
Standard Method of Test for Moisture Sensitivity Using Hydrostatic Pore Pressure to Determine Cohesion and Adhesion Strength of Compacted Asphalt Mixture Specimens

AASHTO Designation: TP 140-22 (2024)¹

Technically Revised: 2022

Reviewed but Not Updated: 2024

Editorially Revised: 2024

**Technical Subcommittee: 2d, Proportioning
of Asphalt–Aggregate Mixtures**



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Moisture Sensitivity Using Hydrostatic Pore Pressure to Determine Cohesion and Adhesion Strength of Compacted Asphalt Mixture Specimens

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1. SCOPE

- 1.1. This test method includes procedures for preparing compacted asphalt mixture specimens, exposing the specimens to prolonged exposure to moisture and hydrostatic pore pressure inside an enclosed chamber and testing the effect of water on the tensile strength and swell of the specimens.
- 1.2. The values stated in either SI units or U.S. Customary units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.
- 1.3. *This standard may involve hazardous materials, operations, and equipment. It does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
- 1.4. *The quality of the results produced by this standard is dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED STANDARDS

- 2.1. *AASHTO Standards:*
 - M 231, Weighing Devices Used in the Testing of Materials
 - M 339M/M 339, Thermometers Used in the Testing of Construction Materials
 - R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
 - R 30, Mixture Conditioning of Asphalt Mixtures

- R 47, Reducing Samples of Asphalt Mixtures to Testing Size
- R 68, Preparation of Asphalt Mixtures by Means of the Marshall Apparatus
- R 79, Vacuum Drying Compacted Asphalt Specimens
- R 97, Sampling Asphalt Mixtures
- R 114, Design Considerations When Using Reclaimed Asphalt Singles (RAS) in Asphalt Mixtures
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated-Dry Specimens
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Asphalt Mixtures
- T 247, Preparation of Test Specimens of Hot Mix Asphalt (HMA) by Means of California Kneading Compactor
- T 269, Percent Air Voids in Compacted Dense and Open Asphalt Mixtures
- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- T 331, Bulk Specific Gravity (G_{mb}) and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method

2.2. *ASTM Standards:*

- D3549/D3549M, Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
- E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
- E2877, Standard Guide for Digital Contact Thermometers

2.3. *International Electrotechnical Commission Standard:*

- IEC 60751: 2008 Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors

3. SUMMARY OF TEST METHOD

- 3.1. Asphalt mixture specimens are prepared using the methods described in R 68, T 247, or T 312. The bulk specific gravity (G_{mb}) of each specimen is measured using T 166 or T 331. A subset of specimens is moisture conditioned by exposing them to moisture at high temperature for 20 h to test for adhesion strength and then using cyclically increasing and decreasing hydrostatic pore pressure to test for cohesion strength. After conditioning, the G_{mb} of each specimen is measured and compared to the G_{mb} obtained prior to conditioning to determine the swell or change in bulk specific gravity of the specimen. Then, the tensile strength is measured for each conditioned and unconditioned specimen. The tensile strength ratio (TSR) for these specimens is calculated to evaluate the effect of moisture damage on the mixture specimens. Finally, a visual or surface evaluation of moisture damage is performed. The extended exposure to moisture at high temperature and cyclic pressure helps in determining moisture damage susceptibility of the specimens from both adhesion and cohesion failures that can occur in the field.