

ANSI/AWWA

C900-22

(Revision of ANSI/AWWA C900-16)

AWWA Standard

Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

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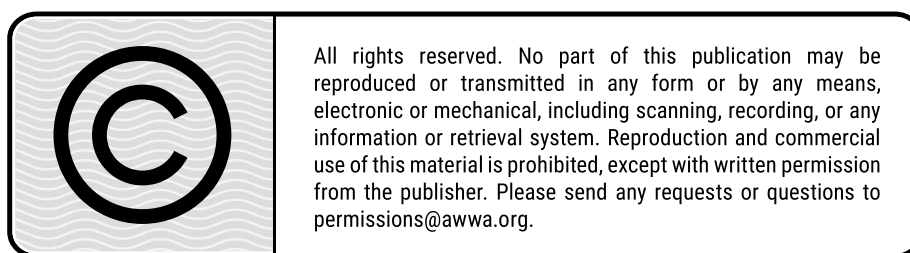
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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C900.

I. Introduction.

I.A. *Background.* This standard pertains to 4-in. through 60-in. (100-mm through 1,500-mm) polyvinyl chloride (PVC) pressure pipe[†] and fabricated fittings with outside diameter (OD) dimensions that conform with either those of ductile and cast iron pipe (CIOD) or steel pipe (IPS). Outside diameter to wall thickness (OD/*t*) dimension ratios (DRs) of 14, 17, 18, 21, 25, 26, 27.5, 32.5, 41, and 51 are included and correspond with pressure classes (PCs) of 305, 250, 235, 200, 165, 160, 150, 125, 100, and 80 psi. Design considerations are provided in AWWA Manual M23, *PVC Pipe—Design and Installation*. The manual includes chapters on general properties of PVC pipe; manufacturing, testing, and inspection; pressure capacity; design factors for external forces; hydraulics; receiving, storage, and handling; testing and maintenance; and service connections (tapping). Recommended installation guidance is provided in ANSI/AWWA C605, *Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings*.

I.B. *History.* In 1966, the American Water Works Association (AWWA) appointed Committee 8350-D to study and report on the adaptability of plastic pipe for use within the water industry. The committee presented its report on June 6, 1967, at AWWA's annual conference. The report included a recommendation that a task group be appointed to prepare standards for the use of plastic materials. The AWWA Standards Committee on Thermoplastic Pressure Pipe Standards Committee was established in 1968.

In June 1988, the Thermoplastic Pressure Pipe Committee was divided into two separate committees: The Polyvinyl Chloride Pressure Pipe and Fittings Standards Committee and the Polyolefin Pressure Pipe and Fittings Standards Committee.

ANSI/AWWA C900 was the first thermoplastic pipe standard approved by the AWWA Board of Directors in June of 1975. This is the seventh edition of ANSI/AWWA C900. Previous revisions to ANSI/AWWA C900 were prepared by the AWWA Standards Committee and approved in Jan. 1981, Jan. 1989, June 1997, June 2007, and on Jan. 16, 2016. This edition of ANSI/AWWA C900 was approved on June 10, 2022.

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

† Including requirements for pipe couplings.

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 (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.[‡] 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

1. Specific policies of the state or local agency.
2. Two standards developed under the direction of NSF[§], NSF/ANSI[¶]/CAN^{**} 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects.
3. 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/CAN 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/CAN 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.

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

[§] NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

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

^{**} Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

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

ANSI/AWWA C900 does not address additives requirements. Thus, 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. *Selection of Pressure Class.* This standard does not include information about PVC pipe design and installation. AWWA Manual M23, PVC Pipe—Design and Installation, provides detailed information to assist in the proper selection, handling, installation, operation, and acceptance testing of PVC pressure pipe. The minimum pressure class of the pipe selected should be equal to or greater than the system working pressure. The sum of the system working pressure and occasional surge pressure should not exceed 1.60 times the pressure class of the pipe. The system working pressure and recurring surge pressure should be analyzed using the method in Sec. 4.7. If surge pressures govern the selection of the pressure class, consideration should be given to removal of the cause of surge pressures or to the incorporation of surge suppressors in the system.

II.B. *UV Light Effects.* Ultraviolet (UV) radiation from sunlight can affect the outer surface coloration of PVC pipe. A UV inhibitor, usually titanium dioxide, is included in the pipe compound to absorb UV radiation. Even after prolonged exposure, PVC pipe's performance characteristics are not significantly altered. Outdoor storage recommendations are included in AWWA M23 and AWWA C605.

II.C. *Chlorine and Chloramine Degradation of Elastomers.* The selection of materials is critical for water service and distribution piping in locations where there is a possibility that elastomers will be in contact with chlorine or chloramines. Documented research has shown that elastomers such as gaskets, seals, valve seats, and encapsulations may be degraded when exposed to chlorine or chloramines. The impact of degradation is a function of the type of elastomeric material, chemical concentration, contact surface area, elastomer cross section, environmental conditions as well as temperature. Careful selection of and specifications for elastomeric materials and the specifics of their application for each water system component should be considered to provide long-term usefulness and minimum degradation (swelling, loss of elasticity or softening) of the elastomer specified.

NOTE: A pipe gasket having the compressed hardness of an elastomer with a large mass relative to the exposed surface area experiences minimal degradation. This was validated in a research paper reported in Journal AWWA (Volume 96, Number 4, April 2004, pp. 153–160) where the pipe gasket degradation in a 110-mg/L chloramine solution was found to be negligible.

II.D *PVC Oxidative Resistance.* PVC pipe and fittings are immune to both internal and external galvanic corrosion. PVC pipe and fittings are also resistant to degradation from long-term exposure water that has been treated with disinfectants, such as chlorine, chlorine dioxide, chloramines, bromine, and ozone. There are no issues and no performance evaluation requirements for either galvanic corrosion or water disinfectant oxidation resistance for PVC pipe and fittings.

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 application being considered.

III.A. *Purchaser Options and Alternatives.* The following items should be provided by the purchaser:

1. Standard to be used—that is, ANSI/AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), of latest revision.
2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, is required.
3. Pipe and fabricated fittings.*
 - a. Nominal size [for example, 14 in. (350 mm) CIOD].
 - b. Working, occasional, and recurring surge pressures (Section 3).
 - c. Pressure class or dimension ratio (DR) (see Tables 1A and 1B).
 - d. Linear feet of each pressure class or DR for each nominal pipe size to be furnished.
 - e. Number, nominal size, pressure class, or DR and configuration for fittings and couplings (for example, 17, nominal 24-in. DR 25, 45° bends, IPS).
4. Applicable details of federal, state, provincial, territorial, and local requirements (Sec. 4.2.1).

* Purchase documents may allow or require the use of fittings other than those described in ANSI/AWWA C900. Some examples of compatible fittings include those covered in ANSI/AWWA standards C907, C208, C153, and C110.

5. When desired, requirements such as the following should be specified in the purchase contract:
 - a. Standard lengths (Sec. 4.3.2.4).
 - b. Shipping (Sec. 6.2).
 - c. Affidavit of compliance (Sec. 6.3).
6. Plant inspection. If plant inspections are desired, provisions must be specified in the purchase contract (Sec. 5.3).
 - a. Production notice. The manufacturer should be required to give adequate advance notice of when and where production of ordered materials will start.
 - b. Inspection aids. The manufacturer should be required to make available, without charge, to the purchaser's inspector such tools and assistance as are necessary for inspection and handling of materials.
 - c. Inspection limitations. To exclude inspection of proprietary manufacturing processes, the manufacturer should be required to give adequate advance notice to the purchaser.

III.B. *Modification to Standard.* Any modifications to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major changes made to the standard in this edition include the following:

1. Clarification and update of pipe material requirements in Sec. 4.2.2.
2. Clarification of fabricated fitting material requirements in Sec. 4.2.6.
3. Update to burst pressure test specimen requirements in Sec. 4.3.3.2
4. Clarification of fabricated fitting pressure test requirements in Sec 4.5.5.
5. Clarification of occasional surge pressure allowance in Sec. 4.7.1.2.1.
6. Update to recurring surge pressure allowance in Sec. 4.7.1.2.2.
7. Update to recurring surge design example in Appendix B.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services Department, 303.794.7711; write to the Department, 6666 West Quincy Avenue, Denver, CO 80235-3098; or email standards@awwa.org.

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ANSI/AWWA C900-22
(Revision of ANSI/AWWA C900-16)

AWWA Standard

Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard covers polyvinyl chloride (PVC) pipe, machined PVC couplings, and fabricated PVC fittings manufactured for conveying potable water, reclaimed water, irrigation water, wastewater, or any fluid compatible with non-plasticized PVC. The standard includes eight-dimension ratios (DRs) and nominal sizes ranging from 4 in. through 60 in. (100 mm through 1,500 mm). Standard pipe outside diameters (ODs) conform to the ductile iron and cast iron sizing system, referred to as *cast iron* or *CIOD*, and steel pipe sizing system, referred to as *IPS* (iron pipe size). Pressure classes range from 80 psi (550 kPa) to 305 psi (2,100 kPa).

This standard does not include injection-molded PVC fittings. Injection-molded PVC fittings are covered in ANSI/AWWA C907.

Sec. 1.2 Purpose

The purpose of this standard is to provide minimum manufacturing, verification, and marking requirements for PVC pressure pipe and fabricated fittings, 4 in. (100 mm) through 60 in. (1,500 mm).

Sec. 1.3 Application

This standard can be referenced in documents for purchasing and receiving PVC pressure pipe and fabricated fittings, 4 in. (100 mm) through 60 in. (1,500 mm). The stipulations of this standard apply when this document has been referenced and then only to PVC pressure pipe and fabricated fittings, 4 in. (100 mm) through 60 in. (1,500 mm).

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI^{*}/AWWA C110/A21.10—Ductile-Iron and Gray-Iron Fittings.

ANSI/AWWA C153—Ductile-Iron Compact Fittings

ANSI/AWWA C907—Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water, Wastewater, and Reclaimed Water Service.

ASME[†]/ANSI B36.10—Welded and Seamless Wrought Steel Pipe.

ASTM[‡] D638—Standard Test Method for Tensile Properties of Plastics.

ASTM D1598—Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.

ASTM D1599—Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings.

ASTM D1784—Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

ASTM D2122—Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

ASTM D2152—Standard Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion.

ASTM D2290—Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe.

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

[†] ASME, Two Park Avenue, New York, NY 10016-5990.

[‡] ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.