



Standard Test Methods for Apparent Porosity, Liquid Absorption, Apparent Specific Gravity, and Bulk Density of Refractory Shapes by Vacuum Pressure¹

This standard is issued under the fixed designation C 830; 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 These test methods cover the determination of the following properties of refractory shapes:

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

1.2 These test methods are applicable to all refractory shapes except those that chemically react with both water and mineral spirits. When testing a material capable of hydration or other chemical reaction with water but which does not chemically react with mineral spirits, mineral spirits is substituted for water and appropriate corrections for the density differences are applied when making calculations.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided 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.*

NOTE 1—Test Methods C 20 cover procedures for testing properties of refractories that are not attacked by water.

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 134 Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick²
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method³

¹ These test methods are under the jurisdiction of ASTM Committee C-8 on Refractories and are the direct responsibility of Subcommittee C08.03 on Physical Tests.

Current edition approved April 10, 2000. Published June 2000. Originally published as C 830 – 76. Last previous edition C 830 – 93 (1998).

² Annual Book of ASTM Standards, Vol 15.01.

³ Annual Book of ASTM Standards, Vol 14.02.

3. Significance and Use

3.1 Apparent porosity, water absorption, apparent specific gravity, and bulk density are primary properties of refractory 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 and are particularly useful for testing hydratable products.

3.2 These test methods are primary standard methods that 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:

3.3.1 The test specimens conform to the requirements for size, configuration, and original faces,

3.3.2 The open pores of the test specimens are fully impregnated with liquid during the vacuum-pressure treatment, and

3.3.3 The blotting of the saturated test specimens is performed as specified in a consistent and uniform manner to avoid withdrawing liquid from the pores.

3.3.4 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 X 2 X 2-in (50 X 50 X 50-mm) and specimens quartered from larger 9 X 4.5 X 2.5-in (228 X 114 X 64-mm) cast specimens. Additionally, an error in the apparent porosity determination was found on castables whenever the specimens were heated to 1500°F (816°C) and then exposed to water as a saturation media. 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. Testing under the same conditions in kerosene produced results that were believed to be more accurate, but the data suggested that the kerosene might not have saturated the open pores of cast specimen as readily as water. Supporting data were filed at ASTM headquarters and can be obtained by requesting research report 1014.