



Designation: D4223/D4223M – 20

## Standard Practices for Preparation of Test Specimens of Asphalt-Stabilized Soils<sup>1</sup>

This standard is issued under the fixed designation D4223/D4223M; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope\*

1.1 This standard covers the selection and proportioning of soils and emulsified or cutback asphalts and the fabrication of 100-mm [4-in.] diameter by 65-mm [2.5-in.] high test specimens.

1.2 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026.

1.2.1 The procedures used to specify how data are collected/recorded or calculated in the standard are regarded as industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the users objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analysis methods for engineering design.

1.3 *Units*—The values stated in either SI units or inch-pound units [presented in brackets] 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.

1.3.1 The gravitational system of inch-pound units is used when dealing with inch-pound units. In this system, the pound (lbf) represents a unit of force (weight) while the unit for mass is slugs. The rationalized slug unit is not given, unless dynamic ( $F=ma$ ) calculations are involved.

1.3.2 It is common practice in the engineering/construction profession to concurrently use pounds to represent both a unit of mass (lbm) and of force (lbf). This implicitly combines two separate systems of units; that is, the absolute system and the gravitational system. It is scientifically undesirable to combine the use of two separate sets of inch-pound units within a single standard. As stated, this standard includes the gravitational

<sup>1</sup> These practices are under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.15 on Stabilization With Admixtures.

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system of inch-pound units and does not use/present the slug unit for mass. However, the use of balances or scales recording pounds of mass (lbm) or recording in lbm/ft<sup>3</sup> shall not be regarded as nonconformance with this standard.

1.4 *This standard offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this standard may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

1.5 *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.*

1.6 *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.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- C117 Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
- C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
- D8 Terminology Relating to Materials for Roads and Pavements
- D75 Practice for Sampling Aggregates
- D653 Terminology Relating to Soil, Rock, and Contained Fluids

<sup>2</sup> 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.

\*A Summary of Changes section appears at the end of this standard



D977 Specification for Emulsified Asphalt  
D1074 Test Method for Compressive Strength of Asphalt Mixtures  
D1188 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples  
D1560 Test Methods for Resistance to Deformation and Cohesion of Asphalt Mixtures by Means of Hveem Apparatus  
D1561 Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor  
D2026 Specification for Cutback Asphalt (Slow-Curing Type)  
D2027 Specification for Cutback Asphalt (Medium-Curing Type)  
D2028 Specification for Cutback Asphalt (Rapid-Curing Type)  
D2216 Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass  
D2397 Specification for Cationic Emulsified Asphalt  
D2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate  
D2726 Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures  
D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction  
D4123 Test Method for Indirect Tension Test for Resilient Modulus of Bituminous Mixtures (Withdrawn 2003)<sup>3</sup>  
D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils  
D6026 Practice for Using Significant Digits in Geotechnical Data  
D6926 Practice for Preparation of Asphalt Mixture Specimens Using Marshall Apparatus

### 3. Terminology

3.1 Refer to Terminology D653 for terms relating to soils and to Terminology D8 for terms relating to asphalt.

### 4. Summary of Practice

4.1 This standard provides two different compaction method alternatives to produce samples for evaluating the performance of various percentages of asphalt emulsions or cutbacks mixed with fine grained soils.

### 5. Significance and Use

5.1 This standard is intended for the preparation of standard specimens of soil-asphalt mixtures suitable for tests of Test Methods D1560, D1561, D4123, and other tests using specimens of the above dimensions. This standard is limited to only fine-grained soils as defined in 7.1.

NOTE 1—The quality of the results produced by this standard is dependent on the competence of the personnel performing it and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent

and objective testing, sampling, inspection, and so forth. Users of this standard are cautioned that compliance with Practice D3740 does not in itself ensure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors.

### 6. Apparatus

6.1 All testing equipment is described in the appropriate standards given in Section 2 of this standard.

### 7. Materials

7.1 *Soils*, shall be combinations of sand, silt, and clay-size materials generally encountered in ground deposits and containing not more than 25 % of material larger than the 4.75 mm (No. 4) sieve. The types of soils considered to be suitable for stabilization with emulsified or cutback asphalts are sands, silty sands, and other fine-grained soils of low plasticity. Generally, a suitable soil will have a sand equivalent test value not less than 25 determined in accordance with Test Method D2419, and the product obtained by multiplying the plasticity index as determined in accordance with Test Method D4318, by the percent passing the 75  $\mu$ m (No. 200) sieve will not be more than 60.

7.1.1 Soils having more than 25 % passing the 745  $\mu$ m (No. 200) sieve or a sand equivalent value below 25 are considered borderline prospects for suitable stabilization with asphalt. Continuation under this standard for such soils should be considered exploratory. However, a soil may still be judged suitable on the basis of subsequent testing, depending on criteria set for the specific objective of the stabilization project.

7.2 *Bituminous Material*, shall be an emulsified asphalt as specified in Specifications D977 or D2397, or a cutback asphalt as specified in Specifications D2026, D2027, or D2028, the type and grade to be as specified.

7.3 *Potable Water*, shall be used in preparing mixtures where required.

### 8. Preparation of Soil

8.1 Sample the soil in accordance with Practice D75.

8.2 Pulverize approximately 4.5 kg [10 lb] of the air-dry soil in such a manner as to separate the soil particles without reducing the individual particle sizes and screen through a 4.75-mm (No. 4) sieve. Record the percentage retained on the 4.75-mm (No. 4) sieve. Screen the soil passing the 4.75-mm (No. 4) sieve through the 2.00-mm (No. 10) sieve, and if soil-binder aggregations are retained on the 2.00-mm (No. 10) sieve, further pulverize them to break down the aggregations without reducing the individual particle sizes.

8.3 Combine and thoroughly mix the material passing the 4.75-mm (No. 4) sieve with the material passing the 2.00-mm (No. 10) sieve and store in tightly closed containers.

8.4 The material retained on the 4.75-mm (No. 4) sieve may be reintroduced into the mix at this point, provided it does not exceed 10 % of the total combined weight of all fractions, and the maximum size is not greater than the 19.0-mm (¾-in.) sieve.

### 9. Water Content, Sieve Analysis, and Sand Equivalent

9.1 *Water Content*—Determine the water content of at least a 500-g [1 lb] sample of the air-dried soil in accordance with

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).