

Standard Method of Test for

Laboratory Determination of Moisture Susceptibility based on Retained Strength of Compacted Asphalt Mixtures

SC Designation: **SC-T-70 (08/18)**

1. SCOPE

This procedure is to measure moisture susceptibility of compacted asphalt specimens tested in indirect tension following special conditioning procedures.

2. REFERENCED DOCUMENTS

- 2.1 SC Test Procedures
SC-T 83 – Determination of Maximum Theoretical Specific Gravity
- 2.2 Forms
Form 400.16
Form MD416

3. APPARATUS

- 3.1 Balance, with ample capacity and sufficient sensitivity
- 3.2 Under water weighing holder
- 3.3 Thermometers – Calibrated liquid-in-glass
- 3.4 Vacuum Pump
- 3.5 Water Bath

4. TEST SPECIMENS

- 4.1 Use a gyratory compactor for compaction of the test specimens. Prepare at least 4 gyratory test specimens using the same blend of aggregates as the job mix formula for dry and wet testing. Adjust the compaction effort for specimens to be used for measuring moisture susceptibility such that there will be $7 \pm 1\%$ air voids.* Ensure the compaction temperature for making the specimens is between 145 and 150°C (290 and 300 °F) for mixes containing PG 64-22.

*NOTE: set machine to height of 95mm, not the design number of gyrations (an adjustment in weight of batches may be necessary to yield $7 \pm 1\%$ air voids)

5. PROCEDURE

- 5.1 Indirect Tension Test for Dry Specimens
 - 5.1.1 Measure and record the height in mm (gyratory) and weight in grams of each specimen after specimens have attained room temperature 25°C (77°F). Specimens usually attain room temperature in about two hours after being extracted from the molds.

- 5.1.2 Submerge each specimen in water for 3-5 minutes and record the submerged weight to the nearest 0.1 gram. Remove each specimen from the water bath and blot the excess water with a damp cloth. Then record the surface-dry weight in air to the nearest 0.1 gram. Compute the bulk volume of the specimen as follows:

$$\text{Bulk Volume, cm}^3 = A - B$$

Where:

A = mass in grams of surface-dry specimen in air

B = mass in grams of specimen in water

- 5.1.3 After 24 hours measure the dry indirect tensile strength of 2 randomly selected specimens at 25 °C (77 °F). Apply a load using a compression testing machine with a rate of 2 inches per minute through two 0.75 inch-wide metal strips. Compute the indirect tensile strength of each specimen as follows:

$$\text{ITS, psi} = \frac{2 (L)}{(\pi) (H) (D)}$$

Where:

L = maximum load applied in pounds

H = height of specimen in mm (must convert into inches.)

D = diameter of specimen in mm (must convert into inches.)

5.2 Indirect Tension Test for Wet-Conditioned Specimen

- 5.2.1 Measure and record height, dry air weight, submerged weight and surface dry weight of the 2 remaining specimens according to the procedures stated in 5.1.1 and 5.1.2.

- 5.2.2 Determine the percent air voids as follows:

$$\% \text{ Air Voids} = \frac{F - E}{F} \times 100\%$$

Where:

F = maximum specific gravity of the uncompacted asphalt mixture

E = bulk specific gravity of the compacted asphalt mixture

- 5.2.3 Compute the volume of air voids as follows:

$$M = \text{Volume of Air Voids, cm}^3 = \frac{G \times V}{100\%}$$

Where:

G = % air voids

V = bulk volume of specimen in cm³

5.2.4 Figure the surface-dry weight for 70 and 80 percent saturation:

$$\text{Surface-dry weight, grams} = \frac{[S \times I] + J}{[100\%]}$$

Where:

S = percent saturation

I = volume of air voids in cm³

J = dry mass of specimen in air in grams before saturation

5.2.5 Place each specimen in a distilled water bath at 25 °C (77 °F) and vacuum saturate for ~ 30 seconds at 20" hg vacuum.

5.2.6 Obtain the surface-dry weight of each specimen to the nearest 0.1 gram and calculate percent saturation as follows:

$$\% \text{ Saturation} = \frac{[K - L]}{[M]} \times 100\%$$

Where:

K = surface-dry weight after saturation in grams

L = dry air mass before saturation in grams

M = volume of air voids in cm³, (calculated in 5.2.3)

NOTE: The surface-dry weight has to be between the calculated surface-dry weights for 70 and 80 percent saturation. Vacuum saturation should be continued if the surface-dry weight is less than 70 percent. A specimen is considered damaged if saturation is greater than 80 percent.

5.2.7 Place the wet conditioned specimens in a 60 °C (140 °F) distilled water bath for 24 hours and then in a 25 °C (77 °F) potable water bath for at least 1 hour before conducting indirect tensile strength tests.

5.2.8 Determine the indirect tensile strength of the wet conditioned specimens at 25 °C (77 °F) using the procedure and equation in 5.1.3.

NOTE: The wet and dry specimens should be tested at the same time.

6. CALCULATIONS

6.1 Calculate the Tensile Strength Ratio (TSR).

$$\text{TSR} = \frac{N}{P} \times 100$$

Where:

N = average indirect tensile strength of wet conditioned specimens.

P = average indirect tensile strength of dry specimens.

7. REPORT

All test results are shown on Form 400.16 (HMA ITS Worksheet). Record average indirect tensile strength of wet conditioned specimens and the Tensile Strength Ratio. Recorded data must be recorded on Form 400.16 (Attached worksheet within QA Workbook and forward results to DAM and AME) or on Form MD 416 (Job Mix Information Sheet).