

American Water Works Association
ANSI/AWWA C153/A21.53-94
(Revision of ANSI/AWWA C153/A21.53-88)



AMERICAN NATIONAL 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



Administrative Secretariat
AMERICAN WATER WORKS ASSOCIATION
Cosecretariat
AMERICAN GAS ASSOCIATION

All changes specified in the erratum to AWWA C153-94 (issued in 1996) are incorporated into this standard.

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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 ANSI/AWWA C153/A21.53.

I. Introduction

I.A. Background. The earliest record of an AWWA standard for cast-iron pipe is contained 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.

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 (A.G.A.), the American Society for Testing and Materials (ASTM), AWWA, and NEWWA. Between 1972 and 1984 the cosecretariats were A.G.A., 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. The present scope of Committee A21 activity is the preparation of standards for cast- and ductile-iron pressure pipe for gas and water, and fittings for use with such pipe. These standards include design, dimensions, materials, coatings, linings, joints, accessories, and methods of inspection and testing.

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 fittings and the preparation of revisions and new standards, when needed, for fittings to be used with cast- and ductile-iron pressure pipe included in A21 standards.

I.B. History of Standard. 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 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, American National 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, American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids, was approved by the AWWA Board of Directors on June 19, 1988, and by ANSI on July 5, 1988. Major revisions included expansion of the sizes covered to include 14- and 16-in. sizes, addition of "long" laying length sleeves, changes in acceptance testing, and new sections on rejection of fittings and determination of rejection.

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 consortium included the American Water Works Association Research Foundation (AWWARF), the Conference of State Health and Environmental Managers (COSHEM), the American Water Works Association (AWWA), and the Association of State Drinking Water Administrators (ASDWA). The consortium is responsible for the cooperative effort of manufacturers, regulators, product users, and other interested parties that develop and maintain the NSF standards.

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.

ANSI/AWWA C153/A21.53-94 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.

*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.

II. Special Issues.

II.A. *Special Service Application.* The fittings for which this standard is intended are those normally used for pressurized water supply systems. Application of fittings in other types of service may require special consideration by the user of this standard (see Sec. 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 known to be necessary, this requirement should be specified.

II.C. *Connecting Mechanical-Joint Fittings and Aged Cast-Iron Pipe.* The following note introduced in the 1977 edition of ANSI/AWWA C110/A21.10 cautioned about using mechanical-joint fittings with aged existing pipe:

NOTE: Care should be used when connecting mechanical-joint fittings to aged existing cast-iron pipe. The outside diameter of aged pipe should be measured prior to cutting since some older pipe was manufactured to a larger diameter than is presently specified in A21 standards. 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 on the purchase order. The following standards contain reference dimensions useful in classifying existing cast-iron pipe:

AWWA 7C.1-1908 (AWWA C100-55) — Standard Specifications for Cast-Iron Pressure Fittings; Table 1.

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.

ANSI A21.6-1975 (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 (AWWA C108-75) — American National Standard for Cast-Iron Pipe Centrifugally Cast in Sand-Lined Molds for Water or Other Liquids; Tables 8.4, 8.5, and 8.6.

ANSI/AWWA C151/A21.51-81 — American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids; Tables 51.4 and 51.5.

II.D. *Metrication.* Throughout the body of this standard, direct metric conversions (rounded) are set in parentheses next to US customary units and are not those specified in International Organization for Standardization (ISO) standards.

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.* A number of items must be specified to completely describe the fitting required. This standard includes certain options that must be specified if desired. The following summary lists these details, available options, and the sections of the standard where they can be found:

1. Required information
 - a. Size — Sec. 53-1.

- b. Configuration — Figures 53.2 through 53.10, and Figures 53.12 through 53.14.
 - c. Joint type — Sec. 53-1.
 - d. Standard used, that is, ANSI/AWWA C153/A21.53-94.
2. Options
- a. Drawings of the joint and gasket — Sec. 53-5.1.2.
 - b. Availability of accessories — Sec. 53-5.2.
 - c. Type of mechanical-joint gland — Sec. 53-5.2.1.
 - d. Certification by manufacturer — Sec. 53-6.3.
 - e. Inspection by purchaser — Sec. 53-7.1.
 - f. Outside coating — Sec. 53-10.1.
 - g. Cement-mortar lining* — Sec. 53-10.2.
 - h. Inside coating — Sec. 53-10.3.
 - i. Special coatings and linings — Sec. 53-10.4.
 - j. Special tests — Sec. 53-14.

III.B. *Modification of This Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided in the purchaser's specifications.

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

1. The standard was edited throughout.
2. The foreword was reformatted and edited and Sec. I.C, Acceptance, and Sec. III.B, Modification of This Standard, were added.
3. The standard was revised to include 18-in. through 24-in. (457-mm through 610-mm) and 54-in. through 64-in. (1,400-mm through 1,600-mm) size range fittings.
4. Section 53-2, Definitions; old Sec. 53-2.4, Inspector; and old Sec. 53-2.7, Owner, were deleted. Section 53-2.2, Ductile Iron; Sec. 53-2.4, Manufacturer; and Sec. 53-2.6, Purchaser, were revised. Section 53-2.7, Purchaser's Representative; and Sec. 53-2.9, Flanged Joint, were added.
5. Tables 53.1, 53.2, 53.4, and 53.7 were revised to include 18-in. through 24-in. (457-mm through 610-mm) fittings.
6. Table 53.6, Mechanical-Joint Reducers, was revised to include four types of reducers, as well as 18-in. through 24-in. (457-mm through 610-mm) sizes.
7. Table 53.3, Mechanical-Joint by Plain-End Bends; Table 53.5, Mechanical-Joint Crosses; Table 53.8, Push-on-Joint Bends; Table 53.9, Push-on-Joint Tees and Crosses; Table 53.10, Push-on-Joint Reducers; Table 53.11, Flange Details; Table 53.12, Flanged Bends; Table 53.13, Flanged Tees and Crosses; and Table 53.14, Flanged Reducers, were added.
8. Sec. 53-19, Special Requirements for Flanged Fittings, was added.
9. Appendix A, Flanged Fittings — Bolts, Gaskets and Installation, was added.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Standards Department, (303) 794-7711 ext. 2201, FAX (303) 795-1440, or write to the department at 6666 W. Quincy Ave., Denver, CO 80235.

*Experience has indicated the petroleum asphaltic inside coating is not complete protection against loss in pipe capacity caused by tuberculation. Cement linings are recommended for most waters.



ANSI/AWWA C153/A21.53-94
(Revision of ANSI/AWWA C153/A21.53-88)

AMERICAN NATIONAL 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

Sec. 53-1 Scope

This standard covers 3-in. through 24-in. (76-mm through 610-mm) and 54-in. through 64-in. (1,400-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 water. For the 3-in. through 24-in. (76-mm through 610-mm) size range, fittings are rated for 350-psi (2,413-kPa) working pressure. For the 54-in. through 64-in. (1,400-mm through 1,600-mm) size range, fittings are rated for 150-psi (1,034-kPa) working pressure.

Fittings with mechanical joints are listed in this standard for the 3-in. through 24-in. (76-mm through 610-mm) sizes. The standard also may be used for fittings of these sizes with push-on joints or such 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 covered by this standard for sizes 3 in. through 24 in. (76 mm through 610 mm), due to the importance of standardized center-to-flange face dimensions for these sizes already covered in ANSI/AWWA C110/A21.10.

Fittings with plain end(s) are listed for bends and reducers of the 3-in. through 24-in. (76-mm through 610-mm) and 54-in. through 64-in. (1,400-mm through

1,600-mm) size ranges and for tees and crosses of the 54-in. through 64-in. (1,400-mm through 1,600-mm) size range.

Sec. 53-2 Definitions

Under this standard the following definitions shall apply:

53-2.1 *Compact fitting*: A short-bodied fitting (as compared to the fittings covered by ANSI/AWWA C110/A21.10) designed with ductile-iron metal and described in this standard.

53-2.2 *Ductile iron*: The cast ferrous material in which a major part of the carbon content occurs as free graphite in a substantially nodular or spheroidal form.

53-2.3 *Flanged joint*: The joint as described in ANSI/AWWA C111/A21.11 and illustrated in ANSI/AWWA C110/A21.10 and in Figure 53.11 of this standard.

53-2.4 *Gray iron*: The cast ferrous material in which a major part of the carbon content occurs as free carbon or graphite in the form of flakes interspersed throughout the metal.

53-2.5 *Manufacturer*: The party that manufactures, fabricates, or produces materials or products.

53-2.6 *Mechanical joint*: A bolted joint of the stuffing-box type as detailed in Table 53.1 and as generally described in ANSI/AWWA C111/A21.11.

53-2.7 *Purchaser*: The person, company, or organization that purchases any materials or work to be performed.

53-2.8 *Purchaser's representative*: The representative of the purchaser authorized to inspect fittings on behalf of the purchaser to determine whether or not the fittings meet the requirements of this standard.

53-2.9 *Push-on joint*: The single rubber-gasket joint as described in ANSI/AWWA C111/A21.11.

Sec. 53-3 References

The following standards are referenced and form a part of this standard to the extent specified herein. In any case of conflict, the requirements of this standard shall prevail.

ASME*/ANSI† B16.1 — Cast Iron Pipe Flanges and Flanged Fittings.

ANSI/ASME B16.5 — Pipe Flanges and Flanged Fittings.

ASTM‡ A536 — Standard Specification for Ductile Iron Castings.

ANSI/AWWA C104/A21.4 — American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

ANSI/AWWA C110/A21.10 — American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids.

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

ANSI/AWWA C207 — Steel Pipe Flanges for Waterworks Service — Sizes 4 In. Through 144 In.

*American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.

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

‡American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.