



Standard Test Method for Drying and Firing Linear Change of Refractory Plastic and Ramming Mix Specimens¹

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1. Scope

1.1 This test method covers the determination of the drying shrinkage and of the combined drying and linear change of ramming and plastic refractories.

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

1.3 *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

- C 113 Test Method for Reheat Change of Refractory Brick
- C 134 Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick
- C 181 Test Method for Workability Index of Fireclay and High-Alumina Plastic Refractories
- C 1054 Practice for Pressing and Drying Refractory Plastic and Ramming Mix Specimens

3. Significance and Use

3.1 This test method is useful in quantitatively rating or ranking both ramming and plastic refractories by their linear stability after heating.

3.2 This test method is also useful for determining whether a ramming or plastic refractory can be used in a specified application based on linear change criteria.

3.3 This test method excludes basic and carbon bearing materials.

3.4 This test method can produce data for the engineering and design of refractory installations. The linear change data can be used to determine the number of joints necessary to maintain integrity of ramming or plastic refractory in a large installation.

4. Apparatus

4.1 *Kiln*, electric or gas type, of such design that the flame, as coming directly from the burner, cannot impinge upon the test specimens.

4.2 *Measuring Device*³, a 12-in. (305-mm), graduated in 0.02-in. (0.5-mm) increments. A hooked rule is convenient to use, and a suitable type is described in Test Methods C 134.

5. Test Specimens

5.1 *Number of Specimens*—A minimum of six specimens molded from the sample (see Note 1) of plastic refractory will be required. Half of the specimens shall be used for the test and the other half used as supporting pieces during the kiln heat treatment.

NOTE 1—For pressing and drying the specimens see Practice C 1054.

5.2 *Measurement of Specimens*—Using the measuring device, measure the bar for all dimensions to the nearest 0.02-in. (0.5-mm). Label and make reference marks to indicate the exact length measurement points. Caution should be taken as deformation of the specimens may be caused by handling.

5.3 *Drying of Specimens*—Dry specimens should be dried as stated in Practice C 1054, 6.6.

5.4 *Measuring Dried Specimens*—Measure specimens as stated in 5.2.

6. Procedure

6.1 *Placing Specimens in Kiln*—Place the dried specimens in the kiln in accordance with Test Method C 113, with the exception that the supporting brick shall consist of the three plastic refractory brick prepared for that purpose.

6.2 *Temperature Measurements*—Conduct temperature measurements in accordance with Test Method C 113.

³ The Lufkin Rule No. 2603R, available from Lufkin Rule Co., P.O. Box 728, Apex, NC 27502, or equivalent is satisfactory.

¹ This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.09 on Monolithic Refractories.

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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.

6.3 *Test Atmosphere*—At all temperatures above 1470°F (800°C), operate the kiln so that the atmosphere shall contain a minimum of 0.5 % oxygen with 0 % combustibles.

6.4 *Test Temperature Schedule*—Operate the kiln so as to conform to the appropriate heating schedule for the class of refractory being tested, as specified in Table 1 of Test Method C 113.

6.5 *Measuring Fired Specimens*—After completion of the heating schedule, cool the specimens in the closed kiln to under 800°F (425°C) before removing to the air. After cooling to room temperature, remeasure them in accordance with 5.2. Record the fired length of each of the three test specimens.

7. Calculation and Report

7.1 *Drying Shrinkage*—Calculate the drying shrinkage as a percentage based on the original length of the specimen as measured in 5.2. Report the average value for the three specimens.

7.2 *Combined Linear Change Due to Drying and Firing*—Calculate the combined drying and firing shrinkage (or expansion) as a percentage based on the original length of the specimen as measured in 5.2. Report the average value for the three specimens.

7.3 The report shall include the workability of the plastic determined in accordance with Test Method C 181.

8. Precision and Bias

8.1 Precision and bias statements for linear change due to drying and firing are being developed.

9. Keywords

9.1 linear change; plastic; ramming mix; refractory; shrinkage

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