



# Performance Examination - Asphalt

## Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage (AASHTO T 283-14)

Candidate Name: \_\_\_\_\_ NICET ID: \_\_\_\_\_

Apparatus	Trial 1	Trial 2
<b>Vacuum Apparatus</b> Vacuum container, preferably Type D from ASTM Method D2041 Vacuum pump or water aspirator (conforms to ASTM D2041) Includes a manometer or vacuum gauge		
<b>Balance</b> Conforms to AASHTO T 166		
<b>Water Baths</b> Three (3) total A. One conforming to AASHTO T 166 B. One capable of maintaining a temperature of $140.0 \pm 1.8$ °F ( $60 \pm 1$ °C) for 24 hours C. One capable of maintaining a temperature of $77 \pm 1.8$ °F ( $25.0 \pm 1.0$ °C)		
<b>Freezer (optional)</b> Maintained at $0 \pm 5$ °F ( $-18 \pm 3$ °C)		
<b>Oven</b> Forced air draft, capable of maintaining the temperature of $140.0 \pm 1.8$ °F ( $60 \pm 1$ °C)		
<b>Testing Apparatus</b> Mechanical or hydraulic testing machine capable of maintaining the required strain rate and measuring load with equal or better precision		
<b>Loading Jack and Ring Dynamometer</b> conforms to AASHTO T 245		
<b>Mechanical or Hydraulic Testing Machine</b> (conforms to AASHTO T 167) Provides a range of rates including 2 in. (50 mm) per minute		
<b>Loading Strips</b> (if used) (conforming to D4123 - Indirect Tension Test for Resilient Modulus)		
<b>Concave surface with a radius of curvature equal to the nominal radius of the test specimen</b> For a 4 in. diameter specimen, width is 0.5 in. For a 6 in. diameter specimen, width is 0.75 in. The length exceeds the thickness of the specimens The edges are rounded by grinding		
<b>Miscellaneous Apparatus</b> Plastic film or heavy-duty plastic bags Masking tape 10 ml graduated cylinder (for freeze-thaw conditioning only) Aluminum pans: bottom surface area of 75 - 100 sq. in., depth of approximately 1 in.		

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Procedures	Trial 1	Trial 2
<b>Sample Preparation (Laboratory Test Specimens)</b>		
1. 4 in. diameter and 2.5 in. thick specimens used Specimens of other dimensions used if aggregate larger than 1 in. is presented		
<b>After Mixing</b>		
1. Place mixture in an aluminum pan and cool at room temp. for 2.0 ± 0.5 hours		
2. Please mixture in a 140 °F (60 °C) oven for 16 hours for curing		
<b>After Curing</b>		
1. Place mixture in an oven at 275 °F (135 °C) for 2 hours before compaction		
2. Compact mixture to 7 ± 1 % air voids or a void level expected in the field		
<b>After Extraction from Molds</b>		
1. Test specimens are stored for 72 to 96 hours (3 to 4 days) at room temperature		
<b>Sample Preparation (Core Test Specimens)</b>		
1. At least six cores for each set of mix conditions		
2. Separate core layers as necessary by sawing or other suitable means, and layers to be stored at room temperature		
3. The theoretical maximum specific gravity of mixture determined by AASHTO T 209		
4. Specimen thickness determined by ASTM D3549		
5. Bulk specific gravity determined by AASHTO T 166		
6. The volume of specimens expressed in cubic centimeters		
7. Air voids calculated by AASHTO T269		
8. Specimens sorted into two subsets of three specimens each so that average air voids of the two subsets are approximately equal		
<b>Preconditioning of Test Specimens</b>		
1. <i>Dry subset</i> Specimens stored at room temperature until tested Specimens wrapped with plastic or placed in a heavy-duty leak-proof plastic bag Specimens placed in a 77 °F (25 °C) water bath for at least 2 hours and then tested		

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Procedures (continued)	Trial 1	Trial 2
2. <i>Conditioned subset</i> Specimens placed in the vacuum container supported above the container bottom by a spacer A container filled with distilled water at room temperature Specimens have at least one in. of water above their surface Partial vacuum (10-26 in. Hg) applied for a short time (5-10 min) Vacuum removed and specimens allowed to be submerged for a short time (5-10 min) Bulk specific gravity determined by AASHTO T166		
3. Saturated surface-dry mass of conditioned samples compared with original saturated		
4. Saturated surface-dry mass and volume of absorbed water calculated		
5. The degree of saturation determined by comparing the volume of air voids with a volume of water absorption		
6. If the volume of water is less than 55%, is the procedure repeated using more vacuum and more time. If the volume of water is more than 80%, is the specimen discarded If the volume of water is between 55 and 80%, then the test continued		
7. <i>(Optional)</i> Vacuum saturated specimens covered tightly with a plastic film and each specimen placed in a plastic bag containing ten ml of water and placed in a freezer at $0 \pm 5$ °F ( $-18 \pm 3$ °C) for 16 hours		
8. Specimens placed into a $140 \pm 1.8$ °F ( $60 \pm 1$ °C) water bath for $24 \pm 1$ hour		
9. If freeze-thaw conditioning was used, plastic bag and film removed from the specimens as soon as possible after placement in the water bath		
10. After 24 hours in the water bath, the specimens removed and placed in a water bath already at $77 \pm 1$ °F ( $25.0 \pm 0.5$ °C) for 1 - 3 hours		
11. If necessary, ice used to prevent water temperature from rising above 77 °F (25 °C)		
12. The water bath should not require more than 15 minutes to reach 77 °F (25 °C)		
<b>Testing</b>		
1. The indirect tensile strength of dry and conditioned specimens determined at 77 °F (25 °C)		
2. The specimens in the 77 °F water bath are removed and placed between the bearing plates in the testing machine. Care taken that the load applied is along the diameter of the		
3. The load applied to the specimen using the constant rate of movement of the testing machine head of 2 in. per minute.		

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Procedures (continued)	Trial 1	Trial 2
<p>4. <i>If the steel loading strips are used</i> Record maximum compressive strength on the testing machine and load continued until a crack appears The specimen is removed from the machine, pulled apart at the crack, inspected for stripping, and observations recorded</p>		
<p>5. <i>If the steel loading strips are not used</i> The loading device is stopped as soon as the maximum compressive load is reached and recorded The specimen is removed, measured, and the side (edge) flattening recorded to the nearest 0.1 in The specimen is replaced in the compression machine and compressed until a crack appears The specimen is removed, pulled apart at the crack, and inspected for stripping Calculations determined</p>		
<b>Sample Preparation (Laboratory Test Specimens)</b>		
1. Specimens used shall be 4 in. diameter and 2.5 in. thick; specimens of other dimensions used if aggregate larger than 1 in. is presented		
2. Six specimens made for each test Three to be tested dry Three to be tested after partial saturation and moisture conditioning		
3. Mixtures prepared in batches large enough to make at least three specimens or a batch large enough for just one specimen		
4. Mixing temperatures and procedures followed for the method used A. If an anti-stripping additive is used, ensure proper follow up procedures. After mixing, mixture placed in a closed container and placed in an oven for 1 to 2 hours to stabilize the specimen at the required compaction temperature B. If preparing a multi-specimen batch, split into single specimens before placing into the oven		
5. After curing mixture compacted to $7 \pm 1$ % air voids or a void level expected in the field		
6. Test specimens are cooled as rapid as possible in a stream of moving air, extracted from molds		
<b>Sample Preparation (Field Specimens)</b>		
1. Truck to be sampled selected by ASTM D3665		
2. The sample was taken from truck at a plant by ASTM D979 (Sampling Bituminous Paving Mixtures)		

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3. Mixture temperature stabilized to approximately the temperature found in the field when rolling begins and temperature maintained in a closed container, in an oven for approximately the time lapse between mixing and the start of actual rolling		
<b>Procedures (continued)</b>	<b>Trial 1</b>	<b>Trial 2</b>
4. Specimens compacted and extruded according to 1(g) and (h) above		
5. If specimens are not to be compacted in the field laboratory, place the samples in a sealed container, transported to the laboratory, and reheated to the required temperature		
<b>Evaluation of Test Specimens and Grouping</b>		
1. The theoretical maximum specific gravity of mixture determined by ATSM D2041		
2. Specimen thickness determined by taking the average of four thickness measurements, ASTM D3549		
3. Bulk specific gravity determined by ASTM D2726		
4. Air voids calculated by ATSM D3203		
5. Specimens sorted into two subsets of three specimens each so that average air voids of the two subsets are approximately equal		
<b>Preconditioning of Test Specimens</b>		
1. <i>Dry Subset</i> Specimens stored at room temperature until the test		
2. <i>Conditioned Subset</i> Specimens placed in the vacuum chamber Container filled with distilled water at room temperature The water used to saturate the specimens may be heated up to 140 °F (60 °C) A partial vacuum such as 20 in Hg applied for a short time (such as 5 minutes) The volume of the partially saturated specimen determined in accordance D2726 Volume of the absorbed water determined by subtracting air dry mass of the specimen from the saturated surface-dry mass of the partially saturated specimen (Sec.8.6.2) The degree of saturation determined by dividing the volume of the absorbed water by the volume of air voids and expressed as a %age (Sec. 8.6.3) If the volume of water is less than 55 %, is the procedure repeated using more vacuum If the volume of water is more than 80 %, is the specimen discarded If the volume of water is between 55 and 80 %, then proceed Specimens placed into a 140.0 ± 1.8 °F (60 ± 1 °C) water bath for 24 hours If a freeze-thaw cycle is desired, a procedure in Note 5 used After 24 hours in the water bath, specimens are removed and placed in a water bath already at 77.0 ± 1.8 °F (25 ± 1 °C) for 1 hour The height of the moisture-conditioned subset determined by D3549 and volume determined by D2726		
3. Water absorption and degree of saturation determined in accordance with 8.6.2 and 8.6.3 (a degree of saturation exceeding 80% is acceptable)		

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4. Swell of the partially saturated specimen determined by dividing the change in specimen volumes in 8.6.2 and 8.3 by volume determined in 8.3 Swell of the moisture conditioned specimen determined by dividing the change in specimen volume in 8.9 and 8.3 by specimen volume in 8.3		
<b>Procedures (continued)</b>	<b>Trial 1</b>	<b>Trial 2</b>
5. The temperature of the dry subset adjusted by soaking in a water bath for 20 minutes at 77.0 ± 1.8 °F		
<b>Testing</b>		
1. The tensile strength of dry and conditioned specimens determined at 77 ± 1.8 °F (25 ± 1 °C)		
2. The specimens in the 77°F water bath are removed and placed into the loading apparatus and the loading strips positioned so that they are parallel and centered on the vertical diametral plane		
3. The load applied to the specimen using the constant rate of movement of the testing machine head of 2 in. per minute. Record maximum compressive strength on the testing machine and load continued until a crack appears. The specimen is removed from the machine, pulled apart at the crack and inspected for the degree of moisture damage		
4. Calculations determined		

First Attempt: Pass: \_\_\_\_\_ Fail: \_\_\_\_\_ Second Attempt: Pass: \_\_\_\_\_ Fail: \_\_\_\_\_

Exam Administration: Remote \_\_\_\_\_ In-Person \_\_\_\_\_

Comments:

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Examiner Name: \_\_\_\_\_ Examiner Signature: \_\_\_\_\_ Date: \_\_\_\_\_