ANSI/AWWA **C200-23**

(Revision of ANSI/AWWA C200-17)

AWWA Standard

Steel Water Pipe, 6 In. (150 mm) and Larger

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American Water Works Association

AWWA Standard

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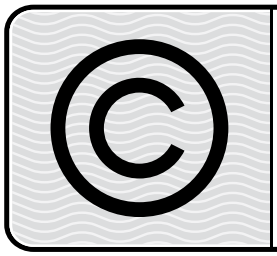

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Contents

All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

Foreword

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

I. Introduction.

I.A. *Background*. This standard covers butt-joint 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 thickness and dimensions, preparation of ends, fabrication of special sections, 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 Both AWWA C201 and AWWA C202 were superseded by AWWA C200-75, approved by the AWWA Board of Directors on January 26, 1975.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.

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

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

† American Petroleum Institute, 200 Massachusetts Ave NW, Suite 1100, Washington, DC 20001.

high-strength steels in AWWA C200-75, API high-pressure pipe was omitted from AWWA C200-75 as being redundant. API 5L and API 5LX pipe grades fully met all requirements of AWWA C200 and could be used for water utility applications if dictated by availability or other economic considerations.

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

Revisions in AWWA C200-86 included clarification of forming for lap-joint ends and gasketed ends and testing of O-ring gaskets. Subsequent editions of this standard were approved by the AWWA Board of Directors on June 23, 1991; February 2, 1997; June 12, 2005, June 10, 2012, and January 14, 2017. This edition was approved on October 23, 2023.

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). 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. Four standards developed under the direction of NSF[§], NSF/ANSI/CAN[¶] 60, Drinking Water Treatment Chemicals—Health Effects, NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, NSF/ANSI/CAN 372—Drinking Water System Components— Lead Content, and NSF/ANSI/CAN 600, Health Effects Evaluation and Criteria for Chemicals in Drinking Water.

[‡] Persons outside the United States should contact the appropriate authority having jurisdiction.
[§] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.
[¶] Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

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.

NSF/ANSI/CAN 600 (which formerly appeared in NSF/ANSI/CAN 60 and NSF/ANSI/CAN 61 as Annex A, "Toxicology Review and Evaluation Procedures") 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 NSF/ANSI/CAN 600 procedures may not always be identical, depending on the certifier.

ANSI/AWWA C200 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. *Advisory Information on Product Application*.

1. Basis of design. ANSI/AWWA C200 pertains to the manufacture and testing of the steel-pipe cylinder. Coatings that protect against corrosion are referenced in Sec. 4.12. ANSI/AWWA C604, Installation of Buried Steel Water Pipe, 4 In. (100 mm) and Larger, which provides field installation guidelines. Overall design of steel pipelines is described in AWWA M11, *Steel Water Pipe: A Guide for Design and Installation*.

Design of the wall thickness of steel pipe is primarily affected by internal pressure, including working, transient, and test pressures. Other factors that may influence the designed wall thickness are external loads, including trench loading and earth fill; special physical loading, such as continuous-beam loading with saddle supports or

** Both publications available from National Academy of Sciences, 2101 Constitution Ave. NW, Washington, DC 20418.

ring girders; vacuum conditions; type of joint used; and practical considerations for handling, shipping, lining, and coating or similar operations.

The design techniques described in AWWA M11 are used to determine required wall thicknesses of steel pipe. The purchaser may establish and specify a wall thickness determined to be satisfactory for all conditions, including internal pressure, trench loadings, special physical loadings, and handling. Selection of design stresses and deflection limits should be made with regard to the properties of the lining and coating materials used. The purchaser may alternatively specify the performance criteria for the pipeline, in which case the manufacturer, using AWWA standards, provides the wall-thickness calculations for purchaser acceptance. Performance criteria provided should include internal design pressures, external loading, and any other special conditions. The manufacturer is allowed to select materials and manufacturing processes within the limitations of this standard to produce pipe to the wall thickness required to additionally satisfy the specified performance criteria. This thickness should govern if it is greater than the wall thickness specified by the purchaser. Thickness tolerances for pipe are governed by the requirements of this standard.

2. Application. This standard describes 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.

3. Brittle fracture precautions. Sec. 4.5.2 provides test requirements for steel to ensure notch toughness. Under certain conditions where a restrained pipeline with welded lap joints will be used, notch toughness verification may be necessary; see also ANSI/AWWA C206, Field Welding of Steel Water Pipe.

4. Testing of special sections. Sec. 5.2.2 provides for nondestructive testing of the weld seams of special sections. This testing should be adequate for normal conditions previously discussed under Item 2, Application.

5. Roundness of pipe. The roundness of pipe during handling, shipping, joint makeup, and backfilling should be covered in the purchaser's documents. When requested, the pipe is delivered with internal bracing for shipping and handling purposes. Although not generally designed for such, bracing can reduce the flexibility of the pipe while placement of the haunch and sidefill materials takes place. Internal bracing is not designed to support construction or earth loads above the pipe and may cause damage to the pipe or pipe lining in these conditions. Bracing design for

purposes other than shipping and handling is the responsibility of the constructor. Additional information on bracing can be found in ANSI/AWWA C604 Installation of Buried Steel Water Pipe—4 In. (100 MM) and Larger and AWWA M11, *Steel Pipe: A Guide for Design and Installation*.

II.B *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, and 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.

II.B.1. *Gasket Degradation Study.* A pipe gasket, having the hardness of a compressed elastomer with a large mass relative to the small, exposed surface area, thus experiences minimal degradation. This was validated in a research paper reported in *Journal AWWA*,* in which the pipe gasket degradation in a 110 mg/L chloramine solution was found to degrade just the exposed surface.

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 provided by the purchaser.

1. Standard used—that is, ANSI/AWWA C200, Steel Water Pipe, 6 In. (150 mm) and Larger, of latest revision.
2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water Treatment Components—Health Effects, is required.
3. Descriptions or drawings indicating the nominal diameter, outside diameter or finished inside diameter after lining, and total quantity of pipe required for each diameter.
4. Internal design pressure(s) (AWWA M11).

* R.W. Bonds. 2004. Effect of Chloramines on Ductile-Iron Pipe Gaskets of Various Elastomer Compounds. *Journal AWWA,* 96(4):153–160.

5. External design pressures and other special physical loadings (AWWA M11).

6. Permeation requirements (Sec. 4.1).

7. Details of federal, state, provincial, territorial, and local requirements (Sec. 4.2).

8. The drawings and calculations to be provided by the manufacturer if required (Sec. 4.3 and Sec. 4.4).

9. Specification of steel if there is a preference (Sec. 4.5).

10. Minimum service temperature for toughness requirements (Sec. 4.5.2).

11. Wall thickness (Sec. 4.5.3).

12. Qualification code for automatic welding (Sec. 4.6.1).

13. Qualification code for manual welding (Sec. 4.6.1).

14. Type of pipe ends (description or drawings) (Sec. 4.11).

15. Requirements for reports of tests of rubber-gasket materials (Sec. 4.11.3.3).

16. Protective coating or lining if applicable (Sec. 4.12).

17. All special sections, indicating for each component part the dimensions or standard designation (Sec. 4.13).

18. Instructions regarding inspection at place of manufacture (Sec. 5.1).

19. Method, acceptance criteria, location, and frequency of nondestructive testing to be used for special sections (Sec. 5.2.2.1).

20. Test reports if required (Sec. 5.4).

21. Requirements for marking, line diagrams, or laying schedules (Sec. 6.1).

22. Special handling requirements and allowable out-of-roundness (Sec. 6.2).

23. Affidavit of compliance if required (Sec. 6.3).

III.B. *Modification to Standard*. Any modification of 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. Updated Sec. I.C. Acceptance in the Foreword with the latest Standards Council language reflecting the addition of reference to NSF/ANSI/CAN 372 and NSF/ANSI/CAN 600.

2. In Sec. II.A Advisory Information on Product Application in the Foreword, Item 5 Roundness of Pipe was revised to provide more information on bracing.

3. The scope was updated to include raw and reclaimed water and wastewater since the standard is applicable to these (Sec. 1.1).

4. The definitions for potable, raw, reclaimed water, and wastewater were added, and the definitions for bevel, check analysis, flame cutting, MT, PT, RT, random lengths, UT, and VT were deleted from Section 3 Definitions.

5. Updated Sec. 4.1 Permeation and Sec. 4.2. Materials with the latest Standards Council boilerplate language.

6. The information in Sec. 4.6 Requirements for Welding Qualifications was rearranged, combined, and slightly revised for better flow.

7. Figure 2 Repair method by offset value and wall thickness was revised to include coil-splice welds.

8. Sec. 4.8.1 Weld-test specimens was renamed and separated into two sections.

9. Sec. 4.9.4.2 on random lengths was deleted.

10. A new Sec. 4.11.5 Ends for field butt joint welding with subsections Sec. 4.11.5.1 Squareness of pipe ends and Sec. 4.11.5.2 End face tolerances was added to update and replace beveled ends section. This separates butt joint end squareness and butt joint face assessment.

11. Sec. 4.11.6.4 Testing and certification was revised.

12. Sec. 4.11.6.5 Gasket dimensions and tolerances was revised and updated splice testing.

13. A new Figure 9 Field butt joint end tolerance was added.

14. Sec. 4.11.8.2 Diameter was rearranged and revised.

15. In Sec. 5.2.2.1 Nondestructive testing (NDT), Item 6, Hydrostatic testing of specials was clarified to be at a maximum of the design pressure of the special.

16. Sec. 5.2.2.2 NDT qualifications were clarified for specific methods.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711; 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
Dedicated to the World's Most Vital Resource®

AWWA Standard

Steel Water Pipe, 6 In. (150 mm) and Larger

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes electrically butt-joint–welded straight-seam or spiral-seam pipe and seamless pipe, 6 in. (150 mm)* in nominal diameter and larger, for the transmission and distribution of potable, raw, and reclaimed water; wastewater; or for use in other water system facilities.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for steel water pipe, 6 in. (150 mm) and larger, including materials and quality of work, fabrication, and testing of pipe and special sections.

Sec. 1.3 Application

This standard can be referenced in the purchaser's documents for steel water pipe, 6 in. (150 mm) and larger. The stipulations of this standard apply when this document has been referenced and then only to steel water pipe, 6 in. (150 mm) and larger.

* Metric conversions given in this standard are direct conversions of US customary units and are not those specified in the International Organization for Standardization (ISO) standards.