



Designation: C1731 – 21

Standard Specification for Concrete Floor Tile¹

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

1.6 *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 C15.03 on Concrete Masonry Units and Related Units.

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2. Referenced Documents

2.1 *ASTM Standards:*²

- 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 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
- C1093 Practice for Accreditation of Testing Agencies for Masonry
- C1116/C1116M Specification for Fiber-Reinforced Concrete
- C1157/C1157M Performance Specification for Hydraulic Cement

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.

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

- [C1232 Terminology for 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:

- [A326.3 American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials³](#)

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.

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 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:

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

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.² (190 cm²).

5.4.3 The average mass loss of all the specimens tested shall not be greater than: (a) 225 g/m² when subject to 28 freeze-thaw cycles, or: (b) 500 g/m² 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 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 ± 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 *Dynamic Coefficient of Friction:*

5.9.1 Sample and test three CFT units in accordance with ANSI A326.3.

5.9.2 For each unit, dynamic coefficient of friction values for wet surfaces shall be 0.42 or greater.

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

6. Sampling

6.1 *Sampling Concrete Mixes*—From each manufacturing location, obtain representative samples from standard production of each concrete mix used for CFT, as appropriate for the physical property in Section 5.

6.2 *Sampling Concrete Floor Tile*—From each manufacturing location, obtain samples of CFT units that are representative of the production from which they are selected.

6.3 Test samples biannually or when materials, proportions, or production methods have changed, whichever is more frequent.

6.3.1 Testing laboratories shall be accredited in accordance with Practice **C1093** or an equivalent standard if testing performed by laboratories not specializing in masonry materials.

6.3.2 All samples shall be tested at least 28 days after manufacture unless otherwise indicated.

6.4 *Color and Texture*—If concrete floor tile having a particular color, color range, or texture are desired, these features shall be specified separately by the purchaser. The texture of the finished surfaces that will be exposed when in place shall conform to an approved sample consisting of not less than four concrete floor tiles, each representing the texture desired. The color range shall be indicated by the approved samples.

7. Packaging and Package Marking

7.1 Each package shall identify the manufacturer's name, product name and identification, date and location of manufacture, and statement of product conformity to this specification.

8. Certification

8.1 Upon request of the purchaser in the contract or order a manufacturer's report shall be furnished at the time of shipment stating results of tests made on samples from regular production and certifying that the CFT units conform to applicable requirements of this specification.

NOTE 4—Guidance on preparing the manufacturer's report is provided in **Appendix X1**.

9. Keywords

9.1 adhered; cementitious; CFT; concrete; concrete floor tile; flooring; manufactured; masonry; tile