



Designation: C913 – 23

# Standard Specification for Precast Concrete Water and Wastewater Structures<sup>1</sup>

This standard is issued under the fixed designation C913; 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 U.S. Department of Defense.*

## 1. Scope

1.1 This specification covers the recommended design requirements and manufacturing practices for monolithic or sectional precast concrete water and wastewater structures with the exception of concrete pipe, box culverts, utility structures, septic tanks, grease interceptor tanks, and items included under the scope of Specification C478/C478M.

NOTE 1—Water and wastewater structures are defined as solar heating reservoirs, cisterns, holding tanks, leaching tanks, extended aeration tanks, wet wells, pumping stations, distribution boxes, oil-water separators, treatment plants, manure pits, catch basins, drop inlets, and similar structures.

NOTE 2—Installation and sealant requirements should receive special consideration due to special features of the application.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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:<sup>2</sup>

A184/A184M Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C27 on Precast Concrete Products and is the direct responsibility of Subcommittee C27.30 on Water and Wastewater Containers.

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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.

A416/A416M Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete  
A421/A421M Specification for Stress-Relieved Steel Wire for Prestressed Concrete  
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  
A1064/A1064M Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete  
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  
C150/C150M Specification for Portland Cement  
C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method  
C231/C231M Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method  
C260/C260M Specification for Air-Entraining Admixtures for Concrete  
C330/C330M Specification for Lightweight Aggregates for Structural Concrete  
C478/C478M Specification for Circular Precast Reinforced Concrete Manhole Sections  
C494/C494M Specification for Chemical Admixtures for Concrete  
C595/C595M Specification for Blended Hydraulic Cements  
C618 Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete  
C685/C685M Specification for Concrete Made by Volumetric Batching and Continuous Mixing  
C890 Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures  
C989/C989M Specification for Slag Cement for Use in Concrete and Mortars  
C990 Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

**C1157/C1157M Performance Specification for Hydraulic Cement**

**C1889 Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Utility, Water, and Wastewater Structures Using AASHTO LRFD Design**

2.2 *American Concrete Institute Standard:*

**ACI 318 Building Code Requirements for Reinforced Concrete**<sup>3</sup>

2.3 *Federal Specification:*

**SS-S-210A Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints**<sup>4</sup>

2.3 *AASHTO Standard:*<sup>5</sup>

**AASHTO LRFD Bridge Design Specifications**

### 3. Ordering Information

3.1 Unless otherwise designated by the purchaser before placing an order, a structure designed in accordance with Section 5 of this specification and found to satisfactorily meet the requirements imposed when tested and inspected as described herein shall be acceptable. The test of materials as required shall be done in accordance with applicable ASTM International standards. Inspection, when required, shall include checks on fabrication and placing of reinforcement and concrete in accordance with approved design drawings.

### 4. Materials

4.1 *Cementitious Materials:*

4.1.1 *Cement*—Cement shall conform to the requirements for portland cement of Specification **C150/C150M**, hydraulic cement Specification **C1157/C1157M**, or shall be portland blast-furnace slag cement, portland-limestone cement or portland-pozzolan cement conforming to the requirements of Specification **C595/C595M**, except that the pozzolan constituent in the Type IP portland-pozzolan cement shall be fly ash.

4.1.2 *Fly Ash*—Fly ash shall conform to the requirements of Specification **C618**.

4.1.3 *Slag Cement*—Slag cement shall conform to the requirements of Grade 100 or 120 of Specification **C989/C989M**.

4.1.4 *Allowable Combinations of Cementitious Materials*—The combination of cementitious materials used in concrete shall be one of the following:

4.1.4.1 Portland cement only;

4.1.4.2 Portland blast furnace slag cement only;

4.1.4.3 Portland-limestone cement only;

4.1.4.4 Portland-pozzolan cement only;

4.1.4.5 A combination of portland cement or portland-limestone cement and fly ash;

4.1.4.6 A combination of portland cement or portland-limestone cement, slag cement, and fly ash; and

4.1.4.7 A combination of portland-pozzolan cement and fly ash.

<sup>3</sup> Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, <http://www.aci-int.org>.

<sup>4</sup> Available from Standardization Documents, Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094. Attn: NPODS.

<sup>5</sup> Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, <http://www.transportation.org>.

4.2 *Aggregates*—Aggregates shall conform to Specification **C33/C33M** and lightweight aggregates shall conform to Specification **C330/C330M**, except that the requirements for grading shall not apply.

4.3 *Water*—Water used in mixing concrete shall be clean and free of injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances incompatible with concrete or steel.

4.4 *Admixtures*—Admixtures shall conform to Specification **C494/C494M** or **C618** and shall not be injurious to other products used in the concrete.

4.4.1 *Air-Entraining Admixtures*—Air-entraining admixtures conforming to Specification **C260/C260M** shall be used when there is a risk that the concrete may be exposed to freeze-thaw cycles. The concrete mixture shall contain  $5.5 \pm 1.5$  % air by volume as determined by Test Method **C231/C231M** or **C173/C173M**.

4.5 *Steel Reinforcement*—Steel reinforcement shall conform to Specification **A1064/A1064M**; Specifications **A416/A416M** and **A421/A421M** for prestressed strand and wire; or Specification **A184/A184M**, **A615/A615M**, or **A706/A706M** for bars.

### 5. Design Requirements

5.1 *Design Method*—The method of structural design of reinforced concrete as outlined in the ACI 318 Building Code shall be used to design the concrete sections, including the reinforcement required, when the structure is subjected to the loading conditions covered in Practice **C890**. Structures subjected to the loading conditions in Practice **C1889** shall be designed in accordance with AASHTO LRFD Bridge Design Specifications. Design requirements in excess of these specifications shall be identified by the purchaser.

5.1.1 *Alternative Method to Design*—An alternative method to the design of a structure is acceptable, with the permission of the purchaser, by performing required performance tests on the completed structure to confirm adequate strength.

5.2 *Access Openings*—The structural design shall take into consideration the number, placement, and size of access openings.

5.3 *Floors*—The minimum floor thickness resulting from slope shall be considered as nominal floor thickness in the structure.

5.4 *Knockouts and Sumps*—Knockouts and sumps shall be designed to carry the loads imposed upon them. The basic structure shall be designed to carry all imposed loads with knockouts removed.

5.5 *Placement of Reinforcement*—The minimum concrete cover for reinforcing bars, mats, or fabric shall not be less than 1 in. (25 mm) for water retaining structures and  $\frac{3}{4}$  in. (19 mm) for other structures subject to the provisions of Section 7.

5.6 *Concrete Strength*—The minimum compressive strength ( $f'_c$ ) for design shall be 4000 psi (28 MPa) at 28 days of age.

5.7 *Joints*—Where required, sealed joints in sectional precast concrete structures shall be of such a design to prevent unacceptable leakage when used with a sealant (**Note 3**)