Designation: C 461 – 81 (Reapproved 2008)

Standard Test Methods for Mastics and Coatings Used With Thermal Insulation[1]

This standard is issued under the fixed designation C 461; 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 These test methods cover procedures for sampling and testing mastics and coatings for use as weather and vapor barrier finishes on thermal insulations and for other accessory use.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The test methods appear in the following order:

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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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C 168 Terminology Relating to Thermal Insulation

C 419 Practice for Making and Curing Test Specimens of Mastic Thermal Insulation Coatings

D 56 Test Method for Flash Point by Tag Closed Cup Tester

D 71 Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)

D 93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

D 140 Practice for Sampling Bituminous Materials

D 217 Test Methods for Cone Penetration of Lubricating Grease

D 2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer

D 3278 Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods, see Terminology C 168.

4. Sampling

4.1 Prior to opening or sampling, or both, any mastic or coating, its Material Safety Data Sheet (MSDS) should be reviewed to ensure appropriate precautions or personal protective equipment, or both, are utilized.

4.2 Take the samples for laboratory examination from the original containers immediately after stirring to a uniform condition. Determine the number of containers sampled as required to represent a shipment in accordance with Practice D 140. Restir the composite sample immediately before taking out portions for individual tests.

5. Uniformity and Storage Stability

5.1 Open the original containers and examine them for uniformity of contents. Record the degree of separation, if any, into portions of appreciably different consistency, such as thick or thin layers, sedimentation or coagulation, etc., also of difficulty encountered in stirring to a uniform condition.

5.2 Examine the contents of a full container of not less than 1 qt (1 L) that has stood undisturbed for 48 h. Make notation of any separation of solvent or water, coagulation, or settlement of suspended matter, that cannot be overcome by moderate agitation.

[1] These test methods are under the jurisdiction of ASTM Committee C16 on Thermal Insulation and are the direct responsibility of Subcommittee C16.33 on Insulation Finishes and Moisture.

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[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.

5.3 Additionally, if required, examine and report the condition in the container after 3 months' storage, examining for uniformity in accordance with 5.1.

6. Stability Under Freezing

6.1 Fill a 1-pt (500-mL) press-top tin can three quarters full with the coating, and hold the filled and closed container in a chamber at a temperature of 0 ± 5°F (−18 ± 3°C) for a minimum of 12 h consecutively under natural convection conditions.

6.2 At the expiration of the freezing period, permit the coating to warm to room temperature by exposure of the container to the temperature of the laboratory for a minimum of 6 h. After the first operation of freezing and thawing, repeat the procedure twice so that the coating will have been subjected to three cycles of freezing and thawing.

6.3 After the completion of the third cycle, open the container, and note any separation of solvent or water, coagulation, settlement of suspended matter, or the presence of distinct layers, or a combination of these. If the compound cannot be rendered homogeneous by moderate stirring at laboratory temperature, report that it has coagulated.

7. Density and Weight per Gallon

7.1 *Apparatus*:

7.1.1 *Container*—Any suitable container of known volume may be used. 7.1.1.1 describes one such container.

7.1.1.1 *Brass Cylinder*, short, about 3 in. (80 mm) high and 1.5 in. (40 mm) in diameter, with the inside bottom angles rounded is most convenient. Adjust the capacity of such a cylinder to hold 83.3 ± 0.1 g of water at 77°F (25°C).

7.2 *Procedure*—Condition the sample at 77°F (25°C) and fill the tared container with a slight excess. In filling the container, take precautions to ensure that no air is entrapped, jarring or vibrating the container until no further change in volume occurs is satisfactory. Remove excess with a straightedge flush with the top of the container and wipe the outside of the container clean. Then weigh the container and contents to within ±0.5 g.

7.3 *Calculations*—Subtract the weight of the empty container and divide the remainder by the capacity of the container in cubic centimetres. The quotient is the density in grams per cubic centimetre which, multiplied by 83.3, gives the weight per gallon in pounds.

7.3.1 If the cylinder described in 7.1.1.1 is used, the weight of the contents in grams, divided by 10, is the weight per gallon in pounds.

8. Consistency

8.1 Refer to Test Method D 217 for apparatus and general procedure, with exceptions as noted in 8.2-8.4.

8.2 In a closed container bring to test temperature sufficient material to overfill the cup of the standard grease worker. Do this either in an air bath or water bath, being careful if the latter is used not to permit water to enter the container. Transfer the material to the standard cup, occasionally jarring the cup sharply on a hard surface and using a spatula for filling to avoid the inclusion of air. Scrape off the excess material extending above the rim of the cup by moving the blade of the spatula, held inclined toward the direction of motion at an angle of 45° across the rim of the cup.

8.3 Determine the cone-penetration reading in accordance with Section 5 of Test Method D 217, with minimum time between filling the cup and the reading to avoid temperature change of the sample. Report the average of the three tests to the nearest 0.1 mm as the penetration of the sample.

8.4 The practical limit of cone penetration is 375. If readings above this value are obtained, or if specified, an aluminum cone and shaft with a total weight of 50 g may be used in place of the 150-g cone and shaft specified in Test Method D 217. If with this modification, readings exceed a penetration of 375, consistency alternatively may be determined by Test Method D 2196. The helipath stand and T-bar spindles may be used.

9. Solids Content

9.1 Weigh about 5 g of material to the nearest 0.01 g into a weighed flat-bottom metal dish or container (Note 1). Place the dish and its contents in an oven at 105 ± 2°C (220 ± 5°F) for 2 to 4 h, or until the material shows a loss of not greater than 0.02 g on successive hourly weighings; then cool in a desiccator and weigh.

NOTE 1—A friction-top can plug, 50 to 80 mm in diameter, has been found convenient.

9.2 From the weight of the dried residue and the weight of the original sample, calculate the percent nonvolatile matter.

10. Content of Volatiles and Coverage of Mastics and Coatings

10.1 *Scope*—This test method covers the determination of the volume of volatile matter and the coverage per unit of dry film thickness of mastics and coatings. The volume of volatile matter is expressed as the percent of the original compound. The coverage is expressed in square feet per gallon of coating as received per 0.10 in. (2.5 mm) of dried film thickness. For supplementary procedures, refer to Test Method D 71 and Section 7 of these test methods.

10.2 *Test Specimens*—To determine the density of the cured film, use two or more test specimen portions at least 1 by 1 in. (25.4 by 25.4 mm) in area and from films of the wet thickness specified by the manufacturer. Prepare and cure these films on dextrin-coated paper as specified in Practice C 419, or on cellophane or other suitable sheet material that can readily be removed after cure of the mastic or coating at room condition. Cure the film to constant weight at 150°F (65°C) and the paper removed before determination of density in accordance with Test Method D 71.

10.3 *Calculations*—From values for density of the coating as received (Section 7), and of the cured film, and the weight content of solids (Section 9), calculate the volume of volatile matter as follows:

$$V = 100 - S_v = 100 - S_w\,(D_1/D_s) \quad (1)$$

where:

V = volume of volatile matter, %,
S_v = volume of solids, %,

S_w = weight of solids (Section 9),
D_1 = density of the coating as received, and
D_s = density of the cured film.

10.3.1 Knowing the percent volume of volatile matter, V, calculate the coverage, expressed in square feet per gallon of coating as received per 0.10 in. (2.5 mm) of dried film thickness as follows:

$$\text{Coverage} = 16\,[1 - (V/100)] \quad (2)$$

11. Build

11.1 Application of the material to the test panels may be in accordance with Practice C 419, or to the thickness and by the method to be followed in practice, such as spray, brush, or trowel. The compound shall be at 77 ± 5°F (25 ± 3°C) unless otherwise specified such as for hot spray. Apply the material to 10 by 10-in. (254 by 254-mm) smooth calcium silicate insulation blocks, primed or unprimed in accordance with the instructions of the manufacturer, at a temperature of 77 ± 5°F. Other insulation types may be substituted, and shall be identified in the report. Mask the panel for 1 in. (25.4 mm) along the edges. Immediately after application remove the masking and suspend the panel in a vertical position in a room at 77 ± 5°F. After 1 h observe the coating for any flow, slippage, and sagging. Record the maximum movement to the nearest 1/32 in. (0.8 mm).

12. Drying Time

12.1 Test the coated panel prepared in accordance with Section 11 at 15-min intervals to determine the time required to set-to-touch, and at 30-min intervals to determine the time to reach practical hardness. The film is considered to have set-to-touch when a light pressure of the finger shows no material adhering to the finger. Practical hardness is that condition when firm pressure of the film between the thumb and the finger shows a slight tacky condition, but the film is not ruptured and none of the coating adheres to the finger.

13. Flash Point

13.1 Refer to Method B of Test Methods D 93.
13.2 Alternatively, refer to Test Method D 56.
13.3 Alternatively, refer to Test Methods D 3278.

14. Precision and Bias

14.1 The precision and bias of the procedures detailed in this standard have not been determined.

14.2 The precision and bias of the test methods identified herein in other ASTM test methods are as specified in those test methods.

15. Keywords

15.1 coatings; consistency; density; mastics; thermal insulation