



Designation: C1058-97 Designation: C 1058 – 03 (Reapproved 2008)

Standard Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation¹

This standard is issued under the fixed designation C 1058; 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 standard mean temperatures for reporting thermal properties of thermal insulations, products, and materials, and of related systems and components, both insulated and uninsulated.

1.2 Thermal properties ~~may shall~~ be determined as a function of temperature by standard test methods. (Test Methods C 177, C 201, C 236, C 335, C 518, C 745, C 976, C 1114, Guide C 653, and Practice C 687, all in combination with Practice C 1045.)

NOTE 1—Standard referenced materials are needed to span the temperature range of the tests.

1.3 This practice recommends standard conditions for use in testing and evaluating thermal properties as a function of temperature by standard test methods.

1.4 General applications of thermal insulations include:

1.4.1 Building envelopes,

1.4.2 Mechanical systems or processes, and

1.4.3 Building and industrial insulations.

1.5 ~~The mean test temperatures to measure thermal properties shall be selected from those listed in Table 1. It is recommended that thermal properties of insulation materials be evaluated over a mean temperature range that represents the intended end use. For this situation, the lowest and greatest mean temperatures should be within 10°C of the maximum and minimum mean temperature of interest. The temperature differences for any chosen mean temperature will depend upon both the thermal insulation application (see appropriate materials specification), the method of evaluation, and the limitations of the apparatus. Temperature differences or relevant temperature conditions required by ASTM material specifications shall take precedence over those recommended in this practice.~~

1.5.1 ~~Standard conditions are presented where both surfaces are exposed to fixed ambient temperatures that are typical for testing building constructions, both insulated and uninsulated (Table 2).~~

1.5.2 ~~Standard conditions are presented where the temperatures of the two surfaces are fixed and surface coefficients are not considered (Table 2 or Table 3).~~

1.5.3 ~~For conditions where the temperature of only one surface is fixed with the other exposed to fixed ambient temperature, use the mean temperatures of Table 1.~~

1.6 ~~The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only. Approximate inch-pound units are provided in the tables.~~

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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 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 Insulating Materials~~ Terminology Relating to Thermal Insulation

¹ This practice is under the jurisdiction of ASTM Committee E-46/C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.30 on Thermal Measurements.

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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*, Vol 04.06, volume information, refer to the standard's Document Summary page on the ASTM website.

- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- C 201 Test Method for Thermal Conductivity of Refractories ~~C 236 Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box²~~
- C 335 Test Method for Steady-State Heat Transfer Properties of Horizontal-Pipe Insulation
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- C 653 Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral Fiber Insulation
- C 687 Practice for Determination of the Thermal Resistance of Loose-Fill Building Insulation
- C 745 ~~Test Method for Heat Flux Through Evacuated Insulations Using a Guarded Flat Plate Boiloff Calorimeter²~~
- ~~C 976 Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box²~~ Test Method for Heat Flux Through Evacuated Insulations Using a Guarded Flat Plate Boiloff Calorimeter
- ~~C 1045 Practice for Calculating Thermal Transmission Properties from Steady-State Heat Flux Measurements²~~ Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
- ~~C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus²~~ Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
- ~~C 1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus~~

3. Terminology

3.1 *Definitions*— For definitions of terms and symbols used in this practice, refer to Terminology C 168.

4. Significance and Use

4.1 The various methods for measuring and calculating thermal properties provide data and information for manufacturer's published information, for comparison of related products, and for designers and users to evaluate insulation products for particular applications. For these purposes it is advisable to provide basic data and information produced under standard temperature conditions.

4.2 Thermal properties of a specimen may change with mean temperature, with temperature difference across the specimens, and with high temperature exposure. Data and information at standard temperatures are necessary for valid comparison of thermal properties.

~~4.3 These conditions must be stated to describe accurately thermal properties such as thermal conductivity versus mean temperature for thermal insulating materials. Thermal insulations exhibiting inflection points due to the change of state of insulating gases (see~~

4.3 The mean test temperatures to measure thermal properties shall be selected from those listed in Table 1. It is recommended that thermal properties of insulation materials be evaluated over a mean temperature range that represents the intended end use. For this situation, the lowest and greatest mean temperatures should be within 10°C of the maximum and minimum mean temperature of interest. The temperature differences for any chosen mean temperature will depend upon both the thermal insulation application (see appropriate materials specification), the method of evaluation, and the limitations of the apparatus. Temperature differences or relevant temperature conditions required by ASTM material specifications shall take precedence over those recommended in this practice.

4.3.1 Standard conditions are presented where both surfaces are exposed to fixed ambient temperatures that are typical for testing building constructions, both insulated and uninsulated (Table 2).

4.3.2 Standard conditions are presented where the temperatures of the two surfaces are fixed and surface coefficients are not considered (Table 3).

4.3.3 For conditions where the temperature of only one surface is fixed with the other exposed to fixed ambient temperature, use the mean temperatures of Table 1.

4.4 These conditions must be stated to describe accurately thermal properties such as thermal conductivity versus mean temperature for thermal insulating materials. Thermal insulations exhibiting inflection points due to the change of state of insulating gases (see Note 2), must be tested at sufficiently small temperature differences between (1) the hot and cold sides and (2) between mean temperatures. The test temperature differences used depend on the vapor pressure versus temperature relationship of the gases involved and the ability of the test apparatus to provide accurate measurements of low temperature differences.

NOTE 2—Certain closed-cell cellular plastic insulations are of this type.

5. Procedure

5.1 Since there are distinctly different needs or uses for thermal performance information, the test conditions selected must be appropriate to the need or use.

5.2 Determine the use classification described in 5.3 and choose the appropriate temperature conditions from the tables.

5.2.1 If the tables do not contain the appropriate temperature conditions, specifically report exceptions.