

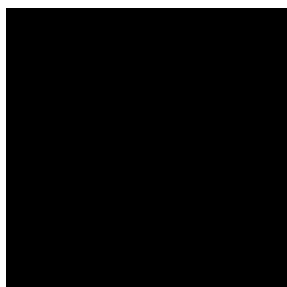
American Water Works Association

ANSI/AWWA C200-97

(Revision of ANSI/AWWA C200-91)



AWWA STANDARD
FOR
STEEL WATER PIPE—6 IN. (150 mm)
AND LARGER



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AMERICAN WATER WORKS ASSOCIATION

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Foreword

This foreword is for information only and is not a part of AWWA C200.

I. Introduction.

I.A. *Background.* This standard covers butt-welded, straight seam or spiral seam steel pipe, 6 in. (150 mm) and larger, for transmission and distribution of water, including fabrication of pipe, requirements of welding operations, permissible variations of weight and dimensions, preparation of ends, fabrication of specials, inspection, and test procedures.

I.B. *History.* The first AWWA steel pipe standards issued were 7A.3 and 7A.4, published in 1940. Standard 7A.4 pertained to steel pipe smaller than 30 in. (750 mm) in diameter, and 7A.3 pertained to steel pipe 30 in. (750 mm) in diameter and larger. Subsequently, in recognition that some pipe used in water utility service was manufactured in steel mills rather than in a fabricator's shop, two new AWWA standards were issued in 1960. AWWA C201 replaced 7A.3 and pertained to all pipe, regardless of diameter, manufactured in a fabricator's shop from steel sheet or plate. The physical and chemical properties are properties of the sheet or plate from which the pipe is made. The properties are a function of the steel mill practice and are not affected significantly by fabricating procedures. AWWA C202 replaced 7A.4 and pertained to mill pipe, which is normally produced in a production pipe mill. The specified physical and chemical properties are those of the completed pipe. Physical testing is performed on the pipe rather than on the steel from which it originates. In many cases, the physical properties are significantly affected by the pipe-manufacturing procedure. AWWA C201 was revised in 1966, and AWWA C202 was revised in 1964. Both AWWA C201 and AWWA C202 were superseded by AWWA C200-75, approved by the AWWA Board of Directors on Jan. 26, 1975.

AWWA C200 includes all types and classes of steel pipe, 6 in. (150 mm) in diameter and larger, used in water utility service, regardless of the pipe manufacturing source. With adequate quality assurance, pipe manufactured in a fabricator's shop or in a steel pipe mill is suitable for water utility service. Pipe produced in a pipe mill according to one of the ASTM* standards cited in AWWA C200 will be subjected to specific quality-control procedures so that no further testing is required by AWWA C200. Shop-fabricated pipe made from materials and in accordance with the quality-control measures stipulated in AWWA C200 will be of high quality.

By reference, AWWA C202 (which pertained to mill-type steel water pipe) included API† 5L and API 5LX pipe grades manufactured to API standards for high-pressure applications. With the inclusion of ASTM A570/A570M and ASTM A572/A572M high-strength steels in AWWA C200, API high-pressure pipe was omitted from AWWA C200 as being redundant. However, API 5L and API 5LX pipe grades fully meet all requirements of AWWA C200 and can be used for water utility applications if dictated by availability or other economic considerations.

*American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

†American Petroleum Institute, 1220 L St. N.W., Washington, DC 20005.

AWWA C200-75 introduced design criteria for determination of wall thickness to meet internal pressure conditions. This facilitated the selection of the optimum combination of thickness and material for steel pipe.

Revisions in ANSI/AWWA C200-86 included clarification of forming for lap joint ends and gasketed ends and testing of O-ring gaskets. ANSI/AWWA C200-91 was approved by the AWWA Board of Directors on June 23, 1991. This edition was approved by the AWWA Board of Directors on Feb. 2, 1997.

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.
3. Two standards developed under the direction of NSF, ANSI[†]/NSF[‡] 60, Drinking Water Treatment Chemicals—Health Effects, and ANSI/NSF 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 ANSI/NSF 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.

Appendix A, “Toxicology Review and Evaluation Procedures,” to ANSI/NSF 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 Appendix A procedures may not always be identical, depending on the certifier.

*Persons in Canada, Mexico, and non-North American countries should contact the appropriate authority having jurisdiction.

†American National Standards Institute, 11 W. 42nd St., New York, NY 10036.

‡NSF International, 3475 Plymouth Rd., Ann Arbor, MI 48106.

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

AWWA C200-97 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.

II.A. *Advisory Information on Product Application.*

Basis of design. ANSI/AWWA C200-97 pertains to the manufacture and testing of the steel-pipe cylinder. Overall design of steel pipelines is described in AWWA Manual M11, *Steel Pipe—A Guide for Design and Installation*. Coatings that protect against corrosion are referenced in Sec. 4.5 of ANSI/AWWA C200-97.

The determination of the wall thickness of steel pipe is affected by (1) internal pressure, including operating static and transient pressures; (2) external loads, including trench loading and earth fill; (3) special physical loading, such as continuous-beam loading with saddle supports or ring girders, vacuum conditions, type of joint used, and variations in operating temperature; and (4) practical considerations for handling, shipping, lining and coating, or similar operations.

The design techniques described in AWWA Manual M11 are used to determine minimum wall thicknesses of steel pipe. The purchaser may establish and specify the wall thickness determined to be satisfactory for all conditions, including internal pressure. Selection of design stresses and deflection limits should be made with regard to the properties of the lining and coating materials used. Alternatively, the purchaser may establish and specify the minimum wall thickness that will satisfy all conditions of external pressure and trench loadings and special physical loadings. The manufacturer is allowed to select materials and manufacturing processes within the limitations of this standard in order to produce pipe to the wall thickness required to additionally satisfy specified internal pressure. The purchaser should specify the internal design pressure and show the depth of cover over the pipe together with installation conditions. The manufacturer should select and furnish pipe having a wall thickness that meets the requirements of the internal design pressure and external load design. This thickness should govern if it is greater than the minimum thickness specified by the purchaser. To meet the requirements of internal design pressure, the pipe wall thickness is determined by using the following formula:

$$t = \frac{PD}{2S} \quad (\text{Eq F.1})$$

Where:

- t = design nominal wall thickness for the specified internal design pressures. Thickness and weight tolerances for pipe shall be governed by the requirements of the specification to which the plates or sheets are ordered (in. [mm])
- P = internal design pressure (psi [kPa])—specified by the purchaser
- D = outside diameter of the steel pipe cylinder (in. [mm])

S = design stress (psi [kPa]), not to exceed the purchaser-specified percentage of the minimum yield point of the steel selected by the manufacturer

Application. This standard covers the requirements for steel water pipe for use in water transmission and distribution under normal circumstances. It is the responsibility of the purchaser for each project to determine if any unusual circumstances related to the project require additional provisions that are not included in the standard. Such special conditions might affect design, manufacture, quality control, corrosion protection, or handling requirements.

Brittle fracture precautions. Under certain conditions where a restrained pipeline with welded lap joints has a pipe wall thickness in excess of ½ in. (12.7 mm) and the pipeline is to be operated at high stress levels at temperatures below 40°F (5°C), the purchaser should take precautions to prevent brittle fracture, which can result from a combination of notches and high stress concentrations at the joints. Precautions may include specifying a steel with adequate notch toughness and transition temperature; and fabrication techniques that would reduce the possibility of brittle fracture.

NOTE: For more information on brittle fracture, refer to AWWA Manual M11, *Steel Pipe—A Guide for Design and Installation*; and R.V. Phillips et al., “Pipeline Problems—Brittle Fracture, Joint Stresses, and Welding,” *Journal AWWA*, 64:7:421 (July 1972).

Rubber-gasketed joints. A gasket manufactured from natural rubber or 100 percent synthetic polyisoprene, if improperly installed, may revert to its uncured state through hysteresis. This condition may occur if a fish-mouthed gasket (that is, where a portion of the gasket is not contained within the gasket groove) is subjected to heat generated by excessive vibration caused by leakage past the gasket when the pipeline is pressurized.

Testing of special sections. Section 5.2.2.1 provides for nondestructive testing of the seams of specials. This testing should be adequate for normal conditions previously discussed under Application. Section 5.2.2.2 describes test methods that may be necessary if, in the opinion of the purchaser, unusually severe conditions exist, such as surge or transient pressures that cause stresses exceeding 75 percent of yield. This special testing must be specified by the purchaser.

Roundness of pipe. The roundness of pipe during handling, shipping, joint makeup, and backfilling should be covered in the purchaser’s specifications. Pipe may have to be stilled so it will remain round during transportation, installation, and backfilling.

III. Use of This Standard. AWWA has no responsibility for the suitability or compatibility of the provisions of this standard to any intended application by any user. Accordingly, each user of this standard is responsible for determining that the standard’s provisions are suitable for and compatible with that user’s intended application.

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

1. Standard used—that is, AWWA C200, Standard for Steel Water Pipe—6 In. (150 mm) and Larger, of latest revision.
2. A description or drawings indicating the diameter and total quantity of pipe required for each diameter.
3. Internal design pressure.