Designation: ~~C1405 – 22~~ C1405 – 23

Standard Specification for Glazed Brick (Single Fired, Brick Units)[1]

This standard is issued under the fixed designation C1405; 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.

1. Scope*

1.1 This specification covers brick, having a ceramic glaze finish fused to the body during the same process as the unit body firing, that are intended for use in masonry and supplying structural or facing components, or both, to the structure. This specification does not cover double-fired glazed brick. Some double-fired decorative glazes have physical properties, which vary from those of single-fired glazes due to the lower temperatures used in applying the decorative coating.

1.2 The property requirements of this specification 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 of this specification is beyond the scope of this specification.

1.3 Glazed brick are prismatic units available in a variety of sizes, textures, colors, and shapes. Glazed brick are manufactured from clay, shale, or similar naturally occurring earthy substances and subjected to a heat treatment at elevated temperatures (firing). The heat treatment shall develop a fired bond between the particulate constituents to provide the strength and durability requirements of this specification (see Terminology C1232).

1.4 Glazed brick are shaped during manufacture by molding, pressing, or extrusion, and the shaping method is a way to describe the brick.

1.5 Glazed brick are classified into one of two grades, one of two types, one of two classes, and one of three divisions.

1.6 Opacity of the glaze is not required unless specified by the purchaser.

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

1.8 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.

1.9 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

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[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**

1.10 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C67/C67M Test Methods for Sampling and Testing Brick and Structural Clay Tile
C1088 Specification for Thin Veneer Brick Units Made From Clay or Shale
C1232 Terminology for Masonry
C1895 Test Method for Determination of Mohs Scratch Hardness
E84 Test Method for Surface Burning Characteristics of Building Materials
E2105 Practice for General Techniques of Thermogravimetric Analysis (TGA) Coupled With Infrared Analysis (TGA/IR)

2.2 *NFPA Standard:*

NFPA No. 255 Test for Surface Burning Characteristics of Building Materials[3]

2.3 *UL Standard:*

UL No. 723 Flammability Studies of Cellular Plastics and Other Building Materials Used for Interior Finishes[4]

3. Terminology

3.1 *Definitions*—Terms used in this specification are defined in accordance with Terminology C1232.

4. Classification

4.1 *Grades*—Grades classify glazed brick according to their permissible variation in face dimension as follows. When grade is not specified, the requirements for Grade S govern.

4.1.1 *Grade S (Standard),* units for use where standard dimensional tolerances are desired.

4.1.2 *Grade SS (Select Sized),* units for use where a higher degree of precision and lower permissible variation in size are desired.

4.2 *Types*—Two types of glazed brick are covered. When type is not specified, the requirements for Type I govern.

4.2.1 *Type I (Single-Faced Units),* for general use where only one face is finished.

4.2.2 *Type II (Two-Faced Units),* for use where two opposite faces are finished.

NOTE 1—Type II units are not typically available as Subdivision Solid Thin units.

4.3 *Classes*—Classes classify brick according to their resistance to damage by freezing and thawing when saturated at a moisture content not exceeding the 24-h cold water absorption. Two classes of glazed brick are covered and the requirements are given in Section 5. When class is not specified, the requirements for Class Exterior govern.

4.3.1 *Class Exterior,* brick intended for use where high resistance to damage caused by cyclic freezing and thawing is desired.

4.3.2 *Class Interior,* brick intended for use where little resistance to cyclic freezing and thawing damage is permissible.

4.4 *Divisions*—Three divisions and one subdivision of glazed brick are covered. Divisions identify the amount and placement of hollow spaces (cores, cells and deep frogs) in the cross section of the unit. In the Division nomenclature, H shall be understood to mean hollow, and V shall be understood to mean void.

[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] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.
[4] Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, http://www.ul.com.

4.4.1 *Division Solid*—Brick with void area less than or equal to 25 % of its gross cross sectional area, measured in any plane parallel to the surface containing the cores, cells, or deep frogs.

4.4.1.1 *Subdivision Solid Thin*—brick with a maximum thickness as defined in Specification C1088.

4.4.2 *Division H40V*—Brick with void area greater than 25 % but less than or equal to 40 % of its gross cross sectional area, measured in any plane parallel to the surface containing the cores, cells, or deep frogs.

4.4.3 *Division H60V*—Brick with void area greater than 40 % but less than or equal to 60 % of its gross cross sectional area, measured in any plane parallel to the surface containing the cores, cells, or deep frogs. The shell thicknesses shall comply with the requirements in Table 1. See Fig. 1.

5. Physical Properties

5.1 *Durability*—Glazed brick shall conform to the physical properties requirements for the class specified as prescribed in Table 2 or in 5.1.1 or 5.1.2. For the compressive strength requirements, test the unit with the compressive force perpendicular to the bed surface of the unit, with the unit in the stretcher position.

NOTE 2—The physical property requirements for durability are based upon correlation of these physical properties and freeze-thaw testing of units in standard production. They indicate durability. Conformance with these property requirements provides a reasonable level of confidence as to durability in lieu of freeze-thaw testing.

5.1.1 *Strength and Absorption Requirements Alternate*—The saturation coefficient requirement for Class Exterior does not apply, provided the average compressive strength of a random sample of five brick equals or exceeds 8000 psi (55.2 MPa) with no individual strength less than 7500 psi (51.8 MPa). Additionally, the 24-h cold water absorption of each unit shall not exceed 6.0 %.

5.1.1.1 *Subdivision Solid Thin*—The saturation coefficient requirement for Class Exterior does not apply, provided the 24-h cold water absorption of each unit shall not exceed 6.0 %.

5.1.2 *Freezing and Thawing Alternative*—The requirements for cold water absorption (5.1.1) and absorption and saturation coefficient (Table 2) for Class Exterior 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 C67/C67M.

NOTE 3—The 50 cycle freezing and thawing test is used as an alternative only when units do not conform to either Table 2 requirements for maximum water absorption and saturation coefficient, or to the appropriate requirements of the Strength and Absorption ~~Alternate~~ Alternates for each Division and Subdivision in 5.1.1.

5.1.2.1 *Subdivision Solid Thin*—The requirements for cold water absorption (5.1.1.1) and absorption and saturation coefficient (Table 2) for Class do not apply, provided a sample of five brick passes the freezing and thawing test as described in the Rating Section of the Freezing and Thawing test procedures of Test Methods C67/C67M.

5.1.2.2 *Class Exterior: Breakage and Weight Loss Requirement*—No individual unit separates or disintegrates resulting in a weight loss greater than 0.5 % of its original dry weight.

5.1.2.3 *Class Exterior: Cracking Requirement*—No individual unit develops a crack that exceeds, in length, the unit's least dimension.

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

Nominal Width of Unit	Face Shell Type		End Shells
	Solid	Cored or Double Shell	
3 and 4 (76 and 102)	¾ (19.0)	...	¾ (19.0)
6 (152)	1 (25.4)	1 ½ (38.1)	1 (25.4)
8 (203)	1 ¼ (31.8)	1 ½ (38.1)	1 (25.4)
10 (254)	1 ⅜ (34.9)	1 ⅝ (41.3)	1 ⅛ (28.6)
12 (305)	1 ½ (38.1)	2 (50.8)	1 ⅛ (28.6)

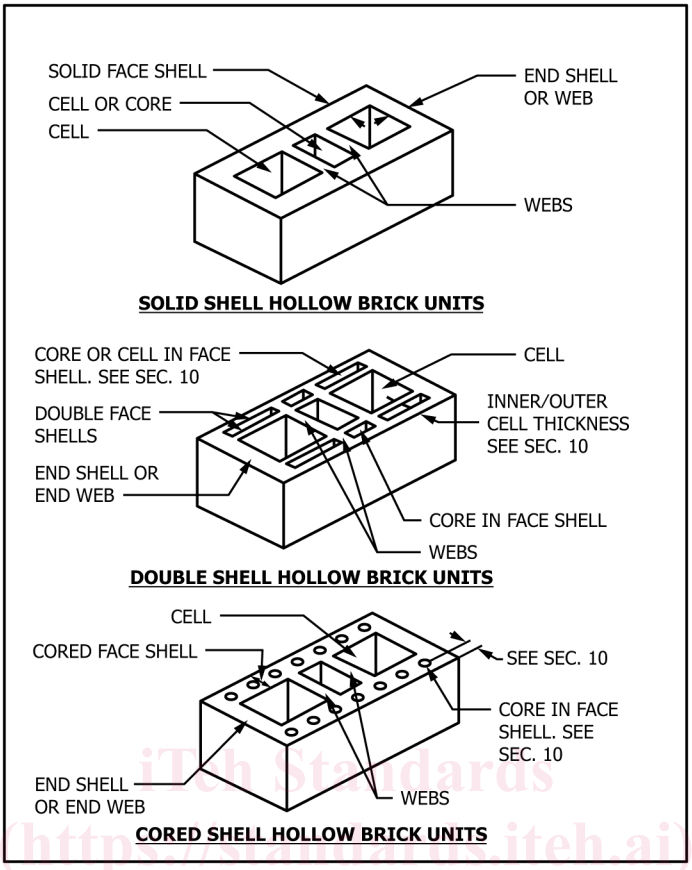

FIG. 1 Types of Hollow Glazed Brick Units

5.2 *Strength*—When glazed brick are required having strengths greater than prescribed by this specification, the purchaser shall specify the desired average compressive strength and the individual minimum compressive strength.

5.3 *Initial Rate of Absorption (IRA)*—Determine results for IRA in accordance with Test Methods C67/C67M and furnish results at the request of the specifier or purchaser.

NOTE 4—*Initial Rate of Absorption (Suction)*—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.

6. Efflorescence

6.1 When the brick are tested in accordance with Test Methods C67/C67M, the rating for efflorescence shall be: "not effloresced."

7. Dimensions and Permissible Variations

7.1 The dimensions of brick shall be as specified by the purchaser. In a sample of ten brick selected to represent the extreme range of sizes of brick to be supplied, no brick shall depart from the specified dimensions by more than the individual tolerance for the grade specified as prescribed in Table 3, Column A. The average size of ten brick sample shall be determined, and no brick in the job lot (delivered brick) shall vary from this average size by more than the individual tolerance for the grade specified as prescribed in Table 3, Column B. No individual brick in the job lot shall fall outside of the dimensional tolerances of Table 3.

7.2 *Warpage*—Tolerances for warpage of surfaces or edges intended to be exposed in use of individual brick from a plane surface and from a straight line, respectively, shall not exceed the maximum for the grade specified as prescribed in Table 4.

7.3 *Out-of-Square*—The maximum permitted dimension for out-of-square of the exposed face of the brick is 3⁄32 in. (2.4 mm).

TABLE 2 Physical Requirements

~~Designation~~	~~Minimum Compressive Strength, psi (MPa), Gross Area~~		~~Maximum Water Absorption by 24-h Cold, 7°~~	~~Maximum Saturation Coefficient~~[A]	
Designation	Minimum Compressive Strength[A] psi (MPa), Gross Area	Maximum Water Absorption by 24-h Cold, 7°		Maximum Saturation Coefficient[B]	
	Average of 5 Brick	Individual	Individual	Average of 5 Brick	Individual
Class Exterior	6000 (41.4)	5000 (34.8)	7.0	0.78	0.80
Class Interior	3000 (20.7)	2500 (17.2)			

[A] The Minimum Compressive Strength shall not be required for Subdivision Solid Thin units due to testing constraints.
[B] The saturation coefficient is the ratio of absorption by 24 h submersion in cold water to that after 5 h submersion in boiling water.

TABLE 3 Tolerances on Dimensions

Specified Dimension or Average Brick Size in Job Lot Sample, in. (mm)	Maximum Permissible Variation in Dimensions, in. (mm) plus or minus from:			
	Column A (for Specified Dimension)		Column B (for Average Brick Size in Job Lot Sample)[A]	
	Grade S	Grade SS	Grade S	Grade SS
3 (76) and under	1/16 (1.6)	1/16 (1.6)	1/16 (1.6)	1/16 (1.6)
Over 3-4 (76-102), incl	3/32 (2.4)	1/16 (1.6)	1/16 (1.6)	1/16 (1.6)
Over 4-6 (102-152), incl	1/8 (3.2)	1/16 (1.6)	3/32 (2.4)	1/16 (1.6)
Over 6-8 (152-203), incl	5/32 (4.0)	1/16 (1.6)	3/32 (2.4)	1/16 (1.6)
Over 8-12 (203-305), incl	7/32 (5.6)	1/16 (1.6)	1/8 (3.2)	1/16 (1.6)
Over 12-16 (305-406), incl	9/32 (7.1)	1/16 (1.6)	3/16 (4.8)	1/16 (1.6)

[A] Lot size shall be determined by agreement between purchaser and seller. If not specified, lot size shall be understood to include all brick of one size and color in the job order.

TABLE 4 Tolerances on Warpage

Maximum Dimension, in. (mm)	Maximum Permissible Warpage, in. (mm)	
	Grade S	Grade SS
8 (203) and under	1/16 (1.6)	1/16 (1.6)
Over 8-12 (203-305) incl	3/32 (2.4)	3/32 (2.4)
Over 12-16 (305-406) incl	1/8 (3.2)	3/32 (2.4)

NOTE 5—Linear dimensions and flat surfaces of specially shaped brick shall meet the requirements for size and warpage, respectively, of the specified grade. Tolerances for size and warpage of nonlinear dimensions and surfaces, and out-of-square shall be determined by agreement with the manufacturer.

8. Finish and Appearance

8.1 The body of the units shall be free of defects, deficiencies, and other imperfections that would interfere with the proper setting of the brick or significantly impair the strength or performance of the construction.

8.2 The color, color range, and texture shall be specified by the purchaser. The stretcher face of the brick and the exposed face(s) of shapes shall have the same general texture, color range, and glaze as the approved sample. The texture of the glazed surfaces shall conform to an approved sample of not less than four stretcher brick, each representing the texture desired. The color range shall be indicated by the approved sample.

8.2.1 Where brick are required having faces glazed other than those identified by type (Section 4), the purchaser shall specify faces to be glazed and the quantity of brick needed.

NOTE 6—Special brick shapes may be desired by the purchaser that do not meet all of the requirements of this specification (see 8.2.1). Consult the manufacturer for the availability of specialty units suitable for the intended purposes.

8.3 The face(s) to be glazed shall be covered with a ceramic glaze of uniform quality. The glaze shall be free of chips, crazes,