

ANSI/A

C151/A21.51-23

(Revision of ANSI/AWWA C151/A21.51-17)

AWWA Standard

Ductile-Iron Pipe, Centrifugally Cast

Effective date: May 1, 2024.

First edition approved by Board of Directors 1965.

This edition approved Oct. 23, 2023.

Approved by American National Standards Institute Jan. 19, 2024.



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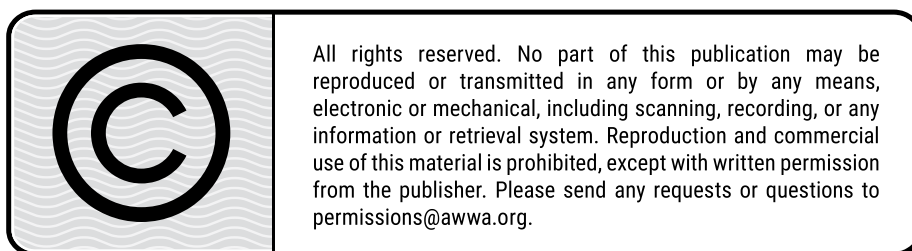
AWWA Standard

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ISBN-13, print: 978-1-64717-184-1

ISBN-13, electronic: 978-1-61300-711-2

DOI: <http://dx.doi.org/10.12999/AWWA.C151.23>

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C151/A21.51.*

I. Introduction.

I.A. *Background.* The purpose of this standard is to provide information to specifiers and users of ductile-iron pipe on the minimum manufacturing requirements of this pipe. This standard includes requirements for laying lengths, dimensional tolerances, marking, and plant tests. In addition to dimensional tables, tables based on the design procedure in ANSI/AWWA C150/A21.50 are included on nominal thicknesses and standard classes of ductile-iron pipe required for various external load and internal pressure conditions as a convenience to the users of this standard.

Section III.A of this foreword lists certain purchaser options and alternatives that users of this standard should consider in purchaser documents for ductile-iron pipe.

Although ANSI/AWWA C151/A21.51 is commonly referenced for ductile-iron pipe for services other than water, users are also directed to ASTM A746, Standard Specification for Ductile Iron Gravity Sewer Pipe, and ASTM A716, Standard Specification for Ductile Iron Culvert Pipe.

I.B. *History.* American National Standards Committee A21 on Cast-Iron Pipe and Fittings was organized in 1926 under the sponsorship of the American Gas Association (AGA), the American Society for Testing and Materials (ASTM), AWWA, and the New England Water Works Association (NEWWA). Between 1972 and 1984, the cosecretariats were AGA, AWWA, and NEWWA, with AWWA serving as administrative secretariat. In 1984, the committee became an AWWA committee called the AWWA Standards Committee A21 on Ductile-Iron Pipe and Fittings. In 1988, NEWWA withdrew as a separate secretariat; however, it continues to maintain its representation on AWWA Committee A21.

The present scope of AWWA Committee A21 activity is the development of standards and manuals addressing ductile-iron pressure pipe for water and other liquids and ductile-iron and gray-iron fittings for use with such pipe. These standards and manuals include design, dimensions, materials, coatings, linings, joints, accessories, and methods of inspection and testing.

The work of AWWA Committee A21 is conducted by subcommittees. The scope of Subcommittee 1, Pipe, includes the periodic review of current Committee A21

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10018

standards for pipe, the preparation of revisions and new standards when needed, and other matters pertaining to pipe standards.

The first edition of ANSI/AWWA C151/A21.51, Standard for Ductile-Iron Pipe for Water and Other Liquids, was issued in 1965. Subsequent revisions to ANSI/AWWA C151/A21.51 were prepared by the AWWA Standards Committee and approved by the AWWA Board of Directors in 1971, 1976, 1981, 1986, 1991, 1995, 2002, 2009, and 2017. This edition of C151/A21.51 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. 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.

[†] 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.

[¶] Both publications available from National Academies Press, 500 Fifth Street, NW, Washington, DC 20001.

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.

ANSI/AWWA C151/A21.51 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.* Unless otherwise provided by the purchaser, pipe and accessories shall comply with this standard. Pipe and accessories not complying with this standard shall be replaced by the supplier at the agreed point of delivery. The supplier shall not be liable for shortages or damaged pipe after the pipe is accepted at the agreed point of delivery except as recorded on the delivery receipt or similar document by the carrier’s agent.

In order to meet a project’s schedule, at the manufacturer’s option and with the purchaser’s agreement, pipe may be shipped whose class is heavier than required or ordered.

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.

Note: Readers may reference the article titled “Effect of Chloramines on Ductile-Iron Pipe Gaskets of Various Elastomer Compounds” (*Journal AWWA*, Volume 96,

Number 4, April 2004, pp. 153–160) for additional information regarding the potential for gasket degradation upon exposure to an oxidant. This paper concluded that a pipe gasket having the compressed hardness of an elastomer with a large mass relative to the exposed surface area experiences minimal degradation following exposure to a 110-mg/L chloramine solution.

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 items should be covered by the purchaser:

1. Standard used—that is, ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, of latest revision.
2. For applications other than potable water, whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, is required.
3. Size, joint type, thickness or class, and laying length (see Tables 1, 2, 3, 4, 5, 6, A.1, and A.2; and Sec. 4.3.2).
4. Details of federal, state, provincial, territorial, and local requirements (Sec. 4.1).
5.
 - a. Special joints (Sec. 4.3.1).
 - b. Specifying ductile-iron gland, if required (Sec. 4.3.1).
6.
 - a. Elimination of outside coating (Sec. 4.4.1).
 - b. Elimination of cement-mortar lining (Sec. 4.4.2). Experience has indicated that asphaltic inside coating is not complete protection against loss in pipe capacity caused by tuberculation. Cement-mortar linings are recommended for most waters.
 - c. Special coatings and linings (Sec. 4.4.3).
7. Special marking on pipe (Sec. 4.7).
8. Certification by manufacturer (Sec. 5.1.1).
9. Inspection by purchaser (Sec. 5.1.2).
10. Orientation of impact-test specimen cut from pipe wall (Sec. 5.2.2.2).
11. Additional tests (Sec. 5.5).
12. Request for an affidavit of compliance (Sec. 6.2).

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. Option for shipping heavier pipe with agreement of the purchaser was added to Section II, Special Issues, in the Foreword.
2. Information on chlorine degradation of elastomers added to Section II in the Foreword.

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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ANSI/AWWA C151/A21.51-23
(Revision of ANSI/AWWA C151/A21.51-17)

AWWA Standard

Ductile-Iron Pipe, Centrifugally Cast

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes 3-in. through 64-in. (80-mm* through 1,600-mm) ductile-iron pipe, centrifugally cast, for potable water, raw water, wastewater, and reclaimed water systems with push-on joints or mechanical joints. Requirements for pipe according to this standard are discussed in the text and are shown in Tables 1, 2, 3, 4, 5, and 6 and Figures 1, 2, and 3. This standard may be used for pipe with other types of joints as may be agreed on at the time of purchase.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for ductile-iron pipe, centrifugally cast, for potable water, raw water, wastewater, and reclaimed water systems.

Sec. 1.3 Application

This standard can be referenced in specifications for ductile-iron pipe, centrifugally cast, for potable water, raw water, wastewater, and reclaimed water systems. The stipulations of this standard apply when this document has been referenced and then only to ductile-iron pipe, centrifugally cast, for potable water, raw water, wastewater, and reclaimed water systems.

* Metric identifiers in this standard are nominal sizes and are not those specified in International Organization for Standardization (ISO) standards.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, these documents 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.

AASHTO* T-99—Standard Method of Test for the Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

ANSI†/AWWA C104/A21.4—Cement–Mortar Lining for Ductile-Iron Pipe and Fittings.

ANSI/AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

ANSI/AWWA C150/A21.50—Thickness Design of Ductile-Iron Pipe.

ANSI/AWWA C600—Installation of Ductile-Iron Water Mains and Their Appurtenances.

ANSI/AWWA C800—Underground Service Line Valves and Fittings.

ASTM‡ D2487—Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

ASTM D3282—Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

ASTM E8—Standard Test Methods for Tension Testing of Metallic Materials.

ASTM E23—Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.

NSF§/ANSI/CAN¶ 61—Drinking Water System Components—Health Effects.

SECTION 3: DEFINITIONS

The following definitions shall apply in this standard:

1. *Accessory*: A component of a pipe joint, such as gasket, bolt, gland, lubricant, and so on.

* American Association of State Highway and Transportation Officials, 555 12th Street NW, Ste. 1000, Washington, DC 20004.

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

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

§ NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

¶ Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.