



Designation: E 518 – 03

## Standard Test Methods for Flexural Bond Strength of Masonry<sup>1</sup>

This standard is issued under the fixed designation E 518; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope\*

1.1 These test methods cover determination of the flexural bond strength of unreinforced masonry assemblages. Two procedures are provided:

1.1.1 *Test Method A*—Simply supported beam with third-point loading.

1.1.2 *Test Method B*—Simply supported beam with uniform loading.

1.2 The values stated in SI units are to be regarded as the 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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile<sup>2</sup>

C 78 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)<sup>3</sup>

C 140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units<sup>2</sup>

C 270 Specification for Mortar for Unit Masonry<sup>2</sup>

C 778 Specification for Standard Sand<sup>4</sup>

E 4 Practices for Force Verification of Testing Machines<sup>5</sup>

E 72 Methods of Conducting Strength Tests of Panels for Building Construction<sup>6</sup>

E 575 Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connections, and Assemblies<sup>6</sup>

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and are the direct responsibility of Subcommittee C15.04 on Research.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.02.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 04.01.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>6</sup> *Annual Book of ASTM Standards*, Vol 04.11.

### 3. Significance and Use

3.1 These test methods are intended to provide simplified and economical means for gathering comparative research data on the flexural bond strength developed with different types of masonry units and mortar or for the purpose of checking job quality control (materials and workmanship).

NOTE 1—These test methods are not intended for use in establishing design stresses. For this purpose, Methods E 72 should be used.

### 4. Apparatus

4.1 *Testing Machine*, conforming to the requirements of Practices E 4.

4.2 *Test Method A*—The third-point loading method is illustrated in Fig. 1. The load is applied by means of a loading apparatus similar to that described in Test Method C 78.

4.3 *Test Method B*—The uniform loading method is illustrated in Fig. 2. The load is applied by means of an air bag typically made of poly(vinyl chloride) 0.5 mm (0.02 in.) thick. The air bag shall be of any convenient thickness and shall have a contact area equal to that of the specimen. It shall be equipped with two valves for inflating and deflating the bag. The air bag shall be backed by a steel channel suspended from the cross head of the testing machine with a suitable stud welded to the web of the channel. The channel shall be an American Standard steel channel whose depth is equal to the width of the air bag. It is recommended that the air pressure in the bag be monitored during the test as a check against the test machine dial indicator.

NOTE 2—When testing specimens constructed with a high bond-strength mortar, or whose thickness is greater than a nominal 100 mm (4 in.), the applied load required to fail the specimen may be such as to rupture the seams of the air bag. In such cases Test Method A is recommended.

### 5. Sampling and Testing

5.1 *Masonry Units*—Representative masonry units shall be sampled and tested in accordance with the following applicable methods: Test Methods C 67 for brick, or Test Methods C 140 for concrete masonry units. Minimum tests required shall be compressive strength, and initial rate of absorption for brick or absorption for concrete masonry units.

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

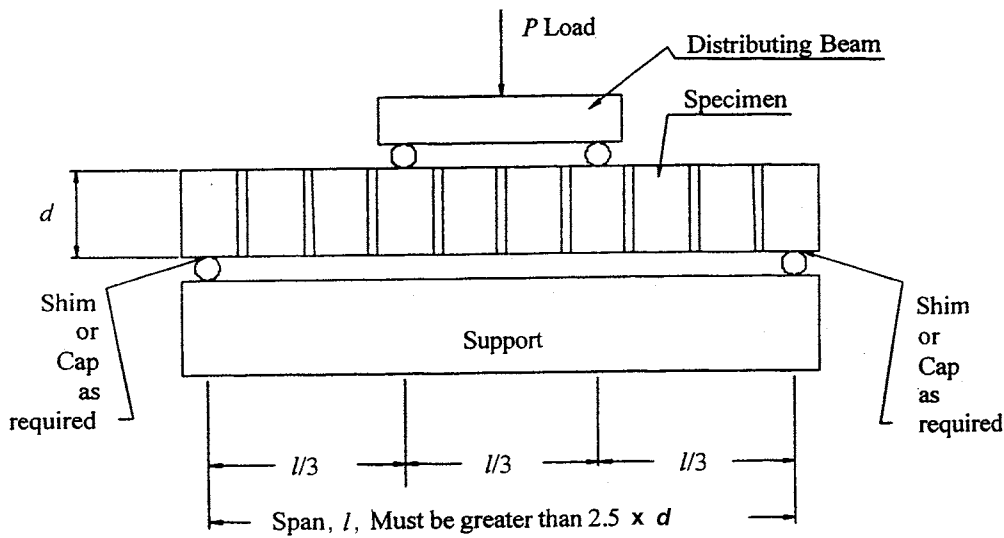


FIG. 1 The Third-Point Loading Method (Test Method A)

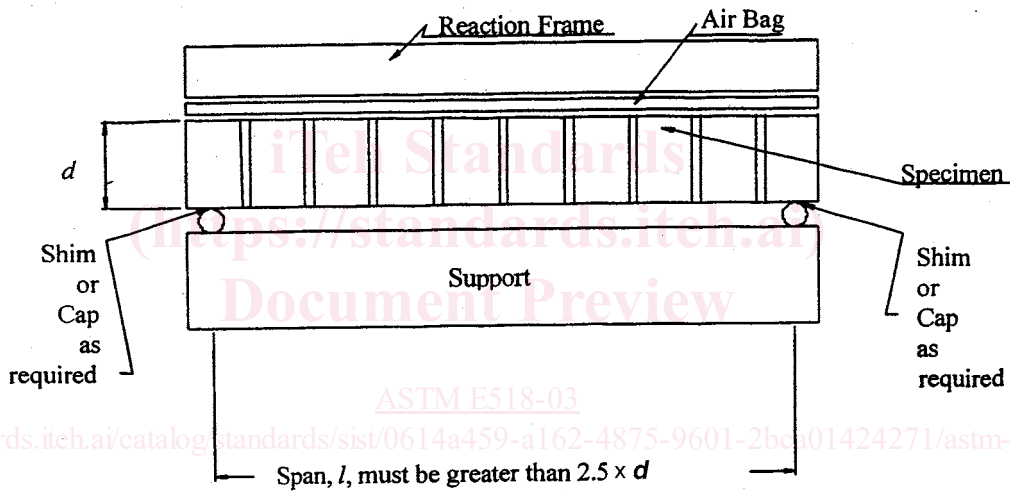


FIG. 2 The Uniform Loading Method (Test Method B)

5.2 Mortar—One of the types of mortar in Specification C 270 shall be used, or the mortar shall conform to that specified for the construction. Sand sieve analysis shall be performed and recorded, except when ASTM C 778 standard sand is used. If ASTM C 778 standard sand is used, the record shall identify the sand as 20–30 sand, graded sand, or a blend of indicated proportions of each sand by weight.

5.2.1 Mortar for prism fabrication shall be mixed to a workable consistency. The compressive strength, initial flow, and water retention of the mortar shall be determined in accordance with the requirements of Specification C 270, except that the cubes molded for the compressive strength test, after moist curing in the molds for 24 h, shall be released and stored in the same atmosphere as the prisms as specified in Section 7. The following physical properties of the mortar shall be determined and recorded:

- 5.2.2 Compressive strength (average of three cubes),
- 5.2.3 Initial flow (laboratory-mixed mortar only),

5.2.4 Flow after suction (water retention) (laboratory-mixed mortar only).

## 6. Test Specimens

6.1 A minimum of five test specimens shall be constructed as stack-bonded prisms, at least 460 mm (18 in.) high with mortar joints  $10 \pm 1.5$  mm ( $\frac{3}{8} \pm \frac{1}{16}$  in.) in thickness. The number of courses in each specimen shall be such as to permit locating supports and loading points midway between joints for Test Method A tests (4, 7, 10, 13, or 16 courses, depending on face heights of units), and to provide for a span-to-depth ratio that exceeds 2.5. When the test is for the purpose of determining the quality of materials and workmanship during construction, the specimens shall be constructed at the site by the masons involved, utilizing the materials on the site and the same masonry construction techniques.

6.2 Applicable portions of the following procedures shall be observed: