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Standard Specification for Concrete Roof Tile¹

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1. Scope

1.1 This specification covers concrete tiles intended for the use as roof covering where durability and appearance are required to provide a weather-resistant surface of specified design.

1.2 Tiles are manufactured from portland cement, water, and mineral aggregates with or without the inclusion of other materials.

1.3 Tiles are shaped during manufacturing by molding, pressing, or extrusion. The shaping method can be used to describe the tile.

1.4 Other constituents, such as chemical and mineral admixtures established as suitable for use in concrete, shall conform to ASTM standard specifications where applicable, or shall be shown by tests or experience not to be detrimental to the durability of concrete.

1.5 Tiles are generally planar or undulating rectangular shapes available in a variety of cross-sectional areas profiles, shapes, sizes, surface textures, and colors.

NOTE 1—Concrete roof tiles covered by this specification are made from lightweight or normal weight aggregates, or both.

NOTE 2—When particular features are desired, such as color, surface texture for appearance, or other special features, such properties should be specified by the purchaser. However, the local sellers should be consulted as to the availability of concrete roof tile having a desired feature.

1.6 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

C 33 Specification for Concrete Aggregates²

C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile³

C 90 Specification for Loadbearing Concrete Masonry Units³

C 140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units³

C 150 Specification for Portland Cement⁴

C 260 Specification for Air-Entraining Admixtures for Concrete²

C 331 Specification for Lightweight Aggregates for Concrete Masonry Units²

C 494/C 494M Specification for Chemical Admixtures for Concrete²

C 595 Specification for Blended Hydraulic Cements⁴

C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete²

C 979 Specification for Pigments for Integrally Colored Concrete²

C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars²

C 1157 Performance Specification for Hydraulic Cement⁴

3. Terminology

3.1 *Definitions*—The following terms are used in connection with concrete roof tiles:

3.2 *batten lugs*—protrusions on the underside of the tile designed to engage over the upper edge of tiling battens.

3.3 *head lap*—distance of overlap measured from the uppermost course to the point that it laps over the undermost course.

3.4 *high profile tile*—tile with a rise to width ratio greater than 1:5.

3.5 *interlocking tile*—tiles with a system of ribs or grooves enabling the lateral joining of adjacent tiles in the same horizontal row, with the overlapping lock covering the underlapping lock.

3.6 *length*—maximum overall dimension of the tile measured parallel to the water course.

3.7 *low profile tile*—tile with a rise equal to or less than 1/2 in.

3.8 *medium profile tile*—tile with a rise greater than 1/2 in. and a rise-to-width ratio of less than or equal to 1:5.

3.9 *nail hole*—small opening passing partially or totally through the tile to allow the penetration of a nail or screw for the purpose of fastening the tile to a support.

3.10 *non-interlocking tile*—tiles that butt at the sides without lapping adjacent tiles.

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² *Annual Book of ASTM Standards*, Vol 04.02.

³ *Annual Book of ASTM Standards*, Vol 04.05.

⁴ *Annual Book of ASTM Standards*, Vol 04.01.

3.11 *nose lugs*—protrusion on the underside of the nose of each tile, contoured to fit into the main water courses of the tile immediately below, inhibiting the entry of wind-driven rain.

3.12 *profile*—contour of the top surface of the tile when viewed from the nose end.

3.13 *rise*—vertical distance from the underside of the batten lug to the highest point of the surface profile.

3.14 *side lap*—continuous longitudinal overlap of a tile on its neighbor.

3.15 *thickness*—any vertical measurement of the cross section of the tiles excluding the lapping area, nose lugs, and weather checks.

3.16 *weather checks*—protrusions below the tile designed to restrict the flow of water between two consecutive courses of tiles.

3.17 *width*—maximum overall dimension of the tile measured perpendicular to the length or water channel

3.18 *water course*—valley portion of a profiled tile along which water drains.

4. Classification

4.1 Concrete roof tiles manufactured in accordance with this specification are of the following types:

4.1.1 *Type I*—High Profile Tile.

4.1.2 *Type II*—Medium Profile Tile.

4.1.3 *Type III*—Low Profile Tile.

4.1.4 *Type IV*—Accessory Tile, shall include those tile such as ridge, rake, hip, and valley tile used in conjunction with those tile listed in 4.1.1-4.1.3.

5. Materials and Manufacture

5.1 Cementitious materials shall conform to the following applicable ASTM specifications.

5.1.1 *Portland Cement*—Specification C 150.

5.1.2 *Modified Portland Cement*—Specification C 90.

5.1.3 *Blended Cement*—Specification C 595.

5.1.4 *Pozzolans*—Specification C 618.

5.1.5 *Ground Granulated Blast Furnace Slag*—Specification C 989.

5.1.6 Performance Specification C 1157.

5.2 Aggregates such as normal weight and lightweight shall conform to the following ASTM specifications, except that grading requirements do not apply.

5.2.1 *Normal Weight Aggregates*—Specification C 33.

5.2.2 *Lightweight Aggregates*—Specification C 331.

5.3 *Admixtures*—shall conform to the following applicable specifications.

5.3.1 *Air-Entrained Admixtures*—Specification C 260.

5.3.2 *Pigments*—Specification C 979.

5.3.3 *Other Admixtures*—Specification C 494/C 494M.

6. Standard Methods of Sampling Concrete Tile

6.1 Tile sampling shall be appropriate for one of the following three purposes:

6.1.1 Resolution of quality disputes.

6.1.2 Third party certification.

6.1.3 Production or job shipment verification.

6.2 Tile sampling for the purpose listed in 6.1 shall be taken according to Table 1. To be rated as in compliance with this

TABLE 1 Physical Testing Criteria

NOTE—Number of tile to be sampled and tested for determining compliance with this specification (see 6.2).

Test	Quality Dispute Resolution	Third Party Certification	Job – Production Verification	
			Up to 250 000 Tile	Over 250 000 Tile
Dimensional	5	5	5	5
Transverse	3	5	3	5
Permeability	3	3	3	5
Water Absorption	3	3	3	5
Freeze Thaw	5	5	Annual Test	Annual Test

standard, the indicated number of tile sampled in accordance with Table 1 must pass the specified test.

6.2.1 In the event of a failure in any of the specified tests indicated in Table 1, a second set of specimens shall be taken and tested in accordance with the criteria listed in Table 2.

6.2.2 Provided that the number of failures in the re-test sample are less than the maximum allowed in Table 2, the lot shall be rated as being in compliance with this specification.

6.3 *Sampling Procedure*—Buyer and seller shall agree on the method of sampling prior to shipment. The random sampling method shall be used.

7. Standard Methods of Testing Concrete Roof Tiles

7.1 The following tests are required on concrete roof tiles:

7.1.1 Dimensional Tolerances.

7.1.2 Freeze Thaw (see 7.3.1).

7.1.3 Transverse Strength.

7.1.4 Permeability.

7.1.5 Water Absorption.

7.2 *Testing for Dimensional Tolerances and Weight:*

7.2.1 *Dimensions*—The total variation in dimensions of tiles (length, width, and height), when measured in accordance with Test Methods C 140, shall not be more than $\pm 5\%$ from the manufacturer's designated dimensions.

7.2.2 *Weight*—The total variation in weight of tiles, when measured in accordance with Test Methods C 140 and Table 1 of this specification, shall not be more than $\pm 5\%$ from the nominal weight specified by the supplier.

7.3 *Freezing and Thawing*—Tiles shall be subjected to 50 cycles of freezing and thawing of Test Methods C 67 as modified in 7.3.4.

TABLE 2 Retest Criteria

NOTE 1—Retest criteria of the specific test that failed (see 6.2.1).

NOTE 2—If 250 000 tiles were in the lot, then 32 specimens would be taken for the retest of the specific test that failed. If 3 or less of the 32 specimens failed, the lot would be rated as passing; however, if 4 or more of the 32 specimens failed, the lot would have failed the specific test.

Number of Tile in the Lot	Number of Specimens	Maximum Number of Failures Allowed for Acceptance
Less than 151	3	0
151–3200	13	1
3200–35 000	20	2
35 001–500 000	32	3
Over 500 000	50	5