Designation: C 201 – 93 (Reapproved 1998)

Standard Test Method for Thermal Conductivity of Refractories[1]

This standard is issued under the fixed designation C 201; 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 covers the determination of the comparative thermal conductivity of refractories under standardized conditions of testing. This test method is designed for refractories having a conductivity factor of not more than 200 Btu·in./h·ft^2·°F (2818 W/m·K), for a thickness of 1 in. (25 mm).

1.2 Detailed ASTM test methods to be used in conjunction with this procedure in testing specific types of refractory materials are as follows: Test Method C 182, Test Method C 202, Test Method C 417, and Test Method C 767.

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

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:*

C 134 Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick[2]

C 155 Classification of Insulating Firebrick[2]

C 182 Test Method for Thermal Conductivity of Insulating Firebrick[2]

C 202 Test Method for Thermal Conductivity of Refractory Brick[2]

C 417 Test Method for Thermal Conductivity of Unfired Monolithic Refractories[2]

C 767 Test Method for Thermal Conductivity of Carbon Refractories[2]

E 220 Method for Calibration of Thermocouples by Comparison Techniques[3]

3. Significance and Use

3.1 The thermal conductivity of refractories is a property required for selecting their thermal transmission characteristics. Users select refractories to provide specified conditions of heat loss and cold face temperature, without exceeding the temperature limitation of the refractory. This test method establishes the testing for thermal conductivity of refractories using the calorimeter.

3.2 This procedure 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, and 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 conform in close detail with that shown in the approved drawings.[4] The equipment is shown in Fig. 1 and Fig. 2, and the essential parts are as follows:

4.1.1 *Heating Chamber*—A heating chamber, shown in Fig. 3, shall be capable of being heated electrically over a temperature range from 400 to 2800°F (205 to 1540°C) in a neutral or oxidizing atmosphere. The temperature of the heating unit shall be controlled by a mechanism capable of maintaining the temperature in the chamber constant to within ±5°F (±3°C). A silicon carbide slab 13½ by 9 by 1 in. (342 by 228 by 25 mm), with the 13½ by 9-in. (342 by 228 mm) faces plane and parallel, shall be placed above the sample for the purpose of providing uniform heat distribution. A layer of insulation equivalent at least to 1 in. (25 mm) of Group 20 insulating firebrick (see Classification C 155) shall be placed below the calorimeter and guard plates.

4.1.2 *Calorimeter Assembly*—A copper calorimeter assembly, of the design shown in Fig. 4, shall be used for measuring the quantity of heat flowing through the test specimen. The water circulation is such that adjacent passages contain incoming and outgoing streams of water. The calorimeter shall be 3 by 3 in. (76 by 76 mm) square and shall have one inlet and one

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[2] *Annual Book of ASTM Standards,* Vol 15.01.

[3] *Annual Book of ASTM Standards,* Vol 14.03.

[4] The complete set of approved drawings necessary for the construction of the apparatus and suggested operating instructions, each of which requires too much space to be included with this test method, were originally drafted by the Insulating Products Division of Babcock and Wilcox Co. ASTM has been advised that these drawings are no longer available. Subcommittee C08 .05 currently is taking this issue under advisement.

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