



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

This standard is issued under the fixed designation E518/E518M; 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 These test methods cover the application of the tests using either inch-pound or SI units. The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with 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:<sup>2</sup>

**C67** Test Methods for Sampling and Testing Brick and Structural Clay Tile

**C78** Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

**C140** Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

**C270** Specification for Mortar for Unit Masonry

**C778** Specification for Standard Sand

<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> 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.

**E4** Practices for Force Verification of Testing Machines  
**E72** Test Methods of Conducting Strength Tests of Panels for Building Construction  
**E575** Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connections, and Assemblies

## 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 E72 should be used.

## 4. Apparatus

4.1 *Testing Machine*, conforming to the requirements of Practices E4.

4.2 *Test Method A*—The third-point loading method is illustrated in Fig. 1. The minimum span between supports shall not be less than 2.5 multiplied by the average depth of the specimen. The distance between each support and the adjacent distributed point load shall be one-third of the span length  $\pm 3$  mm [0.1 in.]. Steel rods with a maximum diameter of 25 mm [1 in.] shall be used to support the specimen and apply the load. The steel rods shall extend over the full width of the specimen and shall have the same nominal diameter.

NOTE 2—The loading apparatus is intended to be similar to that used in Test Method C78 to reduce the need for redundant testing equipment.

4.3 *Test Method B*—The uniform loading method is illustrated in Fig. 2. The minimum span between supports shall not be less than 2.5 multiplied by the average depth of the specimen. Uniformly distributed transverse load shall be applied by air pressure using an air bag over the full surface of the specimen. The air bag reaction frame shall fully contact one surface of the air bag and shall be sufficiently stiff as to not deflect more than the span divided by 600 during testing.

NOTE 3—Air bags manufactured using 0.5 mm [0.02 in.] thick polyvinyl chloride have been successfully used with this test. When testing

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

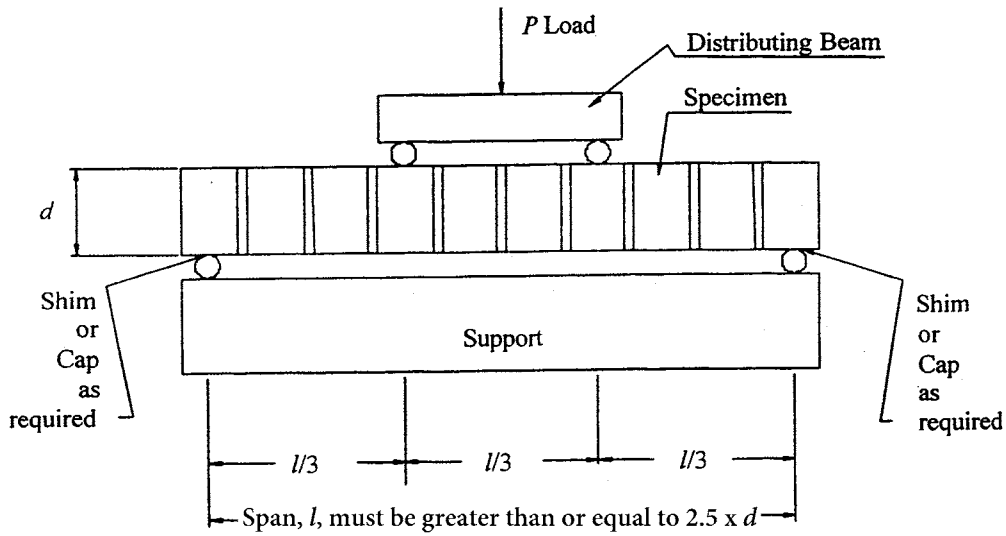


FIG. 1 The Third-Point Loading Method (Test Method A)

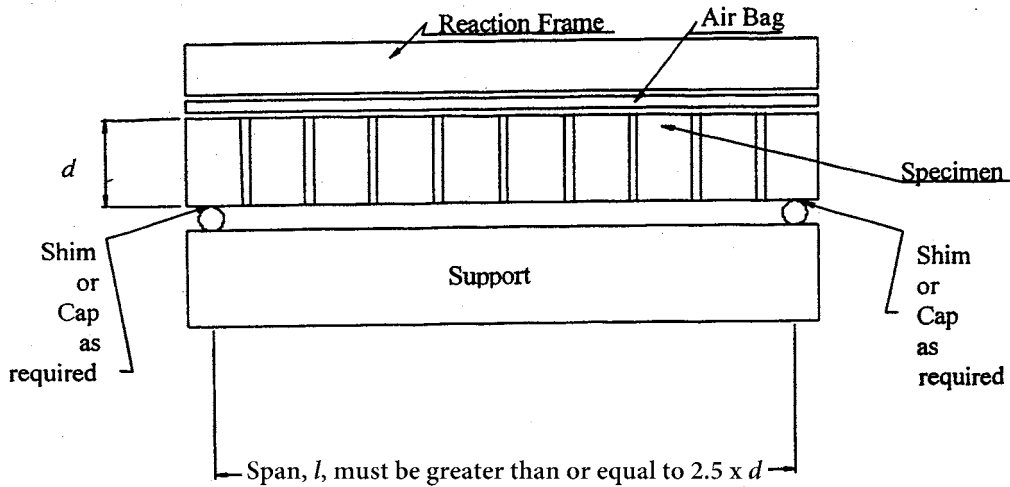


FIG. 2 The Uniform Loading Method (Test Method B)

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 C67 for brick, or Test Methods C140 for concrete masonry units. Minimum tests required shall be compressive strength, and initial rate of absorption for brick or absorption for concrete masonry units.

5.2 *Mortar*—One of the types of mortar in Specification C270 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 C778 standard sand is used. If ASTM C778 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 C270, 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