



Designation: C 357 – 94 (Reapproved 2002)<sup>ε1</sup>

## Standard Test Method for Bulk Density of Granular Refractory Materials<sup>1</sup>

This standard is issued under the fixed designation C 357; 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 approval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

<sup>ε1</sup> NOTE—Footnote 5 was modified editorially in November 2002.

### 1. Scope

1.1 This test method covers a procedure for determining the bulk density of granular refractory materials, commercial products which usually have particles that are retained on a 0.265-in. (6.7-mm) or coarser sieve.

NOTE 1—This test method is not suitable for materials that hydrate in boiling water. Such materials may be tested in accordance with Test Method C 493.

1.2 *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:

C 493 Test Method for Bulk Density and Porosity of Granular Refractory Materials by Mercury Displacement<sup>2</sup>

C 574 Method for Chemical Analysis of Magnesite and Dolomite Refractories<sup>3</sup>

E 11 Specification for Wire-Cloth Sieves for Testing Purposes<sup>4</sup>

### 3. Significance and Use

3.1 Granular refractory materials may be either refractory grain raw materials that are used in the manufacture of finished refractory products, or bulk granular refractory materials that are sold, with or without some degree of processing, to refractory consumers for various uses. In either case, characterizing the properties of a granular refractory material is essential in evaluating its quality or consistency of quality and

in determining suitability for end use. One of the important properties is bulk density because of its relationship to end product quality, usage, and performance.

3.2 The refractories producer can use this test method as one of the quality-control tests for his manufactured or mined refractory grain raw materials or for evaluating potential refractory grain raw materials.

3.3 For the refractories consumer, the principal use of this test method is in the evaluation of the quality or the consistency of quality of the granular material in purchased refractory mixes or in bulk granular refractory materials used by the consumer.

3.4 This is a primary test method, and thus is suitable for use in specifications, quality control, and research and development. It can also serve as a referee test method in purchasing contracts or agreements and as a base for development of more rapid, secondary test methods for use in quality control on manufactured refractory raw materials.

3.5 Fundamental assumptions inherent in this test method are that the sample is representative of the material in general, the particle size of the sample is within the range specified by the test method, the material is not readily hydratable, and the size and quantity of pores in the material permits removal of surface water without drainage from the pores themselves. Deviation from any of these assumptions negates the usefulness of the test results.

3.6 In interpreting the results of this test method, it must be recognized that the specific gravity of the material as well as the porosity affects the value obtained for bulk density. Thus, comparisons of results should only be made between like materials or with full recognition of inherent differences between the materials being compared.

### 4. Apparatus

4.1 *Laboratory Jaw Crusher or Rolls*, for crushing samples to pass a 0.265-in. (6.7-mm) sieve.

4.2 *Standard Sieves, 0.265-in. and No. 8 (2.36-mm) with Pan and Cover* (Note 2)—The sieves shall conform to Specification E 11.

<sup>1</sup> This test method is under the jurisdiction of the ASTM Committee C-8 on Refractories and is the direct responsibility of Subcommittee C08.03 on Physical Properties.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.01.

<sup>3</sup> Discontinued—See 1993 *Annual Book of ASTM Standards*, Vol 03.06.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.