



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 $140 \pm 1.8^\circ$ F.
- b. Vacuum container capable of holding a vacuum of approximately 26mm Hg and large enough to accommodate test samples 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 samples.
- e. Air-bath freezer, maintained at $0 \pm 5^\circ$ F.
- f. Water bath maintained at $55 \pm 1^\circ$ F.
- g. Testing machine meeting requirements of AASHTO T 246 and capable of producing a uniform vertical movement of 0.065 inches per minute.

3. PREPARATION OF LABORATORY-MIXED, LABORATORY-COMPACTED SAMPLES FOR MIX DESIGNS

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

Note 1: It is recommended that liquid anti-strip agents, added directly to the asphalt binder, be added at the level of $\frac{1}{4}\%$, $\frac{1}{2}\%$, $\frac{3}{4}\%$ and 1% by weight of asphalt binder. Latex anti-strip agents must be added to the aggregate in a Saturated Surface Dry (SSD) condition at a level of 0.08%, 0.17%, 0.33% and 0.50% by weight of dry aggregate.

- c. Compact samples per WSDOT Test Method 702.

PRECONDITIONING OF TEST SPECIMENS

- a. Once the set of six samples have been compacted and cooled to room temperature, set one of the samples mixed with 0% anti-strip aside to be stored at room temperature, this will be the referee sample.
- b. Test remaining set of samples per AASHTO T 166. Calculate the air void level of the sample using mix design Theoretical Maximum Specific Gravity value.
- c. Place the samples in the vacuum container. The container must be filled with potable water at room temperature ($77 \pm 9^\circ$ F) so that the samples have at least 1 inch of water above their surface. Apply a vacuum for a short amount of time, suitable to saturate the samples air voids between 60 and 80 percent.
- d. Determine the mass of the saturated, surface-dry specimen after partial vacuum saturation by method A of T166.
- 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 (V_a) using the following equation.

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

Where:

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

Determine the Volume of air voids using the following equation:

$$V_a = \frac{P_a \times E}{100}$$

Where:

- P_a = **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 sample has been damaged and must be discarded.
- h. After saturation is achieved place each sample in a plastic bag, seal the bag and place sample in a freezer at a temperature of $0 \pm 5^\circ$ F for a minimum of 16 hours.

- i. Remove samples from the freezer, remove plastic bags and place them in a water bath maintained at $140 \pm 2^\circ \text{F}$ for 24 ± 1 hour. (Note 2)

Note 2: Some samples 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 hour in the $140 \pm 2^\circ \text{F}$ water bath, remove the samples and place them into the cold water bath maintained at $55 \pm 1^\circ \text{F}$. At this time the referee sample shall be placed into the cold water bath with the conditioned samples. Testing must begin within 2 hours \pm 10 minutes after samples have been placed into the cold water bath.

TESTING

- a. After 2 hours \pm 10 minutes in the cold water bath, remove and test one sample 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 sample.
- b. Continue to load sample until specimen can be easily broken open.
- c. Remove sample from machine, break sample in half by hand for visual inspection. Record the visual condition of each sample as to stripping action: none, slight, moderate, or severe.
- d. Determine the Tensile Strength Ratio (TSR) of each sample by comparing the load needed to break the testing sample to the load needed to break the referee sample, using the following equation:

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

Where:

- S_1 = tensile strength of the conditioned sample
 S_2 = tensile strength of the unconditioned sample

A Tensile Strength Ratio of 80 or greater is required to be considered passing for this test.

VISUAL CONDITIONING DEFINITIONS

NONE: The sample condition is solid with no evidence of asphalt binder withdrawing from aggregate. After the sample has air-dried, the appearance is black.

SLIGHT: The sample condition is solid to slightly soft with evidence of the asphalt binder beginning to withdraw from edges and surfaces of the aggregates. After the sample has air-dried, the appearance remains black.

MODERATE: The sample condition is soft, easily broken in half, with partial to completely exposed aggregates. After the sample has air-dried, the appearance is slightly gray.

SEVERE: The sample condition is soft to falling apart with the majority of coarse aggregate completely exposed and asphalt binder almost nonexistent. After the sample has air-dried, the appearance is gray.

A sample must have a TSR of 80 or greater and exhibit no visual stripping to pass this test. (Note 2)

Note 2: Asphalt Treated Base requires a TSR of 50 or greater and exhibit no visual stripping to pass this test.

REPORT

- a. The report shall include the following: TSR and visual stripping of the specimen.