Washington State
Department of Transportation

WSDOT Test Method T 718

Method of Test for Determining Stripping of Hot Mix Asphalt

1. Scope

a. This test is used to determine the amount of stripping resulting from the effects of water saturation and accelerated water conditioning, with a freeze-thaw cycle of laboratory – compacted Hot Mix Asphalt.

b. This test is the WSDOT equivalent to AASHTO T 283.

2. Equipment

a. Water bath controlled at 140 ± 1.8°F.

b. Vacuum container capable of holding a vacuum of approximately 26 mm Hg and large enough to accommodate test specimens and volume of water as described in this procedure.

c. Perforated platform to hold test samples 2 inches off the bottom of the vacuum container.

d. Vacuum pump, vacuum system or water aspirator, for vacuum saturation of specimens.

e. Air-bath freezer, maintained at 0 ± 5°F.

f. Water bath maintained at 55 ± 1°F.

g. Testing machine – A compression testing machine having a minimum capacity of 10,000 lbf and capable of producing a uniform vertical movement of 0.065 inches per minute.

h. Equipment for preparing and compacting specimens for WSDOT FOP for AASHTO T 312.

i. 100 ± 0.10mm gyratory specimen mold and 99.50 to 99.75mm top/bottom plates which meet WSDOT FOP for AASHTO T 312 section 4.2 (excluding inside diameter measurements) and section 4.3 (excluding diameter measurement).

3. Preparation of Laboratory-Mixed, Laboratory-Compacted Specimens for Mix Designs

a. Mix specimens per WSDOT Test Method 726, at optimum asphalt binder content with appropriate grade and supplier of asphalt binder per the mix design to achieve approximately 4% air voids.

b. Mix six specimens per asphalt binder supplier, two samples with 0% anti-strip additive and the other specimens with varying amounts of anti-strip additive (Note 1).

Note 1: Liquid anti-strip agents added directly to the asphalt binder shall be added by weight of asphalt at levels of ¼%, ½%, ¾% and 1% or levels not exceeding 1% which test an even progression of anti-strip additive per manufacture recommendation. Latex anti-strip agents shall be added to the aggregate in a Saturated Surface Dry (SSD) condition at levels of 0.08%, 0.17%, 0.33% and 0.50% by weight of dry aggregate.

c. Condition and compact the 100 mm specimens per WSDOT FOP for AASHTO T 312 sections 8.5 through 9.8.

Preconditioning of Test Specimens

a. Once the set of six specimens have been compacted and cooled to room temperature, set one of the specimens mixed with 0% anti-strip aside to be stored at room temperature, this will be the referee specimen.

b. Test remaining set of specimens per AASHTO T 166 Method A. Calculate the air void level of the specimen using mix design Theoretical Maximum Specific Gravity value.

c. Place the specimens in the vacuum container. The container must be filled with potable water at room temperature (77 ± 9°F) so that the specimens have at least 1 inch of water above their surface. Apply a vacuum for a short amount of time, suitable to saturate the specimens air voids between 60 and 80 percent.

d. Determine the mass of the saturated, surface-dry specimen after partial vacuum saturation per AASHTO T 166 Method A.

e. Calculate the volume of absorbed water (J) in cubic centimeters by use of the following equation:

$$J = B-A$$

Where:

J = volume of absorbed water, cubic centimeters.
B = mass of saturated, surface-dry specimen after partial vacuum.
A = mass of dry specimen in air.

f. Determine the degree of saturation (S) by comparing the volume of absorbed water (J) with the volume of air voids (Va) using the following equation.

$$S = \frac{100J}{Va}$$

Where:

S = Degree of saturation, percent.
Va = **Volume** of air voids

Determine the Volume of air voids using the following equation:

$$Va = \frac{Pa \times E}{100}$$

Where:

Pa = **Percent** of air voids
E = Volume of Specimen, cubic centimeters (SSD wt. – wt. In water)

g. If the degree of saturation is between 60 and 80 percent then proceed. If the degree of saturation is less than 60 percent then repeat the procedure beginning with c above, using more vacuum and/or time. If the degree of saturation is more than 80 percent then the specimen has been damaged and must be discarded.

h. After saturation is achieved place each specimen in a plastic bag, seal the bag and place specimen in a freezer at a temperature of 0 ± 5°F for a minimum of 16 hours.

i. Remove specimens from the freezer, remove plastic bags and place them in a water bath maintained at 140 ± 2°F for 24 ± 1 hour (Note 2).

Note 2: Some specimens become fragile after curing in the hot bath for 24 hours, as a precaution it may be necessary to place samples into suitable transfer dishes prior to placing them into the hot bath, to facilitate the movement of samples for the hot bath to the cold-water bath.

j. After 24 ± 1 hours in the 140 ± 2°F water bath, remove the specimens and place them into the cold water bath maintained at 55 ± 1°F. At this time the referee specimen shall be placed into the cold water bath with the conditioned specimens. Testing must begin within 2 hours ± 10 minutes after specimens have been placed into the cold water bath.

4. Testing

a. After 2 hours ± 10 minutes in the cold water bath, remove and test one specimen at a time in the testing machine on the diametrical vertical plane. Apply the diametrical loading at a vertical deformation rate of 0.065 inches per minute. Record the maximum compressive load of each specimen.

b. Continue to load specimen until specimen can be easily broken open.

c. Remove specimen from machine, break specimen in half by hand for visual inspection. Record the visual condition of each specimen as to stripping action: none, slight, moderate, or severe.

d. Determine the Tensile Strength Ratio (TSR) of each specimen by comparing the load needed to break the testing specimen to the load needed to break the referee specimen, using the following equation:

$$TSR = \left(\frac{S_1}{S_2}\right) \times 100$$

Where:

S_1 = tensile strength of the conditioned specimen
S_2 = tensile strength of the unconditioned specimen

5. Visiual Condition Definitions

- None – The specimen condition is solid with no evidence of asphalt binder withdrawing from aggregate. After the specimen has air-dried, the appearance is black.
- Slight – The specimen condition is solid to slightly soft with evidence of the asphalt binder beginning to withdraw from edges and surfaces of the aggregates. After the specimen has air-dried, the appearance remains black.
- Moderate – The specimen condition is soft, easily broken in half, with partial to completely exposed aggregates. After the specimen has air-dried, the appearance is slightly gray.
- Severe – The specimen condition is soft to falling apart with the majority of coarse aggregate completely exposed and asphalt binder almost nonexistent. After the specimen has air-dried, the appearance is gray.

6. Report

The report shall include the following: Visually estimated moisture damage (stripping) and Tensile Strength Ratio (TSR) of the specimens.