



## Standard Test Methods for COMPRESSIVE STRENGTH OF MASONRY PRISMS

This Standard is issued under the fixed designation E 447; 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.

### 1. Scope

1.1 These methods cover compression tests of masonry prisms. Two methods are provided:

1.1.1 *Method A*—For determining comparative data on the compressive strength of masonry built in the laboratory with either different masonry units or mortar types, or both.

1.1.2 *Method B*—For determining the compressive strength of masonry built at the job site with the same materials and workmanship to be used, or being used, in a particular structure.

1.2 Test specimens for both methods are short compression prisms; the influence of slenderness ratio is taken into account either by proportions of the fabricated specimens or by the application of a correction factor.

### 2. Applicable Documents

#### 2.1 *ASTM Standards*:

- C 39, Test for Compressive Strength of Cylindrical Concrete Specimens<sup>2</sup>
- C 67, Sampling and Testing Brick and Structural Clay Tile<sup>3</sup>
- C 109, Test for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)<sup>4</sup>
- C 140, Sampling and Testing Concrete Masonry Units<sup>3</sup>
- C 144, Specification for Aggregate for Masonry Mortar<sup>2,3</sup>
- C 270, Specification for Mortar for Unit Masonry<sup>3, 4</sup>
- C 476, Specification for Mortar and Grout for Reinforced Masonry<sup>3</sup>
- E 4, Verification of Testing Machines<sup>5</sup>

E 6, Definitions of Terms Relating to Methods of Mechanical Testing<sup>6</sup>

E 105, Recommended Practice for Probability Sampling of Materials<sup>7</sup>

E 111, Test for Young's Modulus at Room Temperature<sup>8</sup>

### 3. Definitions

3.1 The definitions given in Definitions E 6 shall apply to the terms used in these methods.

### 4. Apparatus

4.1 The testing machine shall conform to the requirements given in Method E 4.

4.2 The upper bearing shall be a spherically seated, hardened metal block firmly attached at the center of the upper head of the machine. The center of the sphere shall lie at the center of the surface held in its spherical seat, but shall be free to turn in any direction, and its perimeter shall have at least 1/4-in. (6.35-mm) clearance from the head to allow for specimens whose bearing surfaces are not exactly parallel. The diameter of the bearing surface shall be at least 5 in. (127 mm). A

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<sup>2</sup> *Annual Book of ASTM Standards*, Part 14.

<sup>3</sup> *Annual Book of ASTM Standards*, Part 16.

<sup>4</sup> *Annual Book of ASTM Standards*, Part 13.

<sup>5</sup> *Annual Book of ASTM Standards*, Parts 10, 14, 32, 35, and 41.

<sup>6</sup> *Annual Book of ASTM Standards*, Parts 10 and 35.

<sup>7</sup> *Annual Book of ASTM Standards*, Parts 15, 32, and 41.

<sup>8</sup> *Annual Book of ASTM Standards*, Part 10.



hardened metal bearing block shall be used beneath the specimen to minimize wear of the lower platen of the machine. The bearing block surfaces intended for contact with the specimen should have a hardness not less than 60 HRC (620 HB). These surfaces shall not depart from plane surfaces by more than 0.0001 in. (0.003 mm) in any 6-in. (152-mm) dimension. When the bearing area of the spherical bearing block is not sufficient to cover the area of the specimen, a steel plate with surfaces machined to true planes within  $\pm 0.0001$  in. (0.003 mm), and with a thickness equal to at least one half of the distance from the edge of the spherical bearing to the most distant corner shall be placed between the spherical bearing block and the capped specimen.

## 5. Test Specimen

### 5.1 Sampling and Testing of Masonry Units:

5.1.1 Select representative masonry units and test for compressive strength in accordance with the following applicable ASTM Methods:

| Masonry Units           | ASTM Designation |
|-------------------------|------------------|
| Building and face brick | C 67             |
| Sandlime brick          | C 67             |
| Concrete brick          | C 140            |
| Concrete block          | C 140            |
| Structural clay tile    | C 67             |

5.1.2 Select random samples of masonry unit test specimens in accordance with Recommended Practice E 105.

5.2 *Sampling and Testing of Mortar*—Unless otherwise specified, use one of the types of mortar as specified in Specifications C 270 or C 476. Determine the compressive strength of the mortar in accordance with Method C 109 except the sand shall conform to Specification C 144. After moist curing in the molds for 24 h release the cubes and store in the same atmosphere as the prisms as specified in 5.5. Determine and record the following minimum physical properties of the mortar:

5.2.1 Compressive strength (minimum three cubes) and

5.2.2 Sand-sieve analysis.

### 5.3 Sampling and Testing of Grout:

5.3.1 Use one of the types of grout as specified in Specification C 476, and the materials

shall conform to the requirements of that specification.

5.3.2 *Fine Grout*—Mold a minimum of three 2-in. (50-mm) cubes from a sample of the fine grout and test in the same manner as prescribed in 5.2, except moist cure cubes 48 h before releasing from molds.

5.3.3 *Coarse Grout*—Mold a minimum of three 3 by 6-in. (76 by 152-mm) cylinders from a sample of the coarse grout and moist cure for 48 h before releasing from molds. Cap and test them in compression in accordance with applicable provisions of Method C 39.

### 5.4 Masonry Prisms:

5.4.1 *Method A*—Build and test a minimum of three prism specimens for each combination of variables. Each test prism shall be a single wythe specimen laid in stack bond, with a height-to-thickness ratio of not less than two nor more than five. The mortar joints shall be  $\frac{3}{8}$  in. (9.5 mm) in thickness. Spread a full bed of mortar on each solid masonry unit and allow no furrowing of the mortar bed. Fully bed the face shells of hollow masonry units with mortar. Strike mortar joints flush with the face of the masonry without tooling. The length of the prism shall be greater than its thickness.

5.4.2 *Method B*—Build and test a minimum of three prisms using the materials and workmanship being used in the structure. In constructing the prisms the mortar bedding, the thickness and tooling of the joints, the grouting, the condition of the units, and the bonding arrangement shall be in so far as possible the same as being used in the structure, except that no structural reinforcement shall be included in the test specimen; however, metal ties may be used. Prisms shall contain no grout unless all hollow cells and spaces in the actual wall construction are to be grouted.

5.4.2.1 The thickness of the prisms shall be the same as the thickness of the masonry part of the wall in the structure. The length of the prism shall be equal to or greater than the thickness of the prism. The height of the prism shall be at least twice the thickness of the prism, and a minimum of 15 in. (381 mm).

### 5.5 Handling and Curing Conditions:

5.5.1 *Method A*—Generally, cure all prisms for 28 days. However, lesser periods of time may be used provided the relation be-