INTERNATIONAL

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Standard Specification for Pedestrian and Light Traffic Paving Brick[1]

This standard is issued under the fixed designation C902; 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 intended for use as paving material subjected to pedestrian and light vehicular traffic. The units are designed for use in pedestrian applications and vehicular areas that are subjected to low volumes of vehicular traffic, such as residential driveways and streets and commercial driveways (passenger drop-offs). The units are not intended to support heavy vehicular traffic covered by Specification C1272 or for industrial applications covered by Specification C410.

NOTE 1—Heavy vehicular traffic is defined as high volumes of heavy vehicles (trucks having 3 or more axles) in Specification C1272.

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 (Section 5) of this specification is beyond the scope of this specification.

1.3 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 must develop sufficient fired bond between the particulate constituents to provide the strength and durability requirement of this specification (see Terminology C1232).

1.4 Use of this standard and the requirements herein to evaluate and corroborate the performance of a paving unit made from other materials, or made with other forming methods, or other means of binding the materials is not covered by the scope of this standard.

1.5 The brick are available in a variety of sizes, colors, and shapes. They are available in three classes according to exposure environment and three types according to type of traffic exposure.

1.6 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.

1.7 *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.*

[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**

2. Referenced Documents

2.1 *ASTM Standards:*[2]

~~C67~~C67/C67M Test Methods for Sampling and Testing Brick and Structural Clay Tile
~~C88~~C88/C88M Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C410 Specification for Industrial Floor Brick
C418 Test Method for Abrasion Resistance of Concrete by Sandblasting
C1232 Terminology for Masonry
C1272 Specification for Heavy Vehicular Paving Brick

3. Terminology

3.1 *Definitions*—For definitions relating to paving brick, refer to Terminology C1232.

4. Classification

4.1 Light traffic paving brick are classified according to the severity of their use-environment. Two types of environment are considered: *(1)* weather and *(2)* traffic:

4.1.1 *Weather*—Weathering resistance is specified by one of three classes. When the class is not specified, the requirements for Class SX shall govern.

4.1.1.1 *Class SX*—Brick intended for use where the brick may be frozen while saturated with water.

4.1.1.2 *Class MX*—Brick intended for exterior use where resistance to freezing is not a factor.

4.1.1.3 *Class NX*—Brick not intended for exterior use but which may be acceptable for interior use where protected from freezing when wet.

NOTE 2—A surface coating may be applied to any class of brick of this standard when protected from freezing while wet. The function of the coating is to prevent penetration of dirt or liquids into the pores of the brick. Coatings should be applied only after complete drying of the paving.

4.1.2 *Traffic*—Abrasion resistance is specified by one of three types. When the type is not specified, the requirements for Type II govern.

4.1.2.1 *Type I*—Brick subjected to extensive abrasion.

NOTE 3—Type I pavers would be used in such places as sidewalks and driveways in publicly occupied spaces.

4.1.2.2 *Type II*—Brick subjected to intermediate abrasion.

NOTE 4—Type II pavers would be used in such places as heavily traveled residential walkways and residential driveways.

4.1.2.3 *Type III*—Brick subjected to low abrasion.

NOTE 5—Type III pavers would be used in such places as floors or patios in single-family homes.

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 class specified as prescribed in Table 1.

[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.

TABLE 1 Freeze Thaw Resistance Property Requirements

Designation	Compressive Strength, flatwise, gross area, min, psi (MPa)		Maximum 24-h Cold Water Absorption, %		Saturation Coefficient, max[A]	
	Average of 5 Brick	Individual	Average of 5 Brick	Individual	Average of 5 Brick	Individual
Class SX	8000 (55.2)	7000 (48.3)	8.0	11.0	0.78	0.80
Class MX	3000 (20.7)	2500 (17.2)	14.0	17.0	no limit	no limit
Class NX	3000 (20.7)	2500 (17.2)	no limit	no limit	no limit	no limit

[A] The saturation coefficient is the ratio of absorption by 24-h submersion in cold water to that after 5-h submersion in boiling water.

5.1.1.1 *Absorption Alternative*—If the average 24-h cold water absorption is less than 6.0 %, the requirement for saturation coefficient shall be waived.

5.1.2 *Freezing and Thawing Test Alternative*—The requirements for water 24-h cold water absorption and saturation coefficient specified in 5.1.1 do not apply, provided a representative sample of five brick, meeting the strength requirements of Table 1, passes the freezing and thawing test as described in the Rating section of the Freezing and Thawing test procedures of Test Methods ~~C67~~C67/C67M.

NOTE 6—The 50 cycle freezing and thawing test is specified only as an alternative when brick do not conform to either Table 1 requirements for maximum 24-h cold water absorption and saturation coefficient, or to the restrictive absorption requirements in 5.1.1.1.

5.1.2.1 *Class SX: 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.

5.1.2.2 *Class SX: Cracking Requirement*—No individual unit develops a crack that exceeds, in length, the unit's least finished face dimension.

5.1.3 *Sulfate Soundness Test Alternative*—The requirements for 24-h cold water absorption and saturation coefficient specified in 5.1.1 shall not be required if a sample of five brick survives 15 cycles of the sulfate soundness test in accordance with Sections 4, 5, and 8 of Test Method ~~C88~~C88/C88M with no visible damage.

NOTE 7—The sulfate soundness test is an optional substitute test for the freezing-and-thawing test (5.1.2).

5.1.4 *Performance Alternative*—If information on the performance of the units in a similar application of similar exposure and traffic is furnished by the manufacturer or his agent and is found acceptable by the specifier of the pavement material, or his agent, the physical requirements in 5.1.1 may be waived.

5.1.5 *Molded Brick* (*Soft Mud, Semi-Dry Pressed, and Dry Pressed Brick*)—The requirements listed in Table 1 shall be changed for molded brick to permit maximum 24-h cold water absorption of 16.0 % average and 18.0 % individual, and minimum compressive strengths of 4000 psi (27.6 MPa) average and 3500 psi (24.1 MPa) individual for Class SX, provided that the requirements for saturation coefficient of Table 1 are met.

NOTE 8—The resistance of brick to weathering cannot be predicted with complete assurance at the present state of knowledge. There is no known test that can predict weathering resistance with complete accuracy.

Brick in general is superior in weathering resistance to other building materials. There are innumerable instances of satisfactory performance beyond 200 years and even into the thousands of years. Nevertheless, there are some brick that cannot survive a few winters of a severe freezing and thawing environment.

The durability requirements of the specification attempt to exclude such brick. This specification utilizes the best knowledge available at this time and is based on extensive research by several investigators. The durability requirements have an excellent correlation with in-use performance. Nevertheless, it is known that some brick that meet this specification may not be serviceable in severe climates. Furthermore, other brick that do not meet these specifications may show superior serviceability in the most severe climate. The best indication of brick durability is its service experience record.

5.2 *Abrasion Resistance*—The brick shall meet the requirements of either column (1) or (2) of Table 2 for the applicable traffic use (see 4.1.2).[3]

[3] McBurney, J. W., Brink, R. H., Eberle, A. R., "Relation of Water Absorption and Strength of Brick to Abrasive Resistance," *Proceedings, ASTM*, Vol 40, 1940, pp. 1143–1151.

TABLE 2 Abrasion Resistance Property Requirements[A]

	(1) Abrasion Index,[B] max	(2) Volume Abrasion Loss,[C] max, cm^3/cm^2
Type I	0.11	1.7
Type II	0.25	2.7
Type III	0.50	4.0

[A] Select the sample according to the sampling procedure of Test Methods ~~C67~~C67/C67M. The brick shall meet the requirements of either column (1) or (2). The values listed shall not be exceeded by any individual unit within the sample.
[B] The abrasion index is calculated from the 24-h cold water absorption in percent and the compressive strength in pounds per square inch as follows:

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

Compressive strength values are influenced by specimen shape (particularly the height to width ratio of the test specimen). Therefore, a shape is specified which conforms to the data on which the abrasion index is based.[4]

The compressive strength shall be determined on specimens measuring 3⅞ by 3⅞ by 2¼ in. ± ¼ in. (98 by 98 by 57 mm ± 6 mm) for length, width, and height respectively. The brick shall be without core holes, other perforations or frogs. Other shaped specimens may be used provided that the producer submits evidence acceptable to the purchaser that the change in shape gives equivalent strength results to those of the specified shape.

The abrasion resistance should be determined according to Column 2 in those cases where the procedural requirements for compressive strength cannot be met.
[C] The volume abrasion loss shall be determined in accordance with Test Method C418, with the following changes in procedure:
(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.
(2) The test shall be run on dry brick.
(3) The duration of the test shall be 2 min.
(4) The rate of sand flow shall be 400 g/min.
(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 shall be determined on each lot of modeling clay.
An alternative method of determining the weight of clay used in filing the sand-blast cavity is to determine the weight of the modeling clay sample before and after filling the cavity.

NOTE 9—Skid/slip resistance should be considered by the purchaser for uses of brick where pedestrian traffic is anticipated. Methods of testing this characteristic are under study and it is hoped that a specification for this property can be added in future revisions of this standard when suitable test methods are developed.

6. Ordering Information

6.1 Orders for pedestrian and light traffic paving brick under this specification shall include the following information:

6.1.1 *Color, Color Range, and Texture*—(9.1), by approving a sample.

6.1.2 *Sampling* (10.2)—Specify location where specimens are to be secured for testing.

6.2 Orders for light traffic paving brick under this specification may include the following information:

6.2.1 *Classification—Weather* (4.1.1)—Class SX governs when class is not specified.

6.2.2 *Classification—Traffic* (4.1.2)—Type II governs when type is not specified.

6.2.3 *Size* (8.1)—Specify width by height by length or accept the manufacturer's stock item.

6.2.4 *Application* (8.2)—Application PS governs when application is not specified.

6.2.5 *Chamfers and Lugs (8.5 and 8.6)*—Specify if chamfers and/or lugs are desired.

6.2.6 *Cost of Tests* (Note ~~10~~11)—Party to pay and conditions for payment of compliance testing.