



Designation: **C1790 – 14 C1790 – 14a**

## Standard Specification for Fly Ash Facing Brick<sup>1</sup>

This standard is issued under the fixed designation C1790; 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.

### 1. Scope-Scope\*

1.1 This specification covers fly ash brick intended for use in masonry, which are made from fly ash, water, and suitable mineral aggregates with or without the inclusion of other materials, and without the use of portland cement. This specification covers units intended for use in masonry, in both structural and facing applications.

1.2 Units covered under this specification include a fly ash binder that undergoes hydraulic, pozzolanic, alkali-activated, or geopolymer reactions, or any combination thereof. These chemical reactions, in conjunction with the other materials in the units, provide the strength and durability necessary to meet the requirements of this specification.

NOTE 1—This specification addresses properties of units formed using fly ash, aggregates, and other allowed binders. Although not required by this standard, users may request tests that establish assembly performance such as unit-mortar bond and fire resistance. As an alternative to tests, evidence of successful use in similar applications could be provided to establish assembly performance.

1.3 This specification 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.

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

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards:*

C33 Specification for Concrete Aggregates

C140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

C331 Specification for Lightweight Aggregates for Concrete Masonry Units

C426 Test Method for Linear Drying Shrinkage of Concrete Masonry Units

C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

C979 Specification for Pigments for Integrally Colored Concrete

C989 Specification for Slag Cement for Use in Concrete and Mortars

C1232 Terminology of Masonry

C1240 Specification for Silica Fume Used in Cementitious Mixtures

C1645 Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units

### 3. Terminology

3.1 Terms defined in Terminology C1232 shall apply for this specification.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *fly ash brick, n*—a masonry unit made from fly ash, water, and suitable aggregates with or without the inclusion of other materials and specifically without the inclusion of portland cement.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.03 on Concrete Masonry Units and Related Units.

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

## 4. Materials

4.1 *Cementitious Materials*—No portland cement shall be used. Materials shall conform to the following applicable specifications:

4.1.1 *Pozzolans*—Specification **C618**.

4.1.2 *Slag Cement*—Specification **C989**.

4.1.3 *Silica Fume*—Specification **C1240**.

4.2 *Aggregates*—Aggregates shall conform to the following specifications, except that grading requirements shall not necessarily apply:

4.2.1 *Normal Weight Aggregates*—Specification **C33**.

4.2.2 *Lightweight Aggregates*—Specification **C331**.

4.3 *Pigments for Integrally Colored Concrete*—Specification **C979**.

4.4 *Other Constituents*—Other constituent materials shall be previously established as suitable for use in fly ash units and shall conform to applicable ASTM standards or shall be shown by test or experience not to be detrimental to the durability of the fly ash units or any material customarily used in masonry construction.

## 5. Physical Properties

5.1 *Physical Requirements*—At the time of delivery to the purchaser, units shall conform to the physical requirements prescribed in **Table 1**. All units shall be sound and free of cracks or other defects that interfere with the proper placement of the units or significantly impair the strength or permanence of the construction. Minor cracks incidental to the usual method of manufacture or minor chipping resulting from customary methods of handling in shipment and delivery are not grounds for rejection.

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

5.3 *Durability*—Freeze-thaw durability shall be demonstrated by test. The units shall be tested in accordance with **8.5**. The average mass loss of all the specimens tested shall not be greater than: (a) 0.046 lb/ft<sup>2</sup> (225 g/m<sup>2</sup>) when subject to 28 freeze-thaw cycles, or (b) 0.102 lb/ft<sup>2</sup> (500 g/m<sup>2</sup>) when subject to 49 freeze-thaw cycles.

5.4 *Shrinkage*—At the time of delivery to the purchaser, the total linear drying shrinkage of units shall not exceed 0.065 % when tested in accordance with Test Method **C426**.

NOTE 2—The purchaser is the public body or authority, association, corporation, partnership, or individual entering into a contract or agreement to purchase or install, or both, fly ash facing brick. The time of delivery to the purchaser is FOB plant when the purchaser or the purchaser's agent transports the fly ash facing brick, or at the time unloaded at the worksite if the manufacturer or the manufacturer's agent transports the fly ash facing brick.

## 6. Permissible Variation in Dimensions

6.1 Measured width, height, and length of test specimens shall not differ by more than  $\pm \frac{1}{8}$  in. ( $\pm 1.6$  ( $\pm 3.2$  mm)) from specified dimensions.

NOTE 3—Specified dimensions of fly ash facing brick are the manufacturer's designated dimensions.

6.2 For those units with faces altered for aesthetic purposes, overall dimensional tolerances apply only to those dimensions not affected by the altering.

NOTE 4—For such units, dimensions will vary. Consult with suppliers to determine achievable dimensional tolerances.

6.3 For cored fly ash facing brick, the net cross-sectional area in any plane parallel to the surface containing the cores shall be at least 75 % of the gross cross-sectional area measured in the same plane. No part of any hole shall be less than  $\frac{3}{4}$  in. (19.1 mm) from any edge of the unit.

## 7. Finish and Appearance

7.1 At the time of delivery to the purchaser, no more than 5 % of the units in the shipment shall have finished face(s) that exhibit one or more of the characteristics described in **7.1.1** through **7.1.3**.

**TABLE 1 Strength, Absorption, and Density Classification Requirements<sup>A</sup>**

Density Classification	Oven-Dry Density, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Maximum Water Absorption, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )		Minimum Net Area Compressive Strength, lb/in. <sup>2</sup> (MPa)	
	Average of Three Units	Average of Three Units	Individual Units	Average of Three Units	Individual Units
Lightweight	Less than 105 (1680)	15 (240)	17 (272)	3500 (24.1)	3000 (20.7)
Medium Weight	105 to less than 125 (1680–2000)	13 (208)	15 (240)	3500 (24.1)	3000 (20.7)
Normal Weight	125 (2000) or more	10 (160)	12 (192)	3500 (24.1)	3000 (20.7)

<sup>A</sup>Average oven-dry density, based on a set of three units, shall fall within ranges defined in the table to be classified as lightweight, medium weight, or normal weight.