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Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale)[1]

This standard is issued under the fixed designation C 652; 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 Department of Defense.

1. Scope*

1.1 This specification covers hollow building brick and hollow facing brick made from clay, shale, fire clay, or mixtures thereof, and fired to incipient fusion. Four types of hollow brick in each of two grades and two classes are covered. In this specification the term hollow brick shall be understood to mean hollow clay masonry units whose net cross-sectional area (solid area) in any plane parallel to the surface, containing the cores, cells, or deep frogs, is less than 75 % of its gross cross-sectional area measured in the same plane (see 3.3). This specification does not cover brick intended for use as paving brick (see Specification C 902).

1.2 The property requirements of this standard apply at the time of purchase. The use of results from testing of brick extracted from masonry structures for determining conformance or nonconformance to the property requirements (Section 5) of this standard is beyond the scope of this standard.

1.3 Brick covered by this specification are manufactured from clay, shale, or similar naturally occurring substances and subjected to a heat treatment at elevated temperatures (firing). The heat treatment shall develop sufficient fired bond between the particulate constituents to provide the strength and durability requirements of this specification. (See "firing" and "firing bond" in Terminology C 43.)

1.4 Hollow brick differ from unglazed structural clay tile (Specifications C 34 and C 212) and solid brick (Specifications C 62 and C 216). Hollow brick require greater shell and web thicknesses and higher minimum compressive strength than structural clay tile, but permit greater void area and lesser distance from exposed edge to core hole than solid brick. Therefore, environmental and structural performance may be different in elements constructed of hollow brick from those constructed of structural clay tile or solid brick.

1.5 The text of this standard 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.

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

2. Referenced Documents

2.1 *ASTM Standards:*

C 34 Specification for Structural Clay Load-Bearing Wall Tile

C 43 Terminology of Structural Clay Products

C 62 Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile

C 212 Specification for Structural Clay Facing Tile

C 216 Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)

C 902 Specification for Pedestrian and Light Traffic Paving Brick

E 835/E 835M Guide for Modular Coordination of Clay and Concrete Masonry Units

3. Classification

3.1 *Grades*—Two grades of hollow brick are covered:

3.1.1 *Grade SW*—Hollow brick intended for use where a high and uniform degree of resistance to frost action and disintegration by weathering is desired and the exposure is such that the hollow brick may be frozen when permeated with water.

3.1.2 *Grade MW*—Hollow brick intended for use where a moderate and somewhat nonuniform degree of resistance to frost action is permissible or where they are unlikely to be permeated with water when exposed to temperatures below freezing.

3.2 *Types*—Four types of hollow brick are covered:

3.2.1 *Type HBS*—Hollow brick for general use in masonry.

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

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3.2.2 *Type HBX*—Hollow brick for general use in masonry where a higher degree of precision and lower permissible variation in size than permitted for Type HBS is required.

3.2.3 *Type HBA*—Hollow brick for general use in masonry selected to produce characteristic architectural effects resulting from nonuniformity in size and texture of the individual units.

3.2.4 *Type HBB*—Hollow brick for general use in masonry where a particular color, texture, finish, uniformity, or limits on cracks, warpage, or other imperfections detracting from the appearance are not a consideration.

3.2.5 When the type is not specified, the requirements for Type HBS shall govern.

3.3 *Class*—Two classes of hollow brick are covered:

3.3.1 *Class H40V*—Hollow brick intended for use where void areas or hollow spaces greater than 25 %, but not greater than 40 %, of the gross cross-sectional area of the unit measured in any plane parallel to the surface containing the cores, cells, or deep frogs are desired. The void spaces, the web thicknesses, and the shell thicknesses shall comply with the requirements of Section 10 on Hollow Spaces.

3.3.2 *Class H60V*—Hollow brick intended for use where larger void areas are desired. The sum of these void areas shall be greater than 40 %, but not greater than 60 %, of the gross cross-sectional area of the unit measured in any plane parallel to the surface containing the cores, cells or deep frogs. The void spaces, the web thicknesses, and the shell thicknesses shall comply with the requirements of Section 10 on Hollow Spaces and to the minimum requirements contained in Table 1 (see Fig. 1).

3.3.3 When the class is not specified, the requirements of class H40V shall govern.

4. Materials and Manufacture

4.1 The body of all hollow brick shall be of clay, shale, fire clay, or mixtures of these materials, with or without admixtures, burned to meet the requirements of this specification. Any coloring or other materials added to the clay shall be suitable ceramic materials and shall be well distributed throughout the body. Unless otherwise specified by the purchaser, surface coloring shall not be applied to any brick other than by sanding or flashing.

5. Physical Properties

5.1 *Durability*—When Grade is not specified, the requirements for Grade SW shall govern.

5.1.1 *Physical Property Requirements*—The brick shall conform to the physical requirements for the Grade specified as prescribed in Table 2. For the compressive strength requirements in Table 2, test the unit with the compressive force perpendicular to the bed surface of the unit, with the unit in the stretcher position.

TABLE 1 Class H60V—Hollow Brick Minimum Thickness of Face Shells and Webs, in. (mm)

Nominal Width of Units	Face Shell Thicknesses		End Shells or End Webs
	Solid	Cored or Double Shell	
3 and 4 (76 and 101)	¾ (19.05)	...	¾ (19.05)
6 (152)	1 (25.4)	1½ (38)	1 (25.4)
8 (203)	1¼ (32)	1½ (38)	1 (25.4)
10 (254)	1⅜ (35)	1⅝ (41)	1⅛ (29.5)
12 (306)	1½ (38)	2 (50)	1⅛ (29.5)

5.1.2 *Absorption Alternate*—The saturation coefficient requirement does not apply, provided the 24–h cold water absorption of each unit of a random sample of five brick does not exceed 8.0 %.

5.1.3 *Freezing and Thawing Alternative*—The requirements for 5 h boiling water absorption and saturation coefficient do not apply, provided a sample of five brick, meeting the strength requirements of Table 2, passes the freezing and thawing test as described in the Rating Section of the Freezing and Thawing test procedures of Test Methods C 67.

5.1.3.1 *Grade SW: Weight Loss Requirement*—Not greater than 0.5 % loss in dry weight of any individual unit.

NOTE 1—The 50 cycle freezing and thawing test is used as an alternative only when the brick do not conform to either Table 2 requirements for maximum water absorption and saturation coefficient, or to the requirements of the Absorption Alternate in Section 5.1.2.

5.1.3.2 *Grade SW: Breakage Requirement*—No individual unit separates into two or more significant pieces.

5.1.3.3 *Grade SW: Cracking Requirement*—No individual unit develops a crack that exceeds, in length, the unit's least dimension.

5.2 *Strength*—When hollow brick are required having strengths greater than prescribed in Table 2, the purchaser shall specify the desired minimum compressive strength.

5.3 *Initial Rate of Absorption (IRA)*—Test results for IRA shall be determined in accordance with Section 9 of Test Methods C 67 and shall be furnished at the request of the specifier or purchaser. IRA is not a qualifying condition or property of units in this specification. This property is measured in order to assist in mortar selection and material handling in the construction process. See Note 2.

NOTE 2—*Initial Rate of Absorption (Suction)*—Both laboratory and field investigation have shown that strong and watertight joints between mortar and masonry units are not achieved by ordinary construction methods when the units as laid have excessive initial rates of absorption. Mortar that has stiffened somewhat because of excessive loss of mixing water to a unit may not make complete and intimate contact with the second unit, resulting in poor adhesion, incomplete bond, and water-permeable joints of low strength. IRA of the units is determined by the oven-dried procedure described in the IRA (Suction) (Laboratory Test) of Test Methods C 67. IRA in the field depends on the moisture content of the masonry unit and is determined in accordance with the IRA (Suction)—Field Test of Test Methods C 67. Units having average field IRA exceeding 30 g/min per 30 in.^{2} (30 g/min 194 cm^2) should have their IRA reduced below 30 g/min per 30 in.^{2} prior to laying. They may be wetted immediately before they are laid, but it is preferable to wet them thoroughly 3 to 24 h prior to their use so as to allow time for moisture to become distributed throughout the unit.

6. Efflorescence

6.1 Brick are not required to be tested for efflorescence to comply with this specification unless requested by the specifier or purchaser. When the efflorescence test is requested by the specifier or purchaser, the brick shall be sampled at the place of manufacture, and tested in accordance with Test Methods C 67, and a rating for efflorescence shall be "not effloresced" or not

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