



**American Water Works  
Association**

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**ANSI/AWWA D107-16**  
(Revision of ANSI/AWWA D107-10)

**AWWA Standard**

# Composite Elevated Tanks for Water Storage

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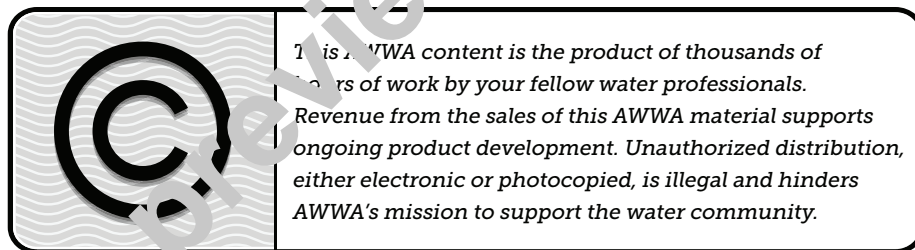
## AWWA Standard

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# Foreword

*This foreword is for information only and is not a part of ANSI\*/AWWA D107.*

## **I. Introduction.**

I.A. *Background.* A composite elevated water tank is composed of a welded steel tank for watertight containment, a single pedestal concrete support structure, a foundation, and accessories.

The AWWA Standards Committee on Composite Elevated Tanks was formed to prepare a standard for the design, construction, inspection, and testing of composite elevated tanks. ACI 371R, Guide for the Analysis, Design, and Construction of Elevated Concrete and Composite Steel-Concrete Water Storage Tanks,<sup>†</sup> and ANSI/AWWA D100, Welded Carbon Steel Tanks for Water Storage, are used as source documents.

Work covered by this standard is usually procured under design-build contract. It is intended that ANSI/AWWA D107 be used as a reference standard in project documents prepared by purchasers and engineers specifying composite elevated water tanks.

I.B. *History.* The AWWA Standards Committee on Composite Elevated Tanks was formed in 1992 to prepare a standard for these structures. The first edition of ANSI/AWWA D107 was approved by the AWWA Board of Directors on Jan. 17, 2010. This edition was approved on Jan. 16, 2016.

I.C. *Acceptance.* In May 1987, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the Water Research Foundation (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.<sup>‡</sup> Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

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\* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

† American Concrete Institute (ACI), 38800 Country Club Drive, Farmington Hills, MI 48331.

‡ Persons outside the United States should contact the appropriate authority having jurisdiction.

1. Specific policies of the state or local agency.
2. Two standards developed under the direction of NSF\*: NSF/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.
3. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,<sup>†</sup> and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, “Toxicology Review and Evaluation Procedures,” to NSF/ANSI 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA D107 does not address additives requirements. Users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.
2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

## II. Special Issues.

II.A. *Applicable Building Codes.* Building codes may not have specific provisions for nonbuilding structures such as composite elevated tanks. The purchaser should make a determination as to the intent of the requirements of the applicable building codes and should specify the extent to which such building codes apply to a project. It is intended that specified building codes govern where they have more stringent requirements than this standard.

II.B. *Personnel Safety Standards.* The personnel safety requirements in this standard are based on OSHA 29 CFR, Part 1910, Occupational Safety and Health Standards, and industry practice. The user in specifying safety-related equipment,

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\* NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

† Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

details, and design criteria should make a determination that the requirements of this standard are in compliance with current OSHA requirements and applicable building code requirements.

II.C. *Special Loading Conditions.* The purchaser should specify design requirements for service not covered by this standard, such as loads associated with surge or process tanks, or local environmental conditions more severe than those required by this standard.

II.D. *Professional Engineer (PE) Certification.* It is recommended that the engineer responsible for design be licensed in the jurisdiction where the composite elevated tank is to be constructed. The design and construction drawings should be sealed.

II.E. *Inspection and Maintenance.* Composite elevated tanks designed and constructed in accordance with the requirements of this standard can be expected to be durable structures. Steel tank construction has a satisfactory history when properly maintained, and concrete that conforms to this standard will meet the requirements for durable concrete as defined in ACI 201.2R, Guide to Durable Concrete.

An inspection of the structure and accessories is recommended approximately one year after completion. Thereafter, periodic inspection and maintenance should be performed.

II.F. *Cold Climates.* The formation of ice in the tank may result in damage to the tank or components such as piping or interior ladders. Design for this condition is beyond the scope of this standard. Reference to ice damage is to improper operation rather than an endorsement of existing condition. The tank should be heated, insulated, or operated in a manner to prevent this condition. Water replacement, circulation, or wasting of water are operational techniques that may be used.

II.G. *Use of Interior Space.* The interior of the support structure is frequently used for mechanical rooms, storage, and parking. This space may be occupied when constructed in accordance with local building code requirements. Typical uses include fire stations and offices. Intermediate floors may be constructed to provide additional space.

II.H. *Aesthetics.* Aesthetics should be considered when planning a composite elevated tank. Minimum architectural features and finishing of exterior concrete surfaces are provided for in this standard. Painting decorative logos or color schemes on the steel tank may enhance the appearance of the structure.

II.I. *Structural Evaluation.* If construction does not meet tolerance, material, or other structural requirements of this standard, an evaluation may be performed

by the responsible design professional. When structural capacity is not compromised, repair or replacement may not be required unless other factors, such as lack-of-fit, aesthetics, or durability, require remedial action.

### **III. Use of This Standard.**

#### *III.A. General.*

III.A.1 Disclaimer. AWWA has no responsibility for the suitability or compatibility of the provisions of this standard to any intended application by any user. Accordingly, it is the responsibility of the user of this AWWA standard to determine that the provisions described in this standard are suitable for use in the particular application being considered.

III.A.2 Minimum Requirements. ANSI/AWWA D107 is based on the collective knowledge of purchasers, consulting engineers, and constructors of composite elevated tanks. A composite elevated tank is considered to be in compliance with ANSI/AWWA D107 when the minimum requirements of this standard have been met. The purchaser may specify more stringent requirements.

III.A.3 Contract Responsibility. Procurement of composite elevated tanks is usually by design-build contracts using proprietary design and methods of construction. The purchaser should provide project documents that describe the work to be performed.

The purchaser typically is responsible for the following:

1. A site on which the composite elevated tank is to be constructed, which should be of sufficient size to permit construction using customary methods.
2. A suitable right-of-way from the nearest public road to the construction site.
3. A geotechnical investigation, including recommendations for foundation type and associated design criteria.
4. A Federal Aviation Administration (FAA) determination with regard to siting, height, marking, and lighting requirements.
5. Water at sufficient pressure for testing and facilities for disposal after testing.
6. Purchaser-furnished materials that are to be installed by the constructor.

The constructor typically is responsible for the following:

1. Designs, drawings, and specifications for the composite elevated tank.
2. All labor, materials, equipment, supplies, and testing as required by this standard.
3. Warranting the structure against defects in material and workmanship for a period of one year from date of completion.
4. Any additional work specified in the project documents.

### III.B. *Specifying ANSI/AWWA D107.*

III.B.1 Reference Standard. ANSI/AWWA D107 is a reference standard that a purchaser may cite in project documents, together with supplementary requirements for a specific project. A statement such as the following may be used to incorporate ANSI/AWWA D107 into the project documents:

“Design and construction of the composite elevated tank shall comply with the requirements of ANSI/AWWA D107, Composite Elevated Tanks for Water Storage, published by the American Water Works Association, Denver, Colorado, except as modified by the requirements of these contract documents.”

III.B.2 Information Required From Purchaser. Incorporating this standard by reference in a project specification requires that the purchaser provide the information listed in Sec. 1.3. ANSI/AWWA D107 has options that the purchaser may specify, and Section B.2 of appendix B, Table B.1, contains a comprehensive list of these options and corresponding defaults.

III.C. *Modification of Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided in the project specifications.

**IV. Major Revisions.** The major revisions in this edition of the standard include the following:

1. The notation and definition for maximum considered earthquake  $MCE_R$  have been revised to conform to the latest edition of ASCE\* 7.
2. Seismic maps are now cited by reference to ASCE 7-10 rather than being incorporated into the standard.
3. Former Table 3, Site Classifications, has been moved to appendix A and has been renumbered as Table A.2.
4. Standard Sec. 4.2.7.8, Seismic Design Category, and appendix Sec. A.4.2.7.8, Seismic Load, have been added.
5. ASCE 7-10 wind provisions have been incorporated into the standard.
6. The gust effect factor  $G_f$  has been revised.
7. The wind map (Figure 2 of the 2010 edition) has been deleted and is now incorporated by reference to ASCE 7-10.
8. Former Tables 2a and 2b on design wind pressure have been revised and moved to appendix A as Tables A.1a and A.1b.
9. Former Table 14, Minimum Safety Factors (now Table 12), has been revised; ASTM D4945 has been added to the dynamic testing provisions.

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\* American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191.

10. Standard Sec. 6.3.3.8.1 and appendix Sec. A.6.3.3.8.1 have been updated to reflect current practice, similar to the provisions described in ACI 371R-08.

11. Standard Sec. 7.3.3.2 and appendix Sec. A.7.3.3 have been updated, whereby allowable compression stress values are now referenced to IBC 2012 rather than being provided in the standard.

12. Appendix Section A.2 has been added to identify specific revision years for ASCE 7 and ACI 318.

13. Determination of meridional compression strength  $F_L$  by method 2 (ANSI/AWWA D107-10, Sec. 5.3.5.3) has been eliminated. Method 3 in ANSI/AWWA D107-10 has been renamed as method 2 in this edition. Section numbers have been revised accordingly.

**V. Comments.** If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, FAX at 303.795.7603; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at [standards@awwa.org](mailto:standards@awwa.org).



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# Composite Elevated Tanks for Water Storage

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## SECTION 1: GENERAL

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### **Sec. 1.1 Scope**

This standard describes the design, construction, inspection, and testing of composite elevated tanks that use a welded steel tank for watertight containment and a single pedestal concrete support structure. Requirements for the steel tank, concrete support structure, foundation, and accessories are included. Site selection and procurement; tank sizing; postcommissioning inspection and maintenance; and the design, operation, and control of the water distribution system that connects to the composite elevated tank are beyond the scope of this standard.

### **Sec. 1.2 Purpose**

The purpose of this standard is to provide minimum requirements for the design, construction, inspection, and testing of composite elevated tanks used for water storage in a water distribution system.

### **Sec. 1.3 Application**

This standard may be referenced in project documents that address the design, construction, inspection, and testing of composite elevated tanks used for water storage. The following information is required to use this standard to specify a composite elevated tank: