

ANSI A21.14-1989
Revision of ANSI A21.14-1984

AMERICAN NATIONAL STANDARD FOR

DUCTILE-IRON FITTINGS 3-INCH THROUGH 24-INCH, FOR GAS

Secretariats
American Gas Association
American Water Works Association

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Foreword

This foreword is provided for information only and is not a part of ANSI A21.14.

American National Standards Committee A21 on Cast-Iron Pipe and Fittings was organized in 1926 under the sponsorship of the American Gas Association (A.G.A.), the American Society for Testing Materials (ASTM), the American Water Works Association (AWWA), and the New England Water Works Association (NEWWA). Between 1948 and 1972 the Co-Secretariats were A.G.A., AWWA, and NEWWA, with AWWA serving as administrative Secretariat. During 1988 NEWWA withdrew from Co-Secretariat status, although the organization continues its committee representation. The committee remains co-sponsored by the American Gas Association, for gas-related activities, and AWWA. The present scope of the A21 activity is the development of standards and manuals addressing ductile-iron pressure pipe for gas, 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 Committee A21 is conducted by subcommittees. The directive of Subcommittee 3 – Fittings is that:

The scope of the subcommittee activity shall include 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-iron and ductile-iron pressure pipe included in A21 standards.

I. History of Standard

The evolution of AWWA and ANSI standards for fittings is presented in this foreword to provide information relative to systems having aged cast-iron pipe and fittings still in service.

The earliest record of an AWWA standard for cast-iron pipe is contained in the proceedings for 1890. In 1902, 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. A second edition, C100-52T, was approved by AWWA Dec. 31, 1952, and by NEWWA Jan. 23, 1953. The third edition, C100-54T, was approved by AWWA Oct. 25, 1954, and finally issued as C100-55, having been advanced from tentative to standard without change June 17, 1955. Standard C100-55 covered fittings in the size range 4-60 in. (100-1520 mm). The fittings were all bell and spigot (caulked joint) of the so-called long-radius design. The outside diameter (OD) for spigots varied with wall thicknesses, which were designated by classes A, B, C, and D. Fittings 4-12 in. (100-300 mm) were made to class D patterns, having only one OD and pressure rating. Fittings 14-24 in. (360-610 mm) were furnished in class B and D, and fittings 30-60 in. (760-1520 mm) were furnished in classes A, B, C, and D. All fittings made to AWWA 7C.1-1908 and C100-55 had the class identification cast on the fitting.

ASA A21.10-1952 (AWWA C110-52) was approved by ASA Sept. 30, 1952. The standard covered 3-12 in. (75-300 mm) fittings of the so-called "short-body" design and were the subject of extensive research and tests by Committee A21. The rated pressure given by the standard was 250 psi (1.72 MPa) plus water hammer. The standard provided a 2.5 safety factor plus water hammer based on burst tests. Hydraulic losses were determined and compared with those found with AWWA long-radius fittings. The minimum grade of cast iron in the standard was 25,000 psi (172.2 MPa) tensile strength.

ASA A21.10-1964 (AWWA C110-64) was

approved by ASA Jan. 9, 1964. The revision covered 2-48 in. (50-1220 mm) fittings. The design of the 14-18 in. fittings in the revision was based on an exhaustive series of burst tests. The minimum grade of cast iron [25,000 psi (172.2 MPa) tensile strength] was retained and higher grades up to 35,000 psi (241.2 MPa) tensile strength were used to secure higher pressure ratings without changing radically the thicknesses. Ductile iron, grade 80-60-03, was also added in the 14-48 in. (360-1220 mm) sizes with a rated working pressure of 250 psi (1.72 MPa) having the same wall thicknesses as 150 psi (1.03 MPa) rated gray-iron fittings. The minimum safety factor on burst tests of representative fittings of the weakest type was 3 times the rated working pressure. Tables for mechanical-joint fittings were added for the first time.

In the middle 1960s Subcommittee 3 was assigned the task of developing a standard for 3-in. through 24-in. (75-610 mm) gray-iron and ductile-iron fittings for gas. Subcommittee 3 submitted a proposed standard to ANSI Standard Committee A21 in 1967 and American National Standard A21.14 was approved and issued in 1968.

Part of the foreword of A21.14-1968 is included below to record a brief history of the development and use of gas fittings.

"As the history of Standards for gas fittings is reviewed, it will be noted they have followed and generally conformed to the water fitting designs and requirements. The American Gas Association Standard revised 1929 provided only one thickness and this was equivalent to the Class A 100'-head water pipe thickness shown in the then current American Water Works Association Standard. There was no mention of pressure in the A.G.A. Standard for fittings and no pressure testing of the fittings was required. As gas distribution pressures increased over the years, the A.G.A. Standard became obsolete and gas companies naturally turned to the Mechanical Joint short body water fittings which were available and were first standardized in ANSI A21.10 in 1952. The relatively heavy-walled cast iron fittings 3 in. to 12 in. (75-300 mm) shown in this Standard have been used regularly in service for many

years and have an excellent record of reliability. It will be noted that Ductile Iron fittings also now are available in the 3 in. to 12 in. (75-300 mm) sizes for those who have special need or prefer a stronger, tougher fitting.

"In the sizes 16 in. to 24 in. (410-610 mm), only Ductile Iron fittings are specified and this allows for greater assurance of strength without the undue burden of excessive weight.

"Note that each fitting shall be subjected to an air test."

ANSI A21.14-1974 approved by ANSI revised the acceptance values of ductile iron to 70-50-05 to provide greater toughness. Also, tabulated weights for 3 in. to 8 in. (75-200 mm) sizes of M J caps and plugs were corrected to reflect actual weights of production fittings.

ANSI A21.14-1979 provided for the discontinuance of gray-iron fittings in the standard, all fittings listed being of 70-50-05 grade ductile iron. Requirements for Mechanical Joint Glands and Bolts were also revised with glands being specified to be ductile iron, and bolts and nuts to be low-alloy, high-strength steel as specified in ANSI Standard A21.11 of latest revision. Metric conversions of all dimensions and physical requirements were included in this standard for the first time. In the updating of this standard, effort was made to conform where applicable with other current A21 Standards, particularly A21.10 and A21.15. A note in the A21.10-77 Foreword, as follows, is also appropriate for A21.14:

NOTE: Care should be used when connecting mechanical-joint fittings to aged cast-iron pipe. The outside diameter of aged pipe should be measured prior to cutting since some pipes were 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) "Cast Iron Pressure Fittings," Table 1.

ASA A21.2-1953 (AWWA C102-53) "American Standard for Cast Iron Pit Cast Pipe," Tables 2.1 and 2.2.

ANSI A21.6-1975 (AWWA C106-1975) "American Standard for Cast Iron Pipe Centrifugally Cast in Metal Molds," Tables 6.4, 6.5, and 6.6.

ANSI A21.11-72 or latest revision "American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe Fittings," Table 11-1.

ASA A21.52-1965 "American Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Gas," Table 3.

ANSI A21.14-1984 revisions were primarily editorial.

II. Major Revisions

1. Acceptance tests.

Sec. 14-11 has been revised to permit selection of test coupons from the casting or the casting's runner bar system in addition to separately cast test coupons.

2. Chemical Limitations.

Sec. 14-11.3 has been added, a 0.08 percent maximum phosphorous content specified.

3. Foundry Records.

Sec. 14-12, a new requirement, lists certain foundry tests for which records shall be retained.

4. Rejection of Fittings and Determining Rejection.

New Sections 14-15 and 14-16 have been added.

III. Metrication

The metric conversions used in this standard are direct conversions of U.S. customary inch-pound units and are not those specified in International Organization for Standardization (IOS) standards. The conversion factors used are:

Pressure Rating: $\text{psi} \times 0.00689 = \text{MPa}$