



Designation: C55 – 22

# Standard Specification for Concrete Building Brick<sup>1</sup>

This standard is issued under the fixed designation C55; 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.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope\*

1.1 This specification covers solid, dry-cast, concrete building brick intended for interior and exterior use in constructing structural masonry, and are made from portland cement, water, and suitable mineral aggregates with or without the inclusion of other materials.

NOTE 1—Specification C1634 addresses concrete facing brick used in facing applications and other exposures (previously referred to in earlier editions of this standard as Grade N—for use as architectural veneer and facing units in exterior walls and for use where high-strength and resistance to moisture penetration and severe frost action are desired). This specification differs from C1634 in that it addresses properties for concrete building brick used in non-facing, utilitarian applications (previously referred to in earlier editions of this specification as Grade S—for general use where moderate strength and resistance to frost action and moisture penetration are required).

1.2 The text of this specification references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

NOTE 2—Concrete building brick covered by this specification are made from lightweight or normal weight aggregates, or both.

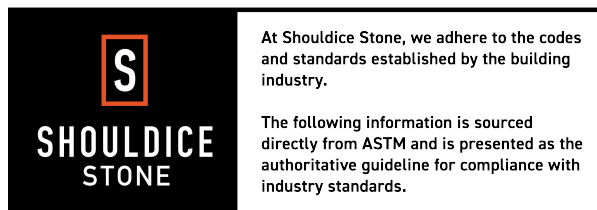
NOTE 3—When particular features are desired, such as density classification, high compressive strength, surface textures for appearance or bond, finish, color, fire resistance, insulation, acoustical properties, or other special features, such properties should be specified separately by the purchaser. Suppliers should be consulted as to the availability of concrete building brick having the desired features.

1.3 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 international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.03 on Concrete Masonry Units and Related Units.

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*mentations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- C33/C33M Specification for Concrete Aggregates
- C140/C140M Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
- C150/C150M Specification for Portland Cement
- C331/C331M Specification for Lightweight Aggregates for Concrete Masonry Units
- C426 Test Method for Linear Drying Shrinkage of Concrete Masonry Units
- C595/C595M Specification for Blended Hydraulic Cements
- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C979/C979M Specification for Pigments for Integrally Colored Concrete
- C989/C989M Specification for Slag Cement for Use in Concrete and Mortars
- C1157/C1157M Performance Specification for Hydraulic Cement
- C1232 Terminology for Masonry
- C1240 Specification for Silica Fume Used in Cementitious Mixtures
- C1634 Specification for Concrete Facing Brick and Other Concrete Masonry Facing Units

## 3. Terminology

3.1 Terminology defined in Terminology C1232 shall apply for this specification.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *concrete building brick, n*—a concrete masonry unit, with a maximum width of four (4) inches and of a weight that will typically permit it to be lifted and placed with one hand, that is manufactured for general use in non-facing, utilitarian applications.

<sup>2</sup> 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

3.2.2 *concrete facing brick, n*—a concrete masonry unit, with a maximum width of four (4) inches and of a weight that will typically permit it to be lifted and placed with one hand, that is manufactured to be typically used in an application where one or more faces of the unit is intended to be exposed.

**4. Materials and Manufacture**

4.1 *Cementitious Materials*—Materials shall conform to the following applicable specifications:

- 4.1.1 *Portland Cement*—Specification C150/C150M.
- 4.1.2 *Modified Portland Cement*—Portland cement conforming to Specification C150/C150M, modified as follows:
  - (1) *Limestone*—If calcium carbonate is added to the cement, the CaCO<sub>3</sub> content shall not be less than 85 %.
  - (2) *Limitation on Insoluble Residue*—1.5 %.
  - (3) *Limitation on Air Content of Mortar*—Volume percent, 22 % max.
  - (4) *Limitation on Loss on Ignition*—7 %.
- 4.1.3 *Blended Hydraulic Cements*—Specification C595/C595M.
- 4.1.4 *Hydraulic Cement*—Specification C1157/C1157M.
- 4.1.5 *Pozzolans*—Specification C618.
- 4.1.6 *Blast Furnace Slag Cement*—Specification C989/C989M.
- 4.1.7 *Silica Fume*—Specification C1240.

4.2 *Aggregates*—Aggregates shall conform to the following specifications, except for grading requirements:

- 4.2.1 *Normal Weight Aggregates*—Specification C33/C33M.
- 4.2.2 *Lightweight Aggregates*—Specification C331/C331M.

NOTE 4—The grading requirements of Specifications C33/C33M and C331/C331M may not be suitable for concrete masonry production. Because of this, producers are allowed to modify grading to meet their needs and the requirements of this specification.

4.3 *Pigments for Integrally Colored Concrete*—Specification C979/C979M.

4.4 *Other Constituents*—Air-entraining agents, integral water repellents, and other constituents shall be previously established as suitable for use in concrete building brick and shall conform to applicable ASTM standards or shall be shown by test or experience not to be detrimental to the durability of the concrete building brick or any material customarily used in masonry construction.

**5. Physical Requirements**

5.1 At the time of delivery to the purchaser, units shall conform to the physical requirements prescribed in Table 1. Units shall be free of defects that significantly impair the strength or permanence of the construction.

5.1.1 When higher compressive strengths than those listed in Table 1 are specified, the tested average net area compressive strength of three units shall equal or exceed the specified compressive strength, and the following single unit strength requirements shall apply.

5.1.1.1 When the specified compressive strength is less than 5000 psi, no single unit net area compressive strength test result shall be less than the specified compressive strength minus 500 psi. Compressive strength shall be tested in accordance with 7.2.

5.1.1.2 When the specified compressive strength is 5000 psi or greater, no single unit net area compressive strength test result shall be less than 90 % of the specified compressive strength. Compressive strength shall be tested in accordance with 7.2.

5.2 At the time of delivery to the purchaser, the average total linear drying shrinkage of the three units tested shall not exceed 0.065 % when tested in accordance with 7.3.

NOTE 5—The purchaser is the public body or authority, association, corporation, partnership, or individual entering into a contract or agreement to purchase or install, or both, concrete building brick. The time of delivery to the purchaser is FOB plant when the purchaser or the purchaser’s agent transports the concrete building brick, or at the time unloaded at the worksite if the manufacturer or the manufacturer’s agent transports the concrete building brick.

**6. Dimensions and Permissible Variations**

6.1 No overall dimension (width, height, and length) shall differ by more than ±1/8 in. (3.2 mm) from the specified standard dimensions.

NOTE 6—Standard dimensions of concrete building brick are the manufacturer’s designated dimensions. Nominal dimensions of modular size concrete building brick are equal to the standard dimensions plus the thickness of one mortar joint. Nominal dimensions of nonmodular size concrete building brick usually exceed the standard dimensions by 1/8 to 1/4 in. (3.2 to 6.4 mm).

6.2 *Coring*—Unless otherwise specified, brick shall be either solid or cored at the option of the seller. For cored concrete building brick, the net cross-sectional area in any plane parallel to the surface containing the cores shall be at least 75 % of the gross cross-sectional area measure in the same plane. No part of any hole shall be less than 3/4 in. (19.1 mm) from any edge of the unit.

**7. Methods of Sampling and Testing**

7.1 The purchaser or authorized representative shall be accorded proper facilities to inspect and sample the concrete building brick at the place of manufacture from the lots ready for delivery.

**TABLE 1 Strength, Absorption, and Density Classification Requirements<sup>A</sup>**

Density Classification	Oven-Dry Density of Concrete, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Maximum Water Absorption, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )		Minimum Net Area Compressive Strength, lb/in <sup>2</sup> (MPa)	
	Average of 3 Units	Average of 3 Units	Individual Units	Average of 3 Units	Individual Units
Lightweight	Less than 105 (1680)	18 (288)	20 (320)	2500 (17.2)	2000 (13.8)
Medium Weight	105 to less than 125 (1680–2000)	15 (240)	17 (272)	2500 (17.2)	2000 (13.8)
Normal Weight	125 (2000) or more	13 (208)	15 (240)	2500 (17.2)	2000 (13.8)

<sup>A</sup>Compressive strength, absorption, and density determined in accordance with 7.2.

7.2 Compressive strength, absorption, density, and dimensional tolerances shall be based on tests of concrete building brick of any configuration or dimensions made with the same materials, concrete mix design, manufacturing process, and curing method, conducted in accordance with Test Methods **C140/C140M**, Annex A2, and not more than 12 months prior to delivery.

7.3 Total linear drying shrinkage shall be based on tests of concrete building brick of any configuration or dimensions made with the same materials, concrete mix design, manufacturing process, and curing method, conducted in accordance with Test Method **C426** and not more than 24 months prior to delivery.

## 8. Compliance

8.1 Minor cracks, incidental to the usual method of manufacture or minor chipping resulting from customary methods of handling in shipment and delivery, are not grounds for rejection.

8.2 *Non-conforming Units*—No more than 5 % of the units in the shipment shall exhibit any of the characteristics described in **8.2.1** through **8.2.3**.

8.2.1 Units that do not comply with the requirements of Section **6**.

8.2.2 Units with cracks or other defects that interfere with the proper placement of the unit.

8.2.3 Units that are broken.

8.3 After units are placed in usage, the manufacturer or manufacturer's agent are not responsible for non-conforming units defined in **8.2**.

8.4 If a sample fails to conform to the specified requirements, the manufacturer shall be permitted to remove units from the shipment. A new sample shall be selected by the purchaser from remaining units from the shipment with a similar configuration and dimension and tested at the expense of the manufacturer. If the second sample meets the specified requirements, the remaining portion of the shipment represented by the sample meets the specified requirements. If the second sample fails to meet the specified requirements, the remaining portion of the shipment represented by the sample fails to meet the specified requirements.

NOTE 7—Unless otherwise specified in the purchase order, the costs of tests is typically borne as follows: (1) if the results of the tests show that the units do not conform to the requirements of this specification, the cost is typically borne by the seller; (2) if the results of the tests show that the units conform to the specification requirements, the cost is typically borne by the purchaser.

## 9. Keywords

9.1 absorption; compressive strength; concrete brick; concrete building brick; concrete masonry units; linear drying shrinkage; portland cement

## SUMMARY OF CHANGES

Committee C15 has identified the location of selected changes to this standard since the last issue (C55 – 17) that may impact the use of this standard. (December 15, 2022)

(1) Removed duplicate subsection on units from Section **1**.  
 (2) Modified Section **4** to add reference to C1240 and C979/C979M, clarify that grading requirements do not apply for aggregates, and clean up language on other constituents.

(3) Made changes throughout to consolidate requirements for compliance into Section **8**.  
 (4) Added reference in **7.2** to Annex A2 relative to C140 testing for concrete building brick.

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