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AWWA Standard

Ductile-Iron Compact Fittings

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American Water Works Association

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STANDARD Since 1881

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Committee Personnel

Subcommittee 3, Fittings, which developed this standard, had the following personnel at the time:

J. Hal Eddings, *Chair*

General Interest Members

J. Hrdlicka (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
R. van Buskirk, Treimtab Consulting LLC, El Dorado Hills, Calif.

Producer Members

S.R. Bandi (*alternate*), SIGMA Corporation, Cream Ridge, N.J.
W. Biery, Victaulic Company, Center Valley, Pa.
M. Bowsher, Star Pipe Products Inc., Houston, Tex.
S. Box, SIGMA Corporation, Ooltewah, Tenn.
K. Couture, American Ductile Iron Pipe Company, Birmingham, Ala.
J.H. Eddings, McWane Ductile, Phillipsburg, N.J.
L.G. Horn, Ductile Iron Pipe Research Association, Birmingham, Ala.
A.M. Horton (*alternate*), U.S. Pipe, Hoover, Ala.
D.A. Hughes, U.S. Pipe, Pelham, Ala.
J.C. Jones, Press-Seal, Fort Wayne, Ind.
K.J. Kempf (*alternate*), Kempf Holdings LLC, Omaha, Neb.
J.S. Palombo, Everett J. Prescott Inc., Gardiner, Maine
S. Sanford (*alternate*), American Ductile Iron Pipe Company, Birmingham, Ala.

User Member

B. Matejcek, Orange County Utilities, Orlando, Fla.
M.L. McLaughlin, Independence Water Department, Independence, Mo.

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

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Michael J. Britch, *Chair*
Kyle Couture, *Vice-Chair*

General Interest Members

M. Dunn, Crist Engineers, Little Rock, Ark.
J. Hebenstreit, Underwriters Laboratories Inc., Northbrook, Ill.
M.B. Horsley, Horsley Engineering LLC, Overland Park, Kans.
J. Hrdlicka (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
C.R. Laucamp, AECOM, Chicago, Ill.
P.J. Mourt, HDR Engineering, Plymouth Meeting, Pa.
J.R. Plattsmier, Independent Consultant, New Port Richey, Fla.
S. Pool (*alternate*), HDR, Denver, Colo.
G. Ramon (*liaison, nonvoting*), Standards Council Liaison, Little Rock Water Reclamation Authority, Little Rock, Ark.
T.M. Stinson, Kleinfelder Inc., Holbrook, Mass.

Producer Members

C. Corcoran (*alternate*), U.S. Pipe, Hoover, Ala.
K. Couture, American Ductile Iron Pipe Company, Birmingham, Ala.
J.H. Eddings, McWane Ductile, Phillipsburg, N.J.
L.G. Horn, Ductile Iron Pipe Research Association, Birmingham, Ala.
D. Hughes, U.S. Pipe, Pelham, Ala.
J.C. Jones, Press-Seal, Fort Wayne, Ind.
D. Lary (*alternate*), Wright-Pierce, Topsham, Maine
L. Leider, Star Pipe Products Inc., Houston, Tex.
J.S. Palombo, Everett J. Prescott Inc., Gardiner, Maine
A. Rich (*alternate*), Garich & Sons, Deer Creek, Ill.
S. Sanford (*alternate*), American Ductile Iron Pipe Company, Birmingham, Ala.
D. Swalley, Electrosteel USA, Birmingham, Ala.
M.A. Vess (*alternate*), Tyler Union Waterworks, Anniston, Ala.

User Members

M.J. Britch, Tualatin Valley Water District, Beaverton, Ore.
J. Fox, Tampa Bay Water, Clearwater, Fla.
M. Jermyn, US Bureau of Reclamation, Denver, Colo.

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M.L. McLaughlin, Independence Water Department, Independence, Mo.
C.J. Patla, Connecticut Water Company, Clinton, Conn.
K. Pelzer (*alternate*), US Bureau of Reclamation, Denver, Colo.
P. Prachya, East Bay Municipal Utility District, Oakland, Calif.
J.M. Ross, Denver Water, Denver, Colo.
P.A. Shively, City of Kansas City, Kansas City, Mo.
J.T. Wilson, Cobb County-Marietta Water Authority, Marietta, Ga.

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C153/A21.53.*

I. Introduction

I.A. *Background.* The earliest record of an AWWA standard for cast-iron pipe appears in the 1890 AWWA annual conference proceedings. In 1902, the New England Water Works Association (NEWWA) adopted a more detailed standard titled "Standard Specification for Cast-Iron Pipe and Special Castings." The next AWWA standard for pipe and fittings, 7C.1-1908, was approved May 12, 1908, and was followed by AWWA C100-52T, Tentative Standard Specifications for Cast Iron Pressure Fittings, which was approved Dec. 31, 1952. A complete listing and description of subsequent cast-iron-fittings standards is presented in the foreword of ANSI/AWWA C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings.

In 1926, the American Standards Association (ASA), now the American National Standards Institute (ANSI), Committee A21 on Cast-Iron Pipe and Fittings was organized under the sponsorship of the American Gas Association (AGA), the American Society for Testing and Materials (ASTM), AWWA, and 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 named 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 the A21 Committee. In 1997, AGA withdrew as co-secretariat. The present scope of Committee A21 activity is the development of standards and manuals addressing ductile-iron pressure pipe for water and ductile-iron and gray-iron fittings for use with such pipe. These standards and manuals include topics such as design, dimensions, materials, coatings, linings, joints, accessories, methods of inspection and testing, and installation.

The work of Committee A21 is conducted by subcommittees. The scope of Subcommittee 3, Fittings, includes the periodic review of all current A21 standards for ductile-iron and gray-iron fittings; preparation of revisions and new standards when needed; and examination of other matters pertaining to standards for fittings.

I.B. *History.* At the meeting of Standards Committee A21 in 1981, Subcommittee 3 was directed to prepare a standard for 3-in. through 12-in. (75-mm

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through 300-mm) compact fittings designed to use the attendant strength of ductile iron. The subcommittee was directed to present this standard to the committee for action in 1983. The first edition of this standard, designated ANSI/AWWA C153/A21.53-84, ANSI Standard for Ductile-Iron Compact Fittings, 3 In. Through 12 In. (75 mm Through 300 mm), for Water and Other Liquids, was approved by the AWWA Board of Directors on Jan. 30, 1984, and by ANSI on Feb. 4, 1985.

The second edition of this standard, designated ANSI/AWWA C153/A21.53-88, ANSI Standard for Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids, was approved on June 19, 1988, and by ANSI on July 5, 1988. Major revisions included expansion of the sizes covered to include 14-in. (355-mm) and 16-in. (406-mm) sizes, addition of "long" laying-length sleeves, changes in acceptance testing, and new sections on rejection of fittings and determination of rejection.

The third edition of this standard, designated ANSI/AWWA C153/A21.53-94, ANSI Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm), for Water Service, was approved on Jan. 30, 1994, and by ANSI on Aug. 18, 1994. Major revisions included expansion of the sizes covered to include 18-in. (457-mm) through 24-in. (610-mm) sizes and 54-in. (1,372-mm) through 64-in.(1,626-mm) sizes; bends with plain ends were added; crosses were added; coverage of reducers was expanded to four types; push-on and flange fittings were added; and the appendix on bolts, gaskets, and installation was added.

The fourth edition of this standard, designated ANSI/AWWA C153/A21.53-00, ANSI Standard for Ductile-Iron Compact Fittings for Water Service, was approved on Jan. 23, 2000, and by ANSI on June 28, 2000. Major revisions included the introduction of surge allowances, fusion-bonded epoxy coating systems, and 30-in. through 48-in. fittings.

The fifth edition of this standard, designated ANSI/AWWA C153/A21.53-06, ANSI Standard for Ductile-Iron Compact Fittings for Water Service, was approved on Feb. 12, 2006, and by ANSI on May 19, 2006. Major revisions included the deletion of the figure and table giving details of the mechanical joint and the referencing of ANSI/AWWA C111/A21.11 for details of mechanical-joint bell, plain end, and accessories.

The sixth edition was approved on June 12, 2011, and by ANSI on Aug. 8, 2011. Major revisions included modifying the title and sections to include wastewater and reclaimed water; required hydrostatic design tests of 2½ times rated working pressure; included 65-45-12 grade iron; required a minimum safety factor of 2½ times rated working pressure; updated tables to reflect current manufactured fittings; and added

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figures and tables for mechanical-joint tapped tees, mechanical-joint flange connecting pieces, and mechanical-joint offsets.

The seventh edition was approved on June 7, 2019, and approved by ANSI on July 19, 2019. This eighth edition was approved on Oct. 13, 2025, and approved by ANSI on Nov. 19, 2025.

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.

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 jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

[†] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48113.

[‡] Persons outside the United States should contact the appropriate authority having jurisdiction.

[§] 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.

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NSF/ANSI/CAN 600 (which formerly appeared in NSF/ANSI/CAN 60 and 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 C153/A21.53 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. *Special Service Application.* The fittings described in this standard are normally used for pressurized water supply systems. Fittings used in other types of service may require special consideration by the user of this standard (see Section III).

II.B. *Orientation of Bolt Holes.* Although this standard does not specify the orientation of bolt holes in the bell flanges of the mechanical joint, it is at times convenient or necessary to have the bolt holes oriented. The normal, but not universal, practice is to have the bolt holes straddle the vertical centerline of the fittings, valves, and hydrants. (The vertical centerline of a fitting is determined when the fitting is in the position to change the direction of fluid flowing in a horizontal plane.) If orientation is necessary, this requirement should be specified.

II.C. *Connecting Fittings and Aged Cast-Iron Pipe.* Fittings should be connected carefully to aged existing cast-iron pipe. The outside diameter of aged pipe should be measured before cutting because some older pipe was manufactured to a larger diameter than is presently specified in AWWA standards. Measurements for ovality should be included to determine if a customized fit is required of the connecting joint. Mechanical-joint sleeves or bell-and-spigot (caulked-joint) sleeves are available to provide transition from existing cast-iron pipe; however, they must be specified by the purchaser. The following standards contain reference dimensions useful in classifying existing cast-iron pipe:

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ANSI A21.6-1975 (ANSI/AWWA C106-75)—American National Standard for Cast-Iron Pipe Centrifugally Cast in Metal Molds for Water or Other Liquids; Tables 6.4, 6.5, and 6.6.

ANSI A21.8-1975 (ANSI/AWWA C108-75)—American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Sand-Lined Molds for Water or Other Liquids; Tables 8.4, 8.5, and 8.6.

ASA A21.2-1953 (AWWA C102-53)—American Standard for Cast Iron Pit Cast Pipe for Water or Other Liquids; Tables 2.1 and 2.2.

AWWA 7C.1-1908 (AWWA C100-55)—Standard Specifications for Cast-Iron Pipe and Special Castings; Table 1.

II.D. *Advisory Information on Product Testing.* The standard acceptance test for static castings is a tensile test from a coupon cast from the same iron. This test is typically done with a separately cast ASTM A536 keel block, a modified keel block, or a Y-block. This standard provides an exception allowing the manufacturer to cut a test coupon from the casting or its runner system as a method of qualifying fittings when separately cast coupons are not available. The mechanical properties of iron castings are influenced by a variety of factors, including the cooling rate, iron chemistry, casting geometry, location of gates and risers, etc. These various factors cause an imprecise relationship between the mechanical properties in various locations of the same casting or between the casting and the separately cast coupon.

II.E. *Advisory Information for the Purchaser and Specifier*. Purchasers and specifiers should be aware that although products may be available that meet the intent of this standard, they may vary in dimensions, characteristics, material properties, or other features. The purchaser and specifier should become knowledgeable of the details of this standard and carefully evaluate the effect deviations from this standard may have on their project. One example of such a deviation is that some manufacturers may supply fittings with thinner flanges than indicated in the standard. While these fittings may have adequate strength for an application, a standard bolt kit may have insufficient threads on a bolt to adequately compress the gasket to prevent leakage.

II.F. *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 those used for 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 time, contact surface area, elastomer cross section, environmental conditions

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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.

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 provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C153/A21.53, Ductile-Iron Compact Fittings, of latest edition.
2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, is required.
3. Size and joint type (Sec. 1.1, Sec. 4.3, and Tables 1 through 18).
4. Details of federal, state, provincial, territorial, and local requirements (Sec. 4.1.1).
5. Joint requirements—including special gasket requirements (Sec. 4.3.1.1 and Sec. 4.3.1.2).
6. Joint accessories (Sec. 4.3.1.4).
7. End combinations (Sec. 4.3.1.5).
8. Standard linings (Sec. 4.4.1). Experience has indicated that petroleum shop-applied inside coating is not complete protection against loss in pipe capacity caused by tuberculation. Cement–mortar linings or fusion-bonded epoxy linings are recommended for most waters.
9. Special coatings and linings (Sec. 4.4.6).
10. Special flange bolt-hole orientation (Sec. 4.7.4).
11. Inspection by purchaser (Sec. 5.1.2).
12. Acceptance tests (Sec. 5.2.1).
13. Special tests (Sec. 5.4).
14. Affidavit of compliance (Sec. 5.8).

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. The major revisions in this edition of ANSI/AWWA C153/A21.53 are as follows:

1. Added ⅛, ½, and 1/64 bend fittings in Table 1.
2. Added 60-in. fittings in Table 3.

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3. Added 60-in. fittings and revised dimensions throughout Table 4.
4. Added 54-in., 60-in., and 64-in. fittings in Table 5.

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

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AWWA Standard

Ductile-Iron Compact Fittings

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes 3-in. through 64-in. (80-mm through 1,600-mm)* ductile-iron compact fittings to be used with ductile-iron pipe or pipe made of other materials with similar outside diameters for conveying potable water, wastewater, and reclaimed water. Minimum working pressures by size range are as follows: 3 in. through 24 in. (80 mm through 600 mm)—350 psi (2,413 kPa); 30 in. through 48 in. (750 mm through 1,200 mm)—250 psi (1,724 kPa); and 54 in. through 64 in. (1,400 mm through 1,600 mm)—150 psi (1,034 kPa). Fittings are adequate for the rated working pressure plus a surge allowance of 100 psi (690 kPa) or a surge allowance of half the rated working pressure, whichever is less.

Fittings with mechanical joints are listed in this standard for the 3-in. through 64-in. (80-mm through 1,600-mm) sizes. The standard also may be used for fittings of these sizes with push-on joints or other joints as agreed on at the time of purchase.

Fittings with push-on joints and flanged joints are listed in this standard for the 54-in. through 64-in. (1,400-mm through 1,600-mm) sizes. Fittings with flange joints are not discussed in this standard for sizes 3 in. through 48 in. (80 mm

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

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