Standard Method of Test for

Determination of Volumetric Properties in Asphalt Laboratory Compacted Specimens

SCDOT Designation: SC-T-68 (11/20)

1. SCOPE

This test method outlines the procedure for determining the volumetric properties, including percent air voids and voids in mineral aggregate (VMA), in laboratory compacted specimens.

2. REFERENCED DOCUMENT

2.1 AASHTO Standards
M 231

2.2 SC Test Methods
T-62, T-83, T-98, T-103

3. SUMMARY OF TEST METHOD

3.1 None

4. SIGNIFICANCE AND USE

4.1 The purpose of this procedure is to determine the percent of air voids in an asphalt mixture to determine whether the mixture meets specifications.

5. APPARATUS

5.1 Balance, meeting the requirements of AASHTO M 231, sufficient capacity, sensitive to 0.1 g., equipped with suitable suspension apparatus and holder to permit weighing the specimen while suspended from the center of the scale pan of the balance.

5.2 Water bath for immersing the specimen in water while suspended under the balance, capable of maintaining temperature of 77 ± 1.8°F.

5.3 Bath towel or cloth capable of removing surface water from compacted specimens.

6. TEST SPECIMENS

6.1 Prepare samples in a design laboratory or obtain asphalt samples from truck in accordance with SC-T-62. Prepare a minimum of 2 compacted specimens according to the method outlined in SC-T-98 or SC-T-103.

7. PROCEDURE

7.1 Cool the specimens to room temperature (77 ± 1.8°F), weigh, and record the dry mass to the nearest 0.1 g. (designated as *A*)

7.2 Immerse each specimen in water for 3-5 minutes on the suspended scale pan, weigh, and record the immersed mass to the nearest 0.1 g. (designated as *C*)

7.3 Remove the specimens from the water, surface dry by blotting with a damp towel, weigh, and record the saturated surface-dry (SSD) mass to the nearest 0.1 g. (designated as *B*)
Tech Note: Damp towel should be immersed in water prior to weighing specimens and rung out until no water is visible.

8. CALCULATIONS

8.1 Calculate the Bulk Specific Gravity (BSG) to the nearest 0.001 of each specimen as follows:

D = Bulk Specific Gravity = A / (B – C)

Where:
A = mass (g) of specimen in air
B = mass (g) of specimen SSD in air
C = mass (g) of specimen in water

8.2 Use the Maximum Specific Gravity (MSG) obtained from (SC-T-83).

8.3 Calculate the percent air voids to the nearest 0.01% as follows:

% Air Voids = (1 – D / E) * 100

Where:
D = Bulk Specific Gravity (nearest 0.001)
E = Maximum Specific Gravity (nearest 0.001)

8.4 Calculate the % Binder by Volume to the nearest 0.01 % as follows:

% Binder by Volume = (F * D) / G

Where:
D = Bulk Specific Gravity (0.001)
F = % Binder in sample (0.01)
G = Specific gravity of Binder (taken from job mix information sheet) (0.001)

8.5 Calculate the percent voids in mineral aggregate to the nearest 0.01% as follows:

% VMA = % Binder by Volume + % Air Voids

8.6 **EXAMPLE CALCULATIONS**

8.6.1 Given: Wt. (g) in air = 4550.1
Wt. (g) SSD = 4554.9
Wt. (g) Water = 2665.3
% Binder of sample = 5.75%
Specific gravity of Binder = 1.034 (from job mix)

Find: % Air Voids and % VMA

8.6.2 Calculations:

Bulk Specific Gravity = D = A / (B – C) = 4550.1 / (4554.9 – 2665.3) = 2.408

MSG = E = 2.502 (ran on same sample test)

% Air Voids = [1 – (D / E)] * 100% = [1 – (2.408/2.502)] * 100% = 3.76%

% Binder by Volume = (F * D) / G = (5.75 * 2.408) / 1.034 = 13.39%

% VMA = % Binder by Volume + % Air Voids = 13.39 + 3.76 = 17.15%

9. REPORT

9.1 Record BSG, MSG, % AV, % Binder by Volume, and % VMA on Form 400.03, and report on Form 400.05 in the QA Workbook. Asphalt split samples collected and used within the asphalt verification program are recorded on Form 400.03 within the HMA Verification QA Workbook. All other asphalt split samples are recorded on worksheet MD 418 (surface mixes) or MD421 (intermediate mixes) and reported on SC-T-75S or SCT-75I within the SCDOT OMR sample workbook. Asphalt Job Mixes are recorded on the computation worksheet and reported on the asphalt job mix information worksheet within the SCDOT mix design workbook.