



Designation: C1776/C1776M – 17 (Reapproved 2022)

Standard Specification for Wet-Cast Precast Modular Retaining Wall Units¹

This standard is issued under the fixed designation C1776/C1776M; 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.

1. Scope

1.1 This specification covers wet-cast precast modular retaining wall units cast from first-purpose concrete with or without the inclusion of steel reinforcement. The precast units covered by this specification are machine-placed units intended for use in the construction of dry stacked modular retaining wall systems.

1.2 The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.3 *Units*—The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text of the specification, the SI units are shown in brackets. The values stated in each system are not exact equivalents. Therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *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.*

1.5 *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:*²

A615/A615M Specification for Deformed and Plain Carbon-

Steel Bars for Concrete Reinforcement
A706/A706M Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
A767/A767M Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
A775/A775M Specification for Epoxy-Coated Steel Reinforcing Bars
A884/A884M Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
A934/A934M Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
A1055/A1055M Specification for Zinc and Epoxy Dual-Coated Steel Reinforcing Bars
A1060/A1060M Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete
A1064/A1064M Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field
C33/C33M Specification for Concrete Aggregates
C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens
C94/C94M Specification for Ready-Mixed Concrete
C125 Terminology Relating to Concrete and Concrete Aggregates
C138/C138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C143/C143M Test Method for Slump of Hydraulic-Cement Concrete
C150/C150M Specification for Portland Cement
C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory
C231/C231M Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C260/C260M Specification for Air-Entraining Admixtures for Concrete
C494/C494M Specification for Chemical Admixtures for Concrete
C595/C595M Specification for Blended Hydraulic Cements

¹ This test method is under the jurisdiction of ASTM Committee C27 on Precast Concrete Products and is the direct responsibility of Subcommittee C27.20 on Architectural and Structural Products.

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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.

C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

C666/C666M Test Method for Resistance of Concrete to Rapid Freezing and Thawing

C823/C823M Practice for Examination and Sampling of Hardened Concrete in Constructions

C979/C979M Specification for Pigments for Integrally Colored Concrete

C989/C989M Specification for Slag Cement for Use in Concrete and Mortars

C1157/C1157M Performance Specification for Hydraulic Cement

C1611/C1611M Test Method for Slump Flow of Self-Consolidating Concrete

2.2 *ACI Documents*:³

ACI 318 Building Code Requirements for Structural Concrete and Commentary

3. Terminology

3.1 *Definitions*—Terminology defined in Terminology **C125** shall apply for this specification.

3.2 *Definitions*:

3.2.1 *concrete, first-purpose, n*—hydraulic cement concrete prepared and used for its original intended purpose.

3.2.2 *width, unit, n*—regarding precast modular retaining wall unit dimensions, the term “width” shall refer to the horizontal dimension of the unit measured perpendicular to the face of the wall, from the front face of the unit to the back of the unit.

3.2.3 *height, unit, n*—regarding precast modular retaining wall unit dimensions, the term “height” shall refer to the vertical dimension of the unit as placed in the wall.

3.2.4 *length, unit, n*—regarding precast modular retaining wall unit dimensions, the term “length” shall refer to the horizontal dimension of the unit measured parallel to the running length of the wall face.

3.2.5 *precast modular retaining wall unit, n*—a machine-placed, solid, slotted or hollow, closed-cell, manufactured concrete unit with nominal base length and nominal base width dimensions greater than its vertical height as installed, used in the construction of dry-stacked earth retaining walls.

3.2.6 *precast modular retaining wall unit, wet-cast, n*—a precast modular retaining wall unit, manufactured from concrete using a wet-cast process.

3.2.7 *wet cast, adj*—manufactured concrete products made from fresh concrete with a measurable slump in accordance with Test Method **C143/C143M** or slump flow in accordance with Test Method **C1611/C1611M**.

4. Ordering Information

4.1 In the absence of designated applicable general specifications, the purchaser shall specify the following:

4.1.1 Unit type and size with applicable dimensions.

4.1.2 Compressive strength of the concrete used in the manufacture of the precast modular retaining wall units (see 6.1).

4.1.3 Air content of the concrete used in the manufacture of the precast modular retaining wall units (see 6.2).

4.1.4 Surface texture, finish and color of the precast modular retaining wall units (see 8.5).

4.1.5 Other special or custom features.

4.1.6 Certification requirements (see 15.1).

4.1.7 Protective coatings for reinforcing steel, if required (see 5.5.1 and 5.5.2).

5. Materials and Manufacture

5.1 First-purpose concrete used for the production of precast modular retaining wall units under this specification shall be ready-mixed or central-mixed concrete conforming with Specification **C94/C94M**.

5.2 Cementitious materials shall conform to the following applicable specifications:

5.2.1 *Portland Cements*—Specification **C150/C150M**.

5.2.2 *Blended Hydraulic Cements*—Specification **C595/C595M**.

5.2.3 *Hydraulic Cement*—Specification **C1157/C1157M**.

5.2.4 *Pozzolans*—Specification **C618**.

5.2.5 *Slag Cement*—Specification **C989/C989M**.

5.3 *Aggregates*—Aggregates shall conform to the following specifications, except that grading requirements shall not necessarily apply:

5.3.1 *Normal Weight Aggregates*—Specification **C33/C33M**.

5.4 *Admixtures*—Specification **C260/C260M**, **C494/C494M**, or **C979/C979M**.

5.5 *Steel Reinforcement*—Design, size, configuration, and placement tolerance of reinforcing steel in any given precast modular retaining wall unit is proprietary and shall be determined by the manufacturer based upon the structural requirements of the units produced. The proprietary reinforcement design of the precast modular retaining wall unit(s) shall be prepared and sealed by a licensed professional engineer. Reinforcing steel placed within precast modular retaining wall units for the purpose of resisting loading stress shall conform with the following:

5.5.1 *Reinforcing Bars*—Steel reinforcing bars used as reinforcement in precast modular retaining wall units shall exhibit a minimum yield stress of 60 ksi [420 MPa]. Deformed or plain bars shall meet the requirements of Specification **A615/A615M**. Reinforcing bars that are welded shall meet the requirements of Specification **A706/A706M**. Zinc-coated (galvanized) steel reinforcing bars shall meet the requirements of Specification **A767/A767M**. Epoxy-coated steel reinforcing bars shall meet the requirements of Specification **A775/A775M**, **A934/A934M**, or **A1055/A1055M** as required by the purchaser.

5.5.2 *Welded Wire Reinforcement (WWR)*—Steel welded wire reinforcement (WWR) used in welded reinforcement mats in precast modular retaining wall units shall exhibit a minimum yield stress of 65 ksi [450 MPa]. Deformed or plain WWR

³ Available from American Concrete Institute (ACI), 38800 Country Club Dr., Farmington Hills, MI 48331-3439, <http://www.concrete.org>.