



Designation: C767 – 20

# Standard Test Method for Thermal Conductivity of Carbon Refractories<sup>1</sup>

This standard is issued under the fixed designation C767; 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 ( $\epsilon$ ) 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 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·ft<sup>2</sup>·°F (28.8 W/m·K).

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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:*<sup>2</sup>

C155 Classification of Insulating Firebrick

C201 Test Method for Thermal Conductivity of Refractories

E220 Test Method for Calibration of Thermocouples By Comparison Techniques

## 3. Significance and Use

3.1 The thermal conductivity of carbon refractories is a property required for selecting their thermal transmission

<sup>1</sup> 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 April 1, 2020. Published April 2020. Originally approved in 1973. Last previous edition approved in 2013 as C767 – 93 (2013). DOI: 10.1520/C0767-20.

<sup>2</sup> 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.

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 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 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 consist of that described in Test Method C201 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 C201.

5.2 *Thermocouples*—Calibrated thermocouples<sup>3</sup> shall be embedded in the test specimen at two points for measuring the temperature. Thermocouples<sup>4</sup> sheathed with material having low reactivity with carbon must be used. Use the top thermocouple for one test only.

5.3 *Installation of Thermocouples*—The hot junction of the thermocouples shall be placed in the center of each 9 by 4½-in. (228 by 114-mm) face and just below the surface of the test specimen. Grooves to receive the wire shall be cut 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.

<sup>3</sup> Test Method E220 specifies calibration procedures for thermocouples.

<sup>4</sup> Claud S. Gordon Co., 5710 Kenosha St., Richmond, IL 60071, ¼-in. (2-mm) sheathed Xactpak thermocouple, Cat. No. 401-2104 or equivalent.