



**American Water Works  
Association**

The Authoritative Resource on Safe Water®

ANSI/AWWA C303-08  
(Revision of ANSI/AWWA C303-02)

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*AWWA Standard*

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# Concrete Pressure Pipe, Bar-Wrapped, Steel- Cylinder Type



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## Foreword

*This foreword is for information only and is not a part of ANSI/AWWA C303.*

### **I. Introduction.**

I.A. *Background.* Bar-wrapped, steel-cylinder concrete pressure pipe has been manufactured and used extensively for many years. The basic element of the pipe is a welded steel cylinder with steel joint rings welded to the ends, formed and tested in the same general manner as other types of steel-cylinder, concrete pressure pipe. The cylinder is lined with centrifugally placed cement mortar or concrete that is ½ in. (13 mm) thick for pipe sizes up to and including 16 in. (400 mm), and ¾ in. (19 mm) thick for larger sizes. Continuous reinforcing bar is then helically wound, under measured tension, around the lined cylinder; and a mortar coating not less than ¾ in. (19 mm) thick measured from the outside of the reinforcing bars is placed using high-velocity impaction.

This standard describes bar-wrapped, steel-cylinder concrete pressure pipe in sizes ranging from 10 in. through 72 in. (250 mm through 1,830 mm) in diameter, which is the prevailing range in sizes. The pipe is generally made in lengths ranging from 24 ft to 40 ft (7.5 m to 12.5 m). In this standard, however, the laying length for pipe 18 in. (450 mm) in diameter and smaller is restricted to a maximum of 36 ft (11 m). This type of pipe is used extensively for cross-country transmission mains, distribution feeder mains, water treatment plants, and other uses (see Section III, Use of This Standard).

I.B. *History.* The first edition of this standard, designated ANSI/AWWA C303-70, Standard for Reinforced Concrete Water Pipe—Steel Cylinder Type, Pretensioned, was approved by the AWWA Board of Directors Jan. 26, 1970. An addendum, designated ANSI/AWWA C303a-74, was subsequently approved Jan. 28, 1974. The third printing, issued July 27, 1973, included an erratum notice that corrected errors in the original printing. The second edition, designated ANSI/AWWA C303-78, Standard for Reinforced Concrete Pressure Pipe—Steel Cylinder Type, Pretensioned, for Water and Other Liquids, was approved June 25, 1978. In February 1981, an addendum designated ANSI/AWWA C303a-81 was approved and subsequently published. The third edition, designated ANSI/AWWA C303-87 with the same title as the second edition, was approved on June 14, 1987. The fourth edition, designated ANSI/AWWA C303-95, Standard for Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type, was approved on Jan. 22, 1995. The fifth edition, designated ANSI/AWWA C303-02, was approved on June 16, 2002. This edition was approved on Jan. 27, 2008.

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 American Water Works Association Research Foundation (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 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<sup>†</sup>/ANSI<sup>‡</sup> 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*,<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 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

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\* 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.

§ Both publications available from National Academy of Sciences, 500 Fifth Street N.W., Washington, DC 20418.



(noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C303 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. *Deflection control.* The pipe described in this standard will safely support normal and usual external loads when installed according to appropriate and adequate bedding and backfilling procedures. To ensure satisfactory performance and continued serviceability of the pipe, bedding, and backfilling procedures must be followed that will enable the deflection of the pipe to be controlled and kept within the limits contained in AWWA Manual M9, *Concrete Pressure Pipe*.

II.B. *Other special issues.* Other special issues, including field welding of pipe joints, are addressed in AWWA Manual M9.

**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.* Purchasers are advised that, while this standard presents information on materials and procedures for manufacture of the pipe, it does not contain all of the engineering information needed to prepare a complete specification for a particular pipeline installation. A specific installation may require provisions more restrictive than those in the standards and most certainly will require additional design and installation features.

AWWA Manual M9 should be considered a supplement to this standard. Material in the manual should not be regarded as superseding any portion of this standard. The purpose of AWWA Manual M9 is to provide information concerning some of the various subjects to be considered in, and the minimum standard of practice for, the design and installation of concrete pressure pipelines.

The following items should be included by the purchaser:

1. Standard used—that is, ANSI/AWWA C303, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type, of latest revision.
2. Manner of storage and delivery, if required of the manufacturer.

3. Working pressure, surge pressure, field-test pressure, external loading conditions, and method of bedding and backfilling (Sec. 4.2.2).
4. If detailed drawings and schedules are to be submitted for review (Sec. 4.3.1 and 4.7.1).
5. If the manufacturer is not permitted to supply pipe from inventory (Sec. 4.3.1).
6. If a tabulated layout schedule will be required (Sec. 4.3.2).
7. Details of other federal, state or provincial, and local requirements (Sec. 4.4).
8. If any material or manufacturing test reports will be required (Sec. 4.4, 5.1.2, and 5.2).
9. Type of cement required if there is a preference (Sec. 4.4.1.1).
10. If submission of the type and amount of admixtures will be required (Sec. 4.4.4).
11. If submission of manufacturer's design calculations will be required (Sec. 4.5.2.1).
12. If submission for approval of welder qualifications (Sec. 4.6.2 and 4.6.3), welding procedure specifications will be required (Sec. 4.6.3).
13. If details of specials and fittings are to be provided by the manufacturer (Sec. 4.7.1).
14. If the purchaser desires to inspect the material, pipe, and fittings at the manufacturer's plant (Sec. 5.1.1).
15. If any material or manufacturing test reports will be required (Sec. 5.1.4).
16. If steel test specimens will be required (Sec. 5.2.6).
17. If an affidavit of compliance will be required (Sec. 6.3).

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

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

1. Tolerance allowance for cylinder to joint ring weld assembly was added (Sec. 4.6.4.2.7).
2. Fittings maximum circumferential stress under working pressure is now defined. Also, a design guideline is now provided for bends having radii less than 2½ times the nominal pipe diameter (Sec. 4.7.2.1). This section also provides guidelines for permissible reinforcement to increase the stiffness of fittings (Sec. 4.7.2.1).
3. Bar reinforcement wrap was added as an alternative to welded wire reinforcement (Sec. 4.7.2.3).

4. Section requiring a quality assurance program was added (Sec. 5.3).

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

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## *AWWA Standard*

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# **Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type**

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## **SECTION 1: GENERAL**

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### **Sec. 1.1 Scope**

This standard describes the manufacture of concrete pressure pipe, reinforced with a steel cylinder that is helically wrapped with mild steel bar reinforcement, in sizes ranging from 10 in. through 72 in. (250 mm through 1,830 mm), inclusive, and for working pressures up to 400 psi (2,760 kPa). Larger pipe sizes and pipe accommodating higher pressures have been manufactured based on the concepts of this standard. With agreement by the purchaser and the manufacturer, pipe may be manufactured to larger sizes and for higher pressures than indicated herein. This standard does not include requirements for design, handling, delivering, laying, field testing, or disinfecting of pipe and fittings. See AWWA Manual M9, *Concrete Pressure Pipe*, for information on these topics.

1.1.1 *Essential requirements.* The pipe shall have the following principal features: a welded steel cylinder with sized steel joint rings welded to the ends; a lining of concrete or cement mortar centrifugally applied within the steel cylinder and spigot ring; reinforcement consisting of continuous steel bar helically wound tightly around the outside of the cylinder and securely fastened by welding to the steel joint ring at each end of the cylinder; a coating of dense mortar covering the