Designation: C1919 – 22

Standard Practice for Measurement of the Steady-State Thermal Transmission Properties of Small Specimens Using the Heat Flow Meter Apparatus[1]

This standard is issued under the fixed designation C1919; 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 practice covers the measurement of steady state thermal transmission properties of the small flat slab thermal insulation specimen using a heat-flow-meter apparatus.

1.2 This practice provides a supplemental procedure for use in conjunction with Test Method C518 for testing a small specimen. This practice is limited to only small specimens and, in all other particulars, the requirements of Test Method C518 apply.

1.3 This practice characterizes small specimens having lateral dimensions less than the lateral dimensions of the heat flux transducer used to measure the heat flow. The procedure in Test Method C518 shall be used for specimens having lateral dimensions equal to or larger than the lateral dimensions of the heat flux transducer.

NOTE 1—The lower limit for specimen size is typically determined by the user for their particular material. As an example, Ref. (**1**)[2] established a lower limit for specimen dimensions of 0.1 m by 0.1 m for several different thermal insulation materials for a 0.3 m by 0.3 m heat-flow-meter apparatus having a heat flux transducer 0.15 m by 0.15 m.

1.4 This practice is intended only for research purposes, in particular, when larger specimens are unavailable. This practice shall not be used in conjunction with Test Method C518 for certification testing of products; compliance with ASTM Specifications; or compliance with regulatory or building code requirements.

1.5 The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this practice.

1.6 *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.*

1.7 *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:*[3]

C168 Terminology Relating to Thermal Insulation

C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions

3. Terminology

3.1 *Definitions*—For definitions of terms and symbols used in this test method, refer to Terminology C168 and to the following subsections.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *mask, n*—the mask is a uniform thermal insulation (for example, medium density foam ($\approx 25 \pm 10$ kg/m^3), aerogel etc.) having stable structural and thermal properties that covers the entire heat-flow-meter plate area with a central section cut out representing the area covered by the specimen (see Fig. 1).

3.3 *Symbols and Units*—The symbols used in this test method have the following significance:

3.3.1 λ_a—apparent thermal conductivity, W/(m·K).

3.3.2 C—thermal conductance, W/(m^2·K).

3.3.3 R—thermal resistance, (m^2·K)/W.

3.3.4 R_m—mask thermal resistance, (m^2·K)/W.

3.3.5 Q—heat flow determined from Test Method C518, W.

3.3.6 Q_s—heat flow through the specimen area A_s, W.

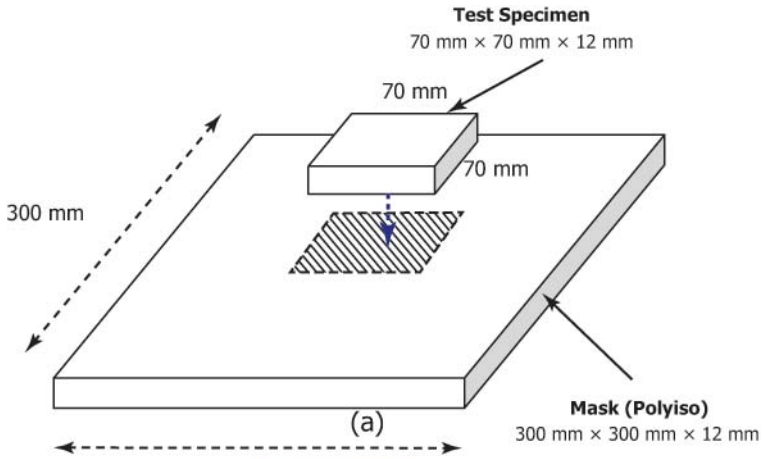
3.3.7 Q_m—heat flow through the mask area A_m, W.

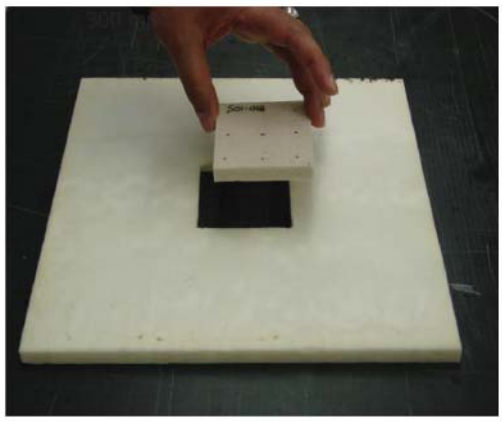
[1] This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.30 on Thermal Measurement.

Current edition approved Dec. 1, 2022. Published January 2023. DOI: 10.1520/C1919-22.

[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

[3] 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.





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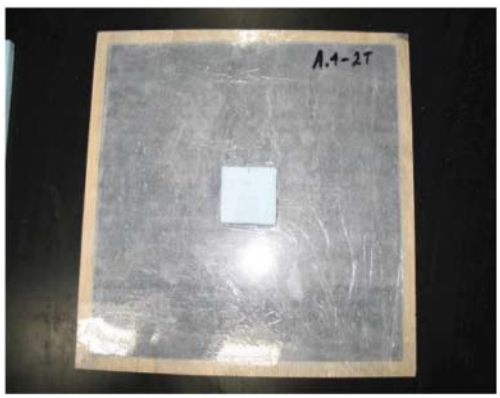

(c)

FIG. 1 (a) Typical set up for thermal conductivity measurement of specimens smaller than the heat flux transducer, (b) photo of a test specimen with a foam mask, (c) photo depicts a test specimen of extruded polystyrene surrounded by a mask of aerogel. A wooden frame is installed around the perimeter of the mask to prevent the mask and specimen from being compressed. The entire assembly (mask and specimen) is wrapped in a polyethylene film to facilitate handling.

3.3.8 Q_{per}—heat flow through perimeter edge between specimen and mask, W.

3.3.9 A—area corresponding to the heat flux transducer (that is, metering area), m^2.

3.3.10 A_s—specimen area, m^2.

3.3.11 A_m—mask area, m^2.

3.3.12 ΔT—temperature difference across the specimen, K.

3.4 *Subscripts:*

3.4.1 *s*—specimen.

3.4.2 *m*—mask.

3.4.3 *per*—perimeter edge between specimen and mask.