



Standard Specification for Heavy Vehicular Paving Brick¹

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1. Scope*

1.1 This specification covers brick intended for use as a paving material in areas with a high volume of heavy vehicular traffic. The units are designed for use in such places as streets, commercial driveways, and aircraft taxiways. These units are not intended for applications covered by Specifications C 410 or C 902.

1.2 Units are manufactured from clay, shale, or similar naturally occurring earthy 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, fired bond, and incipient fusion in Terminology C 43).

1.3 Brick may be shaped during manufacture by extruding, molding, or pressing. Brick may have spacing lugs, chamfered edges, or both.

1.4 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:²

- C 43 Terminology of Structural Clay Products
- C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile
- C 88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C 410 Specification for Industrial Floor Brick
- C 418 Test Method for Abrasion Resistance of Concrete by Sandblasting
- C 902 Specification for Pedestrian and Light Traffic Paving Brick

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.

E 303 Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester

3. Terminology

3.1 *Definitions*—Terms used in this specification are defined in Terminology C 43.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *heavy vehicular traffic*—high volume of heavy vehicles representing trucks or combination vehicles having 3 or more loaded axles.

3.2.1.1 *Discussion*—High volume is considered to be traffic over 251 daily equivalent single axle loads (ESAL).

4. Classification

4.1 *Types*—Heavy vehicular paving brick are classified by type according to their intended installation:

4.1.1 *Type R*—Brick intended to be set in a mortar setting bed supported by an adequate concrete base; or an asphalt setting bed supported by an adequate asphalt or concrete base.

4.1.2 *Type F*—Brick intended to be set in a sand setting bed, with sand joints, and supported by an adequate base.

4.2 *Applications*—Heavy vehicular paving brick are classified by application according to their dimensional tolerances, distortion, and extent of chips.

4.2.1 *Application PS*—Pavers intended for general use.

4.2.2 *Application PX*—Pavers intended for use where dimensional tolerances, warpage, and chippage are limited.

4.2.3 *Application PA*—Pavers intended to produce characteristic architectural effects resulting from nonuniformity in size, color, and texture.

5. Physical Properties

5.1 *Freeze Thaw Resistance*—Use one of the following methods:

5.1.1 *Physical Property Requirements*—The brick shall conform to the physical requirements for the type specified as prescribed in Table 1.

5.1.2 *Freezing and Thawing Alternative*—The cold water absorption requirements specified in 5.1.1 shall not be required provided a sample of five brick, meeting all other requirements, passes the 50 cycle freezing-and-thawing test in Test Methods C 67 with not greater than 0.5 % loss in dry weight of any individual unit.

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

TABLE 1 Physical Requirements

Type	Minimum Compressive Strength, Gross Area, psi (MPa)		Minimum Breaking Load, lb/in. (kN/mm)		Maximum Cold Water Absorption, %	
	Avg. of 5 Brick	Individual	Avg. of 5 Brick	Individual	Avg. of 5 Brick	Individual
R	8000 (55.2)	7000 (48.3)	6.0	7.0
F	10 000 (69.0)	8800 (60.7)	475 (83)	333 (58)	6.0	7.0

NOTE 1—The provisions of 5.1.2 are specified only as an alternative when the sample does not conform to the requirements for cold water absorption prescribed in Table 1.

5.1.2.1 *Sulfate Soundness Test Alternative*—The cold water absorption requirements specified in 5.1.1 shall not be required if a representative sample of five brick survives 15 cycles of the sulfate soundness test in accordance with Sections 4, 5, and 8 of Test Method C 88 with no visible damage.

NOTE 2—The sulfate soundness test is an optional substitute test for the freezing-and-thawing test (5.1.2).

5.1.3 *Performance Alternative*—If information on the performance over time of similar units in a similar application with similar exposure and traffic is furnished by the manufacturer or the manufacturer’s agent and is found acceptable to the specifier of the pavement material or the specifier’s agent, the physical requirements in 5.1.1 or the size requirements in 7.2 shall not be required.

5.2 *Abrasion Resistance*—Each individual brick tested shall meet the requirements of either the Abrasion Index column or the Volume Abrasion Loss column of Table 2.

5.2.1 *Abrasion Index*—The abrasion index is calculated from the cold absorption in percent and the compressive strength in pounds per square inch as follows:

$$\text{abrasion index} = \frac{100 \times \text{absorption}}{\text{compressive strength}} \quad (1)$$

5.2.1.1 The compressive strength shall be determined on half-brick, which are the full height (no less than 2¼ in. (57 mm)) and width of the unit, and with a length equal to one half the full length of the unit (±¼ in. (±6 mm) for each dimension). For abrasion index testing purposes, the brick shall be without core holes, frogs or other perforations. Other shaped specimens may be used provided that a correlation is established with the results of the specified shape and the results are converted to be equivalent to those that would be obtained with the specified shape.

5.2.1.2 In those cases where the height requirements for determining compressive strength cannot be met, the abrasion resistance should be determined according to the volume abrasion loss method.

5.2.2 *Volume Abrasion Loss*—The volume abrasion loss should be determined in accordance with Test Method C 418, with the following changes in procedure:

5.2.2.1 The sand shall be a natural silica sand from Ottawa, IL, graded to pass a No. 50 (300-µm) sieve and retained on a No. 100 (150-µm) sieve.

TABLE 2 Abrasion Requirements^A

Type	Abrasion Index, max	Volume Abrasion Loss, max, cm ³ /cm ²
R and F	0.11	1.7

^A See 5.2.1 and 5.2.2 for additional information.

5.2.2.2 The test shall be run on dry brick.

5.2.2.3 The duration of the test shall be 2 min.

5.2.2.4 The rate of sand flow shall be 400 g/min.

5.2.2.5 The volume loss shall be determined by filling the abraded depression with modeling clay, striking off level with the original surface of the brick, and removing and weighing the modeling clay. The volume loss shall be calculated from the bulk density of the modeling clay. The bulk density should be determined on each lot of modeling clay. An alternative method of determining the weight of clay used in filling the sandblast cavity is to determine the weight of the modeling clay sample before and after filling the cavity.

5.3 *Skid Resistance*—When specified, the units shall be tested for skid resistance in accordance with Test Method E 303.

5.4 *Coring*—The brick shall be without core holes or other perforations.

5.5 *Chips or Cracks*—The brick shall be free of chips or cracks larger than those listed in this specification that would significantly impair the performance of the system.

6. Efflorescence

6.1 When specified, the units shall be tested for efflorescence in accordance with Test Methods C 67. The units shall be sampled at the place of manufacture.

7. Dimensions and Permissible Variations

7.1 The size of the brick shall be as specified by the purchaser.

7.2 The minimum specified thickness of the unit depends on the Type and shall be as follows:

7.2.1 *Type R*—2¼ in. (57.2 mm).

7.2.2 *Type F*—2⅝ in. (66.7 mm).

7.3 When chamfers are specified by the purchaser, the dimensions required in 7.2 are exclusive of chamfers. When lugs are specified by the purchaser, the size of the brick and its associated dimensional tolerances shall include the lugs. The lugs shall project no greater than ⅛ in. (3.2 mm), unless otherwise specified.

7.4 In the sample of units, no unit shall depart from the specified size by more than the individual tolerance for the application specified as prescribed in Table 3. Type F paving brick shall conform to Application PX only.

TABLE 3 Tolerances on Dimensions

Dimension, in. (mm)	Permissible Variation, max, ±in. (±mm)		
	Application PS	Application PX	Application PA
3 (76) and under	⅛ (3.2)	1/16 (1.6)	no limit
Over 3 to 5 (76 to 127)	3/16 (4.7)	3/32 (2.4)	no limit
Over 5 to 8 (127 to 203)	¼ (6.4)	⅛ (3.2)	no limit
Over 8 (203)	5/16 (7.9)	7/32 (5.6)	no limit

7.5 Tolerances for distortion or warpage of surfaces or edges intended to be exposed in use from a plane surface and from a straight line, respectively, shall not exceed the maximum for the application specified as prescribed in Table 4. Type F paving brick shall conform to Application PX only.

8. Visual Inspection

8.1 Other than chips, the brick shall be free of cracks or other imperfections detracting from the appearance of a designated sample when viewed from a distance of 20 ft (6 m).

8.2 The parts of the brick that will be exposed in place shall be free of chips that exceed the limits given in Table 5. The cumulative length of chips on the exposed face of a single unit shall not exceed 10 % of the perimeter of the exposed face of the brick.

8.3 Unless otherwise agreed upon in writing by the purchaser and the seller, a delivery shall contain not more than

TABLE 4 Tolerances on Distortion

Specified Dimension, in. (mm)	Permissible Distortion, max, in. (mm)		
	Application PS	Application PX	Application PA
8 (203) and under	$\frac{3}{32}$ (2.4)	$\frac{1}{16}$ (1.6)	no limit
Over 8 (203) to 12 (305)	$\frac{1}{8}$ (3.2)	$\frac{3}{32}$ (2.4)	no limit
Over 12 (305) to 16 (406)	$\frac{5}{32}$ (4.0)	$\frac{1}{8}$ (3.2)	no limit

TABLE 5 Maximum Permissible Extent of Chippage from Edges and Corners

Application	Chippage, in. (mm) in from	
	Edge	Corner
PS and PX	$\frac{5}{16}$ (7.9)	$\frac{1}{2}$ (12.7)
PA	no limit	no limit

5 % brick that do not meet the combined requirements of Tables 3-5, including broken brick.

9. Sampling and Testing

9.1 The brick shall be sampled and tested in accordance with applicable sections in Test Methods C 67.

NOTE 3—Unless otherwise specified in the purchase order, the cost of tests is typically borne as follows: If the results of the tests show that the brick do not conform to the requirements of this specification, the cost is typically borne by the seller. If the results of the tests show that the brick do conform to the requirements of this specification, the cost is typically borne by the purchaser.

9.2 The manufacturer or the seller shall furnish specimens for tests without charge. The place or places of selection shall be designated when the purchase order is placed.

10. Keywords

10.1 brick; fired masonry units; pavement surfaces

SUMMARY OF CHANGES

Committee C15 has identified the location of selected changes to this standard since the last issue (C 1272–00) that may impact the use of this standard.

(1) In Table 1, the minimum modulus of rupture requirement was replaced with a minimum breaking load.

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