



**American Water Works
Association**

ANSI/AWWA D121-12
(First Edition)

The Authoritative Resource on Safe Water®

AWWA Standard

Bolted Aboveground Thermosetting Fiberglass- Reinforced Plastic Panel-Type Tanks for Water Storage



Effective date: June 1, 2012.

This first edition approved by AWWA Board of Directors Jan. 22, 2012.

Approved by American National Standards Institute March 27, 2012.

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ISBN-13, print: 978-1-58321-888-4
ISBN-10, print: 1-58321-888-2

eISBN-13, electronic: 978-1-61300-146-2
eISBN-10, electronic: 1-61300-146-0

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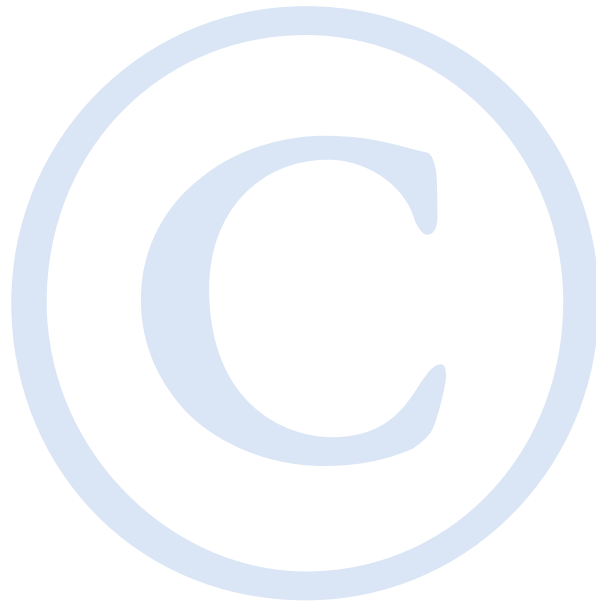
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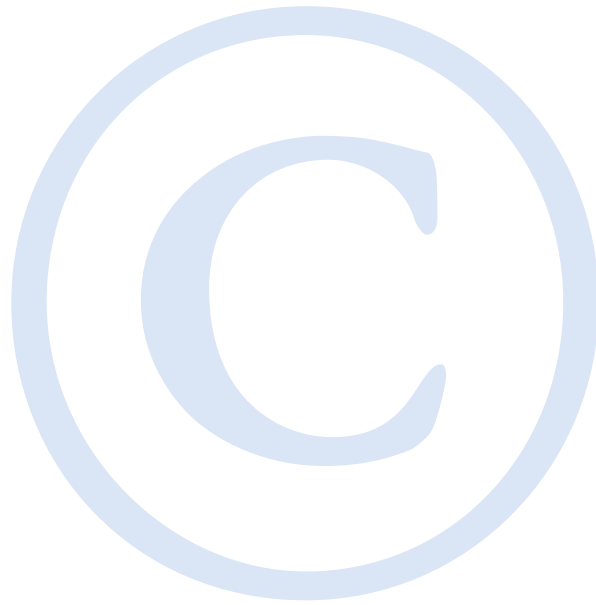
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Foreword

This foreword is for information only and is not a part of ANSI/AWWA D121.*

I. Introduction.

I.A. *Background.* This standard covers bolted aboveground thermosetting fiberglass-reinforced plastic (FRP) panel-type tanks for water storage and is based on more than a decade of accumulated knowledge and experience from installations worldwide, as well as engineering procedures and analyses generally accepted in the tank industry. Bolted FRP panel-type tanks are typically field assembled from factory-produced modular panel units. Tanks ranging in size from 260 gal to 2.5 mil gal have been constructed.

I.B. *History.* This is the first edition of ANSI/AWWA D121. In June 2007, the Standards Council approved this new standard and assigned it to Standards Committee 370, Thermosetting Fiberglass-Reinforced Plastic Tanks. A subcommittee was formed to prepare this standard. Applicable publications, such as ANSI/AWWA D120, ANSI/AWWA D103, BS EN 13280:2001, SS245:1995, and JIS R3411-3417 were consulted in forming this standard, and seismic design procedures are based on current practice as reflected in ASCE/SEI 7-05, ANSI/AWWA D110-04, ACI 350.3-06, and Technical Information Document TID 7024, chapter 6 and appendix F, US Atomic Energy Commission.

This first edition was approved by the AWWA Board of Directors on Jan. 22, 2012.

I.C. *Acceptance.* In May 1985, 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 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.[†] Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health

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

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

effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.
3. 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.
4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,[†] 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 jurisdiction. 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 D121 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 all 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. *Purchase.* When tanks are purchased using this standard, the purchaser must specify certain basic requirements. The purchaser may desire to modify, delete, or amplify sections of this standard to suit special conditions. It is strongly recommended that such modifications, deletions, or amplifications be made by supplementing this

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

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

standard rather than by rewriting or incorporating sections from this standard into a separate specification.

II.B. *Design and Construction.* The details of design and construction covered by this standard are minimum requirements. A tank cannot be represented as adhering to the provisions of ANSI/AWWA D121 if it does not meet the minimum requirements of this standard.

II.C. *Manufacturing Method.* Tanks covered by this standard shall be manufactured by compression molding with SMC (sheet mold compound) using the hot press method. Tanks requiring no internal or external coating and bolted construction have a long life expectancy. Regular inspection and repair of damaged or deteriorated areas may be the determining factors in the length of tank life.

II.D. *Foundations.* Tank foundations are one of the more important aspects of tank design. Detailed requirements for tank foundations are covered in Sec. 5.8 of this standard. This standard does not require the manufacturer or constructor to be responsible for the design of the tank foundation unless otherwise specified by the purchaser. Unless otherwise specified by the purchaser, the purchaser must obtain an adequate soil investigation at the tank site, including recommendations of the type of foundation to be used, the depth of foundation required, and the design soil-bearing pressure. This information, as well as specifications for an adequate soil investigation, should be established by a qualified geotechnical engineer. The top of the foundation strips should be 20 in. (500 mm) minimum above the finished grade, unless otherwise specified by the purchaser. The tank manufacturer shall provide the loads that the foundation beams will have to support.

A drainage inlet structure or suitable erosion protection should be provided to receive the discharge from the tank overflow. The overflow shall not be connected directly to a sewer or a storm drain without an air break.

II.E. *Annual Inspection and Maintenance.* Inspection and maintenance is important if maximum tank life is to be attained. Inspections should be performed annually.

II.F. *Disinfection Procedures.* This standard does not cover tank disinfection procedures. ANSI/AWWA C652, Standard for Disinfection of Water-Storage Facilities, should be consulted for recommended procedures for disinfection of water-storage facilities. If the disinfecting is to be done by the tank constructor, the purchaser must specify how such disinfecting is to be done.

II.G. *Recommended Items to Be Furnished by the Purchaser and Manufacturer.* The following recommendations on items to be furnished by both the

purchaser and the manufacturer are considered good practice, but are not requirements of ANSI/AWWA D121.

When a bolted FRP panel-type tank is to be purchased under the provisions of this standard, the purchaser should provide the following:

1. The site on which the tank is to be built, including sufficient space to permit the structure to be erected by customary methods.
2. Foundation design and construction unless otherwise specified.
3. Water at the proper pressure for testing, as required, and facilities for disposal of waste water after testing.
4. A suitable right-of-way from the nearest public road to the erection site.
5. Materials furnished by the purchaser to be used by the constructor for construction of the tank.

The manufacturer should furnish the following:

1. Foundation layout and loads to be supported for the intended tank.
2. Anchor bolts, if required, for wind, earthquake, or other lateral loads, or if specified to be furnished.
3. All materials, except materials furnished by the purchaser that are necessary to assemble the structure components, including the accessories required by this standard.

Variations in the responsibilities of both the purchaser and the manufacturer as previously outlined may be made by contractual agreement. The purchaser and the bidder should each furnish information identified in the sections that follow.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. Purchaser Options and Alternatives. The following information should be furnished by the purchaser when taking bids for a tank:

1. Standard used—that is, ANSI/AWWA D121, Bolted Aboveground Thermosetting Fiberglass-Reinforced Plastic Panel-Type Tanks for Water Storage, of latest revision.
2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
3. Affidavit of compliance, if required.
4. Tank capacity and dimensional restrictions if any.
5. Maximum flow rate, either in or out.
6. Desired time for completion.

7. Site location.
8. Type of road available for access to the site, and whether the road is public or private.
9. Name of and distance to the nearest town.
10. Name of and distance to the nearest railroad siding.
11. Availability of electric power; who furnishes it and at what fee, if any; what voltage is available; whether direct or alternating current; and, if alternating current, what cycle and phase.
12. Availability of compressed air and at what pressure, volume, and fee, if any.
13. The bottom capacity level of the tank when empty if different from the level when the tank would be emptied through the specified discharge piping.
14. The type of pipe and fittings for fluid conductors and the type of pipe joint.
15. The required freeboard.
16. Details of other federal, state or provincial, and local requirements (Sec. 4.1).
17. Any additional accessories required (Section 7).
18. The number and location of pipe connections, and type and size of pipe to be accommodated.

NOTE: Connections to the piping furnished by the constructor are to be made by the purchaser (Sec. 7.2).

19. If the roof ladder for providing access to roof hatches and vents is to be omitted (Sec. 7.4.3).
20. If safety cages, rest platforms, or other safety devices are required, and on which ladders (Sec. 7.5).

III.B. *Information to Be Furnished by the Manufacturer or Constructor.* The following information shall be furnished by the manufacturer or constructor for a tank:

1. Dimensions of the tank, including the vertical load, lateral loads, and overturning moments imparted to the foundation by all loads should also be identified at the time of the bid.
2. The number, names, and sizes of all accessories. This includes the type of roof ladder if an alternative method from that required in Sec. 7.4.3 is proposed.

III.C. *Items for Consideration by the Purchaser.* The design, construction, and final placement of a storage tank into service require cooperation between the purchaser, manufacturer, and constructor of the tank. Various practices are used to ensure successful tank placement. The following items are suggested for inclusion in the purchaser's requirements, unless local practice dictates otherwise.

Please note that this material is not stipulated in the text of ANSI/AWWA D121.

1. The purchaser may want to provide for field inspection to be performed either by the purchaser or by a commercial inspection agency, the cost of which shall be paid by the purchaser. As an option, the purchaser may require the manufacturer or constructor to perform the inspection work and, at the conclusion of the work, to submit a written report. The report should include a statement indicating that the tank has been erected according to the manufacturer's instructions, that the required testing has been performed, and that any leaks have been repaired.

2. This standard assumes that the purchaser (owner) provides sufficient water replacement and circulation to prevent freezing in the tank and riser pipe. Where low usage may result in the possibility of freezing, the purchaser shall waste water or provide heat to prevent freezing. The purchaser is referred to National Fire Protection Association (NFPA) document NFPA 22, Water Tanks for Private Fire Protection, for heater sizing. Purchasers are cautioned against allowing ice to build up for use as insulation because the ice may break loose and damage the tank. Where reference to ice damage is discussed in the standard, it is in anticipation of improper operation rather than approval of an icing condition.

3. On completion of the tank erection, it is recommended that the constructor dispose of all rubbish and other unsightly material caused by the operations and leave the premises in as good a condition as found at the start of the tank erection. It is recommended that the purchaser provide appropriate containers for placement and removal of disposed materials. Sec. 9.10 of ANSI/AWWA D121 does not list requirements for cleanup.

4. ANSI/AWWA D121 does not require the manufacturer or constructor to blind (i.e., temporarily seal all openings) and fill the tank to top capacity level. It is common practice for the purchaser to provide this effort. Should the purchaser require that the constructor provide this service and a supply of water, this must be provided for in the purchaser's requirements.

5. ANSI/AWWA D121 does not require the constructor to furnish foundation plans (only foundation layout drawings with directional details to support the tank). Should the purchaser specify submission of foundation plans; the purchaser must furnish adequate information relative to the type of foundation, foundation depth, and allowable soil-bearing pressure. (*see* Sec. II.D of the foreword and Sec. 5.8, Foundation Design, for further information.)

6. ANSI/AWWA D121 does not require the manufacturer or constructor to construct and install a foundation. Should the purchaser require that a foundation be

provided by the constructor, any information other than that contained in Sec. 5.8 of this standard must also be provided by the purchaser.

7. It is recommended that the purchaser retain a qualified geotechnical consultant to conduct a proper soil investigation. Unless otherwise specified by the purchaser, ANSI/AWWA D121 does not require that the manufacturer or constructor provide this service (see Sec. 5.8.5).

8. The purchaser may want to provide for shop inspection, to be performed either by the purchaser or by a commercial inspection agency, the cost of which shall be paid by the purchaser.

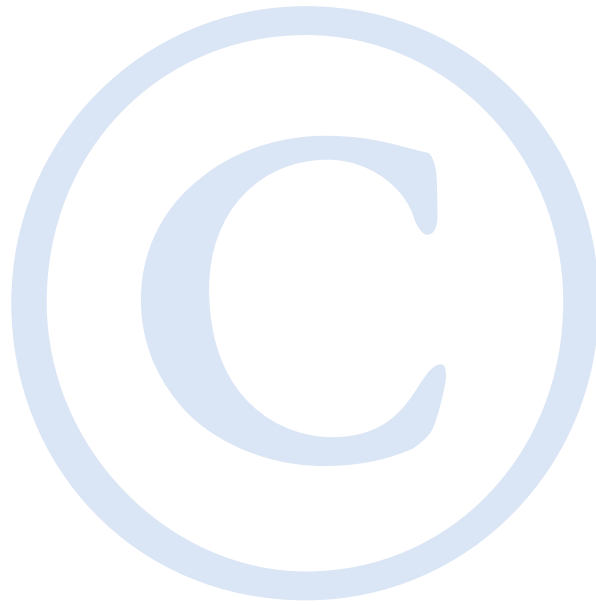
III.D. *Modification to Standard.* Any modification to the provisions, definitions, or terminology in this standard must be provided in the purchaser's documents.

IV. Major Revisions. This is the first edition of this standard.

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.



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**American Water Works
Association**

AWWA Standard

Bolted Aboveground Thermosetting Fiberglass-Reinforced Plastic Panel- Type Tanks for Water Storage

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes the design, fabrication, installation, inspection, and testing of bolted aboveground thermosetting fiberglass-reinforced plastic (FRP) panel-type tanks for potable water storage. Requirements for the fabrication, handling, construction, and testing of FRP panels, concrete and steel foundation structure, foundation, and accessories are included. Site elevation and procurement, tank sizing; post-commissioning inspection and maintenance; and the design, operation, and control of the water distribution system that connects to the bolted aboveground FRP panel-type tank are beyond the scope of this standard.

1.1.1 *Tank roofs.* Tanks storing domestic or potable water shall have roofs conforming to the requirements of this standard. Tanks storing nonpotable water may be constructed without roofs.

1.1.2 *Items not covered.* This standard does not cover all details of design and construction. Details that are not addressed shall be designed and constructed to be as adequate and as safe as those that would otherwise be provided under this standard.