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Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling[1]

This standard is issued under the fixed designation C 1026; 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 test method describes the procedures and equipment required to test either glazed or unglazed ceramic tile for resistance to repeated cycles of freezing and thawing. Ceramic tile of any size or shape may be tested by this test method.

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

1.3 *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:*

C 242 Terminology of Ceramic Whitewares and Related Products[2]

E 220 Method for Calibration of Thermocouples by Comparison Techniques[3]

3. Summary of Test Method

3.1 A designated test-load of tile specimens is saturated with water, and placed in a freezer with thermocouples (thermometer) inserted. Freezing is followed by a thawing cycle with the specimens immersed in water. The number of tile damaged after freezing and thawing for 5, 10, and 15 cycles is determined by visual examination.

4. Significance and Use

4.1 The test for resistance to freezing and thawing functions as a guide to the selection of ceramic tile suitable for outdoor service in geographic areas subjected to freezing. It can serve as a test method to verify compliance with specifications for ceramic tile, and provides a control test for determining the uniformity of tile being manufactured for exterior installations.

5. Apparatus (See Fig. 1)

5.1 The freezing chamber for this test method may be ofany type provided it has the capacity to cool the center of the test load to 0°F (−18°C) within a period of 6 to 8 h. By adjusting the mass of the test load, freezers with various freezing rates may be used in this test as long as the 6 to 8-h period to reach 0°F (−18°C) is maintained.

5.2 Two freezer thermometers of the type that use a thermocouple are required. They shall be calibrated to 0°F (−18°C) against a thermometer of known accuracy (see 2.1).

5.3 *Vacuum Chamber*, capable of withstanding a vacuum of 760 mm Hg (102 MPa).

5.4 *Vacuum Pump*, that can go down to 20 mm Hg (2.6 MPa) pressure.

5.5 *Drill Press.*

5.6 *Carbide Tipped Bit*, slightly larger in diameter than the thermocouple, or other means of drilling the tile.

5.7 *Ultraviolet Light Source and Fluorescent Dye*, (unglazed tile) or black ink (glazed tile).

6. Test Samples

6.1 Select ten samples at random from the lot to be tested.

7. Procedure

7.1 *Calibration of the Freezer Capacity*:

7.1.1 Calibrate the two freezer thermometers.

7.1.2 Select a group of tiles having the same approximate absorption, size, and total mass as the samples to be used in the final test for use as a test load.

7.1.3 Drill a hole through the center of the tile that will be in the middle of the load as it is placed in the freezer in order to accommodate the thermocouple. The fit of the thermocouple bead in the tile should be as snug as possible. The wire should be trailed out either between the ribs or in a slot cut in the back of one of the tiles. It is important that the tile, when stacked, are not held apart by the thermocouple or wire.

7.1.4 Remove the thermocouple from the prepared tile and subject them and the remainder of the tile to be used as the test load to the following:

7.2 *Test Load Preparation*:

7.2.1 Place as many tile at a time as possible in a vacuum container. Evacuate to a pressure of 20 mm Hg for 20 min, then add potable water at room temperature to cover the tile completely while still under vacuum. Hold under vacuum for 40 min. Make sure all tile are submerged in water throughout

[1] This test method is under the jurisdiction of ASTM Committee C-21 on Ceramic Whitewares and Related Products and is the direct responsibility of Subcommittee C21.06 on Ceramic Tile.

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[2] *Annual Book of ASTM Standards*, Vol 15.02.

[3] *Annual Book of ASTM Standards*, Vol 14.03.