractor's SCDOT Asphalt Level 1 technician present. The security seal number will be added to the coring information worksheet by SCDOT for future reference by the **RCE**. The contractor will receive a copy of the paperwork from the SCDOT prior to leaving the laboratory. The cores will be removed from the contractor's laboratory immediately after performing density testing. The cores will remain in the SCDOT's possession for 4 production days. In the event that the contractor disputes the core density test results, all of the cores will be taken to the SCDOT OMR central laboratory for dispute resolution testing and the values obtained at the OMR will be used for determining contractor's LPF. If dispute resolution testing is requested by the contractor, the contractor will be required to contact the **RCE** and the **DAM** in writing within 2 production days.

Note: A table mounted fan or similar drying devise (Core-Dry) may be used to assist in the drying of cores prior to testing. When the cores have reached constant weight, they are ready for testing in accordance with section 8.1. Constant weight is defined as when the weight of a core is measured within +/- 0.2 grams within consecutive 15 minute intervals.

8. CALCULATIONS

- 8.1 Calculate the individual core bulk specific gravities (repeated from SC-T-68):

$$\text{Bulk Specific Gravity} = A / (B-C)$$

Where: A = mass (g) of specimen in air (constant weight)

B = mass (g) of specimen SSD in air

C = mass (g) of specimen in water

Determine the individual roadway core percent compaction:

$$\text{Percent Compaction} = \frac{\text{Roadway core bulk specific gravity}}{\text{Average daily maximum specific gravity}} \times 100\%$$

The average daily roadway compaction shall be the average of the individual core compactions.

9. REPORT

- 9.1 Individual roadway core percent compaction and average roadway core percent compaction is recorded on Forms 400.09 and 400.12.

EXAMPLE CALCULATIONS

1. Five cores were obtained from random locations (using SC-T-101) on the roadway. The cores were taken to the field lab and weighed in air, under water and in SSD condition (SC-T-68). The bulk specific gravity was computed for each core.

Core	Wt. Air (g)	Wt. Water (g)	Wt. SSD (g)	Bulk Spec.Grav.
1	632.1	366.1	633.1	2.367
2	655.3	379.4	657.2	2.359
3	648.9	376.0	650.7	2.362
4	630.2	365.3	631.4	2.368
5	650.7	375.2	651.6	2.354

Figure SC-T-87-A – Bulk specific gravity of cores

2. The average MSG was determined from the average of the contractor's MSG tests for that day's production; calculated to be = 2.480.

The individual and average compactions were determined for the cores.

Core	Bulk Spec. Grav. (BSG)	%Compaction = (BSG/MSG) x 100%
1	2.367	95.44
2	2.359	95.12
3	2.362	95.24
4	2.368	95.48
5	2.354	94.92
Average		95.24

Figure SC-T-87-B

⁽¹⁾ Any cores that are damaged shall not be used in this procedure. If it is determined that a core is damaged while drilling, then another core will be taken within a 2 ft radius of the damaged core location marked by the SCDOT. The original core will be immediately destroyed by the SCDOT and discarded prior to cutting any additional cores.