



**American Water Works
Association**

Dedicated to the World's Most Important Resource®

ANSI/AWWA C151/A21.51-17
(Revision of ANSI/AWWA C151/A21.51-09)

AWWA Standard

Ductile-Iron Pipe, Centrifugally Cast

Effective date: June 1, 2017.

First edition approved by AWWA Board of Directors 1965.

This edition approved Jan. 14, 2017.

Approved by American National Standards Institute Feb, 14, 2017.



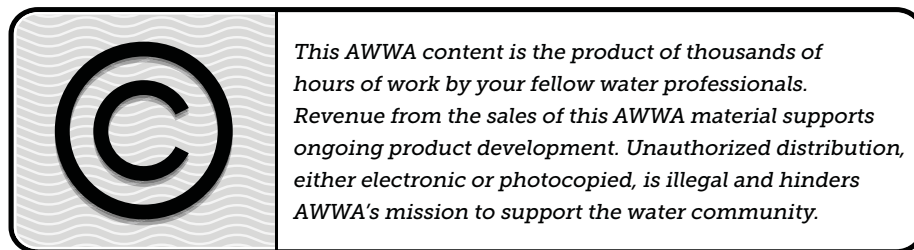
AWWA Standard

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. This standard does not supersede or take precedence over or displace any applicable law, regulation, or code of any governmental authority. AWWA standards are intended to represent a consensus of the water industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the Official Notice section of *Journal – American Water Works Association*. The action becomes effective on the first day of the month following the month of *Journal – American Water Works Association* publication of the official notice.

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

CAUTION NOTICE: The American National Standards Institute (ANSI) approval date on the front cover of this standard indicates completion of the ANSI approval process. This American National Standard may be revised or withdrawn at any time. ANSI procedures require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036; 212.642.4900; or emailing info@ansi.org.



ISBN-13, print: 978-1-62576-219-1

eISBN-13, electronic: 978-1-61300-419-7

DOI: <http://dx.doi.org/10.12999/AWWA.C151.17>

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information or retrieval system, except in the form of brief excerpts or quotations for review purposes, without the written permission of the publisher.

Copyright © 2017 by American Water Works Association
Printed in USA

Committee Personnel

Subcommittee 1, Pipe, which reviewed this standard, had the following personnel at the time:

Maury D. Gaston, *Chair*

General Interest Members

M.B. Horsley, Horsley Engineering LLC, Overland Park, Kan.	(AWWA)
S.M. Passarelli,* Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)
J.R. Plattsmier, HDR Engineering Inc., Denver, Colo.	(AWWA)
P.A. Selig, consultant, Vestavia, Ala.	(DIPRA)
K.E. Wilson, Atkins, Tampa, Fla.	(AWWA)
L.C. Yates, McGoodwin, Williams & Yates, Fayetteville, Ark.	(AWWA)

Producer Members

L.R. Dunn, U.S. Pipe & Foundry Company, Birmingham, Ala.	(AWWA)
J.H. Eddings, McWane Ductile, Phillipsburg, N.J.	(DIPRA)
J.A. Fancher,† American Cast Iron Pipe Company, Birmingham, Ala.	(AWWA)
M.D. Gaston, American Cast Iron Pipe, Birmingham, Ala.	(DIPRA)
L.G. Horn, Ductile Iron Pipe Research Association, Birmingham, Ala.	(AWWA)
K.J. Kempf,† Kempf Holdings LLC, DbA Foundry Services Co., Omaha, Neb.	(AWWA)
H. Kennedy Jr., Harold Kennedy & Associates, Fuquay Varina, N.C.	(AWWA)
T.J. Muntz, National Association of Pipe Fabricators, Stillwater, Minn.	(AWWA)
T.B. Wright,† National Association of Pipe Fabricators, Kerrville, Texas	(AWWA)

User Members

M.J. Britch, Tualatin Valley Water District, Beaverton, Ore.	(AWWA)
--	--------

* Liaison, nonvoting

† Alternate

AWWA Standards Committee A21, Ductile-Iron Pipe and Fittings, which reviewed and approved this standard, had the following personnel at the time of approval:

John R. Plattsmier, *Chair*

General Interest Members

M. Dunn, Crist Engineers Inc., Little Rock, Ark.	(AWWA)
J. Hebenstreit, Underwriters Laboratories Inc., Northbrook, Ill.	(AWWA)
M.B. Horsley, Horsley Engineering LLC, Overland Park, Kan.	(AWWA)
D.H. Kroon, Aegion, Houston, Texas	(AWWA)
D.D. Lary,* Wright-Pierce, Topsham, Maine	(NEWWA)
C.R. Laucamp, AECOM, Chicago, Ill.	(AWWA)
P.J. Mourt, Mott MacDonald, Philadelphia, Pa.	(AWWA)
S.M. Passarelli,† Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)
J.R. Plattsmier, HDR Engineering Inc., Denver, Colo.	(AWWA)
S. Pool,* HDR Engineering Inc., Denver, Colo.	(AWWA)
T.M. Stinson, Kleinfelder, Holbrook, Mass.	(NEWWA)
L.C. Yates, McGoodwin, Williams & Yates, Fayetteville, Ark.	(AWWA)

Producer Members

L.R. Dunn, U.S. Pipe & Foundry Company, Birmingham, Ala.	(AWWA)
J.H. Eddings, McWane Ductile, Phillipsburg, N.J.	(AWWA)
J.A. Fancher,* American Cast Iron Pipe Company, Birmingham, Ala.	(AWWA)
M.D. Gaston, American Cast Iron Pipe Company, Birmingham, Ala.	(DIPRA)
L.G. Horn, Ductile Iron Pipe Research Association, Birmingham, Ala.	(DIPRA)
J.C. Jones, RCT, Los Angeles, Calif.	(AWWA)
K.J. Kempf,* Kempf Holdings LLC, DbA Foundry Services Co., Omaha, Neb.	(AWWA)
H. Kennedy Jr., Harold Kennedy & Associates, Fuquay Varina, N.C.	(AWWA)
J.K. Lambert,* U.S. Pipe & Foundry Company, Hoover, Ala.	(AWWA)
T.J. Muntz, National Association of Pipe Fabricators, Stillwater, Minn.	(AWWA)

* Alternate

† Liaison, nonvoting

User Members

D.T. Bradley, Oak Lodge Water District, Portland, Ore.	(AWWA)
M.J. Britch, Tualatin Valley Water District, Beaverton, Ore.	(AWWA)
C.R. Dugan,* Standards Council Liaison, East Lansing–Meridian Water and Sewer Authority, East Lansing, Mich.	(AWWA)
W.C. Duke, Bureau of Reclamation, Denver, Colo.	(AWWA)
J.M. Kennedy, Tampa Bay Water, Clearwater, Fla.	(AWWA)
D.D. Montgomery, City of Independence, Independence, Mo.	(AWWA)
G.M. Page, Cobb County–Marietta Water Authority, Marietta, Ga.	(AWWA)
C.J. Patla, Connecticut Water Service Inc., Clinton, Conn.	(AWWA)
T.J. Roode, Denver Water, Denver, Colo.	(AWWA)
P.A. Shively, Kansas City, Mo.	(AWWA)
R.L. Worden, COMCD, Norman, Okla.	(AWWA)

* Liaison, nonvoting

This page intentionally blank.

Contents

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

SEC.	PAGE	SEC.	PAGE
Foreword			
I	Introduction.....	ix	
I.A	Background.....	ix	
I.B	History.....	ix	
I.C	Acceptance.....	x	
II	Special Issues.....	xi	
II.A	Advisory Information on Product Application.....	xi	
III	Use of This Standard.....	xi	
III.A	Purchaser Options and Alternatives.....	xi	
III.B	Modification to Standard.....	xii	
IV	Major Revisions.....	xii	
V	Comments.....	xii	
Standard			
1	General		
1.1	Scope.....	1	
1.2	Purpose.....	1	
1.3	Application.....	1	
2	References	2	
3	Definitions	3	
4	Requirements		
4.1	Materials.....	4	
4.2	Permeation.....	4	
4.3	General Requirements.....	4	
4.4	Coatings and Linings.....	5	
4.5	Tolerances or Permitted Variations.....	5	
4.6	Pipe Wall Thickness.....	6	
4.7	Marking Pipe.....	6	
5	Verification		
5.1	Inspection.....	6	
5.2	Test Procedures.....	7	
5.3	Additional Control Tests by the Manufacturer.....	10	
5.4	Foundry Records.....	10	
5.5	Additional Tests Required by the Purchaser.....	10	
5.6	Defective Specimens and Retests.....	10	
5.7	Basis for Rejection.....	10	
6	Delivery		
6.1	Notice of Nonconformance.....	11	
6.2	Affidavit of Compliance.....	11	
Appendix			
A	Pipe Thickness Required for Different Tap Sizes	41	
Figures			
1	Tensile-test specimen.....	8	
2	Impact-test specimen.....	9	
3	Standard laying conditions.....	36	
Tables			
1	Standard Dimensions Of Push-On-Joint Ductile-Iron Pipe and Mechanical-Joint Ductile-Iron Pipe.....	12	

SEC.	PAGE	SEC.	PAGE
2	14	A.1	41
3	18	A.2	43
4	37		
5	38		

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), the American Water Works Association (AWWA), and the New England Water Works Association (NEWWA). Between 1972 and 1984, the co-secretariats were AGA, AWWA, and NEWWA, with AWWA serving as administrative secretariat. In 1984, the committee became an AWWA committee with the name of *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.

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

The work of AWWA Committee A21 is conducted by subcommittees. The scope of Subcommittee 1, Pipe, includes the periodic review of current Committee A21 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, and 2009. This edition of C151.A21.51 was approved on Jan. 14, 2017.

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). 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. Specific policies of the state or local agency.
2. 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.
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 61. Individual states or local agencies have authority to accept

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

† NSF International, 789 North 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, NW, Washington, DC 20001.

or accredit certification organizations within their jurisdictions. 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 C151 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.

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, Ductile-Iron Pipe, Centrifugally Cast, of latest revision.
2. For applications other than potable water, whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
3. Size, joint type, thickness or class, and laying length (see Tables 1 through 5, A.1, and A.2 and 4.3.2).
4. Details of other federal, state or provincial, 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. Scope, purpose, and application of standard were expanded to include raw water applications (Section 1).
2. Definitions for *raw water* and *potable water* were added (Section 3).
3. A new Sec. 4.1.2 was added to include a requirement for NSF/ANSI 61 certification on products if they will be in contact with potable water.
4. The weight requirement for pipe was deleted (former Sec. 4.5.3 and Sec. 4.6).
5. The weight requirement dimensions were deleted from Tables 1, 2, 3, and 4.
6. Resulting Tables 1, 2, 3, and 4 were combined into two tables, Tables 1 and 2, reporting standard dimensions.
7. A maximum crosshead speed for testing tensile specimens was added to Sec. 5.2.2.1.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, FAX at 303.795.7603; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at standards@awwa.org.



**American Water Works
Association**

Dedicated to the World's Most Important Resource®

ANSI/AWWA C151/A21.51-17
(Revision of ANSI/AWWA C151/A21.51-09)

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 through 5 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

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