



Designation: D2489/D2489M – 24

Standard Test Method for Estimating Degree of Particle Coating of Asphalt Mixtures¹

This standard is issued under the fixed designation D2489/D2489M; 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 provides an estimate of the degree of particle coating in an asphalt-aggregate mixture on the basis of the percentage of coarse particles classified as being completely coated.

1.2 The values stated in either SI units or inch-pound 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 nonconformance with the standard.

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 Since a complete precision and bias statement for this standard has not been developed, the test method is to be used for research and informational purposes only. Therefore, this standard should not be used for acceptance or rejection of a material for purchasing purposes.

NOTE 1—This wording was originally approved by Subcommittee D04.90 on June 29, 1999 and represents a combination of the ASTM Form and Style Manual and input from Subcommittee D04.94.

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.*

¹ This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.23 on Plant-Mixed Asphalt Surfaces and Bases.

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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
- D995 Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures (Withdrawn 2009)³
- D3665 Practice for Random Sampling of Construction Materials
- D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- D4215 Specification for Cold-Mixed, Cold-Laid Asphalt Paving Mixtures
- D8055 Guide for Selecting an Appropriate Electronic Thermometer for Replacing Mercury Thermometers in D04 Road and Paving Standards
- E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 For definitions of terms, see Terminology D8.

3.2 For descriptions of mixing plant terms, see Mixing Plants, Specification D995.

4. Significance and Use

4.1 The procedure in this test method for estimating the percentage of coated particles after varying mixing times is used to establish the least mixing time required to produce satisfactory coating for a given set of conditions. This procedure can also be used to sample cold mixtures from stockpiles to determine that satisfactory coating has been retained in the stockpile.

4.2 This procedure is used with asphalt mixtures or with cold-mixed, cold-laid asphalt paving mixtures such as specified in Specification D4215.

NOTE 2—Even when a paving mixture complies with the “percent of

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.



coated particles” that may be specified, there is no assurance that the asphalt cement is uniformly distributed throughout the mixture.

4.3 This test method should not be used for acceptance/rejection by owner agencies.

NOTE 3—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.

5. Apparatus

5.1 *Sieves*, 9.5 mm [$\frac{3}{8}$ in.] and 4.75 mm (No. 4). The sieves shall conform to Specification E11.

5.2 *Stopwatch*, for checking actual mixing time of batch plants.

5.3 *Thermometers*—The thermometer for measuring the temperature of the asphalt mix shall have a temperature range of at least 10 °C [50 °F] to 204 °C [400 °F] and an accuracy of ± 2.0 °C (see Note 4) as recommended by Guide D8055.

NOTE 4—Thermometer types suitable for use include a thermocouple, tolerance ± 2.0 °C, Type T or Type K.

5.4 *Sample Shovel*.

5.5 *Sample Trays*.

6. Sampling

6.1 *Batch Plant*—Permit the plant to operate at an established mixing time per batch (timed by a stopwatch).

6.2 *Continuous Mix Plant*—Establish a mixing time by use of the following formula:

$$T_{\text{Mixing}} = \frac{C_{PM}}{O_{PM}} \quad (1)$$

where:

T_{Mixing} = mixing time in pug mill, s,
 C_{PM} = contents of the pug mill, kg [lb], and
 O_{PM} = output of the pug mill, kg/s [lb/s].

6.3 *Drum Mix Plant*—Operate the plant at a steady state condition for a period of time long enough to complete the sampling.

6.4 Samples should be taken at the site of the asphalt mixing plant immediately after discharge from the plant from three truck loads selected at random in accordance with Practice D3665 and sampled in accordance with Practice D979/D979M. Approximately 2.5 to 4.0 kg [5 to 8 lb] is required to perform the procedure.

6.5 If sampling truck loads is impractical, sample from the roadway before compaction starts in accordance with Practice D979/D979M at three locations selected at random in accordance with Practice D3665.

6.6 If sampling from a cold-mixed stockpile, sample in accordance with Practice D979/D979M at three locations selected at random in accordance with Practice D3665.

7. Procedure

7.1 Sieve each sample immediately while it is still hot on a 9.5 mm [$\frac{3}{8}$ in.] sieve, or a 4.75 mm (No. 4) sieve for material with a maximum 9.5 mm [$\frac{3}{8}$ in.] size. Take a sample large enough to yield between 200 and 500 coarse particles retained on the 9.5 mm [$\frac{3}{8}$ in.] or 4.75 mm (No. 4) sieve. Do not overload the sieves. If necessary, sieve the sample in two or three operations. Minimize shaking the sample in the sieves to prevent recoating of uncoated particles. Record the sample temperature while the material is in a small pile of 200 to 500 coarse particles. In the case of cold-mixed, cold-laid asphalt, record the ambient air temperature.

7.2 Place particles on a clean surface in a one-particle layer and start count immediately.

7.3 Carefully examine each particle under direct sunlight, fluorescent light, or similar light conditions. If any uncoated portion of the stone is noted, classify the particle as “partially coated.” If completely coated, classify the particle as “completely coated.”

8. Report

8.1 Report the estimated percentage of coated particles as follows:

$$CP_{Est\%} = \left(\frac{(\#CP)}{(\#TP)} \right) \times 100 \quad (2)$$

where:

$CP_{Est\%}$ = estimated number of coated particles,
 $(\#CP)$ = number of coated particles counted, and
 $(\#TP)$ = total number of particles counted.

8.2 Report sample temperature measured at the time of the test.

9. Precision and Bias

9.1 Since a complete precision and bias statement for this standard has not been developed, the test method is to be used for research and informational purposes only. Therefore, this standard should not be used for acceptance or rejection of a material for purchasing purposes.

NOTE 5—This wording was originally approved by Subcommittee D04.90 on June 29, 1999 and represents a combination of the ASTM Form and Style Manual and input from Subcommittee D04.94.

9.2 No information can be presented on the bias of the procedure in Test Method D2489/D2489M for measuring particle coating because no material having an accepted reference value is available.

10. Keywords

10.1 asphalt mixtures; asphalt paving mixtures; particle coating