



Designation: **C980—13 C980 – 13a**

Standard Specification for Industrial Chimney Lining Brick¹

This standard is issued under the fixed designation C980; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers solid kiln fired brick made from clay, shale, or mixtures thereof suitable for use in masonry construction in contact with the chemicals present in flue gases found in industrial chimneys. These brick are normally used with chemical-resistant mortars.

~~1.2 The physical and chemical properties of chimney lining brick differ from supplier to supplier mainly because their composition is determined by the source of raw materials. Chimney lining brick, regardless of these differences, are considered to be of three types noted as follows:~~

~~1.2.1 Type I—For use where low absorption and high acid resistance are not major factors.~~

~~1.2.2 Type II—For use where lower absorption and higher acid resistance are required.~~

~~1.2.3 Type III—For use where lowest absorption and highest acid resistance are required.~~

~~NOTE 1—Types I, II, and III may not differ significantly in their resistance to thermal shock, and selection of brick type should be based upon their absorption and acid-resistant service requirements.~~

1.2 Terminology related to industrial floor brick is found in Terminology **C1232**.

1.3 *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.

1.4 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

C20 Test Methods for Apparent Porosity, Water Absorption, Apparent Specific Gravity, and Bulk Density of Burned Refractory Brick and Shapes by Boiling Water

C67 Test Methods for Sampling and Testing Brick and Structural Clay Tile

C1232 Terminology of Masonry

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

C1232 Terminology of Masonry

3. Terminology

3.1 *Definitions*—For definitions relating to industrial chimney lining brick, refer to Terminology **C1232**.

4. Classification

~~4.1 The physical and chemical properties of chimney lining brick differ from supplier to supplier mainly because their composition is determined by the source of raw materials. Chimney lining brick, regardless of these differences, are considered to be of three types noted as follows:~~

~~4.1.1 Type I—For use where low absorption and high acid resistance are not major factors.~~

~~4.1.2 Type II—For use where lower absorption and higher acid resistance are required.~~

¹ This specification is under the jurisdiction of ASTM Committee **C15** on Manufactured Masonry Units and is the direct responsibility of Subcommittee **C15.02** on Brick and Structural Clay Tile.

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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.

*A Summary of Changes section appears at the end of this standard

4.1.3 *Type III*—For use where lowest absorption and highest acid resistance are required.

NOTE 1—Types I, II, and III may not differ significantly in their resistance to thermal shock, and selection of brick type should be based upon their absorption and acid-resistant service requirements.

5. Sulfuric Acid Boil Test

5.1 When tested in accordance with Section 79, the brick shall conform to the requirements for “Maximum Average Weight Loss by H₂SO₄ Boil Test” as shown in Table 1.

6. Physical Properties

6.1 *Compressive Strength*—When tested in accordance with Test Methods C67, Section 6 (Compressive Strength), the brick shall conform to the requirements for “Minimum Compressive Strength” as shown in Table 1.

6.2 *Water Absorption*—When tested in accordance with Test Methods C20, Section 10 (Water Absorption), the brick shall conform to the requirements for “Maximum Water Absorption by 2-h Boiling” as shown in Table 1.

5.3 *Sizes*—The sizes of brick shall be as specified by the purchaser. When tested in accordance with Test Methods C67, Section 11 (Measurement of Size), the brick shall conform to the requirements for “Permissible Variations in Dimensions” as shown in Table 2.

5.4 *Warpage*—When tested in accordance with Test Methods C67, Section 12 (Measurement of Warpage), the tolerance on warpage of the brick shall be as indicated in Table 2.

5.5 *Texture*—Scoring or matte texturing, or both, of the brick is recommended. However, no flutes or scores shall exceed 1/8 in. (3.0 mm) in height of protrusion or in depth.

7. Dimensions, Mass, and Permissible Variations

7.1 *Sizes*—The sizes of brick shall be as specified by the purchaser. When tested in accordance with Test Methods C67, Section 11 (Measurement of Size), the brick shall conform to the requirements for “Permissible Variations in Dimensions” as shown in Table 2.

7.2 *Warpage*—When tested in accordance with Test Methods C67, Section 12 (Measurement of Warpage), the tolerance on warpage of the brick shall be as indicated in Table 2.

8. Black Heart Finish and Appearance

8.1 *Black Heart*—Brick when broken may have a dark area that has a steely appearance and is sharply delineated from the surrounding normal color of the brick it is known as black heart or black core. Black heart is generally the result of the reduction of iron minerals during the firing process. Its presence, regardless of size in brick that otherwise meet the physical and chemical requirements of this specification, shall not be cause for rejection.

8.2 *Texture*—Scoring or matte texturing, or both, of the brick is recommended. However, no flutes or scores shall exceed 1/8 in. (3.0 mm) in height of protrusion or in depth.

9. Test for Solubility in Sulfuric Acid

9.1 *Significance and Use*—This test with sulphuric acid represents an extremely severe one and may not be significant for chemical-resistant brick in less demanding applications. It can be assumed that sulphuric acid in this test concentration will be more corrosive than most other acids excluding those containing flourine. A similar test procedure using other chemicals may be more suitable for specific purposes. The performance of these other tests and appropriate qualifying data should be resolved between the purchaser and the seller.

9.2 *Apparatus:*

9.2.1 *Crusher*, jaw-type.

9.2.2 *Sieves*, 1/4-in. (6.3-mm) and No. 4 (4.75-mm), (equivalent to 3-mesh and 4-mesh sieves, respectively, in the Tyler series), conforming to Specification E11.

TABLE 1 Physical Properties and Chemical Requirements^A

Designation	Minimum Compressive Strength, Gross Area, psi (MPa)		Maximum Water Absorption by 2-h Boiling, %		Maximum Average Weight Loss by H ₂ SO ₄ Boil Test, %
	Average of 10	Individual	Average of 10	Individual	
Type I	8 500 (58.6)	8 000 (55.2)	6.0	7.0	20
Type II	10 000 (69.0)	9 000 (62.2)	4.0	5.0	12
Type III	12 000 (82.8)	10 000 (69.0)	1.0	1.5	8

^A One complete set of tests for each of the above requirements shall be performed from brick randomly selected from every 100 000 bricks.