



## Standard Test Method for Hydration Resistance of Basic Bricks and Shapes<sup>1</sup>

This standard is issued under the fixed designation C 456; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers measurement of the relative resistance of basic brick and shapes to hydration.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given 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. Significance and Use

2.1 This test method compares relative resistance to hydration of basic refractory brick and shapes in laboratory tests.

2.2 This test method allows an estimate to be made of the relative potential for hydration.

2.3 The test method is used in industry and in some cases it is used for specification purposes.

2.4 The results must be carefully used as a means of predicting whether or not basic brick or shapes will hydrate under actual conditions of storage or service.

### 3. Apparatus

3.1 *Autoclave*, suitable for operation at 80 psi (552 kPa) at 324°F (162°C), and equipped with pressure- and temperature-measuring devices, and safety equipment. Fig. 1 is illustrative of a suitable, commercially available apparatus.<sup>2</sup>

### 4. Test Specimens

4.1 The test specimens shall be 1-in. (25-mm) cubes cut from the interior of basic refractory brick or shapes so that no original surfaces are present. Only one specimen shall be cut from each of five bricks or shapes.



FIG. 1 Suitable Apparatus for Measuring Hydration Resistance of Basic Brick and Shapes (See <sup>2</sup>)

### 5. Procedure

5.1 Dry the test specimens to constant weight at 220 to 230°F (105 to 110°C) in a forced-air drier.

5.2 Add sufficient water to the autoclave to maintain 80 psi (552 kPa) at 324°F (162°C) for the duration of each 5-h test, but not enough to permit contact with any of the specimens.

5.3 Place each specimen in a lidless No. 2 porcelain crucible, and place the crucible in the autoclave on a suitable rack to protect the specimen from drip or condensate (Fig. 2).

5.4 Heat the autoclave with the pressure release valve open; after a steady flow of steam is obtained through the valve, continue to purge for 3 min to remove all air, close the valve, and bring the autoclave to 80 psi (552 kPa) and at 324°F (162°C) in a total time of 1 h. Maintain the autoclave at  $80 \pm 5$  psi ( $552 \pm 50$  kPa) at  $324 \pm 4^\circ\text{F}$  ( $162 \pm 2^\circ\text{C}$ ) for 5 h.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.04 on Chemical Behaviors.

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<sup>2</sup> For example, the Cenco-Menzel Autoclave manufactured by Central Scientific Co., 11222 Melrose Ave., Franklin Park, IL 60131, has been found suitable.



**FIG. 2 Suitable Rack for Protecting Specimens from Drip or Condensate**

5.5 Allow sufficient cooling to lower the autoclave to 20 to 30 psi (138 to 207 kPa) with the release valve closed, and then carefully open the relief valve to reduce the autoclave to atmospheric pressure in a total time between 30 and 60 min. Remove the specimens and examine them.

5.6 Repeat the hydration procedure on the same five specimens for successive 5-h periods up to 30 h, or until the specimens have a rating of 4 after a given period (6.1).

## 6. Report

6.1 Determine the deterioration of the specimen qualitatively by visual inspection and rate as follows:

- 1 = unaffected,
- 2 = surface hydration,
- 3 = cracking or crumbling, and
- 4 = disintegration.

6.1.1 Fig. 3 and Fig. 4 show typical examples of the four ratings on test specimens.

6.2 The report shall state the total number of hours the specimens were autoclaved and their individual ratings after each treatment. Photographs may be included to illustrate the degree of hydration.

## 7. Precision and Bias

7.1 No statement is made about either the precision or the bias of this test method because it is qualitative in nature.

## 8. Keywords

8.1 autoclave; basic brick; basic shapes; hydration; refractories; steam

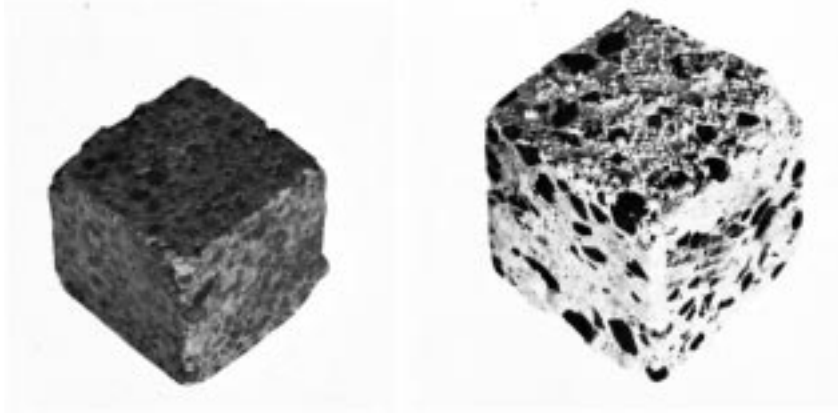


FIG. 3 Rating Basic Brick or Shapes Specimens After Hydration Periods—Rating 1 on Left and Rating 2 on Right

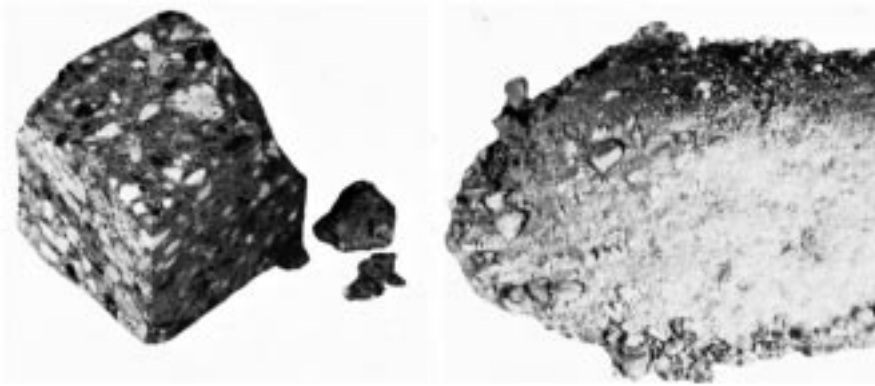


FIG. 4 Rating Basic Brick or Shapes Specimens After Hydration Periods—Rating 3 on Left and Rating 4 on Right

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