



Designation: D4867/D4867M – 22

Standard Test Method for Effect of Moisture on Asphalt Mixtures¹

This standard is issued under the fixed designation D4867/D4867M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers procedures for preparing and testing laboratory-compacted asphalt mixture specimens for the purpose of measuring the effect of water on the tensile strength of the paving mixture. This test method is applicable to dense mixtures such as those appearing in the Table for Composition of Bituminous Paving Mixtures in Specification D3515. This test method can be used to evaluate the effect of moisture with or without antistripping additives including liquids and pulverulent solids such as hydrated lime or portland cement.

1.2 The values stated in either SI units or inch-pound units in brackets shall be regarded separately as standard. The values in each system may not be exact equivalents; therefore, each system must be used independently of the other, without combining values in any way.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.22 on Effect of Water and Other Elements on Asphalt Coated Aggregates.

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2. Referenced Documents

2.1 ASTM Standards:²

- D8 Terminology Relating to Materials for Roads and Pavements
- D979/D979M Practice for Sampling Asphalt Mixtures
- D1074 Test Method for Compressive Strength of Asphalt Mixtures
- D1561/D1561M Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor (Withdrawn 2022)³
- D2041/D2041M Test Method for Theoretical Maximum Specific Gravity and Density of Asphalt Mixtures
- D2726/D2726M Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures
- D3203 Test Method for Percent Air Voids in Compacted Asphalt Mixtures
- D3387 Test Method for Compaction and Shear Properties of Bituminous Mixtures by Means of the U.S. Corps of Engineers Gyrotory Testing Machine (GTM) (Withdrawn 2020)³
- D3496 Practice for Preparation of Bituminous Mixture Specimens for Dynamic Modulus Testing (Withdrawn 2010)³
- D3515 Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures (Withdrawn 2009)³
- D3549/D3549M Test Method for Thickness or Height of Compacted Asphalt Mixture Specimens
- D3665 Practice for Random Sampling of Construction Materials
- D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.



D4013 Practice for Preparation of Test Specimens of Bituminous Mixtures by Means of Gyratory Shear Compactor (Withdrawn 2013)³

D4123 Test Method for Indirect Tension Test for Resilient Modulus of Bituminous Mixtures (Withdrawn 2003)³

D6926 Practice for Preparation of Asphalt Mixture Specimens Using Marshall Apparatus

3. Terminology

3.1 Refer to Terminology **D8** for definitions relating to materials for roads and pavements.

4. Summary of Test Method

4.1 *Potential for Moisture Damage*—The degree of susceptibility to moisture damage is determined by preparing a set of laboratory-compacted specimens conforming to the job-mix formula without an additive. The specimens are compacted to a void content corresponding to void levels expected in the field, usually in the 6 to 8 % range. The set is divided into two subsets of approximately equal void content. One subset is maintained dry while the other subset is partially saturated with water and moisture conditioned. The tensile strength of each subset is determined by the tensile splitting test. The potential for moisture damage is indicated by the ratio of the tensile strength of the wet subset to that of the dry subset.

4.2 *Additive Effect*—The effect of an antistripping additive is determined on a set of specimens containing an additive prepared and tested as described in 4.1. The effect of an additive dosage may be estimated by repeating the tests on sets with different additive dosages.

4.3 *Plant-Produced Mixtures*—The potential for moisture damage or the effectiveness of an additive in a plant-produced mixture is determined on specimens that are laboratory compacted to expected field-level void content, divided into wet and dry subsets, and evaluated as described in 4.2.

5. Significance and Use

5.1 This test method can be used to test asphalt mixtures in conjunction with mixture design testing to determine the potential for moisture damage, to determine whether or not an antistripping additive is effective, and to determine what dosage of an additive is needed to maximize the effectiveness. This test method can also be used to test mixtures produced in plants to determine the effectiveness of additives under the conditions imposed in the field.

NOTE 1—The quality of the results produced by this standard are 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 Specification **D3666** are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification **D3666** alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification **D3666** or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

6. Apparatus

6.1 To prepare and compact the specimens, use apparatus from any one of the following: Test Methods **D1074** and **D3387**, Practice **D3496**, or Practices **D1561/D1561M**, **D4013**, and **D6926**.

6.2 *Vacuum Pump or Water Aspirator*, in accordance with Test Method **D2041/D2041M**.

6.3 *Manometer or Vacuum Gage*, in accordance with Test Method **D2041/D2041M**.

6.4 *Container*, preferably Type F, of Test Method **D2041/D2041M**.

6.5 *Balance*, in accordance with Test Method **D2726/D2726M**.

6.6 *Water Baths*, three:

6.6.1 One water bath in accordance with Test Method **D2726/D2726M**,

6.6.2 One bath capable of maintaining a temperature of $60 \pm 1.0^\circ\text{C}$ [$140 \pm 1.8^\circ\text{F}$] for 24 h, and

6.6.3 One bath capable of maintaining a temperature of $25 \pm 1.0^\circ\text{C}$ [$77 \pm 1.8^\circ\text{F}$].

6.7 *Mechanical or Hydraulic Testing Machine*, capable of maintaining the required strain rate and measuring load with equal or better precision.

6.8 *Loading Strips*, in accordance with Test Method **D4123**.

7. Preparation of Laboratory Test Specimens

7.1 Make at least six specimens for each test, three to be tested dry and three to be tested after partial saturation and moisture conditioning.

7.2 Use specimens 100 mm [4 in.] in diameter and 62.5 mm [2.5 in.] high, in general, but specimens of other dimensions may be used if desired. When using aggregate larger than 25 mm [1 in.], use specimens at least 150 mm [6 in.] in diameter.

NOTE 2—The user is cautioned that the specimen diameter has been determined to influence both the tensile strength and the tensile strength ratio. The tensile strength and the tensile strength ratio values may be different for 150 mm specimens compared to 100 mm specimens.

7.3 Prepare mixtures in batches large enough to make at least three specimens or, as an alternative, prepare a batch just large enough for one specimen. If theoretical maximum specific gravity is to be determined, use a batch large enough or prepare a separate batch to provide a specimen for this purpose.

7.4 When a liquid antistripping additive is used, heat a sufficient quantity of asphalt cement for one batch to $150 \pm 6^\circ\text{C}$ [$300 \pm 10^\circ\text{F}$] in a closed 1 L [1 qt] can in an oven. Add the required quantity of additive and immediately mix, for approximately 2 min, with a mechanical stirrer approximately 25 mm [1 in.] from the bottom of the container. Maintain the treated asphalt cement at $150 \pm 6^\circ\text{C}$ [$300 \pm 10^\circ\text{F}$] in the closed can until it is used. Discard the treated asphalt cement if not used the same day it is prepared, or if allowed to cool so that it requires reheating.