



**American Water Works
Association**

The Authoritative Resource for Safe Drinking WaterSM

ANSI/AWWA C302-04
(Revision of ANSI/AWWA C302-95)

AWWA Standard

Reinforced Concrete Pressure Pipe, Noncylinder Type



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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C302.

I. Introduction.

I.A. *Background.* Reinforced concrete pressure pipe of the noncylinder type has been used extensively since the turn of the century. This type of pipe is made with one or more cages of steel reinforcing bars or wire encased in concrete. The concrete is usually placed by vertical or centrifugal casting methods. Rubber gasketed joints may have either steel or concrete bell and spigot surfaces. The pipe is manufactured in sizes ranging from 12 in. (300 mm) to more than 144 in. (3,660 mm) in diameter and is generally made in 8-ft (2.5-m) through 24-ft (7.5-m) laying lengths.

Reinforced concrete pressure pipe, noncylinder type, is designed for the specific combination of internal pressure and external load required for a project, in accordance with the procedures outlined in AWWA Manual M9, *Concrete Pressure Pipe*. This pipe is normally limited in working pressure to a maximum of 55 psi (380 kPa) and is used for low-pressure transmission lines in irrigation, industrial, and domestic water supply systems, and other applications (see Sec. III).

Design criteria and examples along with installation recommendations and other related data pertaining to this pipe are covered in AWWA Manual M9.

I.B. *History.* In April 1943, the AWWA Board of Directors authorized the preparation of "Tentative Emergency Specifications for Concrete Pressure Pipe." These tentative specifications, which covered several types of pipe in a single document, served a useful purpose during World War II but are now obsolete and have been withdrawn.

The first edition of this standard was approved as tentative on Sept. 4, 1951, and made a standard on May 5, 1953. The second edition was made a standard on July 19, 1957. Substantial changes, including the addition of limiting stresses for combined loading design, were incorporated into the third edition, which was made a standard on Jan. 27, 1964.

The fourth edition, dated Jan. 28, 1974, included several significant changes. Format and terminology were modified to generally conform to ANSI/AWWA C301, Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids, and section titles were added. The scope of sizes was changed to include 12-in. (300-mm) through 144-in. (3,660-mm) pipe with certain

length restrictions as a function of diameter. Provisions for concrete admixtures were included along with modifications of curing parameters. Design requirements and reference appendixes were added.

The fifth edition, dated June 14, 1987, included general format changes and several minor technical revisions for aggregates. Provisions for pozzolanic materials as a cement replacement under controlled conditions were introduced. Maximum levels for soluble chloride ion (Cl^-) content in the concrete mix were established. The criteria for curing the pipe were upgraded.

The sixth edition, dated Jan. 22, 1995, was rewritten to reflect the current AWWA standard style. The yield strength and testing frequency of steels was specified. Requirements for spacing of circumferential reinforcement and cage placement supports were added and requirements for rubber gaskets were expanded. The minimum pipe wall thickness requirements were extended for pipe sizes up to 144 in. (3,660 mm). A section on the design of fittings was added. The design procedures for this pipe that had been in appendix A were moved to AWWA Manual M9.

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 all direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (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. 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.

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

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 C302 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 all parties offering to certify products for contact with or treatment of drinking water.
3. Determine current information on product certification.

II. Special Issues. Special issues are addressed in AWWA Manual M9, *Concrete Pressure Pipe*.

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.

^{*}NSF International, 789 N. Dixboro Rd., Ann Arbor, MI 48113.

[†]American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

[‡]Both publications available from National Academy of Sciences, 2102 Constitution Ave. N.W., Washington, DC 20418.

III.A. *Purchaser Options and Alternatives.* The following items should be included in the purchaser's specifications:

1. Standard used, that is, ANSI/AWWA C302, Standard for Reinforced Concrete Pressure Pipe, Noncylinder Type, of latest revision.
2. The working pressure, surge pressure, field test pressure, depth and weight of earth cover, trench bedding condition, and live load for which the pipe is to be designed (Sec. 4.2.2).
3. If detailed drawings and schedules are to be submitted for review (Sec. 4.3.1 and Sec. 4.7.1).
4. If the manufacturer is not permitted to supply pipe from inventory (Sec. 4.3.1).
5. If a tabulated layout schedule will be required (Sec. 4.3.2).
6. Type of cement required, if there is a preference (Sec. 4.4.1.1).
7. If submission of the type and amount of admixtures will be required (Sec. 4.4.5).
8. If submission of manufacturer's design calculations for approval before manufacturing any pipe will be required.
9. If either steel or concrete bell and spigot joint, or double spigot and sleeve joint of steel and concrete will be required (Sec. 4.5.3.1).
10. If submission for approval of welder qualification (Sec. 4.6.2) and welding procedure specifications (Sec. 4.6.3) will be required.
11. Fittings details (Sec. 4.7.1).
12. If the purchaser desires to inspect the material, pipe, and fittings at the manufacturer's plant (Sec. 5.1.1).
13. If any material or manufacturing test reports will be required (Sec. 5.1.2).
14. If steel test specimens will be required (Sec. 5.2.3).
15. If welds in reinforcements will be required (Sec. 5.2.5).
16. If hydrostatic pressure testing of pipe at the manufacturer's yard will be required (Sec. 5.3.1).
17. If an affidavit of compliance is required (Sec. 6.3).

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

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

1. Supplier has been added to the definitions (Sec. 3).
2. The interval between specific gravity measurements and other tests on fine and coarse aggregate has been changed from six months to annually (Sec. 4.4.2 and Sec. 4.4.3).
3. The information on sampling, testing, and thickness of steel for fittings have been made separate sections and expanded upon (Sec. 4.4.6.5 and Sec. 4.4.6.6).
4. Reinforcement cages have been designated as either circular or elliptical in shape (Sec. 4.5.2).
5. The welder qualification requirements have been expanded to include additional welding codes (Sec. 4.6.2).
6. A new section for Welding Procedure Specifications has been added (Sec. 4.6.3).
7. The requirements for making concrete test cylinders during fabrication have been modified (Sec. 4.6.5.5).
8. The temperature requirements of the concrete during accelerated curing have been clarified (Sec. 4.6.6.2).
9. An extensive section on cracks in the piping has been added (Sec. 4.6.7).
10. The section on defective concrete or mortar has been rewritten (Sec. 4.6.8).
11. Maximum duration of the soaking period prior to hydrostatic pressure tests has been reduced to 48 hours (Sec. 5.3.2).
12. Information on required pipe markings has been added (Sec. 6.1).

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer and Technical Support Group (303) 794-7711, FAX (303) 795-7603, or write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or by e-mail at standards@awwa.org.

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