



Designation: **C1731 – 15 C1731 – 16**

## Standard Specification for Concrete Floor Tile<sup>1</sup>

This standard is issued under the fixed designation C1731; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### INTRODUCTION

The purpose of this specification is to establish the product specifications and minimum performance requirements of concrete floor tile.

#### 1. Scope\*

1.1 This specification covers concrete floor tile (CFT) for application as interior and exterior flooring. The units described by this specification are manufactured from cementitious materials, mineral aggregates (normal weight, lightweight, or both), water, and additives that are cast into various textures and shapes, often simulating natural stone, brick, terracotta, saltillo, and others.

1.2 This specification is limited to requirements for the physical attributes for the CFT units.

1.3 The use of results from testing installed CFT units that have been removed from use for determining conformance or nonconformance to the requirements of this specification is beyond the scope of this specification.

1.4 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.

1.5 *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:*<sup>2</sup>

[C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field](#)

[C33/C33M Specification for Concrete Aggregates](#)

[C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens](#)

[C140/C140M Test Methods for Sampling and Testing Concrete Masonry Units and Related Units](#)

[C150/C150M Specification for Portland Cement](#)

[C157/C157M Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete](#)

[C172/C172M Practice for Sampling Freshly Mixed Concrete](#)

[C260/C260M Specification for Air-Entraining Admixtures for Concrete](#)

[C331/C331M Specification for Lightweight Aggregates for Concrete Masonry Units](#)

[C482 Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste](#)

[C494/C494M Specification for Chemical Admixtures for Concrete](#)

[C595/C595M Specification for Blended Hydraulic Cements](#)

[C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete](#)

[C979/C979M Specification for Pigments for Integrally Colored Concrete](#)

[C989/C989M Specification for Slag Cement for Use in Concrete and Mortars](#)

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

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<sup>2</sup> The last approved version for referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For of this historical Annual Book of ASTM Standards standard is referenced on [www.astm.org](http://www.astm.org) volume information, refer to the standard's Document Summary page on the ASTM website.

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

[C1028 Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method \(Withdrawn 2014\)](#)<sup>2</sup>

[C1093 Practice for Accreditation of Testing Agencies for Masonry](#)

[C1116/C1116M Specification for Fiber-Reinforced Concrete](#)

[C1157/C1157M Performance Specification for Hydraulic Cement](#)

[C1232 Terminology of Masonry](#)

[C1353/C1353M Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform Abraser](#)

[C1600/C1600M Specification for Rapid Hardening Hydraulic Cement](#)

[C1602/C1602M Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete](#)

[C1645/C1645M Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units](#)

NOTE 1—An installation guide for concrete floor tile (CFT) is being developed concurrently in Subcommittee C15.05 Masonry Assemblies.

## 2.2 *ANSI Standards:*

[A137.1-2012 American National Standard Specification for Ceramic Tile](#)<sup>3</sup>

### 3. Terminology

3.1 Terminology defined in Terminology [C1232](#) shall apply for this section.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *concrete floor tile (CFT), n*—manufactured masonry unit that is a blend of cementitious material, aggregates, pigments, chemical admixtures, and water that is designed to be applied via masonry mortar to a horizontal substrate.

3.2.2 *back pattern, n*—grooves or other textures included on the back of the CFT unit.

### 4. Materials and Manufacture

4.1 *Cementitious Materials* shall conform to the following applicable specifications:

4.1.1 *Portland Cement*—Specification [C150/C150M](#).

4.1.2 *Blended Cement*—Specification [C595/C595M](#).

4.1.3 *Hydraulic Cement*—Specification [C1157/C1157M](#).

4.1.4 *Rapid Hardening Hydraulic Cements*—Specification [C1600/C1600M](#).

4.1.5 *Pozzolans and Fly Ash*—Specification [C618](#).

4.1.6 *Ground Granulated Blast-Furnace Slag*—Specification [C989/C989M](#).

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

4.2.1 *Normal Weight*—Specification [C33/C33M](#).

4.2.2 *Lightweight*—Specification [C331/C331M](#).

4.3 *Chemical Admixtures* shall conform to the following applicable specifications:

4.3.1 *Air-Entraining Admixtures*—Specification [C260/C260M](#).

4.3.2 *Water-Reducing, Retarding, and Accelerating Admixtures*—Specification [C494/C494M](#).

4.3.3 *Pigments for Integrally Colored Concrete*—Specification [C979/C979M](#).

4.4 *Reinforcing Fibers*—Specification [C1116/C1116M](#).

4.5 *Water*—Specification [C1602/C1602M](#).

4.6 *Other Constituents*—Integral water repellents and other materials shall be previously established as suitable for use in concrete floor tile or shall be shown by test or experience not to be detrimental to concrete floor tile or any material customarily used in concrete floor tile construction.

### 5. Physical Properties

5.1 *Dimensions:*

5.1.1 CFT units shall have a minimum thickness of ¼ in. (6.4 mm) and a maximum thickness of 1.2 in. (30 mm).

5.1.2 CFT units shall not exceed 36 in. (914 mm) in any face dimension.

5.1.3 *Dimensional Tolerances:*

5.1.3.1 *Standard Units*—For standard units, no overall dimension (width, height, and length) shall differ by more than ± ⅛ in. (3.2 mm) from the specified dimensions.

5.1.3.2 *Irregular Units*—For irregular units that feature deliberate dimensional variations more than ± ⅛ in. (3.2 mm), the CFT manufacturer shall be consulted as to specific dimensional tolerances.

<sup>3</sup> Available from Available from Tile Council of North America, <https://www.tcnatile.com>.

NOTE 2—Dimensional tolerances for irregular units may vary due to the wide variety of CFT shapes and styles including tumbled, flagstone, and other rustic appearances.

## 5.2 Compressive Strength:

5.2.1 The average compressive strength shall equal or exceed 4000 psi (27.6 MPa) with no individual specimen less than 3600 psi (24.8 MPa).

5.2.2 For wet-cast products sample concrete from regular production in accordance with Practice **C172/C172M** and prepare three cylinders in accordance with Practice **C31/C31M**. Test compressive strength of the concrete mix in accordance with Test Method **C39/C39M**.

5.2.3 For dry-cast products sample a minimum of three specimens from regular production in accordance with Test Method **C140/C140M**. Test compressive strength in accordance with Annex **A4.3A4** of Test Method **C140/C140M**.

## 5.3 Shear Bond Strength:

5.3.1 Units shall develop a shear bond strength with the mortar substrate of at least 50 psi (0.34 MPa) when tested in accordance with Test Method **C482** with the following modifications (listed in 5.3.1.1 through 5.3.1.4):

5.3.1.1 Five units shall be tested.

5.3.1.2 The mortar substrate shall be that specified for testing of non-vitreous tile in Test Method **C482**.

5.3.1.3 CFT units shall be cut to 4 by 4 in. (101.6 by 101.6 mm). If the CFT nominal unit length or width is smaller than 4 in. (101.6 mm), the CFT unit mix shall be cast into a larger mold that allows the 4- by 4-in. (101.6- by 101.6-mm) sample unit to be cut.

5.3.1.4 Shear bond testing shall be conducted using the actual bonding surface of the CFT unit as manufactured. If the CFT unit used for testing has a directional back pattern, this back pattern shall be oriented parallel to the direction of loading.

## 5.4 Resistance to Freezing and Thawing:

5.4.1 If units are exposed to freezing and deicing materials during service, the manufacturer shall satisfy the purchaser either by proven field performance or a laboratory freezing-and-thawing test that the units have adequate resistance to freezing and thawing.

5.4.2 If a laboratory test is used sample and test five CFT units in accordance with Test Method **C1645/C1645M**. Specimens sampled from units that will not be exposed to deicing salts in service shall be tested in tap water. Specimens sampled from units that will be exposed to deicing materials in service shall be tested in a 3 % saline solution. If the CFT is too large to test full-size due to specimen configuration or lack of suitable specimen containers, obtain a specimen by saw-cutting a full-height coupon with a surface area of at least 29.5 in.<sup>2</sup> (190 cm<sup>2</sup>).

5.4.3 The average mass loss of all the specimens tested shall not be greater than: (a) 225 g/m<sup>2</sup> when subject to 28 freeze-thaw cycles, or: (b) 500 g/m<sup>2</sup> when subject to 49 freeze-thaw cycles.

## 5.5 Water Absorption:

5.5.1 Sample and test three CFT units in accordance with Test Method **C140/C140M**.

5.5.2 Perform tests on full-size CFT units. If the CFT is too large for the testing apparatus, the unit shall be cut to 8 by 8 in. (203.2 by 203.2 mm) or as necessary to fit the testing apparatus.

5.5.3 The average CFT water absorption shall not exceed 12 % with no individual specimen exceeding 14 %.

## 5.6 Flexural Load:

5.6.1 Sample and test three CFT units in accordance with Annex **A6.5A6** of Test Method **C140/C140M**.

5.6.2 The average CFT flexural load shall be greater than or equal to 300 lbs (1334 N) with no individual specimen less than 250 lbs (1112 N).

## 5.7 Length Change:

5.7.1 The concrete mix shall be tested for length change in accordance with Test Method **C157/C157M** except as modified below:

5.7.1.1 Sample concrete from regular production in accordance with Practice **C172/C172M** and mold three prism specimens for testing following the requirements in Procedures for Molding Specimens, Concrete Specimens of Test Method **C157/C157M**.

5.7.2 The length change of each specimen shall not exceed  $\pm 0.10$  % when tested at seven days after manufacture.

## 5.8 Abrasion Resistance:

5.8.1 Sample and test three full-size CFT units in accordance with Test Method **C1353/C1353M**.

5.8.2 For each unit, CFT wear index shall be 20 or greater.

## 5.9 Static/Dynamic Coefficient of Friction:

5.9.1 Sample and test three CFT units in accordance with Test Method **C1028** of ANSI A137.1.

5.9.2 For each unit, static/dynamic coefficient of friction values for both wet and dry surfaces shall be  $\geq 0.60/0.42$  or greater.

NOTE 3—Sealing CFT units may affect coefficient of friction values.