



Standard Test Method for Pyrometric Cone Equivalent (PCE) of Fireclay and High Alumina Refractory Materials¹

This standard is issued under the fixed designation C24; 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 U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of the Pyrometric Cone Equivalent (PCE) of fire clay, fireclay brick, high alumina brick, and silica fire clay refractory mortar by comparison of test cones with standard pyrometric cones under the conditions prescribed in this test method.

1.2 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.2.1 *Exceptions*—Certain weights are in SI units with inch-pound in parenthesis. Also, certain figures have SI units without parenthesis. These SI units are to be regarded as standard.

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

C71 Terminology Relating to Refractories

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E220 Test Method for Calibration of Thermocouples By Comparison Techniques

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

¹ This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.02 on Thermal 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. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology C71.

4. Summary of Test Method

4.1 This test method consists of preparing a test cone from a refractory material and comparing its deformation end point to that of a standard pyrometric cone. The resultant PCE value is a measure of the refractoriness of the material.

4.2 Temperature equivalent tables for the standard cones have been determined by the National Institute of Standards and Technology when subjected to both slow and rapid heating rates.

5. Significance and Use

5.1 The deformation and end point of a cone corresponds to a certain heat-work condition due to the effects of time, temperature, and atmosphere.

5.2 The precision of this test method is subject to many variables that are difficult to control. Therefore, an experienced operator may be necessary where PCE values are being utilized for specification purposes.

5.3 PCE values are used to classify fireclay and high alumina refractories.

5.4 This is an effective method of identifying fireclay variations, mining control, and developing raw material specifications.

5.5 Although not recommended, this test method is sometimes applied to materials other than fireclay and high alumina. Such practice should be limited to in-house laboratories and never be used for specification purposes.

6. Procedure

6.1 Preparation of Sample:

6.1.1 *Clay or Brick*—Crush the entire sample of fire clay or fireclay brick, in case the amount is small, by means of rolls or a jaw crusher to produce a particle size not larger than ¼ in. (6 mm). If the amount is large, treat a representative sample