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Standard Test Method for Reheat Change of Fireclay Nozzles and Sleeves¹

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1. Scope

1.1 This test method covers the determination of the permanent volume (and linear by calculation) change of fireclay steel-teeming nozzles and stopper-rod sleeves when heated under prescribed conditions.

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

1.3 *This standard does not purport to address all of the safety problems, 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 20 Test Methods for Apparent Porosity, Water Absorption, Apparent Specific Gravity, and Bulk Density of Burned Refractory Brick and Shapes by Boiling Water²

C 113 Test Method for Reheat Change of Refractory Brick²

C 830 Test Methods for Apparent Porosity, Liquid Absorption, Apparent Specific Gravity, and Bulk Density of Refractory Shapes by Vacuum Pressure²

E 691 Practice for Conducting an Interlaboratory Test Study to Determine the Precision of a Test Method³

3. Significance and Use

3.1 Several qualities of fireclay steel-teeming nozzles and sleeves are available for industrial applications. This test method is useful to classify products in accordance with the amount of volume change resulting from heating.

3.2 This test method is useful in research and quality control testing to determine the relative quality of developmental or commercial fireclay steel-teeming nozzles and sleeves.

3.3 This test method may be used to determine compliance with customer specifications.

4. Apparatus

4.1 *Kiln*—A kiln of such design that the specified heating schedule and atmosphere can be maintained throughout the heating zone.

4.2 *Thermocouple*—The temperature within the kiln shall be measured by means of a calibrated platinum-rhodium/platinum thermocouple, with the hot junction of the couple placed so as to register the temperature of the test specimens.

4.3 Equipment for determining the external volume of the test specimens shall be as described in Test Methods C 20 or Test Methods C 830.

5. Test Specimens

5.1 The pie-shaped test specimens shall have a volume of approximately 25 or 26 in.³ (410 or 426 cm³) cut or broken from the midlength of at least 4 samples of sleeves or nozzles.

6. Procedure

6.1 The test specimens shall have their external volume (A) predetermined using the standard procedure described in Test Methods C 20 or Test Methods C 830.

6.2 Placing the test specimens in the furnace, set the specimens in the furnace on a ¼ in. (6 mm) deep bedding material that is nonreactive under the test conditions and that passes a No. 16 (1.18 mm) sieve and is retained on a No. 40 (425 μ m) sieve. The minimum distance between the specimens shall be 2 in. (51 mm).

6.3 *Furnace Atmosphere*—During the test, maintain the atmosphere within the kiln at a minimum of 0.5 % free oxygen and with no combustibles at all temperatures in excess of 1470°F (800°C).

6.4 *Test Temperature Schedule*—Operate this kiln to conform to Schedule D of Test Method C 113, as shown in Table 1.

6.5 *Cooling*—After completion of the heating period, 5 h held at 2460°F (1350°C), allow the test specimens to cool in the kiln at not over 200°F (110°C) per hour, to a maximum of 1000°F (540°C) before removal.

6.6 *Final Measurement*—After cooling the specimens, brush them free of any adhering bedding material. Determine the exterior volume (B) again using the same procedure specified in 6.1 (using the procedures described in Test Methods C 20 or C 830).

7. Calculation and Report

7.1 Calculate the percent volume change for each specimen as follows:

$$\frac{V_B \text{ (from 6.6)} - V_A \text{ (from 6.1)}}{V_A \text{ (from 6.1)}} \times 100 \quad (1)$$

= Percent Volume Change

7.2 The individual value of volume change for each specimen and the average volume change from the four

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

³ *Annual Book of ASTM Standards*, Vol 14.02.