



Designation: C 767 – 93 (Reapproved 1998)

Standard Test Method for Thermal Conductivity of Carbon Refractories¹

This standard is issued under the fixed designation C 767; 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 approval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method supplements Test Method C 201, and shall be used in conjunction with that procedure to determine the thermal conductivity of carbon or carbon-bearing refractories. This test method is designed for refractories having a conductivity factor of not more than 200 Btu·in./h·ft²·°F (28.8 W/m·K).

1.2 The values stated in inch-pound units are to be regarded as the 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:

C 155 Classification of Insulating Firebrick²

C 201 Test Method for Thermal Conductivity of Refractories²

E 220 Method for Calibration of Thermocouples by Comparison Techniques³

3. Significance and Use

3.1 The thermal conductivity of carbon refractories is a property required for selecting their thermal transmission characteristics. Users select carbon refractories to provide specified conditions of heat loss and cold face temperature, without exceeding the temperature limitation of the carbon 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 C 201 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 is 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 C 201 with the addition of thermocouples, back-up insulation, and refractory fiber paper as described in Section 5 of this test method.

5. Test Specimen and Preparation

5.1 Select the test specimen and prepare in accordance with Test Method C 201.

5.2 *Thermocouples*—Embed calibrated thermocouples⁴ in the test specimen at two points for measuring temperature. Thermocouples⁵ sheathed with material having low reactivity with carbon must be used. Use the top thermocouple for one test only.

5.3 *Installation of Thermocouples*—Place the hot junction of the thermocouples in the center of each 9 by 4½-in. (228 by 114-mm) face and just below the surface of the test specimen. Cut grooves to receive the wire in each 9 by 4½-in. face of the brick to a depth necessary to embed the thermocouple just beneath the surface by means of an abrasive wheel. The layout for the grooves allows all of the cold-junction ends of the wires to extend from one end of the brick. Cut a groove in the center of each 9 by 4½-in. face along the 9-in. dimension and end ¼ in. (6 mm) beyond the center. Before cementing⁶ the thermocouples in place, take measurements to obtain, within ±0.01 in. (±0.3 mm), the eventual distance between the center lines of the thermocouple junctions. Do this by measuring the 2½-in. (64-mm) dimension of the brick at the location for the hot junctions and deducting the distance between the center line of each junction in its embedded position and the surface of the brick.

5.4 Cover the calorimeter and inner and outer guards with a 0.50-in. (12.7-mm) thick layer of Group 20 insulating firebrick (see Classification C 155) for the purpose of obtaining a higher mean temperature in the test sample than would result by placing the sample directly over the calorimeter area. Cut and

¹ This test method is under the jurisdiction of ASTM Committee C-8 on Refractories and is the direct responsibility of Subcommittee C08.02 on Thermal Properties.

Current edition approved Dec. 15, 1993. Published February 1994. Originally published as C 767 – 73. Last previous edition C 767 – 86 (1993) ^{ε1}.

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

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

⁴ Method E 220 specifies calibration procedures for thermocouples.

⁵ Claud S. Gordon Co., 5710 Kenosha St., Richmond, IL 60071, 1 / 16 -in. (2-mm) sheathed Xactpak thermocouple, Cat. No. 401-2104 or equivalent.

⁶ Alundum Cement RA 562 supplied by the Norton Co., One New Bond St., Worcester, MA 01606, is satisfactory for this purpose.