



Standard Test Method for Thermal Conductivity of Unfired Monolithic Refractories¹

This standard is issued under the fixed designation C417; 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 supplements Test Method C201, and shall be used in conjunction with that test method for determining the thermal conductivity of unfired monolithic refractories.

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 *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

C182 Test Method for Thermal Conductivity of Insulating Firebrick

C201 Test Method for Thermal Conductivity of Refractories

C862 Practice for Preparing Refractory Concrete Specimens by Casting

C1054 Practice for Pressing and Drying Refractory Plastic and Ramming Mix Specimens

E220 Test Method for Calibration of Thermocouples By Comparison Techniques

3. Significance and Use

3.1 The thermal conductivity of monolithic refractories is a property required for selecting their thermal transmission characteristics. Users select monolithic refractories to provide specified conditions of heat loss and cold face temperature, without exceeding the temperature limitation of the monolithic

refractory. This test method establishes placement of thermocouples and positioning of test specimens in the calorimeter.

3.2 This procedure must be used with Test Method C201 and requires a large thermal gradient and steady state conditions. The results are based upon a mean temperature.

3.3 The data from this test method are suitable for specification acceptance, estimating heat loss and surface temperature, and the design of multi-layer refractory construction.

3.4 The use of these data requires consideration of the actual application environment and conditions.

4. Apparatus

4.1 The apparatus shall be in accordance with Test Method C201, modified as in 4.2 of this test method, with the addition of thermocouples and refractory fiber paper, as described in Sections 6 and 7.

4.2 The furnace shall be modified by drilling a nominal $\frac{3}{8}$ -in. (10-mm) diameter hole (Fig. 1) through the insulating firebrick in the furnace wall at each end of the center line of the 18-in. (456-mm) dimension of the furnace cavity. These holes shall be positioned so that the length of the hole will be parallel to the calorimeter surface and the bottom of the hole will coincide with the surface of the calorimeter. Copper tubing shall be placed within each hole so that a compressed-air source can be attached to one side and flexible leads to a flowmeter can be attached to the other.

4.3 A compressed-air supply and flowmeter for air.

5. Test Specimens

5.1 *Castable Refractories*—The test specimens may consist of either a panel 18 by 13½ by 2½ in. (456 by 342 by 64 mm), or an assembly of three straights 9 by 4½ by 2½ in. (228 by 114 by 64 mm) and six soaps 9 by 2¼ by 2½ in. (228 by 57 by 64 mm). These specimens shall be prepared as in one of the following methods and in general accordance with the manufacturer's recommendation for water content and Practice C862.

5.1.1 *Panel Specimens*—This test specimen shall be a monolithic panel 18 by 13½ by 2½ in. (456 by 342 by 64 mm) in size, and shall be prepared in general accordance with Practice C862, as outlined in 5.1. The panel shall be cast in a

¹ This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.02 on Thermal Properties.

Current edition approved Oct. 1, 2015. Published October 2015. Originally approved in 1958. Last previous edition approved in 2010 as C417 – 05(2010)^{e1}. DOI: 10.1520/C0417-05R15.

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.