Designation: C901 – 10

Standard Specification for Prefabricated Masonry Panels[1]

This standard is issued under the fixed designation C901; 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.

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

1. Scope*

1.1 This specification covers the structural design and quality control of fabrication for load-bearing and non-load-bearing prefabricated masonry panels. Methods of prefabrication, field erection, and jointing are not covered in this specification.

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.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

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

C270 Specification for Mortar for Unit Masonry

C476 Specification for Grout for Masonry

C780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

C1019 Test Method for Sampling and Testing Grout

C1180 Terminology of Mortar and Grout for Unit Masonry

C1232 Terminology of Masonry

C1314 Test Method for Compressive Strength of Masonry Prisms

C1357 Test Methods for Evaluating Masonry Bond Strength

C1717 Test Methods for Conducting Strength Tests of Masonry Wall Panels

E518 Test Methods for Flexural Bond Strength of Masonry

2.2 *Other Standards:*

TMS 402/ACI 530/ASCE 5 Building Code Requirements for Masonry Structures[3]

TMS 602/ACI 530.1/ASCE 6 Specification for Masonry Structures[3]

3. Terminology

3.1 The terms used in this specification are identified in Terminologies C1180 and C1232.

4. Materials and Manufacture

4.1 *Masonry*—Masonry units, mortar, grout, reinforcement, anchors, ties, and accessories shall conform to TMS 602/ACI 530.1/ASCE 6.

5. Structural Design

5.1 *General*—Structural design of panels shall be performed in accordance with the provisions of the applicable local building code and the requirements of TMS 402/ACI 530/ASCE 5. Structural design of panels shall consider all loading and restraint conditions from initial fabrication to in-service conditions in the completed structure, including storage, transportation, and erection. The design loads shall be of the type and magnitude required by the applicable building code. Panels and connections required to resist wind, seismic, or other dynamic loads shall be designed to resist the required positive and negative forces in all directions. The joints between dissimilar materials within each panel, between panels, and between panels and their structural supports shall be designed to accommodate differential movement and deflections of each material, panel, and adjacent building elements.

5.2 *Lifting Devices*—Lifting devices and their connections to the panels shall have an ultimate capacity of four times the dead weight of the appropriate portion of the panel. Inclination of the lifting forces shall be considered.

6. Dimensions and Permissible Variations

6.1 *Standard Dimensions*—The standard nominal widths and heights of the panels shall be in multiples of nominal

[1] This specification is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.05 on Masonry Assemblies.

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[2] 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.

[3] Available from The Masonry Society, 3970 Broadway, Suite 201-D, Boulder, CO 80304–1135, http://www.masonrysociety.org.

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

individual masonry unit heights and lengths. The nominal thickness of panels shall be the sum of the nominal thicknesses of the masonry units in the panels plus the nominal thickness of cavities, if any. The specified dimensions may be less than the required nominal dimensions by the thickness of one mortar joint but not by more than ½ in. (13 mm).

6.2 *Custom Dimensions*—For custom installations, all dimensions of panels shall be as shown on the drawings or as specified.

6.3 *Thickness of panels*—The specified thickness of the panels shall be as required for adequate strength, fire resistance, or other design criteria for the type of construction and occupancy as required by the applicable building code.

6.4 *Dimensional Tolerances*—Based on actual dimensions, a prefabricated masonry wall panel shall not vary from the specified face dimensions by more than the following:

10 ft (3.05 m) or under—±⅛ in. (3.2 mm)
10 to 20 ft (3.5 to 7.1 m)—+⅛ in. (3.2 mm) or –3⁄16 in. (4.8 mm)
20 to 30 ft (6.096 to 9.144 m)—+⅛ in. (3.2 mm) or –¼ in. (6.4 mm)
For each additional 10 ft (3.5 m)—±1⁄16 in. (1.6 mm)

The maximum permissible variation from the specified thickness of prefabricated masonry panels shall be not greater than −⅛ in. (3.2 mm) or +¼ in. (6.4 mm). Prefabricated masonry panels shall have maximum out-of-square differential dimensions (difference in length of the two diagonal face measurements) not greater than ⅛ in./6 ft (3.2 mm/1.83 m) nor an absolute maximum of greater than ¼ in. (6.4 mm).

7. Workmanship, Finish, and Appearance

7.1 *General*—For facing panels, the workmanship and appearance shall be equal to or better than that of the approved sample. The method of fabrication shall be such as to prevent misalignment of individual units, and the joints shall be even and aligned properly within each panel and with adjacent panels. Mortar, grout, or other stains on all panel surfaces to be left exposed shall be removed before the panel is delivered to the job site. Panels shall be protected from further staining during storage, shipment, and erection.

7.2 *Warpage*—The faces of the panels shall not be out of plane more than ⅛ in. (3.2 mm) for each 6 ft (1.83 m) of either height or width.

7.3 *Location of Inserts and Fittings*—The location of anchors, inserts, and lifting and connection devices shall not vary from center-line location shown on the plans or shop drawings, or both, by more than ⅜ in. (9.5 mm).

8. Quality Assurance

8.1 *Preparation of Materials:*

8.1.1 *Brick*—Test the initial rate of absorption (suction) of the brick in accordance with Test Methods C67, and when required, adjust the initial rate of absorption by wetting the units prior to pouring grout or spreading mortar.

8.1.2 *Mortar and Grout*—Proportion the mortar and grout by weight or volume on the basis of the unit weights of the ingredients as given in Specifications C270 or C476. If a high-bond mortar admixture is used, proportion and mix the mortar and grout in accordance with the admixture manufacturer's specifications.

8.2 *Quality Control Tests:*

8.2.1 Subject a sample of at least ten specimens of masonry units for each 50 000 units of a given type used in the fabrication of panels to the compressive strength and absorption tests in accordance with Test Methods C67 or C140.

8.2.2 *Mortar and Grout*—After the mortar or grout formulation, or both, has been established, sample a representative batch of each, if both are used, and mold not less than twelve standard 2-in. (50-mm) cube specimens of each, if both are used, following the procedures contained in the applicable sections of Test Method C109/C109M and Test Methods C1019, respectively.

8.2.2.1 Test three specimens, each at 1, 3, 7, and 28 days, and determine the relationship between the early age strengths and the 28-day strength for both mortar and grout, if both are used. Repeat this procedure whenever the mortar or grout formulation is changed.

8.2.2.2 Thereafter, during production, sample at least one representative batch of mortar or grout, or both, each day, and mold three cube specimens of each, if both are used, for testing at ages of 1, 3, or 7 days. Follow the applicable portions of Test Method C780 and Test Methods C1019, respectively.

8.2.3 *Panel Assemblage*— Test a sample of specimens, that is, unreinforced assemblages representative of the full-size panel, for compressive and flexural strength. Test one sample of three compression specimens for every 5000 ft^2 of panel production or every story height. Test one sample of three flexural specimens for each day's work on panels.

8.2.3.1 Specimen configuration for compressive and flexural tests shall be as specified in the appropriate ASTM standard. Testing shall be conducted in accordance with Test Methods C1314, E518, or C1357.

NOTE 1—Good correlation has not been established between the results of flexural prism tests of masonry and those of full-size wall sections under a variety of loading, slenderness, and bending conditions. Quality control flexural tests of prisms should be supplemented initially with uniform transverse load tests of full-size wall panels in accordance with Test Methods C1717.

9. Identification and Marking

9.1 Each prefabricated member shall be marked to indicate its location in the structure, its top surface, and the date of fabrication. Identification marks shall correspond to those shown on the placing drawings.

10. Shop Drawings

10.1 Shop drawings shall consist of fabrication drawings and placement drawings that may be separate or combined into one set of shop drawings.

10.2 Fabrication drawings shall show all details and location of reinforcement, inserts, anchors, bearing seats, lifting inserts, coursing, size and shape of openings, and panel size and shape.

10.3 Placing drawings shall show panel identification, panel location, reference dimensions, panel dimensions, dimension of joints between panels, and connection details.

11. Handling, Storage, and Transportation

11.1 During manufacture, curing, storage, and transportation, care shall be taken not to overstress, warp, or otherwise damage the panels. Structurally damaged panels shall be replaced, except that repair of structurally damaged panels instead of replacement is allowed, at the discretion of the architect or engineer. Non-structural damage shall be repaired or replaced, utilizing the manufacturer's standard procedures. The repair shall be to the satisfaction of the architect or engineer.

12. Keywords

12.1 dimensional tolerances; dimensions; masonry units; prefabricated masonry panels; quality control; structural design

SUMMARY OF CHANGES

Committee C15 has identified the location of selected changes to this standard since the last issue (C901 – 09) that may impact the use of this standard. (Approved Dec. 15, 2010.)

(1) Test Method C1717 was added to Section 2 and replaced E72 where cited in Note 1.