



# Standard Practice for Making and Curing Test Specimens of Mastic Thermal Insulation Coatings<sup>1</sup>

This standard is issued under the fixed designation C 419; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice covers the preparation of specimens of mastics and coatings in the form of cured sheets or films that may be used in other procedures for evaluation of physical properties.

1.2 Three procedures are described for casting and curing (Note 1) mastics and coatings of all types for thermal insulation.

NOTE 1—The term “cure” is used primarily to denote the condition that develops as the result of loss of volatile matter but also to denote possible subsequent changes in chemical or physical properties due to crosslinking.

1.2.1 *Procedure A* is intended to provide a specimen of controlled thickness applied to insulation, and equivalent in other respects to that obtainable under field application conditions. The thermal insulation intended for field use may be specified as the backing.

1.2.2 *Procedure B* is intended to provide a free-film specimen of controlled thickness having smooth surfaces on both sides. This type is required for some types of physical testing.

1.2.3 *Procedure C* is intended to provide a free-film specimen of controlled thickness having one smooth surface (as field applied).

1.3 The procedures of this practice are not intended for the evaluation of application properties. These are covered in Test Methods C 461 and Guide C 647.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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

## 2. Referenced Documents

### 2.1 ASTM Standards:

C 461 Test Methods for Mastics and Coatings Used With Thermal Insulation<sup>2</sup>

C 533 Specification for Calcium Silicate Block and Pipe Thermal Insulation<sup>2</sup>

C 647 Guide to Properties and Tests of Mastics and Coating Finishes for Thermal Insulation<sup>2</sup>

D 6 Test Method for Loss on Heating of Oil and Asphaltic Compounds<sup>3</sup>

## 3. Summary of Practice

3.1 Mastics and coatings are applied by a metal blade to thermal insulation backing material in a thickness regulated by guide bars. Moderate heat is applied to the specimens to dry or otherwise cure them.

## 4. Significance and Use

4.1 The method of preparation of test specimens of mastic thermal insulation coatings can have an impact upon values obtained during testing. Testing laboratories should follow this practice to help ensure the reproducibility of test methods for which a cured sheet or film of a mastic thermal insulation coating is required.

## 5. Apparatus

5.1 *Guide Bars*—Two rectangular steel bars of thickness equal to the desired wet thickness of the applied mastic or coating. The guide bars shall be equal in length to the total length of the specimens. For use on relatively soft backing material, the guide bars may be equipped with pins projecting from the lower surface at each end, which can be forced into the backing to hold the bars in position during preparation of the test specimen.

5.2 *Strike-Off Bar*—A flat strip of rigid metal, not less than 2 in. (51 mm) greater in length than the width of the specimen. One edge shall be smooth and straight.

5.3 *Leveling Roller*—One section of straight 1½-in. (38-mm) stainless steel pipe or any other convenient cylindrical leveling tool. The tool shall have a smooth surface. Minimum length shall be 2 in. (51 mm) longer than the width of the specimen.

5.4 *Backing Material*—Unless otherwise specified by the

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.33 on Insulation Finishes and Moisture.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.06.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.04.

procedure for the test to be made, the backing for the specimen shall consist of commercial block-type calcium silicate insulation meeting the requirements of Specification C 533 and measuring 2 by 18 by 24 in. (51 by 457 by 610 mm). The backing block may be prepared by assembling not more than three blocks of smaller dimensions by the use of suitable adhesive or pins, in such a manner as to form a solid, rigid block.

**5.5 Release Paper**—A smooth, dense white paper coated on one side with dextrin, or other water-soluble gum.<sup>4</sup> Size should be approximately the same as the backing block.

NOTE 2—Films coated with PTFE or other suitable nonsoluble release agent may be used as an acceptable alternative.

## 6. Preparation of Test Specimens

6.1 Stir the mastic or coating until uniform throughout the container before removing the sample for specimen preparation.

6.2 Determine the percent volatile matter by weight in accordance with Test Methods C 461, for use in calculating the degree of cure in 7.1.2.

6.3 Unless otherwise specified, lay down films to a nominal wet thickness of 0.125 in. (3.2 mm).

6.4 **Procedure A (Adhered Film)**—For the determination of degree of cure as described in 7.1.2, prepare one extra specimen in addition to the number required by the other procedures in which they are to be used. If a primer or pretreatment of the block is specified, apply to the test specimen in accordance with the recommendations of the manufacturer of the mastic or coating. Place and secure guide bars of a thickness equal to the desired wet mastic thickness on the backing material along each of the long edges. Fill the area between the guide bars with mastic and smooth out with a trowel to a level about 0.063 in. (1.6 mm) above the guide bars. Place the strike-off bar upon the guide bars at one end of the filled area and move it slowly to the other end of the specimen, pushing the mastic along the surface of the backing. A see-sawing motion of the strike-off bar will be found to aid in uniform distribution of the mastic. As the mastic is distributed, take care to prevent inclusion of air pockets. Move the strike-off bar from end to end of the specimen in both directions, removing the excess material and filling the depressions, until a coat of uniform thickness extending from end to end of the specimen covers the entire space between the guide bars. Remove the guide bars without disturbing the wet specimen.

6.5 **Procedure B (Free Film)**—For the determination of degree of cure as described in 7.1.2, prepare one extra specimen in addition to the number required by the other procedures in which they are to be used. Place a sheet of the release paper on the backing block so that the coated surface of the paper faces upward, away from the backing block. Place and secure guide bars of thickness equal to the desired wet mastic thickness on the release paper along each of the long edges. Fill the area between the guide bars with mastic and

smooth out with a trowel to a level about 0.063 in. (1.6 mm) above the guide bars. Place on the freshly applied mastic another sheet of release paper with the coated surface facing the mastic, in the following manner: Place a short edge of the coated paper at one end of the mastic-filled area and gradually roll the paper into the wet mastic, using the leveling roller. Take care to prevent formation of air pockets, or bubbles, under the paper. When firmly in contact with the mastic, roll out the paper-covered mastic until its thickness matches that of the guide bars. Then remove the guide bars without disturbing the thickness of the specimen or the position of the paper. A convenient method for accomplishing this is to slit the paper with a sharp blade along the inside length of the guide bars.

6.6 **Procedure C (Free Film)**—For the determination of degree of cure as described in 7.1.2, prepare one extra specimen in addition to the number required by the other procedures in which they are to be used. Place a sheet of the release paper on the backing block so that the coated surface of the paper faces upward, away from the backing block. Place guide bars of thickness equal to the desired wet mastic thickness on the release paper along each of the long edges. Fill the area between the guide bars with mastic and smooth out with a trowel to a level about 0.063 in. (1.6 mm) above the guide bars. Place the strike-off bar upon the guide bars at one end of the filled area and move it slowly to the other end of the specimen, pushing the mastic along the surface of the backing. A see-sawing motion of the strike-off bar will be found to aid in uniform distribution of the mastic. As the mastic is distributed, take care to prevent inclusion of air pockets. Move the strike-off bar from end to end of the specimen in both directions, removing the excess material and filling the depressions, until a coat of uniform thickness extending from end to end of the specimen covers the entire space between the guide bars. Remove the guide bars without disturbing the wet specimen.

6.7 When a reinforcing membrane is specified, apply the mastic in two separate coats of equal thickness unless otherwise specified. Immediately following the first coat press the membrane into the wet mastic. Then apply the second coat to the required thickness.

## 7. Curing Prepared Specimens

7.1 **Procedure A (Adhered Film):**

7.1.1 During the first 24-h hold the test specimens at 60 to 80°F (15 to 27°C). At the end of the 24-h period remove the specimens to a thermostatically controlled oven having a temperature of 150 ± 5°F (63 to 68°C) and hold in this oven until the desired degree of cure has been reached.

7.1.2 To determine the degree of cure, take from the extra specimen a sample of the coating from an area typical of that to be subjected to test conditions during later procedures. Determine the percentage of volatile liquids evaporated from the mastic during the curing as follows: Weigh a 1 to 2-g sample to the nearest 0.001 g and place it for a period of 5 h at 220 ± 5°F (104 ± 3°C) in an oven conforming to the requirements specified in Test Method D 6. At the conclusion of the 5-h heating period, remove the sample from the oven, cool to room temperature, and weigh to the nearest 0.001 g. Calculate the loss in weight as a percent of the weight before

<sup>4</sup> A suitable paper is "Ideal" gummed paper, White No. 534D, supplied by Alling and Cory, 1300 W. Lehigh Ave., Philadelphia, PA 19132.

heating. Calculate the degree of cure as follows:

$$\text{Degree of cure, \%} = (A/B) \times 100 \quad (1)$$

where:

*A* = percent loss in weight, and

*B* = percent volatile matter (6.2).

**7.2 Procedures B and C (Free Film):**

**7.2.1** Do not remove the specimens from the backing block. Allow the specimens to cure for 7 days at 60 to 80°F (15 to 27°C). At the end of the 7-day period transfer the specimens (still on the backing blocks) to a thermostatically controlled oven having a temperature of 150 ± 5°F (63 to 68°C). Hold in this oven for a minimum of 14 days, and for as long thereafter as may be necessary to reach the desired degree of cure. Determine the degree of cure in accordance with 7.1.2.

**7.2.2 Conditioning of Free Film**—Allow the specimens to cool, remove them from the backing block, and immerse in tap water at approximately 50°F (10°C). When the paper coating has softened (usually 20 to 30 min), strip all the paper from the specimens and rinse them in cool (50°F, 10°C) water until no

water-soluble gum remains on the surfaces. Blot carefully to remove excess water and allow to dry at room temperature with good ventilation. Before using the specimens in further tests, remove and discard the outer 0.050 in. (1.3 mm) of mastic around the perimeter.

**7.2.3** Measure dry thickness at several locations to the nearest 0.001 in. (0.025 mm) with a suitable ratchet micrometer, and record. The dry thickness at any point shall deviate not more than 10 % from the average thickness.

**8. Report**

**8.1** Since this practice covers only the preparation and curing of specimens to be tested by other methods, no report is necessary. Data here obtained should be included in the report of the succeeding test. These data include procedure used, dry thickness of specimen, number of coats, presence of primer or membrane, or both, degree of cure, and any deviation from the stated procedure.

**9. Keywords**

9.1 mastic; thermal insulation; thermal insulation coating

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