



Designation: C 34 – 96 (Reapproved 2001)

## Standard Specification for Structural Clay Load-Bearing Wall Tile<sup>1</sup>

This standard is issued under the fixed designation C 34; 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 Department of Defense.*

### 1. Scope

1.1 This specification covers structural clay loading-bearing wall tile. Two grades of tile are covered, as follows:

1.1.1 *Grade LBX*—Suitable for general use in masonry construction and adapted for use in masonry exposed to weathering, provided they meet the durability requirements for Grade SW of Specification C 216.

1.1.2 *Grade LB*—Suitable for general use in masonry where not exposed to frost action, or for use in exposed masonry where protected with a facing of 3 in. (76.2 mm) or more of stone, brick, terra cotta, or other masonry.

1.1.3 If tile having a particular color, texture, or finish are desired, these features shall be specified separately by the purchaser.

NOTE 1—Color of tile varies with the type of clay used and degree of burning; hence, it cannot be taken as indicative of classification until after it has been related to absorption and strength by actual tests.

1.2 The property requirements of this standard apply at the time of purchase. The use of results from testing of tile extracted from masonry structures for determining conformance or non-conformance to the property requirements (Section 3) of this standard is beyond the scope of this standard.

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

1.4 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.

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

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### 2. Referenced Documents

2.1 *ASTM Standards:*

C 43 Terminology of Structural Clay Products<sup>2</sup>

C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile<sup>2</sup>

C 216 Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)<sup>2</sup>

### 3. Physical Properties

3.1 Structural clay load-bearing wall tile shall conform to the physical properties for the grade specified as prescribed in Table 1.

3.2 Tile of Grade LBX shall be accepted under all conditions instead of Grade LB.

3.3 End-construction tile are tile designed to be placed in the wall with axes of the cells vertical. Side-construction tile are tile designed to be placed in the wall with the axes of the cells horizontal. Where end-construction tile are used on the side they shall conform to the requirements of side-construction tile and vice versa.

3.4 Bonding tile shall be so designed as to provide recesses for header brick courses when laid up in brick-faced walls.

### 4. Number of Cells

4.1 Load-bearing tile shall conform to the following requirements for minimum number of cells<sup>A</sup> in the direction of wall thickness (see Note 2 for approximate weights of tile):

Nominal Horizontal Thickness of Tile as Laid in Wall, in. (mm)	Minimum Number of Cells <sup>A</sup> in Direction of Wall Thickness
4 (101.6)	1
6 (152.4)	1
8 (203.2)	2
10 (254.0)	2
12 (304.8)	3

<sup>A</sup>Cells are hollow spaces enclosed within the perimeter of the exterior shells, and having a minimum dimension of not less than 1/2 in. (12.7 mm) and a cross-sectional area of not less than 1 in.<sup>2</sup> (6.5 cm<sup>2</sup>).

Fire-resistance regulations of governing codes should be checked as to type of tile required.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.05.



**TABLE 1 Physical Properties**

Grade	Maximum Water Absorption <sup>A</sup> by 1-h Boiling, %		Minimum Compressive Strength (Based on Gross Area), <sup>B</sup> psi (MPa)			
			End Construction Tile		Side Construction Tile	
	Average of Five Tests	Individual	Average of Five Tests	Individual	Average of Five Tests	Individual
LBX	16	19	1400 (9.6)	1000 (6.8)	700 (4.8)	500 (3.4)
LB	25	28	1000 (6.8)	700 (4.8)	700 (4.8)	500 (3.4)

<sup>A</sup>The range in percentage absorption for tile delivered to any one job shall be not more than 12.

<sup>B</sup>Gross area of a unit shall be determined by multiplying the horizontal face dimension of the unit as placed in the wall, by its thickness.

NOTE 2—The following average masses of structural clay load-bearing wall tile are given only as information:

Nominal Horizontal Thickness of Tile as Laid in Wall, in. (mm)	Average mass, lb/ft <sup>2</sup> (kg/m <sup>2</sup> ) of tile <sup>A</sup>
4 (101.6)	20 (97.6)
6 (152.4)	30 (146.4)
8 (203.2)	36 (175.7)
10 (254.0)	42 (205.0)
12 (304.8)	52 (253.8)

<sup>A</sup>The masses given in the above table are for scored tile. If any of the faces are not scored the weights are increased 1 lb/ft<sup>2</sup> of unscored area.

4.2 In double-shell tile, the two voids between exterior and interior shells on the sides of the tile shall be considered as one cell in thickness of wall when their combined width is not less than ½ in. (12.7 mm) provided the short webs between the inner and outer shells are not greater in number of thickness than the long transverse webs holding the inner shells.

4.3 Re-entrant spaces not less than 1 in. (25.4 mm) in depth and not less than 1 in.<sup>2</sup> (6.5 cm<sup>2</sup>) in area, which form cells when the units are laid in the walls, shall be considered as cells in the direction of wall thickness, but not in the units.

## 5. Shell and Web Thickness

5.1 The average over-all thickness of the shells, measured between the inner and extreme outer surfaces of end-construction load-bearing tile, shall be not less than ¾ in. (19 mm) except that in double-shell tile the combined average over-all thickness of the inner and outer shell shall be not less than ¾ in. The thickness of the webs shall be not less than ½ in. (12.7 mm).

5.2 The average over-all thickness of the shells, measured between the inner and extreme outer surfaces of side-construction load-bearing tile, shall be not less than ⅝ in. (15.8 mm) except that in double-shell tile the combined average over-all thickness of the inner and outer shells shall be not less than ¾ in. (19 mm). The thickness of the webs shall be not less than ½ in. (12.7 mm).

5.3 The width of any cell in side-construction tile, measured in the direction of wall thickness, shall not exceed four and one half times the average over-all thickness of either the upper or lower bearing shell. If no cell in side-construction tile, measured in the direction of the wall thickness, exceeds four times the average over-all thickness of either the upper or lower bearing shell, the requirements for minimum shell and web thickness specified in 5.2 shall be waived.

5.4 The thickness of bonding and other types of tile manufactured for use in combination with brick or other materials is permitted to vary from the nominal thicknesses indicated in Section 4, as required by construction requirements.

NOTE 3—Purchasers and designers should ascertain the type and size of

tile, modular or nonmodular, available in the locality under consideration and should specify accordingly, stating the size and type represented by the available tile.

Modular sizes are designated by the specified nominal dimensions which are equal to the actual manufactured dimensions plus the thickness of one mortar joint, not to exceed ½ in. (12.7 mm) (see Section 5.) For example, if the modular, specified, or nominal dimensions of a unit are 4 by 8 by 12 in. (101.6 by 203.2 by 304.8 mm) the actual manufactured dimensions may be 3½ by 7½ by 11½ in. (88.9 by 190.5 by 292.1 mm).

## 6. Permissible Variations in Dimensions

6.1 No over-all dimension shall vary more than 3 % over or under the specified dimension for any form or size of tile.

## 7. Finish

7.1 The finish of the outer face or faces of tile shall be plaster-base finish or exposed wall finish as specified in the invitation for bids.

7.2 Surfaces of tile for plaster-base finish shall be smooth, scored, combed, or roughened. When smooth, the tile shall be free of glaze and the absorption shall be not less than 5 % nor more than 25 %. When scored, each groove shall be not less than ⅓ in. (1.6 mm) nor more than ¼ in. (6.4 mm) in depth, and not more than 1 in. (25.4 mm) in width. The area covered by the grooves shall not exceed 50 % of the area of the scored faces. When combed, the tile shall be scratched or scarified, prior to burning, by mechanical means which shall make scratches or scarifications on the surface of the tile not less than ⅓ in., nor more than ⅛ in. (3.2 mm) in depth, and not more than ¼ in. apart. When roughened, the die skin on the face of the tile shall be entirely broken by mechanical means, such as wire cutting or wire brushing. (The die skin may be observed within the cells of the tile.)

7.3 Surfaces of tile with exposed finish shall be smooth, combed, or roughened. Combed or roughened tile surfaces shall conform to the requirements for these finishes given in 7.2.

## 8. Sampling and Testing

8.1 The purchaser or his authorized representative shall be accorded proper facilities for sampling and inspection of units both at the place of manufacture and at the site of the work. At least 10 days from the time of sampling is allowed for completion of the tests.

8.2 Tile shall be sampled and tested in accordance with Test Methods C 67.

## 9. Visual Inspection

9.1 All tile shall be reasonably free of laminations and of cracks, blisters, surface roughness, and other defects that



would interfere with the proper setting of the tile or impair the strength or permanence of the construction.

## **10. Rejection**

10.1 In case the shipment fails to conform to the requirements for the grade specified, the manufacturer may sort it, and new specimens shall be selected by the purchaser from the retained lot and tested at the expense of the manufacturer. In case the second set of specimens fails to meet the requirements, the entire lot shall be rejected.

## **11. Expense of Tests**

11.1 Except as specified in Section 10, and unless otherwise agreed, the expense of inspection and testing shall be borne by the purchaser.

## **12. Keywords**

12.1 clay; load-bearing tile; masonry construction; physical properties; shale; structural wall tile; tile

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