



Designation: C20 – 00 (Reapproved 2005)

Standard Test Methods for Apparent Porosity, Water Absorption, Apparent Specific Gravity, and Bulk Density of Burned Refractory Brick and Shapes by Boiling Water¹

This standard is issued under the fixed designation C20; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover the determination of the following properties of burned refractory brick:

- 1.1.1 Apparent porosity,
- 1.1.2 Water absorption,
- 1.1.3 Apparent specific gravity, and
- 1.1.4 Bulk density.

1.2 These test methods are not applicable to refractories attacked by water.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are 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:*²
 - [C134 Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick](#)
 - [C830 Test Methods for Apparent Porosity, Liquid Absorption, Apparent Specific Gravity, and Bulk Density of Refractory Shapes by Vacuum Pressure](#)
 - [E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

¹ These test methods are under the jurisdiction of ASTM Committee C08 on Refractories and are the direct responsibility of Subcommittee C08.03 on Physical Properties.

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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. Significance and Use

3.1 Apparent porosity, water absorption, apparent specific gravity, and bulk density are primary properties of burned refractory brick and shapes. These properties are widely used in the evaluation and comparison of product quality and as part of the criteria for selection and use of refractory products in a variety of industrial applications. These test methods are used for determining any or all of these properties.

3.2 These test methods are primary standard methods which are suitable for use in quality control, research and development, establishing criteria for and evaluating compliance with specifications, and providing data for design purposes.

3.3 Fundamental assumptions inherent in these test methods are that the test specimens are not attacked by water, the test specimens conform to the requirements for size, configuration, and original faces, the open pores of the test specimens are fully impregnated with water during the boiling treatment, and the blotting of the saturated test specimens is performed as specified in a consistent and uniform manner to avoid withdrawing water from the pores. Deviation from any of these assumptions adversely affects the test results.

3.4 In laboratory studies involving castable specimen, a bias was noted between formed 2 by 2 by 2-in. (50 by 50 by 50-mm) and specimens that were quartered from larger 9 by 4.5 by 2.5 (228 by 114 by 64 mm) cast specimens. Additionally, an error in the apparent porosity determination on castables was found whenever the specimens were heated to 1500°F (816°C) and then exposed to water as a saturation media (Test Method C830). The error was attributed to reactivity of cement with water and subsequent re-hydration of cement phases. The higher the cement level of the castable, the greater the error noted. It was concluded that an error in porosity values could occur for refractory materials having a potential to form hydrated species with water.³

³ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: 1014.