



Designation: D6627/D6627M – 22

Standard Test Method for Determination of a Volatile Distillate Fraction of Cold Asphalt Mixtures¹

This standard is issued under the fixed designation D6627/D6627M; 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 the determination, by direct measurement, of the ambient to 260 °C [500 °F] volatile distillate fraction of cold mix asphalt mixtures.

1.2 A precision and bias statement for this test method has not been developed since this test method is used for research purposes or information only. Therefore this test method should not be used for acceptance or rejection of a material for purchasing purposes.

1.3 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.

1.4 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.

1.5 *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 D04.27 on Cold Mix Asphalts.

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2. Referenced Documents

2.1 *ASTM Standards:*²

- D979/D979M Practice for Sampling Asphalt Mixtures
- D1461 Test Method for Moisture or Volatile Distillates in Asphalt Mixtures
- D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing
- D6997 Test Method for Distillation of Emulsified Asphalt

3. Significance and Use

3.1 This test method is used for determining the amount of a temperature-specific volatile distillate fraction in cold mix asphalt mixtures.

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.

4. Apparatus

4.1 *Vertical Cylindrical Metal Still*, similar to that used in Test Method D6997, having a faced flange at the top to which the head is tightly attached by means of a clamp. The head shall be of a metal, preferably copper or brass, and shall be provided with a tubular opening of 25 mm [1 in.] in inside diameter and an additional tubular opening of 13 mm [$\frac{1}{2}$ in.] in inside diameter. Threaded into the 25 mm [1 in.] tubular opening is a

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.

stainless steel or brass fitting connected firmly to a ground glass joint by means of flexible stainless steel or glass tubing. Inserted into the 13 mm [$\frac{1}{2}$ in.] tubular opening is a metal thermometer with a range of 93 to 538 °C [200 to 1000 °F] extending 125 mm [5 in.] into the metal still and firmly connected by means of a graphite ferrule compression fitting.

4.2 *Condenser*, of the water-cooled reflux glass-tube type, having a condenser jacket not less than 400 mm [$15\frac{3}{4}$ in.] long with an inner tube 9.5 to 13 mm [$\frac{3}{8}$ to $\frac{1}{2}$ in.] in the outside diameter. The end of the condenser inserted in the ground glass joint shall be ground off at an angle of 30° from the vertical axis of the condenser. For mixtures with very volatile solvents, it may be necessary to supplement this water-cooled condenser with a second water-cooled condenser of approximately the same dimensions.

4.3 *Collection Flask*, cylinder of well-annealed glass having a capacity of 100 mL [3.4 fl oz.] graduated with divisions of 0.1 mL [0.003 fl oz.] and attached to the condenser(s) by means of a well-annealed glass bend. The glass bend attaching the condenser to the graduated cylinder is secured by ground glass joints on either end and vented with a 3 mm [$\frac{1}{8}$ in.] vent on top of the bend directly above the graduated cylinder to prevent pressure in the apparatus. The collection flask is submerged to the top of the gradations in an ice bath.

4.4 *Distillation Liquid*, 40 mL [1.4 fl oz.] of distilled water.

4.5 *Heating Device*, of high-temperature electrical heating tape wrapped around the entire still and the connecting tubing between the still and condenser. A variable voltage transformer connected to the heating tape is used to control the rate of temperature rise to approximately 5 °C [10 °F] per minute. Insulate the entire still, including the connecting tubing from the still to the condenser, with 25 mm [1 in.] of fiberglass insulation to prevent heat loss.

4.6 *Balance for Weighing*, conforming to Guide **D4753** for Class GP2.

4.7 *Thermometer*, for measuring the temperature of the asphalt mixture while in the still. The thermometer shall have a measurement range of 200 to 300 °C [392 to 572 °F], and an accuracy of at least ± 1.5 °C [3 °F]. The thermometer shall meet the following requirements:

4.7.1 A digital metal stem thermometer with a thermocouple sensor and a stem length of at least 150 mm [6 in.] paired with an appropriate meter capable of displaying temperature to the nearest 0.1 °C [0.2 °F]. The sensor shall be encased in a stainless steel sheath that has a length of at least 150 mm [6 in.] and a minimum immersion depth of not more than 40 mm [1.6 in.].

5. Sampling

5.1 Sampling shall be carried out in accordance with Practice **D979/D979M**. The sample shall be obtained and sealed at the production site within 30 s after completion of the asphalt mixture production cycle.

5.2 The sample shall be representative of the material and shall preferably be of such size to fill a friction top metal pail. A metal pail of 1 L [$\frac{1}{4}$ gal] capacity is preferred; however, a friction top metal pail of 2 L [$\frac{1}{2}$ gal] capacity is allowed. Keep the pail tightly sealed at all times to avoid loss of volatiles.

6. Sample and Test Specimen

6.1 After obtaining a 700 ± 5 g mass from the representative sample as described in 5.1 and 5.2, record the mass of the sample to 0.1 g [0.004 oz.]. Keep the remainder of the sample in the tightly covered container.

7. Procedure

7.1 After the sample has been placed in the still, add 40 mL [1.4 fl oz.] of distilled water.

7.2 Assemble the components of the apparatus as illustrated in Fig. 1. Make all connections liquid and vapor tight. Insert a gasket of heavy paper moistened with distilled water, or a nonabsorbent gasket, between the still body and cover. The condenser tube and collection flask shall be clean to ensure free drainage into the collection flask.

7.3 Apply heat so that the rate of temperature rise is approximately 5 °C [10 °F] per minute. Maintain the sample temperature at 260 ± 5 °C [500 ± 10 °F], for 15 min. If condensate is being collected at the end of the 15 min period, continue distillation until no condensate is being collected. The maximum hold period at test temperature shall not exceed 30 min.

7.4 Record the volume of diluent in the collection flask to the nearest 0.1 mL [0.003 fl oz.] scale division. If applicable, transfer the sample to a clean, inert glass container, seal, and place in refrigerator for distillate determination.

NOTE 2—The diluent is lighter than water and will be on top of the water in the collection flask. The diluent will tend to appear cloudy.

8. Calculation

8.1 Calculate the volatile distillate as follows:

$$\text{diluent, \%} = \frac{(\text{diluent vol, in collection flask}) \times (\text{diluent density at } 25^\circ\text{C})}{\text{original mass of sample}} \times 100 \quad (1)$$

NOTE 3—Assume density of diluent based on knowledge of diluent type or values in the range of 0.85 to 0.90 g/cm³ [53.06 to 56.10 lb/ft³], as set forth in accordance with Test Method **D1461**.

9. Precision and Bias

9.1 A precision and bias statement for the test method has not been developed since this test method is used for research purposes or information only. Therefore this test method should not be used for acceptance or rejection of a material for purchasing purposes.

10. Keywords

10.1 cold asphalt mixtures; cold mix; distillation; volatiles