



Designation: C482 – 20

## Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste<sup>1</sup>

This standard is issued under the fixed designation C482; 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 (ε) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This test method covers the determination of the ability of ceramic tile, ceramic mosaic tile, quarry tile, porcelain tile, and paver tile to be bonded to portland cement paste. Tiles may be glazed or unglazed. This test method includes both face-mounted and back-mounted tile.

1.2 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.

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

1.4 *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.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

C150 Specification for Portland Cement

C185 Test Method for Air Content of Hydraulic Cement Mortar

C207 Specification for Hydrated Lime for Masonry Purposes

C242 Terminology of Ceramic Whitewares and Related Products

### 3. Terminology

#### 3.1 Definitions:

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C21 on Ceramic Whitewares and Related Products and is the direct responsibility of Subcommittee C21.06 on Ceramic Tile.

Current edition approved April 1, 2020. Published April 2020. Originally approved in 1961. Last previous edition approved in 2014 as C482 – 02 (2014). DOI: 10.1520/C0482-20.

<sup>2</sup> 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 *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.1 For definitions of the types of tile listed in 1.1, refer to Terminology C242.

### 4. Summary of Test Method

4.1 This test method consists of bonding tile under controlled conditions to a pure portland cement paste bond coat, supported by a cement mortar bed.

4.2 After proper cure of the test assembly, a load is applied to one edge of the tile and the load increased at a definite rate until the bond between tile and bond coat is broken.

4.3 Because the laboratory method of applying shear stress rapidly loads both tile and setting bed in compression, a stronger than normal setting bed for the test specimens is specified. This avoids failure of the setting bed before the desired failure at the tile-bond coat interface occurs. In real tile installations with portland cement paste an entirely different loading mechanism, usually generated primarily by shrinking of the setting bed or structural backing, results in mild tension in setting bed and mild compression in the tile, but the same type of shear stress occurs between tile and bond coat as does in response to the laboratory loading method. The finding of an adequate bond strength under the conditions of this test method can be taken as proof that the tested tile could be permanently bonded in a properly installed conventional installation using the lean, low-shrinkage mortars customarily specified for this particular purpose.

4.4 To maintain practical sample size and limit maximum breaking load, tile larger than nominal 4¼ in. (108 mm) on a side must be cut to 4 in. (102 mm).

### 5. Significance and Use

5.1 This test method provides a means of determining whether or not tile of the types indicated in 1.1 can be bonded with adequate strength to portland cement paste. Tile specifications can refer to this test method in order to establish minimum bond strength limits appropriate to the service conditions that are anticipated.

5.2 Separation between bond coat and setting bed, or breakage of the setting bed itself shall not be considered failures of tile bond.



## 6. Apparatus

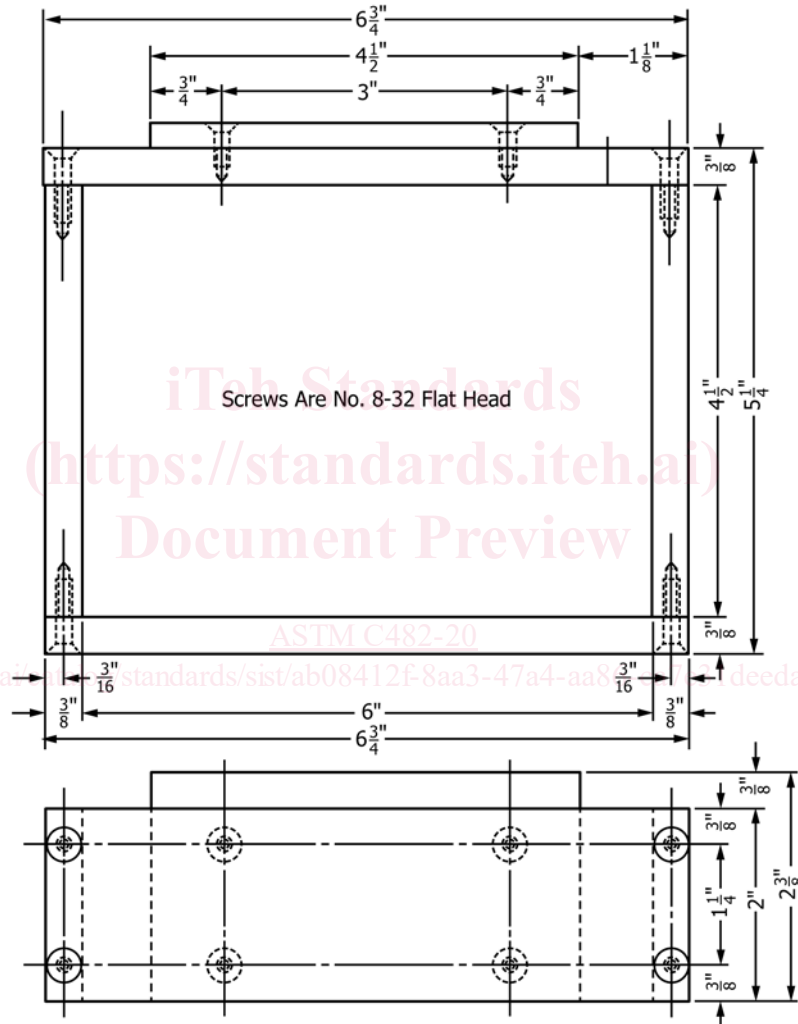
6.1 *Molds*—Five frame-type molds having inside dimensions 6 by 4½ by 2 in. (152 by 114 by 51 mm) in depth. The molds shall be made of ⅜-in. (9.5 mm) thick rigid material such as brass, and the inside faces of the molds shall present a smooth surface. They shall be constructed in such a manner that they can be taken apart without damage to the molded cement block. Diagrams of suitable molds are shown in Fig. 1.

6.2 *Compression Testing Machine*—The testing machine may be either a hydraulic or screw type, with an accuracy of ±1.0 %. It shall be capable of applying a uniformly distributed

shearing load at a rate of  $200 \pm 20$  psi/min ( $1.4 \pm 0.1$  MPa/min) to the tile being tested. To obtain the actual loading rate in lbf/min (kgf/min) for a particular tile size, multiply the bonded area of the tile in square inches by  $200 \pm 20$  (in pascals by  $1.4 \pm 0.1$ ).

6.3 *Fixture*, for holding the specimen assembly in an upright position to prevent tilting while the specimen assembly is under load. The construction of such a fixture is shown in Fig. 2.

6.4 *Keys*—Differently sized keys, each for use with a different size range of tile, to be inserted between the edge of



Metric Equivalents

Letter	in.	mm
A	3/16	4.8
B	3/8	9.5
C	6	152
D	6 3/4	171
E	4 1/2	114
F	5 1/4	133
G	1 1/4	32
H	2	51

FIG. 1 Mold for Mortar Block (Five Required)