Designation: ~~C182 – 88 (Reapproved 2013)~~ C182 – 19

Standard Test Method for Thermal Conductivity of Insulating Firebrick[1]

This standard is issued under the fixed designation C182; 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 to determine the thermal conductivity of insulating firebrick.

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 ~~problems,~~concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety~~ safety, health, and ~~health~~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:*[2]

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 insulating firebrick (IFB) is a property required for the selection of IFB for a specific thermal performance. Users select brick to provide a specified heat-loss and cold-face temperature without exceeding the temperature limitation of the brick. This test method establishes placement of thermocouples and the positioning of test ~~samples~~specimens in the calorimeter. This test method must be used with Test Method C201.

4. Apparatus

4.1 The apparatus shall consist of that described in the Apparatus section of Test Method C201 with the addition of thermocouples, drilling jig, and refractory fiber paper as described in Sections 6 and 7.

5. Test ~~Sample~~Specimens

5.1 The test ~~sample~~specimens shall be selected and prepared as described in the Test Sample and Preparation section of Test Method C201.

6. Installation of Thermocouples in Test Specimen

6.1 *Thermocouples*—Calibrated[3] thermocouples shall be embedded in the test specimen at three points for measuring the temperature. Chromel-Alumel thermocouples shall be used for temperatures below ~~1400°F (760°C),~~1400 °F (760 °C), and above that temperature platinum-10 % rhodium/platinum thermocouples shall be used. The platinum thermocouples may also be used at

[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 ~~Sept. 1, 2013~~April 1, 2019. Published ~~September 2013~~May 2019. Originally approved in 1943. Last previous edition approved in ~~2009~~2013 as C182 – 88 (2013). ~~(2009).~~ DOI: ~~10.1520/C0182-88R13.~~10.1520/C0182-19.

[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.

[3] Test Method E220 specifies calibration procedures for thermocouples.

the lower temperatures, but the electromotive force (emf) will not be as high as when using base-metal thermocouples. Wire of AWG 28 (0.320 mm) shall be used for making either type of thermocouple.

6.2 *Installation of Thermocouples*—Holes for the thermocouple wires shall be drilled through the 4½-in. (114-mm) dimension of the test specimen by the use of a drilling jig so as to obtain accurate placement of the thermocouples. The three thermocouples shall be located so that the hot junction of the first couple is 0.20 in. (5.1 mm) below the hot face of the test specimen, the junction of the second at the midpoint, and the junction of the third 0.20 in. above the cold face. The thermocouple wires leading out from the hot junctions shall be located in planes parallel to the calorimeter surface. In order to have the hot junctions over the center of the calorimeter, they shall be located on an axis passing through the center of and at right angles to the 9 by 4½-in. (228 by 114-mm) area of the test specimen.

NOTE 1—Insulating firebrick that cannot be prepared to this precision because of the structure of the ~~product,~~product should be prepared in accordance with the instructions for fireclay dense refractories.

7. Set-Up of Test ~~Sample~~Specimen and Silicon Carbide Slab

7.1 Two strips of refractory fiber paper 13½ by ½ by ~~0.02 in.~~ 0.02 in. (343 by 13 by 0.5 mm) shall be placed along the 13½-in. dimension of the inner guard at the outside edges, as shown in Fig. 1. Twelve strips of refractory fiber paper 2 by ½ by ~~0.02 in.~~ 0.02 in. (51 by 13 by 0.5 mm) shall be placed on the outer guard at intervals in the pattern shown in Fig. 1. These strips serve as spacers to prevent contact between the test material and the calorimeter assembly. The test specimen shall be placed centrally over the center of the calorimeter section on its 9 by 4½-in. (228 by 114-mm) face, the guard brick placed at the sides of the test specimen so as to completely cover the calorimeter and inner guard area, and the soap brick placed around the edge of the three brick so as to completely cover the calorimeter assembly. The small space between the furnace walls and the test brick assembly shall be filled with a granulated insulating firebrick.

7.2 When testing Group 28, 30, 32, or 33 insulating firebrick, it may be desirable to obtain test results at higher mean temperatures than is possible with the sample set-up described in 7.1. This can be accomplished by placing a 0.5-in. (13-mm) thick layer of ceramic fiber-block insulation or 0.5 in. of Group 20 insulating firebrick between the calorimeter area and the test ~~sample.~~specimen. Sufficient material is required to cover an area 18 by 13½ in. (456 by 342 mm). The solid sheet of back-up insulation shall be ground so as to provide surfaces that are plane and do not vary from parallel by more than ±0.01 in. (0.3 mm). This shall be placed on the refractory fiber strips described in 7.1. Additional refractory fiber strips, in an identical pattern, shall be placed on top of the ceramic fiber board. The test specimen and guard brick shall then be placed as described in 7.1.

7.3 The silicon carbide slab shall be placed over the 9 by 13½-in. (228 by 342-mm) area of the three 9-in. sample brick, and it shall be spaced 1 in. (25 mm) above the sample by placing under each corner of the slab rectangular pieces of Group 30 or 32 (see Classification C155) insulating firebrick cut to measure ⅜ in. (10 mm) square and 1.00 in. (25.4 mm) in length.

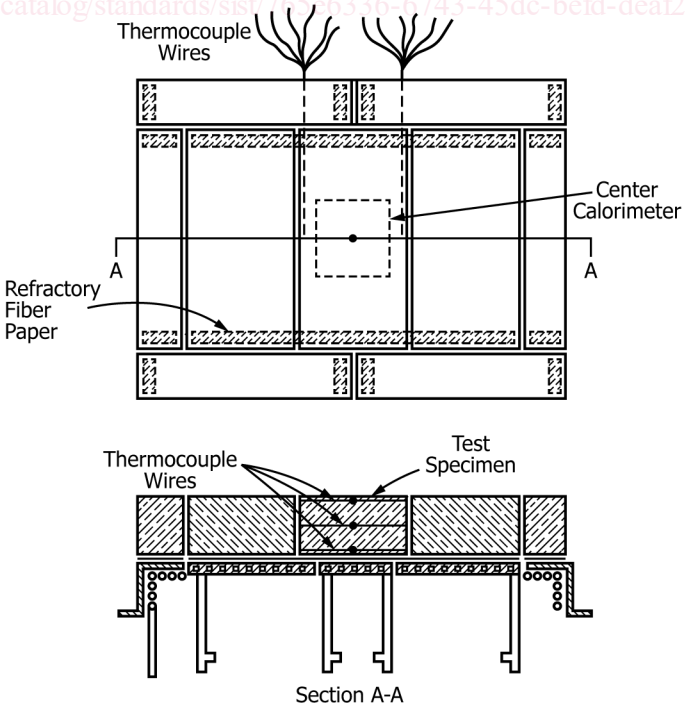

FIG. 1 Arrangement of Refractory Fiber-Paper Strips in Calorimeter Assemblage