ANSI/AWWA C110/A21.10-03
(Revision of ANSI/AWWA C110/A21.10-98)

American Water Works Association

The Authoritative Resource for Safe Drinking Water℠

American National Standard

American National Standard for

Ductile-Iron and Gray-Iron Fittings for Water

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Contents

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

Foreword

This foreword is for information only and is not a part of ANSI/AWWA C110/A21.10.

I. Introduction.

I.A. *Background.* 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 cosecretariats were AGA, AWWA, and NEWWA, with AWWA serving as administrative secretariat. In 1984, the committee became an AWWA committee with the name 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 cosecretariat.

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 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.B. *History.* The evolution of AWWA and ANSI standards for fittings is presented in this foreword to provide information relating 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 *Report of Proceedings of the Tenth Annual Meeting of the American Water Works Association* (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, AWWA 7C.1-1908, was approved May 12, 1908. A second edition, AWWA C100-52T, was approved by AWWA Dec. 31, 1952, and by NEWWA Jan. 23, 1953. The third edition, AWWA

C100-54T, was approved by AWWA Oct. 25, 1954, and finally issued as AWWA C100-55, having been advanced from tentative to standard without change June 17, 1955. AWWA C100-55 covered fittings in the size range 4 to 60 in. (102 to 1,500 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 classes A, B, C, and D. Fittings 4 to 12 in. (102 to 305 mm) were made to class D patterns, having only one OD and pressure rating. Fittings 14 to 24 in. (356 to 610 mm) in size were furnished in classes B and D, and fittings 30 to 60 in. (762 to 1,500 mm) in size were furnished in classes A, B, C, and D. All fittings made in accordance with 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, following approval by AWWA May 4, 1951. The standard described 3- to 12-in. (76- to 305-mm) fittings of the so-called *short-body design*, which were the subject of extensive research and tests by Committee A21. The rated pressure given by the standard was 250 psi (1,724 kPa) plus water hammer. The standard provided a safety factor of 2.5 plus water hammer based on burst tests. Hydraulic losses were determined and compared with those found with long-radius fittings manufactured in accordance with AWWA Standards. The minimum grade of cast iron in the standard was 25,000 psi (172.4 MPa) tensile strength.

ASA A21.10-1964 (AWWA C110-64) was approved by ASA Jan. 9, 1964. The revision described 2- to 48-in. (50- to 1,219-mm) fittings. The design of the 14- to 48-in. (356- to 1,219-mm) fittings in the revision was based on an exhaustive series of burst tests. The minimum grade of cast iron (25,000 psi [172.4 MPa] tensile strength) was retained, and higher grades up to 35,000 psi (241.3 MPa) tensile strength were used to secure higher pressure ratings without radically changing the thicknesses. Ductile iron, grade 80-60-03, was also added in the 14- to 48-in. (356- to 1,219-mm) sizes with a rated working pressure of 250 psi (1,724 kPa), having the same wall thicknesses as 150-psi (1,034-kPa)-rated gray-iron fittings. The minimum safety factor based on burst tests of representative fittings of the weakest type was

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

†American Standards Association (ASA) is the former name of the American National Standards Institute.

three times the rated working pressure. Tables for flanged fittings and mechanical-joint fittings were added for the first time.

ANSI A21.10-1971 (AWWA C110-71) was approved by ANSI July 14, 1971. Ductile-iron fittings were added in sizes 3 to 12 in. (76 to 305 mm) and were rated for 350 psi (2,413 kPa) working pressure. The grade of ductile iron was changed to 70-50-05 to provide greater strength. The safety factor against bursting was three times the rated working pressure. If required by the purchaser on special order, fittings were required to withstand a hydrostatic proof test not to exceed one and one half times the rated working pressure without leaks or permanent distortions.

ANSI A21.10a-1972 (AWWA C110a-72) was approved Dec. 17, 1972, as a supplement to ANSI A21.10-1971. The pressure rating for 14- to 24-in. (356- to 610-mm) ductile-iron fittings was increased to 350 psi (2,413 kPa).

ANSI/AWWA C110-77 (ANSI A21.10) was approved by ANSI Apr. 7, 1977. The major change in this revision was the discontinuance of bell-and-spigot fittings (caulked joints) and 2- and 2¼-in. (50- and 56-mm) fittings in the standard. These actions were taken because the use of caulked joints had steadily declined until their use had become a rarity and the 2- and 2¼-in. (50- and 56-mm) sizes were no longer manufactured in the United States. (Bell-and-spigot fittings are still available from some foundries on special order.) With the elimination of 2- and 2¼-in. (50- and 56-mm) sizes, the standard included 3- to 48-in. (76- to 1,219-mm) mechanical-joint and flanged fittings only.

Another change made in the 1977 edition was in bolt lengths for flanged fittings to comply with ANSI/AWWA C115/A21.15-75, Standard for Flanged Cast-Iron and Ductile-Iron Pipe With Threaded Flanges. Appendix A was added to the standard to cover bolts, gaskets, and the installation of flanged fittings. Appendix B was added as a listing of available special fittings that are not a part of the standard. These include reducing bends, Y-branches, blind flanges, reducing tees, bullhead tees, flared fittings, side-outlet tees and elbows, and wall pipe.

The following note introduced in the 1977 edition cautioned about using mechanical-joint fittings with aged existing cast-iron 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 of the 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. Center to bottom-of-socket dimensions (dimension *A* in Table 3 and dimension *J* in Table 4 of this standard) for A21.10 mechanical-joint fittings are the same as the center to bottom-of-socket dimensions for bell-and-spigot (caulked-joint) fittings specified in the 1971 and previous editions of A21.10. 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/A21.51-86, 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.

ANSI/AWWA C110/A21.10-82, as approved by ANSI Aug. 24, 1982, introduced no major revisions.

ANSI/AWWA C153/A21.53-84 (First Edition), American National Standard for Ductile-Iron Compact Fittings, 3 In. through 12 In. (76 mm through 305 mm), for Water and Other Liquids, was approved by ANSI Feb. 4, 1985. This standard, developed by Standards Committee A21, Subcommittee 3, Fittings, presents compact fittings designed to use the attendant strength of ductile iron.

ANSI/AWWA C110/A21.10-87 was approved by ANSI Oct. 30, 1987. The major revisions included new sections on rejection of fittings and determination of rejection, and ductile-iron grade 60-42-10 was added. Cast marking of the country where cast was added; Sec. 10-4.3, Joint Accessories, was added; and 14-in. through 48-in. (356-mm through 1,219-mm) solid sleeves made with B-pattern equipment were added.

ANSI/AWWA C110/A21.10-93 was approved by ANSI Aug. 10, 1993. Major revisions in this edition of the standard included the addition of a section on health effects and permeation, allowance for reduced metal-section thicknesses for ductile-

iron glands, addition of a precautionary note on the use of flange gaskets thinner than 1/8 in. (3.2 mm) in appendix A, addition of flanged-joint bolt tightening sequence to appendix A, and the addition of a section on ring gaskets in appendix A.

ANSI/AWWA C110-A21.10-98 was approved by ANSI Sept. 10, 1998. Major revisions included limiting the scope to water service, noting the possibility of 350 psi rating for 12-in. and smaller flanged fittings with the use of special gaskets, and the optional, status of seal coat on cement–mortar linings. Table 1 was revised to include plus tolerances on the K1, K2, and L dimensions, longer bolt lengths for 42- and 48-in. sizes, and the footnote on ductile-iron glands. Tables 16 through 19 were revised to show 3- through 12-in. flanged ductile-iron fittings with the same dimensions as gray-iron fittings.

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 original consortium included the American Water Works Association Research Foundation (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. 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.

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*Persons outside the US should contact the appropriate authority having jurisdiction.

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

‡NSF International, 789 N. Dixboro Rd., Ann Arbor, MI 48105.

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.

Annex 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 Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C110/A21.10 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. *Advisory Information on Product Application.* Unless otherwise provided in the purchaser's specifications, all fittings and accessories shall comply with this standard.

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.* This standard includes certain options that, if desired, must be specified in the purchaser's specifications. It is also necessary that such options be included on the purchase order. Also, a number of items must be specified to describe completely the fittings required. The following

[*] Both publications available from National Academy of Sciences, 2101 Constitution Ave. N.W., Washington, DC 20418.

list summarizes the details and available options, and references the sections of the standard where they are found.

1. Size, joint type, pressure rating (Sec. 1.1 and tables).
2. Joint requirements (Sec. 4.2.1 and 4.2.2).
3. Joint accessories (Sec. 4.2.3).
4. Type of iron (Sec. 4.2.4).
5. End combinations (Sec. 4.2.5).
6. Certification by manufacturer (Sec. 5.1.3).
7. Inspection by purchaser (Sec. 5.2).
8. Elimination of cement–mortar lining (Sec. 4.3.2). Experience has indicated that the petroleum asphaltic inside coating is not complete protection against loss in pipe capacity caused by tuberculation. Cement–mortar linings are recommended for most waters.
9. Special coatings and linings (Sec. 4.3.3).
10. Acceptance tests (Sec. 5.4).
11. Special tests (Sec. 5.6).
12. Special flange bolt-hole orientation (Sec. 4.4.3).

III.B. *Special Service Requirements.* The following special service requirements should be noted:

1. The fittings for which this standard is intended are those normally used for water. Fittings for other services may require special consideration by the purchaser.

2. The method of installation of fittings depends on the type of joint and should be made in accordance with applicable parts of ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings; ANSI/AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances; and recommendations of manufacturers regarding their product.

3. Attention is directed to an apparent conflict between this standard and ASME/ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings, with regard to pressure ratings for flanged fittings.

In ANSI/AWWA C110/A21.10, flanged joint fittings are rated for 150 or 250 psi (1,034 or 1,724 kPa) working pressure, depending on the material, that is, gray iron or ductile iron; the wall thickness of gray iron; and the size of the fitting. The ratings of these fittings were established on the basis of hydrostatic testing of fittings to bursting and provide for a factor of safety of at least 3.0 at the rated working pressure and at ambient temperature. ANSI/AWWA C110/A21.10 flanges that are adequate

for water service of 250 psi (1,724 kPa) working pressure have facing and drilling identical to ASME/ANSI B16.1 class 125 flanges, and match class 125 B16.1 flanges, that for service at –20° to 150°F (–28.9° to 65.6°C) are rated for only 150 to 200 psi (1,034 to 1,724 kPa), depending on the flange size and the class or grade of iron.

ASME/ANSI B16.1 describes both separate flanges and flanged fittings of gray iron for service at both ambient and elevated temperatures. The pressure-temperature ratings of these flanges, as stated in ASME/ANSI B16.1 and stated on the flyleaf of that standard, are not based on burst strength, but have evolved over an extended period of time of satisfactory performance in a wide range of general service conditions. These ratings encompass pressure combined with elevated temperature, stresses imposed by piping, thermal stresses caused by temperature variations, and many other conditions causing stress in the flange or fitting.

ASME/ANSI B16.1 also contains the design of a class 250 flange, which is much heavier, has a larger bolt circle, and uses larger-sized bolts than the B16.1 class 125 flange and the flanges described in ANSI/AWWA C115/A21.15 and in this standard. ASME/ANSI B16.1 class 250 flanges will not connect to the B16.1 class 125 flange, the ANSI/AWWA C115/A21.15 flange, or the ANSI/AWWA C110/A21.10 flange.

4. Although this standard does not detail the orientation of bolt holes in the flanges of the mechanical joint, it is at times convenient or necessary to have the bolt holes specially 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. With standard base bends and standard base tees, the vertical centerline is determined when the fitting is in a position to change the fluid flowing in a vertical plane.) If special orientation is known to be necessary, it should be stated on the purchase order.

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

IV. Major Revisions. The major revisions made to this standard in this edition are as follows:

1. Sec. I.A, Background, was revised to recognize the current scope of the A21 Committee.

2. The scope was amended and Tables 12 and 15 through 19 were footnoted to recognize that 24-in. (610 mm) and smaller flanged fittings may be rated for 350 psi with the use of specially designed gaskets, either ring or full face using

annular rings molded into the gasket to improve performance, as recommended by the manufacturer.

3. The scope was revised to include a surge allowance.

4. Sec. 4.2.1 was revised to reference ANSI/AWWA C111/A21.11 for the details of mechanical joint bell, plain end and accessories. The figure and table providing details of the mechanical joint were deleted.

5. Sec. 4.3 was revised to include fusion-bonded epoxy coating systems as a manufacturer's option.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer and Technical Support Group at (303) 794-7711, FAX (303) 795-7603, or write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or by e-mail at standards@awwa.org.

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American National Standard

American National Standard for

Ductile-Iron and Gray-Iron Fittings for Water

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes 3- to 48-in. (76- to 1,219-mm) gray-iron or ductile-iron fittings to be used with ductile-iron pipe for water. Requirements for fittings with mechanical joints and flanged joints are listed in Tables 1 through 19 (Figures 1 through 19) at the end of this standard. This standard may also be used for fittings with push-on joints or such other joints as may be agreed on at the time of purchase.

For the 3- to 24-in. (76- to 610-mm) size range, ductile-iron mechanical-joint fittings and ductile-iron push-on-joint fittings are rated for 350 psi (2,413 kPa) working pressure. Ductile-iron flange-joint fittings are rated for 250-psi (1,724-kPa) working pressure; however, 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets. Gray-iron fittings having all types of joints described in this standard are rated for 150- or 250-psi (1,034- or 1,724-kPa) working pressures, as shown in the tables.

For the 30- to 48-in. (762- to 1,219-mm) size range, fittings with all types of joints described in this standard are shown in the tables with rated working pressures

of 150 or 250 psi (1,034 or 1,724 kPa), depending on the type of iron as shown in the tables.

Fittings are adequate for the rated working pressure plus a surge allowance of 775 g (100 psi) or a surge allowance of half the rated working pressure, whichever is less.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for ductile-iron and gray-iron fittings, 3 in. through 48 in. (76 mm through 1,219 mm), for water.

Sec. 1.3 Application

This standard can be referenced in specifications for ductile-iron and gray-iron fittings, 3 in. through 48 in. (76 mm through 1,219 mm), for water. The stipulations of this standard apply when this document has been referenced and then only to ductile-iron and gray-iron fittings, 3 in. through 48 in. (76 mm through 1,219 mm), for water.

SECTION 2: DEFINITIONS

The following definitions shall apply in this standard:

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

2. *Flange joint:* The flanged and bolted joint as detailed in Figure 14 and Table 14.

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

4. *Manufacturer:* The party that manufactures, fabricates, or produces materials or products.

5. *Mechanical joint:* The gasketed and bolted joint as detailed in the latest revision of ANSI/AWWA C111/A21.11.

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

7. *Push-on joint:* The single rubber-gasket joint as stated in the latest revision of ANSI/AWWA C111/A21.11.

SECTION 3: REFERENCES

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

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

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

ANSI/AWWA C116/A21.16—American National Standard for Protective Fusion Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.

ANSI/AWWA C153/A21.53—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.

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

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

ASTM‡ A48—Standard Specification for Gray Iron Casting.

ASTM A438—Standard Test Method for Transverse Testing of Gray Cast Iron.

ASTM A536—Standard Specification for Ductile Iron Castings.

SECTION 4: REQUIREMENTS

Sec. 4.1 Permeation

The selection of materials is critical for water service and distribution piping in locations where there is likelihood the pipe will be exposed to significant concentrations of pollutants composed of low molecular weight petroleum products or organic solvents or their vapors. Research has documented that pipe materials,

*American Society of Mechanical Engineers, Three Park Ave., No. 20, New York, NY 10016.

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

‡American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428.

such as polyethylene, polybutylene, polyvinyl chloride, and asbestos cement, and elastomers, such as used in jointing gaskets and packing glands, may be subject to permeation by lower molecular weight organic solvents or petroleum products. If a water pipe must pass through such a contaminated area or an area subject to contamination, consult with the manufacturer regarding permeation of pipe walls, jointing materials, and so forth, *before* selecting materials for use in that area.

Sec. 4.2 General Requirements

4.2.1 *Mechanical joint and flange joint.* Fittings with mechanical joints and flange joints shall conform to the dimensions and weights shown in the tables in this standard unless otherwise agreed on at the time of purchase. The mechanical joint bells, plain ends, and accessories shall conform to ANSI/AWWA C111/A21.11. Either ductile-iron or gray-iron glands may be used unless otherwise specified by the purchaser.

Split glands and glands in segments and other variations shall be allowed, provided they meet the performance requirements of ANSI/AWWA C111/A21.11.

4.2.2 *Push-on joint.* Fittings with push-on joints shall have weights and dimensions of the bell, socket, and plain end in accordance with the manufacturer's standard design. The manufacturer shall provide drawings of the joint and gasket if requested by the purchaser. Performance requirements and special requirements for push-on joints shall conform to the requirements for the push-on joint in ANSI/AWWA C111/A21.11.

4.2.3 *Joint accessories.* Inclusion of joint accessories shall be specified by the purchaser. Accessories include products such as gaskets and lubricants for push-on joints; gaskets, glands and bolts for mechanical joints; and gaskets and bolts for flange joints.

4.2.4 *Type of iron.* Fittings shall be cast from gray iron or ductile iron and have pressure ratings as shown in the tables. When both materials are shown in the tables, either may be provided at the manufacturer's option unless otherwise specified by the purchaser. All fittings shall be capable of withstanding, without bursting, hydrostatic tests of three times the rated water working pressure.

4.2.5 *Other joint designs or dimensions.* Standard fittings shall be provided with the end combinations shown in the tables. When fittings of other designs or dimensions are purchased under this standard, the purchaser must specify the fitting

design. Plain ends of mechanical-joint fittings may be provided with bevels for assembly with push-on joint bells.

NOTE: Bell fittings without plain ends are most readily available.

Sec. 4.3 Coatings and Linings

4.3.1 *General.* The manufacturer may supply either asphaltic coating with cement–mortar lining or fusion bonded epoxy inside and out unless otherwise specified by the purchaser.

4.3.2 *Asphaltic outside coating.* The outside coating shall be a petroleum asphaltic coating approximately 1 mil (25 mm) thick applied to the outside of the fittings. The finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun, and strongly adherent to the fitting.

4.3.3 *Cement–mortar linings.* Cement–mortar linings shall be in accordance with the latest revision of ANSI/AWWA C104/A21.4. At the manufacturer's option, moist cement–mortar linings can be given a seal coat of asphaltic material for curing the cement mortar. Cement–mortar linings are not normally supplied in caps, plugs, or sleeves.

4.3.4 *Fusion-bonded epoxy coating.* Fusion-bonded epoxy coatings shall be in accordance with ANSI/AWWA C116/A21.16 and shall be applied to interior and exterior surfaces.

4.3.5 *Inside coating.* When specified by the purchaser, the inside of fittings that are not cement–mortar or epoxy-lined shall be an asphaltic material as thick as practicable (at least 1 mil [25mm]). This coating shall conform to all appropriate requirements for seal coat in ANSI/AWWA C104/A21.4.

4.3.6 *Special coatings and linings.* For special conditions, other types of coatings and linings may be available. Such special coatings and linings shall be specified by the purchaser.

Sec. 4.4 Special Requirements for Flanged Fittings

4.4.1 *Flanges.* Flanges shall conform to the dimensions shown in Table 14, which are adequate for the pressure ratings given in Sec. 4.2.2 of ANSI/AWWA C111/A21.11.

NOTE: The bolt circle and bolt holes of these flanges match those of ASME/ANSI B16.1 and can be joined with these class 125 flanges. Flanges of ANSI/AWWA C110/A21.10 fittings cannot be joined with class 250 B16.1 flanges.

4.4.2 *Facing.* Flanges shall be flat-faced without projection or raised-face and shall be smooth or with shallow serrations. Flanges may be back-faced or spot-faced for compliance with the flange thickness tolerance stated in this standard. Bearing surfaces for bolting shall be parallel to the flange face within 3°.

4.4.3 *Bolt holes.* Bolt holes shall be in accordance with the dimensions shown in Table 14. Bolt holes shall be equally spaced and shall straddle the centerlines of the flange as shown in Figure 14.

4.4.3.1 Misalignment of corresponding bolt holes of two opposing flanges shall not exceed 0.12 in. (3.0 mm).

4.4.3.2 If bolt-hole orientation other than provided for in this standard is required by the purchaser, the special orientation shall be specified in the purchaser's specification.

4.4.4 *Laying-length dimensions.* Face-to-face dimensions shall conform to a tolerance of ±0.06 in. (±1.5 mm) for sizes 3 to 10 in. (76 to 254 mm) and ±0.12 in. (±3.0 mm) for sizes 12 to 48 in. (305 to 1,219 mm). Center-to-face tolerances shall be one half those of face-to-face tolerances. The largest opening shall govern the tolerance for all openings.

SECTION 5: VERIFICATION

Sec. 5.1 Inspection and Certification by Manufacturer

5.1.1 *Quality control and inspection practice.* The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with this standard. All fittings shall be clean and sound without defects that could impair their service.

5.1.2 *Repairs of defects.* Repairing defects by welding or other methods shall not be allowed if such repairs could adversely affect the serviceability of the fitting or its capability to meet the strength requirements of this standard.

5.1.3 *Certification by manufacturer.* If required by the purchaser, the manufacturer shall provide a sworn statement that the inspection and all the specified tests have been made and the results thereof comply with the requirements of this standard.

5.1.4 *Manufacturer's records.* The results of the specified tests (Sec. 5.4, 5.5, 5.6, and 5.9 if applicable) shall be recorded and retained for one year and shall be available to the purchaser at the manufacturer's plant.

Sec. 5.2 Inspection by Purchaser

5.2.1 *Purchaser's obligations.* If the purchaser desires to inspect fittings at the manufacturer's plant, it shall be stated in the purchaser's specifications and the conditions described under which the inspection shall be made (such as time and extent of the inspection).

5.2.2 *Manufacturer's obligations.* The purchaser's representative shall have free access to those areas of the manufacturer's plant as are necessary to determine compliance with this standard. The manufacturer shall make available for the use by the purchaser's representative such gauges as are necessary for inspection. The manufacturer shall provide the purchaser's representative with assistance as necessary for the handling of fittings.

Sec. 5.3 Tolerances or Permitted Variations

5.3.1 *Dimensions.* Fittings shall be measured with suitable gauges at sufficiently frequent intervals to ensure that the dimensions comply with the requirements of this standard. The smallest inside diameter (ID) of the sockets and the outside diameter (OD) of the plain ends shall be tested with circular gauges. Other socket dimensions shall be measured as appropriate.

5.3.2 *Thickness.* Minus tolerances for metal thicknesses, except those shown in Tables 1 and 2, shall not exceed the following:

Fitting Size*	Minus Tolerance	
in.	*in.*	*(mm)*
3–6	0.10	(2.5)
8–20	0.12	(3.0)
24–48	0.15	(3.8)

*Metric conversion for dimension: in. × 25.4 = mm.

An additional tolerance shall be permitted over areas not exceeding 8 in. (200 mm) in any direction as follows: for 3- to 12-in. (76- to 305-mm) fittings, 0.02 in. (0.5 mm); for 14- to 48-in. (356- to 1,219-mm) fittings, 0.03 in. (0.8 mm).

5.3.3 *Weight.* The weight of any fitting shall not be less than the nominal tabulated weight by more than 10 percent for fittings 12 in. (305 mm) or smaller in diameter or by more than 8 percent for fittings larger than 12 in. (305 mm) in diameter. The nominal tabulated weight is the weight of the fitting before the application of any lining or coating other than the standard coatings.

Sec. 5.4 Acceptance Tests

5.4.1 *Physical test—gray-iron fittings.* The standard acceptance test for the physical characteristics of gray-iron fittings shall be one of the following:

1. Transverse test conducted in accordance with ASTM A438.
2. Tensile test conducted in accordance with ASTM A48.
3. Transverse or tensile tests conducted on coupons obtained from a part of the castings' runner-bar system or the casting. The diameter of the runner bar or the thickness of the casting where the test coupon or bar is selected must be similar to that required of ASTM A438 or A48 test bars.

5.4.1.1 Choice of test. Unless specified by the purchaser, selection of the test bar coupon and test method (either the transverse test or tensile test, as the acceptance test) shall be at the option of the manufacturer. The acceptance values for tensile and transverse tests shall be as shown in the following table.

Iron Strength		Fitting Size	Bar Diam.		Span†		Min. Breaking Load		Min. Tensile Strength‡	
psi (*1,000s*)	(*MPa*)	*in.**	*in.*	(*mm*)	*in.*	(*mm*)	*lb*	(*kg*)	*psi* (*1,000s*)	(*MPa*)
25	(172)	3–14	1.20	(30.5)	18	(457)	2,000	(907)	25	(172)
30	(207)	14–24	1.20	(30.5)	18	(457)	2,200	(998)	30	(207)
30	(207)	20–48	2.00	(50.8)	24	(610)	7,600	(3,447)	30	(207)
35	(241)	16–24	1.20	(30.5)	18	(457)	2,400	(1,089)	35	(241)
35	(241)	20–36	2.00	(50.8)	24	(610)	8,300	(3,765)	35	(241)

*Metric conversion for dimension: in. × 25.4 = mm.
†ASTM A438.
‡ASTM A48.

For 20-in. (508-mm) and 24-in. (610-mm) fittings with a body thickness greater than 1 in. (25.4 mm), a 2-in. (50.8-mm) test bar shall be used.

5.4.2 *Physical test—ductile-iron fittings.* The standard acceptance test for the physical characteristics of ductile-iron fittings shall be a tensile test on coupons cast from the same iron as the fittings.

Except as otherwise provided in this standard, coupons shall be cast and the test made in accordance with ASTM A536. The test coupon shall be obtained, at the manufacturer's option, from one of the following: (1) the ASTM A536 keel block, modified keel block, or Y-block separately cast coupon; (2) the castings' runner-bar system, provided that the diameter of the runner bar at the location the coupon is selected is similar to the respective ASTM A536 coupon; or (3) the casting.

5.4.2.1 Acceptance value. The standard grade of iron shall be 70-50-05, with acceptance values as follows: minimum tensile strength, 70,000 psi (483 MPa); minimum yield strength, 50,000 psi (345 MPa); minimum elongation, 5 percent.

Another permissible acceptance value shall be the 60-42-10 grade of iron, with acceptance values as follows: minimum tensile strength, 60,000 psi (414 MPa); minimum yield strength, 42,000 psi (290 MPa); and minimum elongation, 10 percent; provided the manufacturer of fittings produced from this grade can provide records to demonstrate that such fittings meet the performance test requirements of this standard.

5.4.3 *Sampling.* At least one sample shall be taken during each period of approximately 3 hr, while the melting unit is operated continuously.

Sec. 5.5 Chemical Limitations

5.5.1 *Gray-iron fittings.* Analyses of the iron in gray-iron fittings shall be made at sufficiently frequent intervals to ensure compliance with the following limits: phosphorus, 0.90 percent maximum; sulfur, 0.15 percent maximum.

Control of the other chemical constituents shall be maintained to meet the physical property requirements of this standard. Samples for chemical analyses shall be representative and shall be obtained from either acceptance-test specimens or specimens cast for this purpose.

5.5.2 *Ductile-iron fittings.* Analyses of the iron shall be made at sufficiently frequent intervals to ensure compliance with the following limit: phosphorus, 0.08 percent maximum. Control of other chemical constituents shall be maintained to meet the physical property requirements of this standard.

Samples for chemical analyses shall be representative and shall be obtained from either an acceptance-test specimen or specimens cast for this purpose.

Sec. 5.6 Additional Tests Required by the Purchaser

If tests other than those provided in this standard are required by the purchaser, such tests shall be specified by the purchaser. Although it is not customary to make hydrostatic proof tests of fittings at the foundry, such tests may be made if specified by the purchaser. If proof tests at the foundry are required by the purchaser for an order of fittings, the fittings shall withstand, without leaks or permanent distortion, hydrostatic test pressures not to exceed one and one half times the rated water working pressures.

Sec. 5.7 Defective Specimens and Retests

When any physical test specimen shows defective machining or lack of continuity of metal, it shall be discarded and replaced by another specimen cast in the same sampling period as the specimen that failed.

Sec. 5.8 Rejection of Fittings

If the test results of any sound specimen fail to meet the applicable requirements of Sec. 5.4, or the chemical analyses do not conform to the limitations of Sec. 5.5 where applicable, the fittings represented by these tests or analyses shall be rejected, except as provided in Sec. 5.9.

Sec. 5.9 Determining Rejection

The manufacturer may limit the amount of rejection by making additional acceptance tests until the rejected lot is bracketed, in order of manufacture, by an acceptable test at each end of the interval in question.

SECTION 6: DELIVERY

Sec. 6.1 Marking

Fittings shall have distinctly cast on them the pressure rating, nominal diameters of openings, manufacturer's identification, country where cast, and the number of degrees or fraction of the circle on all bends. Ductile-iron fittings shall have the

letters "DI" or "Ductile" cast on them. Cast letters and figures shall be on the outside body of the fitting and shall have dimensions no smaller than the following:

Fitting Size*	Height of Letters		Relief	
in.	*in.*	(*mm*)	*in.*	(*mm*)
Less than 8	As large as practical		As large as practical	
8–10	3/4	(19)	3/32	(2.5)
12–48	1 1/4	(32)	3/32	(2.5)

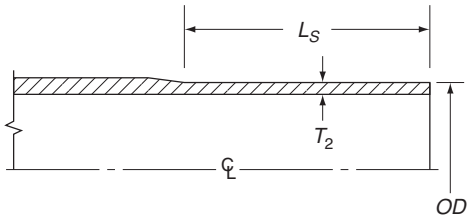
*Metric conversion for dimension: in. × 25.4 = mm.

Sec. 6.2 Packing and Shipping

This standard has no applicable information for this section.

Sec. 6.3 Affidavit of Compliance

This standard has no applicable information for this section.



NOTES:
1. All sizes of fittings with plain ends have 8 in. (203 mm) of added laying length as compared with the laying length of standard all-bell fittings.
2. In Figure 2, dimension L_S is the minimum length of the plain end that must be gauged to ensure that the outside diameter is within the dimensions and tolerances specified in Table 2.
3. Metric conversions:
   Iron strength: psi (1,000s) × 6.89 = MPa;
   Pressure rating: psi × 0.00689 = MPa;
   Dimension: in. × 25.4 = mm;
   Weight: lb × 0.4536 = kg

Figure 1 Mechanical-joint plain-end dimensions and tolerances (see Table 1)

Table 1 Plain-end dimensions and tolerances for mechanical-joint fittings

Size *in.*	*OD* *in.*	T_2 *in.*	L_S *in.*
3	3.96±0.06	0.48–0.10	5.5
4	4.80±0.06	0.47–0.10	5.5
6	6.90±0.06	0.50–0.10	5.5
8	9.05±0.06	0.54–0.12	5.5
10	11.10±0.06	0.60–0.12	5.5
12	13.20±0.06	0.68–0.12	5.5
14	15.30+0.05 –0.08	0.66–0.12	8.0
16	17.40+0.05 –0.08	0.70–0.12	8.0
18	19.50+0.05 –0.08	0.75–0.12	8.0
20	21.60+0.05 –0.08	0.80–0.12	8.0
24	25.80+0.05 –0.08	0.80–0.15	8.0
30	32.00+0.08 –0.06	1.03–0.15	8.0
36	38.30+0.08 –0.06	1.15–0.15	8.0
42	44.50+0.08 –0.06	1.28–0.15	8.0
48	50.80+0.08 –0.06	1.42–0.15	8.0

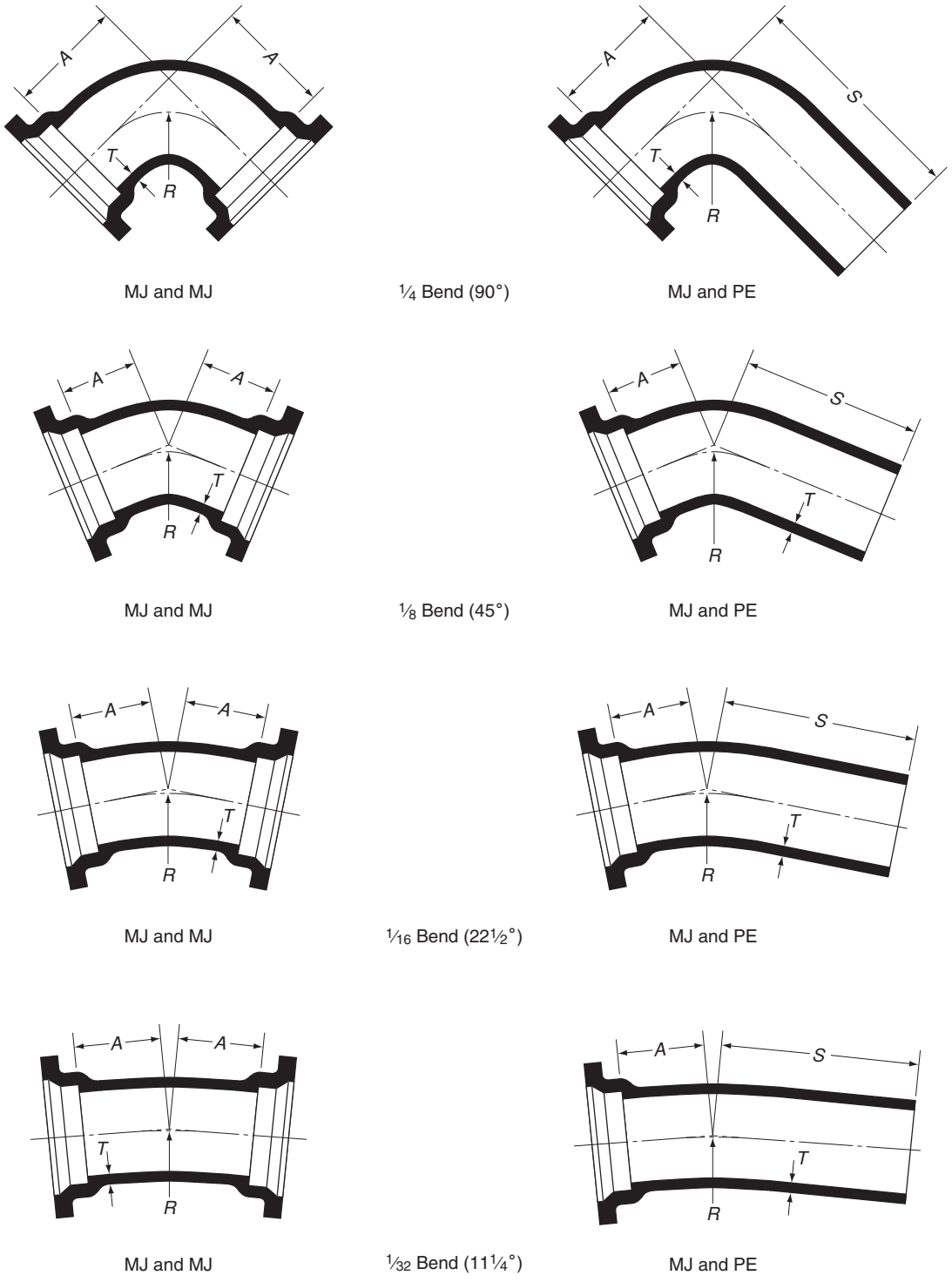


Figure 2 Mechanical-joint bends (see Table 2)

Table 2 Mechanical-joint bends

Size *in.*	Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—*in.**				Weight—*lb*†	
			T	*A*	*S*	*R*	MJ & MJ	MJ & PE
			1/4 Bends (90°)					
3	250	25	0.48	5.5	13.5	4.0	35	35
3	350	DI‡	0.48	5.5	13.5	4.0	35	35
4	250	25	0.52	6.5	14.5	4.5	55	50
4	350	DI	0.52	6.5	14.5	4.5	55	50
6	250	25	0.55	8.0	16.0	6.0	85	80
6	350	DI	0.55	8.0	16.0	6.0	85	80
8	250	25	0.60	9.0	17.0	7.0	125	120
8	350	DI	0.60	9.0	17.0	7.0	125	120
10	250	25	0.68	11.0	19.0	9.0	190	190
10	350	DI	0.68	11.0	19.0	9.0	190	190
12	250	25	0.75	12.0	20.0	10.0	255	255
12	350	DI	0.75	12.0	20.0	10.0	255	255
14	150	25	0.66	14.0	22.0	11.5	340	325
14	250	25	0.82	14.0	22.0	11.5	380	365
14	350	DI	0.66	14.0	22.0	11.5	340	325
16	150	30	0.70	15.0	23.0	12.5	430	410
16	250	30	0.89	15.0	23.0	12.5	490	470
16	350	DI	0.70	15.0	23.0	12.5	430	410
18	150	30	0.75	16.5	24.5	14.0	545	520
18	250	30	0.96	16.5	24.5	14.0	625	600
18	350	DI	0.75	16.5	24.5	14.0	545	520
20	150	30	0.80	18.0	26.0	15.5	680	650
20	250	30	1.03	18.0	26.0	15.5	790	755
20	350	DI	0.80	18.0	26.0	15.5	680	650
24	150	30	0.89	22.0	30.0	18.5	1,025	985
24	250	30	1.16	22.0	30.0	18.5	1,215	1,175
24	350	DI	0.89	22.0	30.0	18.5	1,025	985
30	150	30	1.03	25.0	33.0	21.5	1,690	1,585
30	250	30	1.37	25.0	33.0	21.5	2,030	1,920
30	250	DI	1.03	25.0	33.0	21.5	1,690	1,585
36	150	30	1.15	28.0	36.0	24.5	2,475	2,310
36	250	30	1.58	28.0	36.0	24.5	3,045	2,880
36	250	DI	1.15	28.0	36.0	24.5	2,475	2,310
42	150	30	1.28	31.0	39.0	27.5	3,410	3,200
42	250	30	1.78	31.0	39.0	27.5	4,255	4,050
42	250	DI	1.28	31.0	39.0	27.5	3,410	3,200
48	150	30	1.42	34.0	42.0	30.5	4,595	4,330
48	250	30	1.96	34.0	42.0	30.5	4,595	4,330
48	250	DI	1.42	34.0	42.0	30.5	4,595	4,330

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 2 Mechanical-joint bends (continued)

Size *in.*	Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—*in.**				Weight—*lb*†	
			T	*A*	*S*	*R*	MJ & MJ	MJ & PE
			1/8 Bends (45°)					
3	250	25	0.48	3.0	11.0	3.62	30	30
3	350	DI‡	0.48	3.0	11.0	3.62	30	30
4	250	25	0.52	4.0	12.0	4.81	50	45
4	350	DI	0.52	4.0	12.0	4.81	50	45
6	250	25	0.55	5.0	13.0	7.25	75	70
6	350	DI	0.55	5.0	13.0	7.25	75	70
8	250	25	0.60	5.5	13.5	8.44	110	105
8	350	DI	0.60	5.5	13.5	8.44	110	105
10	250	25	0.68	6.5	14.5	10.88	155	155
10	350	DI	0.68	6.5	14.5	10.88	155	55
12	250	25	0.75	7.5	15.5	13.25	215	215
12	350	DI	0.75	7.5	15.5	13.25	215	215
14	150	25	0.66	7.5	15.5	12.06	270	255
14	250	25	0.82	7.5	15.5	12.06	300	280
14	350	DI	0.66	7.5	15.5	12.06	270	255
16	150	30	0.70	8.0	16.0	13.25	340	320
16	250	30	0.89	8.0	16.0	13.25	380	360
16	350	DI	0.70	8.0	16.0	13.25	340	320
18	150	30	0.75	8.5	16.5	14.50	420	395
18	250	30	0.96	8.5	16.5	14.50	470	445
18	350	DI	0.75	8.5	16.5	14.50	420	395
20	150	30	0.80	9.5	17.5	16.88	530	500
20	250	30	1.03	9.5	17.5	16.88	595	565
20	350	DI	0.80	9.5	17.5	16.88	530	500
24	150	30	0.89	11.0	19.0	18.12	755	715
24	250	30	1.16	11.0	19.0	18.12	865	825
24	350	DI	0.89	11.0	19.0	18.12	755	715
30	150	30	1.03	15.0	23.0	27.75	1,380	1,275
30	250	30	1.37	15.0	23.0	27.75	1,620	1,510
30	250	DI	1.03	15.0	23.0	27.75	1,380	1,275
36	150	30	1.15	18.0	26.0	35.00	2,095	1,930
36	250	30	1.58	18.0	26.0	35.00	2,525	2,360
36	250	DI	1.15	18.0	26.0	35.00	2,095	1,930
42	150	30	1.28	21.0	29.0	42.25	2,955	2,745
42	250	30	1.78	21.0	29.0	42.25	3,635	3,425
42	250	DI	1.28	21.0	29.0	42.25	2,955	2,745
48	150	30	1.42	24.0	32.0	49.50	4,080	3,815
48	250	30	1.96	24.0	32.0	49.50	5,040	4,770
48	250	DI	1.42	24.0	32.0	49.50	4,080	3,815

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 2 Mechanical-joint bends (continued)

Size *in.*	Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—*in.**				Weight—*lb*†	
			T	*A*	*S*	*R*	MJ & MJ	MJ & PE
			1/16 Bends (22 1/2°)					
3	250	25	0.48	3.0	11.0	7.56	30	30
3	350	DI‡	0.48	3.0	11.0	7.56	30	30
4	250	25	0.52	4.0	12.0	10.06	50	45
4	350	DI	0.52	4.0	12.0	10.06	50	45
6	250	25	0.55	5.0	13.0	15.06	75	70
6	350	DI	0.55	5.0	13.0	15.06	75	70
8	250	25	0.60	5.5	13.5	17.62	110	105
8	350	DI	0.60	5.5	13.5	17.62	110	105
10	250	25	0.68	6.5	14.5	22.62	160	160
10	350	DI	0.68	6.5	14.5	22.62	160	160
12	250	25	0.75	7.5	15.5	27.62	220	220
12	350	DI	0.75	7.5	15.5	27.62	220	220
14	150	25	0.66	7.5	15.5	25.12	275	260
14	250	25	0.82	7.5	15.5	25.12	300	285
14	350	DI	0.66	7.5	15.5	25.12	275	260
16	150	30	0.70	8.0	16.0	27.62	345	325
16	250	30	0.89	8.0	16.0	27.62	385	365
16	350	DI	0.70	8.0	16.0	27.62	345	325
18	150	30	0.75	8.5	16.5	30.19	430	405
18	250	30	0.96	8.5	16.5	30.19	480	455
18	350	DI	0.75	8.5	16.5	30.19	430	405
20	150	30	0.80	9.5	17.5	35.19	535	505
20	250	30	1.03	9.5	17.5	35.19	605	575
20	350	DI	0.80	9.5	17.5	35.19	535	505
24	150	30	0.89	11.0	19.0	37.69	765	725
24	250	30	1.16	11.0	19.0	37.69	880	840
24	350	DI	0.89	11.0	19.0	37.69	765	725
30	150	30	1.03	15.0	23.0	57.81	1,400	1,295
30	250	30	1.37	15.0	23.0	57.81	1,650	1,540
30	250	DI	1.03	15.0	23.0	57.81	1,400	1,295
36	150	30	1.15	18.0	26.0	72.88	2,135	1,970
36	250	30	1.58	18.0	26.0	72.88	2,580	2,410
36	250	DI	1.15	18.0	26.0	72.88	2,135	1,970
42	150	30	1.28	21.0	29.0	88.00	3,020	2,810
42	250	30	1.78	21.0	29.0	88.00	3,720	3,510
42	250	DI	1.28	21.0	29.0	88.00	3,020	2,810
48	150	30	1.42	24.0	32.0	103.06	4,170	3,905
48	250	30	1.96	24.0	32.0	103.06	5,160	4,895
48	250	DI	1.42	24.0	32.0	103.06	4,170	3,905

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 2 Mechanical-joint bends (continued)

Size *in.*	Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—*in.**				Weight—*lb*†	
			T	*A*	*S*	*R*	MJ & MJ	MJ & PE
			1/32 Bends (11 1/4°)					
3	250	25	0.48	3.0	11.0	15.25	30	30
3	350	DI‡	0.48	3.0	11.0	15.25	30	30
4	250	25	0.52	4.0	12.0	20.31	50	45
4	350	DI	0.52	4.0	12.0	20.31	50	45
6	250	25	0.55	5.0	13.0	30.50	75	70
6	350	DI	0.55	5.0	13.0	30.50	75	70
8	250	25	0.60	5.5	13.5	35.50	110	105
8	350	DI	0.60	5.5	13.5	35.50	110	105
10	250	25	0.68	6.5	14.5	45.69	160	160
10	350	DI	0.68	6.5	14.5	45.69	160	160
12	250	25	0.75	7.5	15.5	55.81	220	220
12	350	DI	0.75	7.5	15.5	55.81	220	220
14	150	25	0.66	7.5	15.5	50.75	275	260
14	250	25	0.82	7.5	15.5	50.75	305	285
14	350	DI	0.66	7.5	15.5	50.75	275	260
16	150	30	0.70	8.0	16.0	55.81	345	325
16	250	30	0.89	8.0	16.0	55.81	385	365
16	350	DI	0.70	8.0	16.0	55.81	345	325
18	150	30	0.75	8.5	16.5	60.94	430	405
18	250	30	0.96	8.5	16.5	60.94	480	455
18	350	DI	0.75	8.5	16.5	60.94	430	405
20	150	30	0.80	9.5	17.5	71.06	540	510
20	250	30	1.03	9.5	17.5	71.06	610	575
20	350	DI	0.80	9.5	17.5	71.06	540	510
24	150	30	0.89	11.0	19.0	76.12	770	730
24	250	30	1.16	11.0	19.0	76.12	885	845
24	350	DI	0.89	11.0	19.0	76.12	770	730
30	150	30	1.03	15.0	23.0	116.75	1,410	1,305
30	250	30	1.37	15.0	23.0	116.75	1,655	1,550
30	250	DI	1.03	15.0	23.0	116.75	1,410	1,305
36	150	30	1.15	18.0	26.0	147.25	2,145	1,980
36	250	30	1.58	18.0	26.0	147.25	2,545	2,425
36	250	DI	1.15	18.0	26.0	147.25	2,145	1,980
42	150	30	1.28	21.0	29.0	177.69	3,035	2,825
42	250	30	1.78	21.0	29.0	177.69	3,740	3,535
42	250	DI	1.28	21.0	29.0	177.69	3,035	2,825
48	150	30	1.42	24.0	32.0	208.12	4,190	3,925
48	250	30	1.96	24.0	32.0	208.12	5,195	4,925
48	250	DI	1.42	24.0	32.0	208.12	4,190	3,925

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

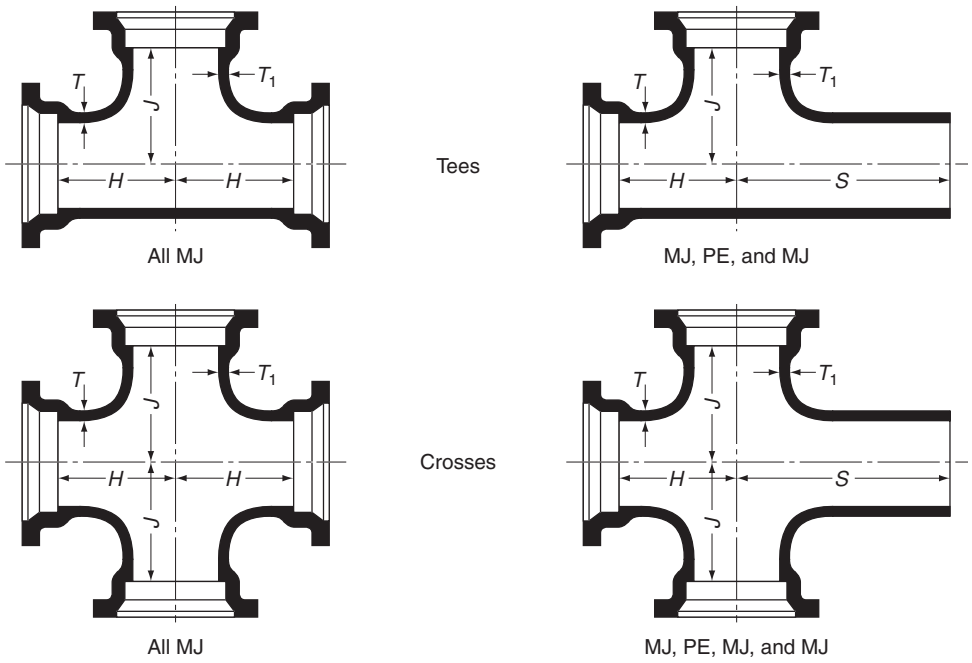


Figure 3 Mechanical-joint tees and crosses (see Table 3)

Table 3 Mechanical-joint tees and crosses

Size *in.*		Pressure Rating *psi*	Iron Strength *psi* *(1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
3	3	250	25	0.48	0.48	5.5	5.5	13.5	55	55	70	70
3	3	350	DI‡	0.48	0.48	5.5	5.5	13.5	55	55	70	70
4	3	250	25	0.52	0.48	6.5	6.5	14.5	75	70	90	85
4	3	350	DI	0.52	0.48	6.5	6.5	14.5	75	70	90	85
4	4	250	25	0.52	0.52	6.5	6.5	14.5	80	75	105	100
4	4	350	DI	0.52	0.52	6.5	6.5	14.5	80	75	105	100
6	3	250	25	0.55	0.48	8.0	8.0	16.0	110	105	125	120
6	3	350	DI	0.55	0.48	8.0	8.0	16.0	110	105	125	120
6	4	250	25	0.55	0.52	8.0	8.0	16.0	115	110	140	135
6	4	350	DI	0.55	0.52	8.0	8.0	16.0	115	110	140	135
6	6	250	25	0.55	0.55	8.0	8.0	16.0	125	120	160	155
6	6	350	DI	0.55	0.55	8.0	8.0	16.0	125	120	160	155
8	4	250	25	0.60	0.52	9.0	9.0	17.0	165	160	185	180
8	4	350	DI‡	0.60	0.52	9.0	9.0	17.0	165	160	185	180
8	6	250	25	0.60	0.55	9.0	9.0	17.0	175	170	205	200
8	6	350	DI	0.60	0.55	9.0	9.0	17.0	175	170	205	200

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 3 Mechanical-joint tees and crosses (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
8	8	250	25	0.60	0.60	9.0	9.0	17.0	185	180	235	230
8	8	350	DI	0.60	0.60	9.0	9.0	17.0	185	180	235	230
10	4	250	25	0.68	0.52	11.0	11.0	19.0	235	235	260	260
10	4	350	DI	0.68	0.52	11.0	11.0	19.0	235	235	260	260
10	6	250	25	0.68	0.55	11.0	11.0	19.0	250	250	285	285
10	6	350	DI	0.68	0.55	11.0	11.0	19.0	250	250	285	285
10	8	250	25	0.68	0.60	11.0	11.0	19.0	260	260	310	310
10	8	350	DI	0.68	0.60	11.0	11.0	19.0	260	260	310	310
10	10	250	25	0.80	0.80	11.0	11.0	19.0	310	310	380	380
10	10	350	DI	0.80	0.80	11.0	11.0	19.0	310	310	380	380
12	4	250	25	0.75	0.52	12.0	12.0	20.0	315	315	340	340
12	4	350	DI	0.75	0.52	12.0	12.0	20.0	315	315	340	340
12	6	250	25	0.75	0.55	12.0	12.0	20.0	325	325	360	360
12	6	350	DI	0.75	0.55	12.0	12.0	20.0	325	325	360	360
12	8	250	25	0.75	0.60	12.0	12.0	20.0	340	340	385	385
12	8	350	DI	0.75	0.60	12.0	12.0	20.0	340	340	385	385
12	10	250	25	0.87	0.80	12.0	12.0	20.0	390	390	460	460
12	10	350	DI	0.87	0.80	12.0	12.0	20.0	390	390	460	460
12	12	250	25	0.87	0.87	12.0	12.0	20.0	410	410	495	495
12	12	350	DI	0.87	0.87	12.0	12.0	20.0	410	410	495	495
14	6	150	25	0.66	0.55	14.0	14.0	22.0	435	420	475	460
14	6	250	25	0.82	0.55	14.0	14.0	22.0	485	470	525	505
14	6	350	DI	0.66	0.55	14.0	14.0	22.0	435	420	475	460
14	8	150	25	0.66	0.60	14.0	14.0	22.0	450	435	500	485
14	8	250	25	0.82	0.60	14.0	14.0	22.0	500	480	550	535
14	8	350	DI	0.66	0.60	14.0	14.0	22.0	450	435	500	485
14	10	150	25	0.66	0.68	14.0	14.0	22.0	465	435	540	525
14	10	250	25	0.82	0.68	14.0	14.0	22.0	515	500	585	570
14	10	350	DI	0.66	0.68	14.0	14.0	22.0	465	450	540	525
14	12	150	25	0.82	0.75	14.0	14.0	22.0	540	525	630	615
14	12	250	30	0.82	0.75	14.0	14.0	22.0	540	525	630	615
14	12	350	DI‡	0.66	0.75	14.0	14.0	22.0	495	475	585	570
14	14	150	25	0.82	0.82	14.0	14.0	22.0	585	570	710	695
14	14	250	30	0.82	0.82	14.0	14.0	22.0	585	570	710	695
14	14	350	DI	0.66	0.66	14.0	14.0	22.0	520	500	635	620
16	6	150	30	0.70	0.55	15.0	15.0	23.0	540	520	575	555
16	6	250	30	0.89	0.55	15.0	15.0	23.0	615	590	650	630
16	6	350	DI	0.70	0.55	15.0	15.0	23.0	540	520	575	555
16	8	150	30	0.70	0.60	15.0	15.0	23.0	550	530	605	585

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 3 Mechanical-joint tees and crosses (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
16	8	250	30	0.89	0.60	15.0	15.0	23.0	625	605	675	655
16	8	350	DI	0.70	0.60	15.0	15.0	23.0	550	530	605	585
16	10	150	30	0.70	0.68	15.0	15.0	23.0	570	550	645	625
16	10	250	30	0.89	0.68	15.0	15.0	23.0	645	620	710	690
16	10	350	DI	0.70	0.68	15.0	15.0	23.0	570	550	645	625
16	12	150	30	0.70	0.75	15.0	15.0	23.0	590	570	685	665
16	12	250	30	0.89	0.75	15.0	15.0	23.0	660	640	745	725
16	12	350	DI	0.70	0.75	15.0	15.0	23.0	590	570	685	665
16	14	150	30	0.89	0.82	15.0	15.0	23.0	710	690	830	810
16	14	250	35	0.89	0.82	15.0	15.0	23.0	710	690	830	810
16	14	350	DI	0.70	0.66	15.0	15.0	23.0	620	600	735	715
16	16	150	30	0.89	0.89	15.0	15.0	23.0	740	720	895	875
16	16	250	35	0.89	0.89	15.0	15.0	23.0	740	720	895	875
16	16	350	DI	0.70	0.70	15.0	15.0	23.0	650	625	790	770
18	6	150	30	0.75	0.55	13.0	15.5	21.0	590	565	625	600
18	6	250	30	0.96	0.55	13.0	15.5	21.0	670	645	705	680
18	6	350	DI	0.75	0.55	13.0	15.5	21.0	590	565	625	600
18	8	150	30	0.75	0.60	13.0	15.5	21.0	605	580	655	630
18	8	250	30	0.96	0.60	13.0	15.5	21.0	685	655	730	705
18	8	350	DI	0.75	0.60	13.0	15.5	21.0	605	580	655	630
18	10	150	30	0.75	0.68	13.0	15.5	21.0	620	595	685	660
18	10	250	30	0.96	0.68	13.0	15.5	21.0	700	670	760	735
18	10	350	DI	0.75	0.68	13.0	15.5	21.0	620	595	685	660
18	12	150	30	0.75	0.75	13.0	15.5	21.0	640	615	725	700
18	12	250	30	0.96	0.75	13.0	15.5	21.0	715	690	790	765
18	12	350	DI‡	0.75	0.75	13.0	15.5	21.0	640	615	725	700
18	14	150	30	0.75	0.66	16.5	16.5	24.5	755	730	870	845
18	14	250	30	0.96	0.82	16.5	16.5	24.5	865	840	990	965
18	14	350	DI	0.75	0.66	16.5	16.5	24.5	755	730	870	845
18	16	150	30	0.96	0.89	16.5	16.5	24.5	905	880	1,060	1,035
18	16	250	35	0.96	0.89	16.5	16.5	24.5	905	880	1,060	1,035
18	16	350	DI	0.75	0.70	16.5	16.5	24.5	785	760	930	905
18	18	150	30	0.96	0.96	16.5	16.5	24.5	945	920	1,130	1,105
18	18	250	35	0.96	0.96	16.5	16.5	24.5	945	920	1,130	1,105
18	18	350	DI	0.75	0.75	16.5	16.5	24.5	820	795	995	965
20	6	150	30	0.80	0.55	14.0	17.0	22.0	725	695	760	730
20	6	250	30	1.03	0.55	14.0	17.0	22.0	830	800	865	835
20	6	350	DI	0.80	0.55	14.0	17.0	22.0	725	695	760	730
20	8	150	30	0.80	0.60	14.0	17.0	22.0	735	705	790	760

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 3 Mechanical-joint tees and crosses (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
20	8	250	30	1.03	0.60	14.0	17.0	22.0	845	810	890	860
20	8	350	DI	0.80	0.60	14.0	17.0	22.0	735	705	790	760
20	10	150	30	0.80	0.68	14.0	17.0	22.0	755	725	820	790
20	10	250	30	1.03	0.68	14.0	17.0	22.0	860	825	920	890
20	10	350	DI	0.80	0.68	14.0	17.0	22.0	755	725	820	790
20	12	150	30	0.80	0.75	14.0	17.0	22.0	775	745	860	830
20	12	250	30	1.03	0.75	14.0	17.0	22.0	875	840	955	920
20	12	350	DI	0.80	0.75	14.0	17.0	22.0	775	745	860	830
20	14	150	30	0.80	0.66	14.0	17.0	22.0	795	765	905	875
20	14	250	35	1.03	0.82	14.0	17.0	22.0	910	875	1,025	990
20	14	350	DI	0.80	0.66	14.0	17.0	22.0	795	765	905	875
20	16	150	30	0.80	0.70	18.0	18.0	26.0	945	915	1,085	1,055
20	16	250	35	1.03	0.89	18.0	18.0	26.0	1,095	1,060	1,245	1,215
20	16	350	DI	0.80	0.70	18.0	18.0	26.0	945	915	1,085	1,055
20	18	150	35	1.03	0.96	18.0	18.0	26.0	1,140	1,110	1,330	1,300
20	18	350	DI	0.80	0.75	18.0	18.0	26.0	985	950	1,155	1,120
20	20	150	35	1.03	1.03	18.0	18.0	26.0	1,185	1,155	1,415	1,385
20	20	350	DI	0.80	0.80	18.0	18.0	26.0	1,020	990	1,230	1,200
24	6	150	30	0.89	0.55	15.0	19.0	23.0	985	945	1,025	985
24	6	250	30	1.16	0.55	15.0	19.0	23.0	1,145	1,105	1,180	1,140
24	6	350	DI‡	0.89	0.55	15.0	19.0	23.0	985	945	1,025	985
24	8	150	30	0.89	0.60	15.0	19.0	23.0	1,000	960	1,045	1,005
24	8	250	30	1.16	0.60	15.0	19.0	23.0	1,160	1,115	1,200	1,160
24	8	350	DI	0.89	0.60	15.0	19.0	23.0	1,000	960	1,045	1,005
24	10	150	30	0.89	0.68	15.0	19.0	23.0	1,025	1,980	1,085	1,015
24	10	250	30	1.16	0.68	15.0	19.0	23.0	1,170	1,130	1,230	1,190
24	10	350	DI	0.89	0.68	15.0	19.0	23.0	1,020	980	1,085	1,045
24	12	150	30	0.89	0.75	15.0	19.0	23.0	1,030	990	1,110	1,070
24	12	250	30	1.16	0.75	15.0	19.0	23.0	1,185	1,145	1,260	1,220
24	12	350	DI	0.89	0.75	15.0	19.0	23.0	1,030	990	1,110	1,070
24	14	150	30	0.89	0.66	15.0	19.0	23.0	1,055	1,015	1,155	1,115
24	14	250	30	1.16	0.82	15.0	19.0	23.0	1,220	1,180	1,325	1,285
24	14	350	DI	0.89	0.66	15.0	19.0	23.0	1,055	1,015	1,155	1,115
24	16	150	30	0.89	0.70	15.0	19.0	23.0	1,075	1,035	1,200	1,160
24	16	250	35	1.16	0.89	15.0	19.0	23.0	1,245	1,200	1,375	1,335
24	16	350	DI	0.89	0.70	15.0	19.0	23.0	1,075	1,035	1,200	1,160
24	18	150	30	0.89	0.75	22.0	22.0	30.0	1,400	1,360	1,590	1,550
24	18	250	35	1.16	0.96	22.0	22.0	30.0	1,660	1,615	1,865	1,820
24	18	350	DI	0.89	0.75	22.0	22.0	30.0	1,400	1,360	1,590	1,550

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 3 Mechanical-joint tees and crosses (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
24	20	150	35	1.16	1.03	22.0	22.0	30.0	1,720	1,680	1,965	1,925
24	20	350	DI	0.89	0.80	22.0	22.0	30.0	1,450	1,410	1,675	1,630
24	24	150	35	1.16	1.16	22.0	22.0	30.0	1,815	1,775	2,155	2,115
24	24	350	DI	0.89	0.89	22.0	22.0	30.0	1,535	1,490	1,835	1,795
30	6	150	30	1.03	0.55	18.0	23.0	26.0	1,730	1,615	1,770	1,655
30	6	250	30	1.37	0.55	18.0	23.0	26.0	2,050	1,935	2,085	1,970
30	6	250	DI	1.03	055	18.0	23.0	26.0	1,730	1,615	1,770	1,655
30	8	150	30	1.03	0.60	18.0	23.0	26.0	1,745	1,630	1,795	1,680
30	8	250	30	1.37	0.60	18.0	23.0	26.0	2,060	1,945	2,110	1,990
30	8	250	DI	1.03	0.60	18.0	23.0	26.0	1,745	1,630	1,795	1,680
30	10	150	30	1.03	0.68	18.0	23.0	26.0	1,760	1,645	1,830	1,715
30	10	250	30	1.37	0.68	18.0	23.0	26.0	2,075	1,960	2,135	2,020
30	10	250	DI‡	1.03	0.68	18.0	23.0	26.0	1,760	1,645	1,830	1,715
30	12	150	30	1.03	0.75	18.0	23.0	26.0	1,780	1,665	1,865	1,750
30	12	250	30	1.37	0.75	18.0	23.0	26.0	2,090	1,970	2,165	2,045
30	12	250	DI	1.03	0.75	18.0	23.0	26.0	1,780	1,665	1,865	1,750
30	14	150	30	1.03	0.66	18.0	23.0	26.0	1,800	1,685	1,905	1,790
30	14	250	30	1.37	0.82	18.0	23.0	26.0	2,120	2,005	2,230	2,115
30	14	250	DI	1.03	0.66	18.0	23.0	26.0	1,800	1,685	1,905	1,790
30	16	150	30	1.03	0.70	18.0	23.0	26.0	1,820	1,705	1,950	1,835
30	16	250	30	1.37	0.89	18.0	23.0	26.0	2,145	2,030	2,280	2,165
30	16	250	DI	1.03	0.70	18.0	23.0	26.0	1,820	1,705	1,950	1,835
30	18	150	30	1.03	0.75	18.0	23.0	26.0	1,845	1,730	2,000	1,885
30	18	250	35	1.37	0.96	18.0	23.0	26.0	2,170	2,055	2,330	2,215
30	18	250	DI	1.03	0.75	18.0	23.0	26.0	1,845	1,730	2,000	1,885
30	20	150	30	1.03	0.80	18.0	23.0	26.0	1,875	1,760	2,060	1,945
30	20	250	35	1.37	1.03	18.0	23.0	26.0	2,205	2,090	2,395	2,280
30	20	250	DI	1.03	0.80	18.0	23.0	26.0	1,875	1,760	2,060	1,945
30	24	150	35	1.37	1.16	25.0	25.0	33.0	2,880	2,765	3,180	3,065
30	24	250	DI	1.03	0.89	25.0	25.0	33.0	2,400	2,280	2,675	2,560
30	30	150	35	1.37	1.37	25.0	25.0	33.0	3,105	2,990	3,640	3,520
30	30	250	DI	1.03	1.03	25.0	25.0	33.0	2,595	2,480	3,075	2,955
36	8	150	30	1.15	0.60	20.0	26.0	28.0	2,520	2,345	2,565	2,390
36	8	250	30	1.58	0.60	20.0	26.0	28.0	3,050	2,870	3,095	2,915
36	8	250	DI	1.15	0.60	20.0	26.0	28.0	2,520	2,345	2,565	2,390
36	10	150	30	1.15	0.68	20.0	26.0	28.0	2,535	2,360	2,600	2,425
36	10	250	30	1.58	0.68	20.0	26.0	28.0	3,065	2,885	3,120	2,940
36	10	250	DI	1.15	0.68	20.0	26.0	28.0	2,535	2,360	2,600	2,425
36	12	150	30	1.15	0.75	20.0	26.0	28.0	2,550	2,375	2,630	2,455

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 3 Mechanical-joint tees and crosses (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
36	12	250	30	1.58	0.75	20.0	26.0	28.0	3,075	2,895	3,140	2,906
36	12	250	DI	1.15	0.75	20.0	26.0	28.0	2,550	2,375	2,630	2,455
36	14	150	30	1.15	0.66	20.0	26.0	28.0	2,570	2,395	2,665	2,490
36	14	250	30	1.58	0.82	20.0	26.0	28.0	3,105	2,925	3,205	3,025
36	14	250	DI	1.15	0.66	20.0	26.0	28.0	2,570	2,395	2,665	2,490
36	16	150	30	1.15	0.70	20.0	26.0	28.0	2,585	2,410	2,705	2,530
36	16	250	30	1.58	0.89	20.0	26.0	28.0	3,125	2,945	3,245	3,065
36	16	250	DI‡	1.15	0.70	20.0	26.0	28.0	2,585	2,410	2,705	2,530
36	18	150	30	1.15	0.75	20.0	26.0	28.0	2,610	2,435	2,750	2,575
36	18	250	30	1.58	0.96	20.0	26.0	28.0	3,150	2,970	3,290	3,110
36	18	250	DI	1.15	0.75	20.0	26.0	28.0	2,610	2,435	2,750	2,575
36	20	150	30	1.15	0.80	20.0	26.0	28.0	2,635	2,460	2,805	2,630
36	20	250	35	1.58	1.03	20.0	26.0	28.0	3,175	2,995	3,345	3,165
36	20	250	DI	1.15	0.80	20.0	26.0	28.0	2,635	2,460	2,805	2,630
36	24	150	30	1.15	0.89	20.0	26.0	28.0	2,690	2,515	2,910	2,735
36	24	250	35	1.58	1.16	20.0	26.0	28.0	3,230	3,050	3,450	3,270
36	24	250	DI	1.15	0.89	20.0	26.0	28.0	2,690	2,515	2,910	2,735
36	30	150	35	1.58	1.37	28.0	28.0	36.0	4,345	4,170	4,790	4,615
36	30	250	DI	1.15	1.03	28.0	28.0	36.0	3,545	3,365	3,965	3,790
36	36	150	35	1.58	1.58	28.0	28.0	36.0	4,590	4,410	5,280	5,105
36	36	250	DI	1.15	1.15	28.0	28.0	36.0	3,745	3,565	4,370	4,190
42	12	150	30	1.28	0.75	23.0	30.0	31.0	3,555	3,335	3,640	3,420
42	12	250	30	1.78	0.75	23.0	30.0	31.0	4,385	4,160	4,450	4,225
42	12	250	DI	1.28	0.75	23.0	30.0	31.0	3,555	3,335	3,640	3,420
42	14	150	30	1.28	0.66	23.0	30.0	31.0	3,575	3,355	3,675	3,455
42	14	250	30	1.78	0.82	23.0	30.0	31.0	4,415	4,190	4,515	4,290
42	14	250	DI	1.28	0.66	23.0	30.0	31.0	3,575	3,355	3,675	3,455
42	16	150	30	1.28	0.70	23.0	30.0	31.0	3,595	3,375	3,715	3,495
42	16	250	30	1.78	0.89	23.0	30.0	31.0	4,435	4,210	4,550	4,325
42	16	250	DI	1.28	0.70	23.0	30.0	31.0	3,595	3,375	3,715	3,495
42	18	150	30	1.28	0.75	23.0	30.0	31.0	3,615	3,395	3,755	3,535
42	18	250	30	1.78	0.96	23.0	30.0	31.0	4,455	4,230	4,595	4,370
42	18	250	DI	1.28	0.75	23.0	30.0	31.0	3,615	3,395	3,755	3,535
42	20	150	30	1.28	0.80	23.0	30.0	31.0	3,640	3,420	3,810	3,590
42	20	250	30	1.78	1.03	23.0	30.0	31.0	4,480	4,255	4,645	4,420
42	20	250	DI	1.28	0.80	23.0	30.0	31.0	3,640	3,420	3,810	3,590
42	24	150	30	1.78	1.16	23.0	30.0	31.0	4,530	4,305	4,745	4,520
42	24	250	DI	1.28	0.89	23.0	30.0	31.0	3,690	3,470	3,910	3,690
42	30	150	30	1.78	1.37	31.0	31.0	39.0	5,800	5,575	6,210	5,985
42	30	250	DI‡	1.28	1.03	31.0	31.0	39.0	4,650	4,425	5,040	4,815

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 3 Mechanical-joint tees and crosses (continued)

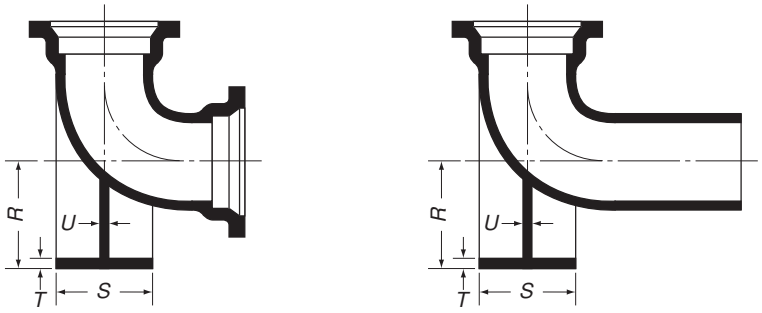
Size *in.*		Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Dimensions—in.*					Weight—*lb*†			
									Tee		Cross	
Run	Branch			*T*	T_1	*H*	*J*	*S*	All MJ	MJ, PE, & MJ	All MJ	MJ, PE, MJ, & MJ
42	36	150	DI	1.28	1.15	31.0	31.0	39.0	4,880	4,655	5,425	5,200
42	36	250	DI	1.78	1.58	31.0	31.0	39.0	6,075	5,850	6,655	6,430
42	42	150	DI	1.28	1.28	31.0	31.0	39.0	5,085	4,860	5,840	5,615
42	42	250	DI	1.78	1.78	31.0	31.0	39.0	6,320	6,095	7,145	6,920
48	12	150	30	1.42	0.75	26.0	34.0	34.0	4,870	4,580	4,955	4,665
48	12	250	30	1.96	0.75	26.0	34.0	34.0	6,025	5,735	6,095	5,805
48	12	250	DI	1.42	0.75	26.0	34.0	34.0	4,870	4,580	4,955	4,665
48	14	150	30	1.42	0.66	26.0	34.0	34.0	4,885	4,595	4,985	4,695
48	14	250	30	1.96	0.82	26.0	34.0	34.0	6,055	5,770	6,155	5,865
48	14	250	DI	1.42	0.66	26.0	34.0	34.0	4,885	4,595	4,985	4,695
48	16	150	30	1.42	0.70	26.0	34.0	34.0	4,905	4,615	5,025	4,735
48	16	250	30	1.96	0.89	26.0	34.0	34.0	6,075	5,785	6,195	5,905
48	16	250	DI	1.42	0.70	26.0	34.0	34.0	4,905	4,615	5,025	4,735
48	18	150	30	1.42	0.75	26.0	34.0	34.0	4,925	4,635	5,065	4,775
48	18	250	30	1.96	0.96	26.0	34.0	34.0	6,095	5,804	6,235	5,945
48	18	250	DI	1.42	0.75	26.0	34.0	34.0	4,925	4,635	5,065	4,775
48	20	150	30	1.42	0.80	26.0	34.0	34.0	4,950	4,660	5,115	4,825
48	20	250	30	1.96	1.03	26.0	34.0	34.0	6,120	5,830	6,285	5,995
48	20	250	DI	1.42	0.80	26.0	34.0	34.0	4,950	4,660	5,115	4,825
48	24	150	30	1.42	0.89	26.0	34.0	34.0	4,995	4,705	5,210	4,920
48	24	250	30	1.96	1.16	26.0	34.0	34.0	6,165	5,880	6,375	6,085
48	24	250	DI	1.42	0.89	26.0	34.0	34.0	4,995	4,705	5,210	4,920
48	30	150	30	1.96	1.37	26.0	34.0	34.0	6,315	6,025	6,670	6,385
48	30	250	DI	1.42	1.03	26.0	34.0	34.0	5,140	4,855	5,495	5,210
48	36	150	30	1.96	1.58	34.0	34.0	42.0	7,835	7,545	8,360	8,075
48	36	250	DI	1.42	1.15	34.0	34.0	42.0	6,280	5,995	6,790	6,500
48	42	150	DI	1.42	1.28	34.0	34.0	42.0	6,510	6,225	7,150	6,860
48	42	250	DI	1.96	1.78	34.0	34.0	42.0	8,130	7,845	8,815	8,530
48	48	150	DI	1.42	1.42	34.0	34.0	42.0	6,765	6,475	7,655	7,370
48	48	250	DI	1.96	1.96	34.0	34.0	42.0	8,420	8,135	9,380	9,095

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1.

†Weight does not include accessory weights.

‡Ductile iron.



For other dimensions of base bends, see Table 3.

Figure 4 Mechanical-joint base bends (see Table 4)

Table 4 Mechanical-joint base bends

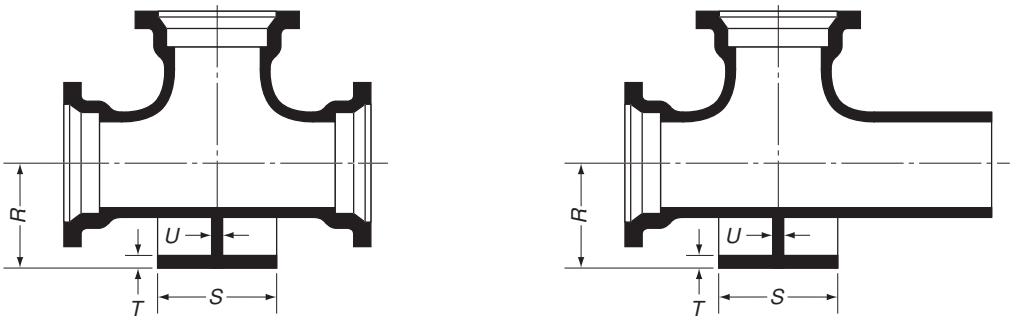
Size	Pressure Rating	Iron Strength	Dimensions—*in.*				Weight—*lb**		Base
in.	*psi*	*psi* (*1,000s*)	*R*†	*S* Diam.	*T*	*U*	MJ & MJ	MJ & PE	Only
3	250	25	4.88	5.00	0.56	0.50	45	45	10
3	350	DI‡	4.88	5.00	0.56	0.50	45	45	10
4	250	25	5.50	6.00	0.62	0.50	65	60	10
4	350	DI	5.50	6.00	0.62	0.50	65	60	10
6	250	25	7.00	7.00	0.69	0.62	105	100	20
6	350	DI	7.00	7.00	0.69	0.62	105	100	20
8	250	25	8.38	9.00	0.94	0.88	165	160	40
8	350	DI	8.38	9.00	0.94	0.88	165	160	40
10	250	25	9.75	9.00	0.94	0.88	235	235	45
10	350	DI	9.75	9.00	0.94	0.88	235	235	45
12	250	25	11.25	11.00	1.00	1.00	320	320	65
12	350	DI	11.25	11.00	1.00	1.00	320	320	65
14	150	25	12.50	11.00	1.00	1.00	410	395	70
14	250	25	12.50	11.00	1.00	1.00	450	435	70
14	350	DI	12.50	11.00	1.00	1.00	410	395	70
16	150	30	13.75	11.00	1.00	1.00	505	485	75
16	250	30	13.75	11.00	1.00	1.00	565	545	75
16	350	DI	13.75	11.00	1.00	1.00	505	485	75
18	150	30	15.00	13.50	1.12	1.12	660	635	115
18	250	30	15.00	13.50	1.12	1.12	740	715	115
18	350	DI	15.00	13.50	1.12	1.12	660	635	115
20	150	30	16.00	13.50	1.12	1.12	800	770	120
20	250	30	16.00	13.50	1.12	1.12	910	875	120
20	350	DI	16.00	13.50	1.12	1.12	800	770	120
24	150	30	18.50	13.50	1.12	1.12	1,155	1,115	130
24	250	30	18.50	13.50	1.12	1.12	1,345	1,305	130
24	350	DI	18.50	13.50	1.12	1.12	1,155	1,115	130
30	150	30	23.00	16.00	1.19	1.15	1,880	1,775	190
30	250	30	23.00	16.00	1.19	1.15	2,220	2,110	190
30	250	DI	23.00	16.00	1.19	1.15	1,880	1,775	190
36	150	30	26.00	19.00	1.25	1.15	2,725	2,560	250
36	250	30	26.00	19.00	1.25	1.15	3,295	3,130	250
36	250	DI	26.00	19.00	1.25	1.15	2,725	2,560	250
42	150	30	30.00	23.50	1.44	1.28	3,820	3,610	410
42	250	30	30.00	23.50	1.44	1.28	4,665	4,460	410
42	250	DI	30.00	23.50	1.44	1.28	3,820	3,610	410
48	150	30	34.00	25.00	1.56	1.42	5,110	4,845	515
48	250	30	34.00	25.00	1.56	1.42	6,260	5,990	515
48	250	DI	34.00	25.00	1.56	1.42	5,110	4,845	515

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Weight does not include accessory weights.

†Dimension *R* is a finished dimension; unfinished bases will be 1/8 in. (3 mm) longer; for base drilling see Table 15.

‡Ductile iron.



For other dimensions of base tees, see Table 4.

Figure 5 Mechanical-joint base tees (see Table 5)

Table 5 Mechanical-joint base tees

Size *in.*	Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	Dimensions—*in.*				Weight—*lb**		Base Only
			R†	*S* Diam.	*T*	*U*	All MJ	MJ, PE, & MJ	
3	250	25	4.88	5.00	0.56	0.50	60	60	5
3	350	DI‡	4.88	5.00	0.56	0.50	60	60	5
4	250	25	5.50	6.00	0.62	0.50	90	85	10
4	350	DI	5.50	6.00	0.62	0.50	90	85	10
6	250	25	7.00	7.00	0.69	0.62	140	135	15
6	350	DI	7.00	7.00	0.69	0.62	140	135	15
8	250	25	8.38	9.00	0.94	0.88	215	210	30
8	350	DI	8.38	9.00	0.94	0.88	215	210	30
10	250	25	9.75	9.00	0.94	0.88	340	340	30
10	350	DI	9.75	9.00	0.94	0.88	340	340	30
12	250	25	11.25	11.00	1.00	1.00	455	455	45
12	350	DI	11.25	11.00	1.00	1.00	455	455	45
14	150	25	12.50	11.00	1.00	1.00	635	620	50
14	250	30	12.50	11.00	1.00	1.00	635	620	50
14	350	DI	12.50	11.00	1.00	1.00	570	550	50
16	150	30	13.75	11.00	1.00	1.00	790	770	50
16	250	35	13.75	11.00	1.00	1.00	790	770	50
16	350	DI	13.75	11.00	1.00	1.00	700	675	50
18	150	30	15.00	13.50	1.12	1.12	1,020	995	75
18	250	35	15.00	13.50	1.12	1.12	1,020	995	75
18	350	DI	15.00	13.50	1.12	1.12	895	870	75
20	150	35	16.00	13.50	1.12	1.12	1,260	1,230	75
20	350	DI	16.00	13.50	1.12	1.12	1,095	1,065	75
24	150	35	18.50	13.50	1.12	1.12	1,895	1,855	80
24	350	DI	18.50	13.50	1.12	1.12	1,615	1,570	80
30	150	35	23.00	16.00	1.19	1.15	3,225	3,110	120
30	250	DI	23.00	16.00	1.19	1.15	2,715	2,600	120
36	150	35	26.00	19.00	1.25	1.15	4,750	4,570	160
36	250	DI	26.00	19.00	1.25	1.15	3,905	3,725	160
42	150	DI	30.00	23.50	1.44	1.28	5,355	5,130	270
42	250	DI	30.00	23.50	1.44	1.28	6,590	6,365	270
48	150	DI	34.00	25.00	1.56	1.42	7,100	6,810	335
48	250	DI	34.00	25.00	1.56	1.42	8,755	8,470	335

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Weight does not include accessory weights.

†Dimension *R* is a finished dimension; unfinished bases will be $^1/_8$ in. (3 mm) longer; for base drilling see Table 15.

‡Ductile iron.

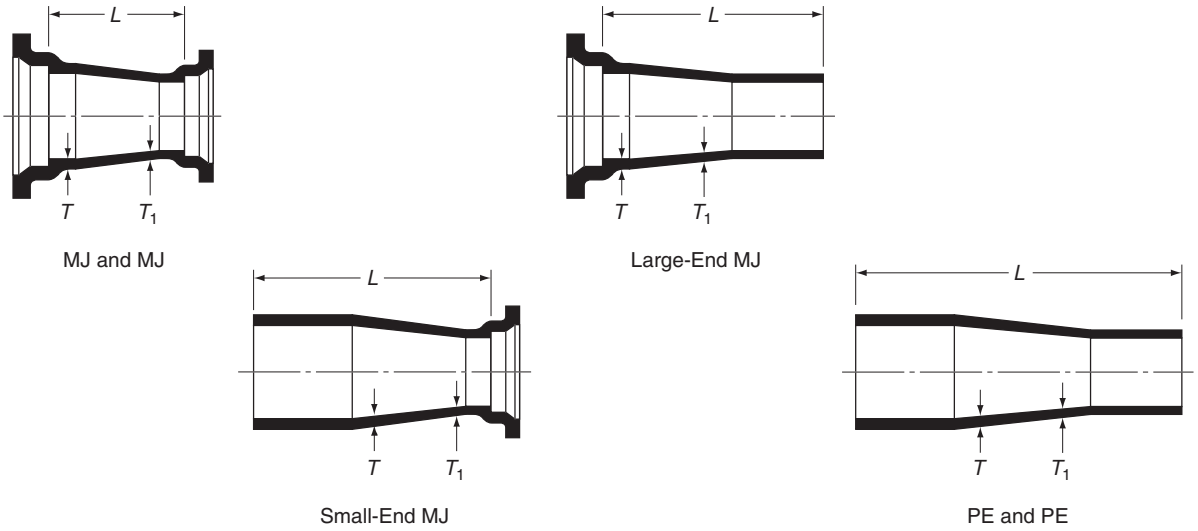


Figure 6 Mechanical-joint reducers (see Table 6)

Table 6 Mechanical-joint reducers*

Size *in.*		Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	Thickness *in.*		MJ & MJ		Small-End MJ		Large-End MJ		PE to PE	
Large End	Small End			*T* Large End	T_1 Small End	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*
4	3	250	25	0.52	0.48	7	40	15	35	15	40	23	35
4	3	350	DI‡	0.52	0.48	7	40	15	35	15	40	23	35
6	3	250	25	0.55	0.48	9	55	17	50	17	55	25	50
6	3	350	DI	0.55	0.48	9	55	17	50	17	55	25	50
6	4	250	25	0.55	0.52	9	60	17	60	17	60	25	55
6	4	350	DI	0.55	0.52	9	60	17	60	17	60	25	55
8	4	250	25	0.60	0.52	11	80	19	80	19	80	27	75
8	4	350	DI	0.60	0.52	11	80	19	80	19	80	27	75
8	6	250	25	0.60	0.55	11	95	19	90	19	90	27	85
8	6	350	DI	0.60	0.55	11	95	19	90	19	90	27	85
10	4	250	25	0.68	0.52	12	105	20	100	20	100	28	100
10	4	350	DI	0.68	0.52	12	105	20	100	20	100	28	100
10	6	250	25	0.68	0.55	12	115	20	115	20	115	28	115
10	6	350	DI	0.68	0.55	12	115	20	115	20	115	28	115
10	8	250	25	0.68	0.60	12	135	20	130	20	130	28	130
10	8	350	DI	0.68	0.60	12	135	20	130	20	130	28	130
12	4	250	25	0.75	0.52	14	135	22	130	22	130	30	130
12	4	350	DI	0.75	0.52	14	135	22	130	22	130	30	130

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 6 Mechanical-joint reducers* (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	Thickness *in.*		MJ & MJ		Small-End MJ		Large-End MJ		PE to PE	
Large End	Small End			*T* Large End	T_1 Small End	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*
12	6	250	25	0.75	0.55	14	150	22	150	22	145	30	145
12	6	350	DI‡	0.75	0.55	14	150	22	150	22	145	30	145
12	8	250	25	0.75	0.60	14	165	22	165	22	165	30	165
12	8	350	DI	0.75	0.60	14	165	22	165	22	165	30	165
12	10	250	25	0.75	0.68	14	190	22	190	22	185	30	185
12	10	350	DI	0.75	0.68	14	190	22	190	22	185	30	185
14	6	150	25	0.66	0.55	16	190	24	175	24	185	32	170
14	6	250	25	0.82	0.55	16	200	24	185	24	200	32	185
14	6	350	DI	0.66	0.55	16	190	24	175	24	185	32	170
14	8	150	25	0.66	0.60	16	210	24	190	24	205	32	190
14	8	250	25	0.82	0.60	16	220	24	205	24	220	32	205
14	8	350	DI	0.66	0.60	16	210	24	190	24	205	32	190
14	10	150	25	0.66	0.68	16	230	24	215	24	230	32	215
14	10	250	25	0.82	0.68	16	245	24	230	24	245	32	230
14	10	350	DI	0.66	0.68	16	230	24	215	24	230	32	215
14	12	150	25	0.66	0.75	16	255	24	240	24	255	32	240
14	12	250	25	0.82	0.75	16	270	24	255	24	275	32	260
14	12	350	DI	0.66	0.75	16	255	24	240	24	255	32	240
16	6	150	30	0.70	0.55	18	230	26	210	26	230	34	210
16	6	250	30	0.89	0.55	18	250	26	230	26	250	34	230
16	6	350	DI	0.70	0.55	18	230	26	210	26	230	34	210
16	8	150	30	0.70	0.60	18	250	26	230	26	250	34	230
16	8	250	30	0.89	0.60	18	270	26	250	26	270	34	250
16	8	350	DI	0.70	0.60	18	250	26	230	26	250	34	230
16	10	150	30	0.70	0.68	18	280	26	255	26	275	34	255
16	10	250	30	0.89	0.68	18	300	26	280	26	300	34	280
16	10	350	DI	0.70	0.68	18	280	26	255	26	275	34	255
16	12	150	30	0.70	0.75	18	305	26	285	26	305	34	285
16	12	250	30	0.89	0.75	18	325	26	305	26	330	34	310
16	12	350	DI	0.70	0.75	18	305	26	285	26	305	34	285
16	14	150	30	0.70	0.66	18	335	26	310	26	315	34	295
16	14	250	30	0.89	0.82	18	370	26	350	26	355	34	335
16	14	350	DI	0.70	0.66	18	335	26	310	26	315	34	295
18	8	150	30	0.75	0.60	19	295	27	270	27	295	35	270
18	8	250	30	0.96	0.60	19	320	27	295	27	320	35	295
18	8	350	DI	0.75	0.60	19	295	27	270	27	295	35	270

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 6 Mechanical-joint reducers* (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	Thickness *in.*		MJ & MJ		Small-End MJ		Large-End MJ		PE to PE	
Large End	Small End			*T* Large End	T_1 Small End	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*
18	10	150	30	0.75	0.68	19	325	27	300	27	320	35	295
18	10	250	30	0.96	0.68	19	350	27	325	27	350	35	325
18	10	350	DI‡	0.75	0.68	19	325	27	300	27	320	35	295
18	12	150	30	0.75	0.75	19	350	27	325	27	350	35	325
18	12	250	30	0.96	0.75	19	380	27	355	27	385	35	360
18	12	350	DI	0.75	0.75	19	350	27	325	27	350	35	325
18	14	150	30	0.75	0.66	19	380	27	355	27	365	35	340
18	14	250	30	0.96	0.82	19	425	27	400	27	410	35	385
18	14	350	DI	0.75	0.66	19	380	27	355	27	365	35	340
18	16	150	30	0.75	0.70	19	415	27	390	27	395	35	370
18	16	250	30	0.96	0.89	19	465	27	440	27	445	35	420
18	16	350	DI	0.75	0.70	19	415	27	390	27	395	35	370
20	10	150	30	0.80	0.68	20	375	28	345	28	375	36	345
20	10	250	30	1.03	0.68	20	410	28	380	28	410	36	380
20	10	350	DI	0.80	0.68	20	375	28	345	28	375	36	345
20	12	150	30	0.80	0.75	20	405	28	375	28	405	36	375
20	12	250	30	1.03	0.75	20	440	28	410	28	445	36	415
20	12	350	DI	0.80	0.75	20	405	28	375	28	405	36	375
20	14	150	30	0.80	0.66	20	430	28	400	28	415	36	385
20	14	250	30	1.03	0.82	20	485	28	455	28	470	36	440
20	14	350	DI	0.80	0.66	20	430	28	400	28	415	36	385
20	16	150	30	0.80	0.70	20	470	28	435	28	445	36	415
20	16	250	30	1.03	0.89	20	530	28	500	28	510	36	475
20	16	350	DI	0.80	0.70	20	470	28	435	28	445	36	415
20	18	150	30	0.80	0.75	20	510	28	475	28	485	36	455
20	18	250	30	1.03	0.96	20	575	28	545	28	550	36	520
20	18	350	DI	0.80	0.75	20	510	28	475	28	485	36	455
24	12	150	30	0.89	0.75	24	550	32	510	32	550	40	510
24	12	250	30	1.16	0.75	24	610	32	570	32	615	40	575
24	12	350	DI	0.89	0.75	24	550	32	510	32	550	40	510
24	14	150	30	0.89	0.66	24	575	32	535	32	560	40	520
24	14	250	30	1.16	0.82	24	660	32	620	32	645	40	605
24	14	350	DI	0.89	0.66	24	575	32	535	32	560	40	520
24	16	150	30	0.89	0.70	24	615	32	575	32	595	40	555
24	16	250	30	1.16	0.89	24	705	32	665	32	685	40	645
24	16	350	DI	0.89	0.70	24	615	32	575	32	595	40	555
24	18	150	30	0.89	0.75	24	660	32	620	32	635	40	595

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 6 Mechanical-joint reducers* (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	Thickness *in.*		MJ & MJ		Small-End MJ		Large-End MJ		PE to PE	
Large End	Small End			*T* Large End	T_1 Small End	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*
24	18	250	30	1.16	0.96	24	760	32	720	32	735	40	695
24	18	350	DI‡	0.89	0.75	24	660	32	620	32	635	40	595
24	20	150	30	0.89	0.80	24	705	32	665	32	675	40	635
24	20	250	30	1.16	1.03	24	815	32	775	32	785	40	745
24	20	350	DI	0.89	0.80	24	705	32	665	32	675	40	635
30	18	150	30	1.03	0.75	30	990	38	885	38	965	46	860
30	18	250	30	1.37	0.96	30	1,160	38	1,050	38	1,130	46	1,025
30	18	250	DI	1.03	0.75	30	990	38	885	38	965	46	860
30	20	150	30	1.03	0.80	30	1,050	38	945	38	1,020	46	915
30	20	250	30	1.37	1.03	30	1,225	38	1,120	38	1,195	46	1,090
30	20	250	DI	1.03	0.80	30	1,050	38	945	38	1,020	46	915
30	24	150	30	1.03	0.89	30	1,165	38	1,060	38	1,125	46	1,020
30	24	250	30	1.37	1.16	30	1,360	38	1,255	38	1,320	46	1,215
30	24	250	DI	1.03	0.89	30	1,165	38	1,060	38	1,125	46	1,020
36	20	150	30	1.15	0.80	36	1,450	44	1,285	44	1,420	52	1,255
36	20	250	30	1.58	1.03	36	1,730	44	1,560	44	1,695	52	1,530
36	20	250	DI	1.15	0.80	36	1,450	44	1,285	44	1,420	52	1,255
36	24	150	30	1.15	0.89	36	1,580	44	1,410	44	1,535	52	1,370
36	24	250	30	1.58	1.16	36	1,885	44	1,720	44	1,845	52	1,680
36	24	250	DI	1.15	0.89	36	1,580	44	1,410	44	1,535	52	1,370
36	30	150	30	1.15	1.03	36	1,855	44	1,690	44	1,750	52	1,585
36	30	250	30	1.58	1.37	36	2,225	44	2,060	44	2,120	52	1,950
36	30	250	DI	1.15	1.03	36	1,855	44	1,690	44	1,750	52	1,585
42	20	150	30	1.28	0.80	42	1,915	50	1,705	50	1,880	58	1,670
42	20	250	30	1.78	1.03	42	2,320	50	2,110	50	2,285	58	2,080
42	20	250	DI	1.28	0.80	42	1,915	50	1,705	50	1,880	58	1,670
42	24	150	30	1.28	0.89	42	2,060	50	1,855	50	2,020	58	1,810
42	24	250	30	1.78	1.16	42	2,495	50	2,285	50	2,455	58	2,245
42	24	250	DI	1.28	0.89	42	2,060	50	1,855	50	2,020	58	1,810
42	30	150	30	1.28	1.03	42	2,370	50	2,165	50	2,265	58	2,055
42	30	250	30	1.78	1.37	42	2,885	50	2,675	50	2,780	58	2,570
42	30	250	DI	1.28	1.03	42	2,370	50	2,165	50	2,265	58	2,055
42	36	150	30	1.28	1.15	42	2,695	50	2,485	50	2,530	58	2,320
42	36	250	30	1.78	1.58	42	3,310	50	3,100	50	3,145	58	2,935
42	36	250	DI	1.28	1.15	42	2,695	50	2,485	50	2,530	58	2,320

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

†Weight does not include accessory weights.

‡Ductile iron.

Table continued next page.

Table 6 Mechanical-joint reducers* (continued)

Size *in.*		Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	Thickness *in.*		MJ & MJ		Small-End MJ		Large-End MJ		PE to PE	
Large End	Small End			*T* Large End	T_1 Small End	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*	*L* *in.*	Weight† *lb*
48	30	150	30	1.42	1.03	48	3,005	56	2,740	56	2,900	64	2,635
48	30	250	30	1.96	1.37	48	3,680	56	3,410	56	3,570	64	3,305
48	30	250	DI‡	1.42	1.03	48	3,005	56	2,740	56	2,900	64	2,635
48	36	150	30	1.42	1.15	48	3,370	56	3,100	56	3,205	64	2,940
48	36	250	30	1.96	1.58	48	4,160	56	3,890	56	3,990	64	3,725
48	36	250	DI	1.42	1.15	48	3,370	56	3,100	56	3,205	64	2,940
48	42	150	30	1.42	1.28	48	3,750	56	3,480	56	3,540	64	3,275
48	42	250	30	1.96	1.78	48	4,655	56	4,390	56	4,445	64	4,180
48	42	250	DI	1.42	1.28	48	3,750	56	3,480	56	3,540	64	3,275

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Dimension details of plain ends are shown in Table 1. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

†Weight does not include accessory weights.

‡Ductile iron.

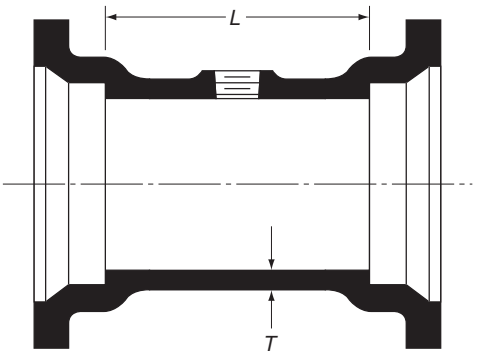


Figure 7 Mechanical-joint tapped tees (see Table 7)

Table 7 Mechanical-joint tapped tees*

Size *in.*	Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	*T* *in.*	*L* *in.*	Max. Tap in Boss *in.*	Weight† *lb*
3	250	25	0.48	8	2½	35
3	350	DI‡	0.48	8	2½	35
4	250	25	0.52	8	2½	45
4	350	DI	0.52	8	2½	45
6	250	25	0.55	8	2½	70
6	350	DI	0.55	8	2½	70
8	250	25	0.60	8	2½	95
8	350	DI	0.60	8	2½	95
10	250	25	0.68	8	2½	130
10	350	DI	0.68	8	2½	130
12	250	25	0.75	8	2½	165
12	250	DI	0.75	8	2½	165

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Two bosses can be used to make a tapped cross.

†Weight does not include accessory weights.

‡Ductile iron.

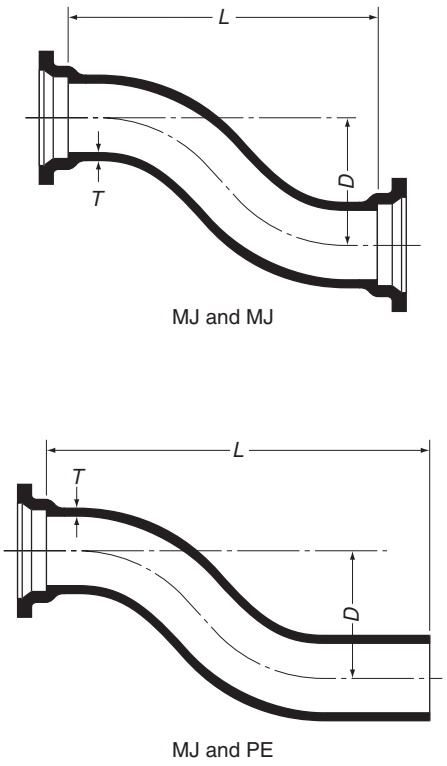


Figure 8 Mechanical-joint offsets (see Table 8)

Table 8 Mechanical-joint offsets*

Size *in.*	PR† *psi*	Iron Strength *psi (1,000s)*	*D* *in.*	*T* *in.*	MJ & MJ *L* *in.*	MJ & MJ Wgt.‡ *lb*	MJ & PE *L* *in.*	MJ & PE Wgt.‡ *lb*
3	250	25	5	0.48	19	50	27	50
3	350	DI§	5	0.48	19	50	27	50
3	250	25	12	0.48	22	60	30	60
3	350	DI	12	0.48	22	60	30	60
3	250	25	18	0.48	30	75	38	75
3	350	DI	18	0.48	30	75	38	75
4	250	25	6	0.52	19	75	27	70
4	350	DI	6	0.52	19	75	27	70
4	250	25	12	0.52	22	85	30	80
4	350	DI	12	0.52	22	85	30	80
4	250	25	18	0.52	30	105	38	100
4	350	DI	18	0.52	30	105	38	100
6	250	25	6	0.55	20	110	28	105
6	350	DI	6	0.55	20	110	28	105
6	250	25	12	0.55	26	135	34	130
6	350	DI	12	0.55	26	135	34	130
6	250	25	18	0.55	33	165	41	160
6	350	DI	18	0.55	33	165	41	160
8	250	25	6	0.60	21	150	29	155
8	350	DI	6	0.60	21	160	29	155
8	250	25	12	0.60	28	200	36	195
8	350	DI	12	0.60	28	200	36	195
8	250	25	18	0.60	35	245	43	240
8	350	DI	18	0.60	35	245	43	240
10	250	25	6	0.68	22	220	30	220
10	350	DI	6	0.68	22	220	30	220
10	250	25	12	0.68	30	250	38	280
10	350	DI	12	0.68	30	250	38	280
10	250	25	18	0.68	38	340	46	340
10	350	DI	18	0.68	38	340	46	340
12	250	25	6	0.75	26	320	34	320
12	350	DI	6	0.75	26	320	34	320
12	250	25	12	0.75	37	420	45	420
12	350	DI	12	0.75	37	420	45	420
12	250	25	18	0.75	48	520	56	520
12	350	DI	18	0.75	48	520	56	520
14	150	25	6	0.66	27	380	35	365
14	250	25	6	0.82	27	435	35	420
14	350	DI	6	0.66	27	380	35	365
14	150	25	12	0.66	38	480	46	465
14	250	25	12	0.82	38	560	46	545
14	350	DI	12	0.66	38	480	46	465
14	150	25	18	0.66	49	585	57	570
14	250	25	18	0.82	49	680	57	665
14	350	DI	18	0.66	49	585	57	570
16	150	30	6	0.70	27	460	35	440
16	250	30	6	0.89	27	535	35	515
16	350	DI	6	0.70	27	460	35	440
16	150	30	12	0.70	40	600	48	580
16	250	30	12	0.89	40	715	48	690
16	350	DI	12	0.70	40	600	48	580
16	150	30	18	0.70	50	710	58	690
16	250	30	18	0.89	50	850	58	830
16	350	DI	18	0.70	50	710	58	690

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*For dimension details of plain ends, see Table 1.

†Pressure rating.

‡Weight does not include accessory weights.

§Ductile iron.

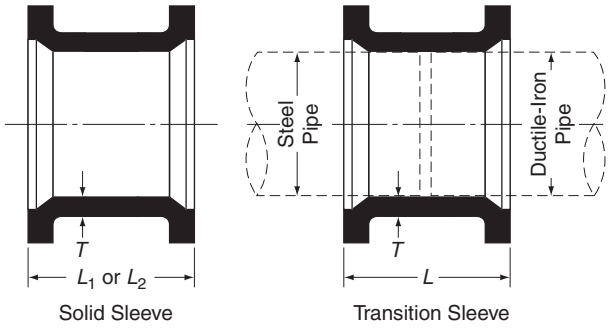
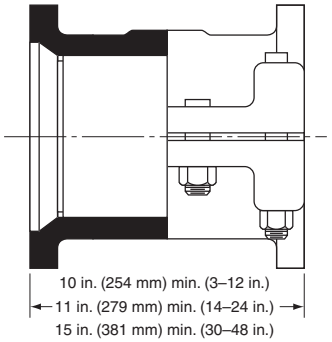


Figure 9 Mechanical-joint sleeves (see Table 9)



Split sleeves are furnished with a pressure rating of 150 psi (1.0 MPa) and can be furnished with boss and tap for service connections. Consult manufacturers for details.

Figure 9a Mechanical-joint split sleeves

Table 9 Mechanical-joint sleeves

				Solid Sleeves				Transition Sleeves*		
				L_1		L_2			L	
Size *in.*	Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	T *in.*	Length *in.*	Wgt† *lb*	Length *in.*	Wgt† *lb*	Fits OD Steel Pipe	Length *in.*	Wgt† *lb*
3	250	25	0.48	7.5	25	12	30	3.50	7.5	25
3	350	DI‡	0.48	7.5	25	12	30	3.50	7.5	25
4	250	25	0.52	7.5	35	12	45	4.50	7.5	35
4	350	DI	0.52	7.5	35	12	45	4.50	7.5	35
6	250	25	0.55	7.5	45	12	65	6.62	7.5	45
6	350	DI	0.55	7.5	45	12	65	6.62	7.5	45
8	250	25	0.60	7.5	65	12	85	8.62	7.5	65
8	350	DI	0.60	7.5	65	12	85	8.62	7.5	65
10	250	25	0.68	7.5	85	12	115	10.75	7.5	85
10	350	DI	0.68	7.5	85	12	115	10.75	7.5	85
12	250	25	0.75	7.5	110	12	145	12.75	7.5	110
12	350	DI	0.75	7.5	110	12	145	12.75	7.5	110
14	150	30	0.66	9.5	150	15	195			
14	250	30	0.82	9.5	165	15	225			
14	350	DI	0.66	9.5	150	15	195			
16	150	30	0.70	9.5	180	15	235			
16	250	30	0.89	9.5	200	15	275			
16	350	DI	0.70	9.5	180	15	235			
18	150	30	0.75	9.5	215	15	285			
18	250	30	0.96	9.5	240	15	330			
18	350	DI	0.75	9.5	215	15	285			
20	150	30	0.80	9.5	240	15	325			
20	250	30	1.03	9.5	275	15	380			
20	350	DI	0.80	9.5	240	15	325			
24	150	30	0.89	9.5	320	15	425			
24	250	30	1.16	9.5	360	15	505			
24	350	DI	0.89	9.5	320	15	425			
30	150	30	1.03	15	635	24	885			
30	250	30	1.37	15	745	24	1,085			
30	250	DI	1.03	15	635	24	885			
36	150	30	1.15	15	855	24	1,190			
36	250	30	1.58	15	1,030	24	1,495			
36	250	DI	1.15	15	855	24	1,190			
42	150	30	1.28	15	1,115	24	1,550			
42	250	30	1.78	15	1,330	24	1,940			
42	250	DI	1.28	15	1,115	24	1,550			
48	150	30	1.42	15	1,385	24	1,940			
48	250	30	1.96	15	1,645	24	2,405			
48	250	DI	1.42	15	1,385	24	1,940			

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Transition sleeves are furnished with one end designed to fit standard steel pipe and the other to fit plain-end ductile-iron pipe.

†Weight does not include accessory weights.

‡Ductile iron.

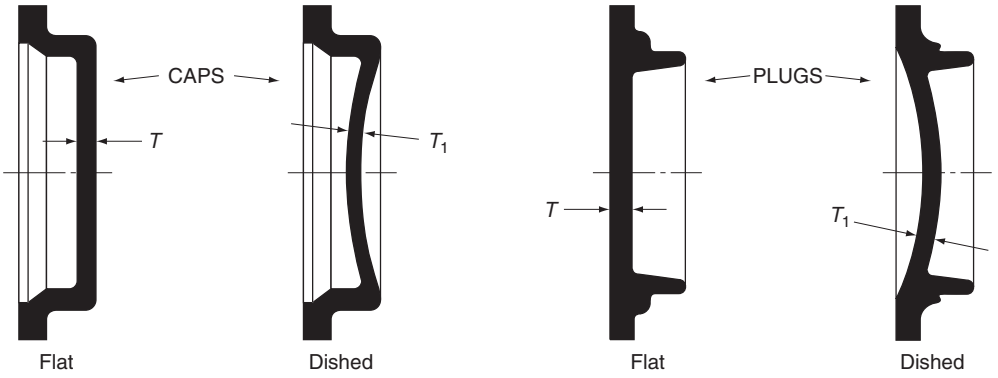


Figure 10 Mechanical-joint caps and plugs (see Table 10)

Table 10 Mechanical-joint caps and plugs

Size *in.*	Pressure Rating *psi*	Iron Strength *psi (1,000s)*	Caps				Plugs			
			Dimensions—*in.*		Weight—*lb*		Dimensions—*in.*		Weight—*lb*	
			T	T_1	Flat	Dished*	*T*	T_1	Flat	Dished*
3	250	25	0.50	0.48	12	12	0.50	0.48	10	10
3	350	DI†	0.50	0.48	12	12	0.50	0.48	10	10
4	250	25	0.60	0.52	15	15	0.60	0.52	15	15
4	350	DI	0.60	0.52	15	15	0.60	0.52	15	15
6	250	25	0.65	0.55	25	25	0.65	0.55	25	25
6	350	DI	0.65	0.55	25	25	0.65	0.55	25	25
8	250	25	0.70	0.60	45	45	0.70	0.60	45	45
8	350	DI	0.70	0.60	45	45	0.70	0.60	45	45
10	250	25	0.75	0.68	60	60	0.75	0.68	65	70
10	350	DI	0.75	0.68	60	60	0.75	0.68	65	70
12	250	25	0.75	0.75	80	80	0.75	0.75	85	90
12	350	DI	0.75	0.75	80	80	0.75	0.75	85	90
14	250	30	1.00	0.82	130	115	1.00	0.82	120	120
14	250	DI	0.32	0.66	120	110	0.32	0.66	115	115
16	250	30	1.11	0.89	175	155	1.11	0.89	155	150
16	250	DI	0.89	0.70	155	150	0.59	0.70	145	145
18	250	30	1.25	0.96	225	215	1.25	0.96	200	190
18	250	DI	0.96	0.75	195	185	0.96	0.75	185	180
20	250	30	1.40	1.03	285	250	1.40	1.03	255	215
20	250	DI	1.03	0.80	240	200	1.03	0.80	225	200
24	250	30	1.50	1.16	400	370	1.50	1.16	390	350
24	250	DI	1.16	0.89	345	300	1.16	0.89	335	390
30	150	30		1.37		680		1.37		660
30	250	DI		1.03		590		1.03		573
36	150	30		1.58		1,005		1.58		975
36	250	DI		1.15		850		1.15		815
42	150	30		1.78		1,535		1.78		1,355
42	250	DI		1.28		1,180		1.28		1,110
48	150	30		1.96		1,950		1.96		1,810
48	250	DI		1.42		1,595		1.42		1,455

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*All plugs and caps 30 in. and larger are "dished."

†Ductile iron.

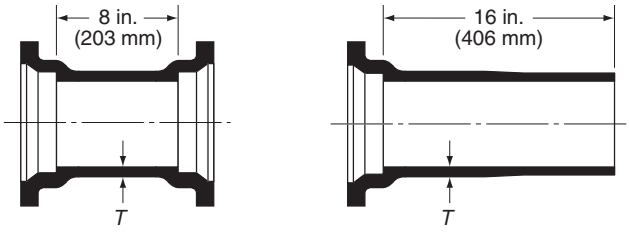


Figure 11 Mechanical-joint connecting pieces (see Table 11)

Table 11 Mechanical-joint connecting pieces*

Size *in.*	Pressure Rating *psi*	Iron Strength *psi (1,000s)*	*T—in.*	Weight—*lb*†	
				MJ & MJ	MJ & PE‡
3	250	25	0.48	35	35
3	350	DI§	0.48	35	35
4	250	25	0.52	45	45
4	350	DI	0.52	45	45
6	250	25	0.55	70	65
6	350	DI	0.55	70	65
8	250	25	0.60	95	95
8	350	DI	0.60	95	95
10	250	25	0.68	130	125
10	350	DI	0.68	130	125
12	250	25	0.75	165	165
12	350	DI	0.75	165	165
14	150	25	0.66	220	205
14	250	25	0.82	235	220
14	350	DI	0.66	220	205
16	150	30	0.70	270	250
16	250	30	0.89	290	270
16	350	DI	0.70	270	250
18	150	30	0.75	325	300
18	250	30	0.96	350	325
18	350	DI	0.75	325	300
20	150	30	0.80	390	360
20	250	30	1.03	420	385
20	350	DI	0.80	390	360
24	150	30	0.89	515	475
24	250	30	1.16	555	515
24	350	DI	0.89	515	475
30	150	30	1.03	840	730
30	250	30	1.37	905	795
30	250	DI	1.03	840	730
36	150	30	1.15	1,170	1,005
36	250	30	1.58	1,270	1,105
36	250	DI	1.15	1,170	1,005
42	150	30	1.28	1,500	1,295
42	250	30	1.78	1,635	1,430
42	250	DI	1.28	1,500	1,295
48	150	30	1.42	1,910	1,640
48	250	30	1.96	2,075	1,810
48	250	DI	1.42	1,910	1,640

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*For dimensional details of plain ends see Table 1.

†Weight does not include accessory weights.

‡May be furnished from centrifugally cast pipe.

§Ductile iron.

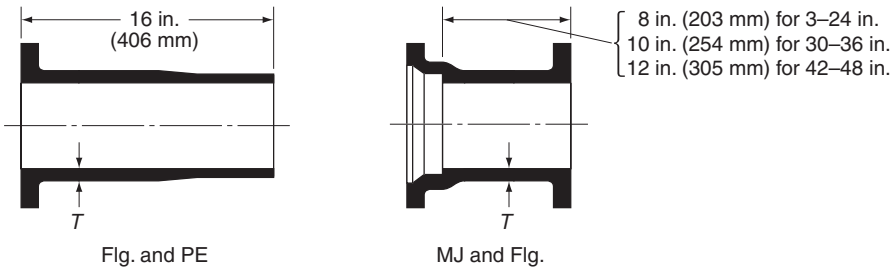


Figure 12 Connecting pieces, one-end flanged (see Table 12)

Table 12 Connecting pieces, one-end flanged*

Size *in.*	Pressure Rating *psi*	Iron Strength *psi* (*1,000s*)	*T*—*in.*	Weight—*lb*†	
				MJ & MJ	Fig. & PE‡
3	250	25	0.48	30	30
3	250	DI§	0.48	30	30
4	250	25	0.52	40	40
4	250	DI	0.52	40	40
6	250	25	0.55	60	55
6	250	DI	0.55	60	55
8	250	25	0.60	85	85
8	250	DI	0.60	85	85
10	250	25	0.68	115	115
10	250	DI	0.68	115	115
12	250	25	0.75	155	155
12	250	DI	0.75	155	155
14	150	25	0.66	195	180
14	250	25	0.82	210	195
14	250	DI	0.66	195	180
16	150	30	0.70	240	220
16	250	30	0.89	260	240
16	250	DI	0.70	240	220
18	150	30	0.75	280	255
18	250	30	0.96	305	280
18	250	DI	0.75	280	255
20	150	30	0.80	340	305
20	250	30	1.03	365	335
20	250	DI	0.80	340	305
24	150	30	0.89	455	415
24	250	30	1.16	495	455
24	250	DI	0.89	455	415
30	150	30	1.03	760	600
30	250	30	1.37	840	665
30	250	DI	1.03	760	600
36	150	30	1.15	1,070	830
36	250	30	1.58	1,195	930
36	250	DI	1.15	1,070	830
42	150	30	1.28	1,505	1,115
42	250	30	1.78	1,685	1,250
42	250	DI	1.28	1,505	1,115
48	150	30	1.42	1,885	1,390
48	250	30	1.96	2,140	1,560
48	250	DI	1.42	1,885	1,390

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*For dimensional details of plain ends see Table 13.

†Weight does not include accessory weights.

‡May be furnished from centrifugally cast pipe.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

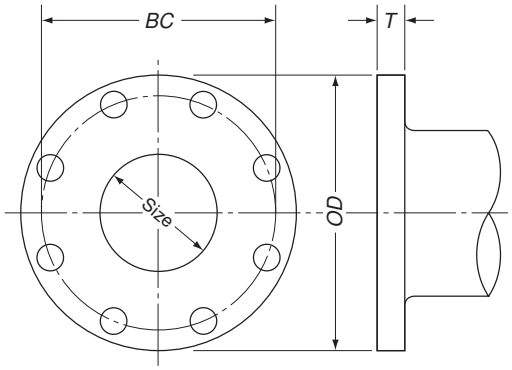


Figure 13 Flange details (see Table 13)

Table 13 Flange details

Size *in.*	Dimensions—*in.*					
	OD	*BC*	*T*	Bolt Hole Diam.	Bolt Diam. & Length—*in.*	No. of Bolts
3	7.50	6.00	0.75 ± .12	3/4	5/8 × 2 1/2	4
4	9.00	7.50	0.94 ± .12	3/4	5/8 × 3	8
6	11.00	9.50	1.00 ± .12	7/8	3/4 × 3 1/2	8
8	13.50	11.75	1.12 ± .12	7/8	3/4 × 3 1/2	8
10	16.00	14.25	1.19 ± .12	1	7/8 × 4	12
12	19.00	17.00	1.25 ± .12	1	7/8 × 4	12
14	21.00	18.75	1.38 ± .19	1 1/8	1 × 4 1/2	12
16	23.50	21.25	1.44 ± .19	1 1/8	1 × 4 1/2	16
18	25.00	22.75	1.56 ± .19	1 1/4	1 1/8 × 5	16
20	27.50	25.00	1.69 ± .19	1 1/4	1 1/8 × 5	20
24	32.00	29.50	1.88 ± .19	1 3/8	1 1/4 × 5 1/2	20
30	38.75	36.00	2.12 ± .25	1 3/8	1 1/4 × 6 1/2	28
36	46.00	42.75	2.38 ± .25	1 5/8	1 1/2 × 7	32
42	53.00	49.50	2.62 ± .25	1 5/8	1 1/2 × 7 1/2	36
48	59.50	56.00	2.75 ± .25	1 5/8	1 1/2 × 82	44

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

NOTE: For other requirements see Sec. 5.9.

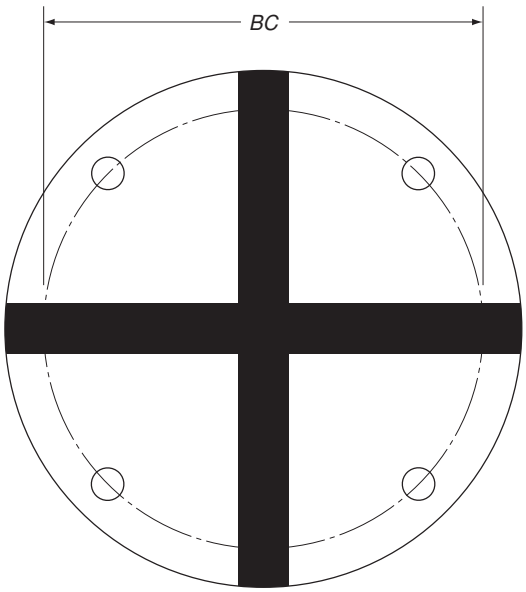


Figure 14 Base drilling details (see Table 14)

Table 14 Base drilling details*

Nom. Diam. *in.*	Dimensions—*in.*			Approx. Wgt. of Base—*lb*	
	BC	Bolt Hole Diam.	No. of Bolts	Bends	Tees
3	3.88	5/8	4	10	5
4	4.75	3/4	4	10	10
6	5.50	3/4	4	20	15
8	7.50	3/4	4	40	30
10	7.50	3/4	4	45	30
12	9.50	7/8	4	65	45
14	9.50	7/8	4	70	50
16	9.50	7/8	4	75	50
18	11.75	7/8	4	115	75
20	11.75	7/8	4	120	75
24	11.75	7/8	4	130	80
30	14.25	1	4	190	120
36	17.00	1	4	250	160
42	21.25	1 1/8	4	410	270
48	22.75	1 1/4	4	515	335

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Bases are not faced or drilled unless so specified in the purchase order.

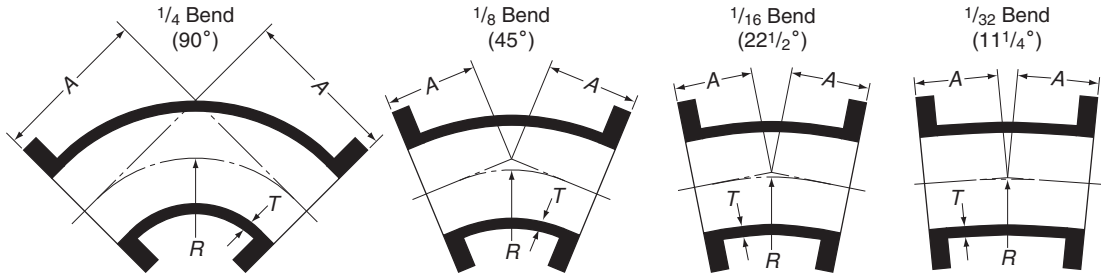


Figure 15 Flanged bends (see Table 15)

Table 15 Flanged bends

Size	PR*†	Iron Strength		Dimensions‡—*in.*								Weight—lb			
				1/4 Bend (90°)		1/8 Bend (45°)		1/16 Bend (22 1/2°)		1/32 Bend (11 1/4°)					
in.	*psi*	*psi* (*1,000s*)	*T*	*A*	*R*	*A*	*R*	*A*	*R*	*A*	*R*	1/4 Bend (90°)	1/8 Bend (45°)	1/16 Bend (22 1/2°)	1/32 Bend (11 1/4°)
3	250	25/DI§	0.48	5.5	4.0	3.0	3.62	3.0	7.56	3.0	15.25	25	20	20	20
4	250	25/DI§	0.52	6.5	4.5	4.0	4.81	4.0	10.06	4.0	20.31	45	40	40	40
6	250	25/DI§	0.55	8.0	6.0	5.0	7.25	5.0	15.06	5.0	30.50	65	55	55	55
8	250	25/DI§	0.60	9.0	7.0	5.5	8.44	5.5	17.62	5.5	35.50	105	90	90	90
10	250	25/DI§	0.68	11.0	9.0	6.5	10.88	6.5	22.62	6.5	45.69	165	130	135	135
12	250	25/DI§	0.75	12.0	10.0	7.5	13.25	7.5	27.62	7.5	55.81	235	195	205	205
14	150	25	0.66	14.0	11.5	7.5	12.06	7.5	25.12	7.5	50.75	290	220	225	225
14	250	25	0.82	14.0	11.5	7.5	12.06	7.5	25.12	7.5	50.75	330	245	250	255
14	250	DI**	0.66	14.0	11.5	7.5	12.06	7.5	25.12	7.5	50.75	290	220	225	225
16	150	30	0.70	15.0	12.5	8.0	13.25	8.0	27.62	8.0	55.81	370	280	285	285
16	250	30	0.89	15.0	12.5	8.0	13.25	8.0	27.62	8.0	55.81	430	315	325	325
16	250	DI	0.70	15.0	12.5	8.0	13.25	8.0	27.62	8.0	55.81	370	280	285	285
18	150	30	0.75	16.5	14.0	8.5	14.50	8.5	30.19	8.5	60.94	450	325	335	335
18	250	30	0.96	16.5	14.0	8.5	14.50	8.5	30.19	8.5	60.94	530	375	385	385
18	250	DI	0.75	16.5	14.0	8.5	14.50	8.5	30.19	8.5	60.94	450	325	335	335
20	150	30	0.80	18.0	15.5	9.5	16.88	9.5	35.19	9.5	71.06	580	430	435	435
20	250	30	1.03	18.0	15.5	9.5	16.88	9.5	35.19	9.5	71.06	685	485	505	505
20	250	DI	0.80	18.0	15.5	9.5	16.88	9.5	35.19	9.5	71.06	580	430	435	435
24	150	30	0.89	22.0	18.5	11.0	18.12	11.0	37.69	11.0	76.12	900	630	640	645
24	250	30	1.16	22.0	18.5	11.0	18.12	11.0	37.69	11.0	76.12	1,085	730	755	760
24	250	DI	0.89	22.0	18.5	11.0	18.12	11.0	37.69	11.0	76.12	900	630	640	645
30	150	30	1.03	25.0	21.5	15.0	27.75	15.0	57.81	15.0	116.75	1,430	1,120	1,135	1,150
30	250	30	1.37	25.0	21.5	15.0	27.75	15.0	57.81	15.0	116.75	1,755	1,335	1,385	1,395
30	250	DI	1.03	25.0	21.5	15.0	27.75	15.0	57.81	15.0	116.75	1,430	1,120	1,135	1,150
36	150	30	1.15	28.0	24.5	18.0	35.00	18.0	72.88	18.0	147.25	2,135	1,755	1,790	1,805
36	250	30	1.58	28.0	24.5	18.0	35.00	18.0	72.88	18.0	147.25	2,690	2,155	2,235	2,250
36	250	DI	1.15	28.0	24.5	18.0	35.00	18.0	72.88	18.0	147.25	2,135	1,755	1,790	1,805
42	150	30	1.28	31.0	27.5	21.0	42.25	21.0	88.00	21.0	177.69	3,055	2,600	2,665	2,680
42	250	30	1.78	31.0	27.5	21.0	42.25	21.0	88.00	21.0	177.69	3,880	3,240	3,365	3,390
42	250	DI	1.28	31.0	27.5	21.0	42.25	21.0	88.00	21.0	177.69	3,055	2,600	2,665	2,680
48	150	30	1.42	34.0	30.5	24.0	49.50	24.0	103.06	24.0	208.12	4,095	3,580	3,665	3,695
48	250	30	1.96	34.0	30.5	24.0	49.50	24.0	103.06	24.0	208.12	5,210	4,485	4,660	4,690
48	250	DI	1.42	34.0	30.5	24.0	49.50	24.0	103.06	24.0	208.12	4,095	3,580	3,665	3,695

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Pressure rating.

†Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

‡Dimension details of flanges are shown in Table 13.

§3–12-in. sizes may be gray iron (class 25) or ductile iron.

**Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

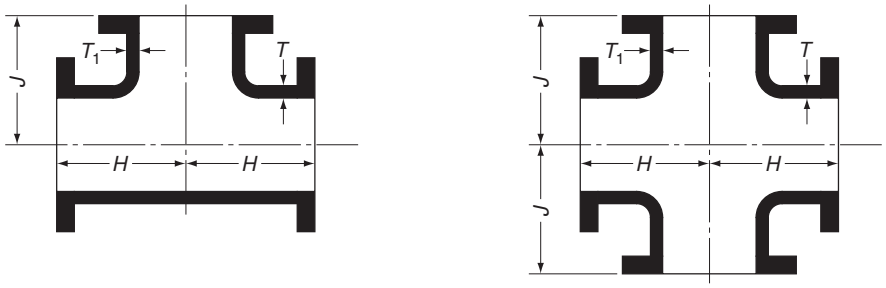


Figure 16 Flanged tees and crosses (see Table 16)

Table 16 Flanged tees and crosses

Size—*in.*		Pressure Rating*	Iron Strength	Dimensions—*in.*†				Weight—*lb*	
Run	Branch	*psi*	*psi* (*1,000s*)	*T*	T_1	*H*	*J*	Tee	Cross
3	3	250	25/DI‡	0.48	0.48	5.5	5.5	40	50
4	3	250	25/DI‡	0.52	0.48	6.5	6.5	60	70
4	4	250	25/DI‡	0.52	0.52	6.5	6.5	65	80
6	3	250	25/DI‡	0.55	0.48	8.0	8.0	85	95
6	4	250	25/DI‡	0.55	0.52	8.0	8.0	90	110
6	6	250	25/DI‡	0.55	0.55	8.0	8.0	95	120
8	4	250	25/DI‡	0.60	0.52	9.0	9.0	140	155
8	6	250	25/DI‡	0.60	0.55	9.0	9.0	145	165
8	8	250	25/DI‡	0.60	0.60	9.0	9.0	155	195
10	4	250	25	0.68	0.52	11.0	11.0	205	220
10	6	250	25	0.68	0.55	11.0	11.0	215	240
10	8	250	25	0.68	0.60	11.0	11.0	225	265
10	10	250	25	0.80	0.80	11.0	11.0	270	330
12	4	250	25	0.75	0.52	12.0	12.0	290	310
12	6	250	25	0.75	0.55	12.0	12.0	295	320
12	8	250	25	0.75	0.60	12.0	12.0	310	345
12	10	250	25	0.87	0.80	12.0	12.0	360	415
12	12	250	25	0.87	0.87	12.0	12.0	385	460
14	6	150	25	0.66	0.55	14.0	14.0	375	400
14	6	250	25	0.82	0.55	14.0	14.0	420	450
14	6	250	DI§	0.66	0.55	14.0	14.0	375	400
14	8	150	25	0.66	0.60	14.0	14.0	390	425
14	8	250	25	0.82	0.60	14.0	14.0	435	475
14	8	250	DI	0.66	0.60	14.0	14.0	390	425
14	10	150	25	0.66	0.68	14.0	14.0	400	460
14	10	250	25	0.82	0.68	14.0	14.0	450	505
14	10	250	DI	0.66	0.68	14.0	14.0	400	460
14	12	150	25	0.82	0.75	14.0	14.0	470	555
14	12	250	30	0.82	0.75	14.0	14.0	470	555
14	12	250	DI	0.66	0.75	14.0	14.0	425	505
14	14	150	25	0.82	0.82	14.0	14.0	500	595
14	14	250	30	0.82	0.82	14.0	14.0	500	595
14	14	250	DI	0.66	0.66	14.0	14.0	435	530

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are in Table 13.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

Table continued next page.

Table 16 Flanged tees and crosses (continued)

Size—*in.*		Pressure Rating*	Iron Strength	Dimensions—*in.*†				Weight—*lb*	
Run	Branch	*psi*	*psi* (*1,000s*)	*T*	T_1	*H*	*J*	Tee	Cross
16	6	150	30	0.70	0.55	15.0	15.0	465	490
16	6	250	30	0.89	0.55	15.0	15.0	540	565
16	6	250	DI‡	0.70	0.55	15.0	15.0	465	490
16	8	150	30	0.70	0.60	15.0	15.0	475	520
16	8	250	30	0.89	0.60	15.0	15.0	555	590
16	8	250	DI	0.70	0.60	15.0	15.0	475	520
16	10	150	30	0.70	0.68	15.0	15.0	495	555
16	10	250	30	0.89	0.68	15.0	15.0	565	620
16	10	250	DI	0.70	0.68	15.0	15.0	495	555
16	12	150	30	0.70	0.75	15.0	15.0	520	605
16	12	250	30	0.89	0.75	15.0	15.0	590	665
16	12	250	DI	0.70	0.75	15.0	15.0	520	605
16	14	150	30	0.89	0.82	15.0	15.0	610	700
16	14	250	35	0.89	0.82	15.0	15.0	610	700
16	14	250	DI	0.70	0.66	15.0	15.0	530	620
16	16	150	30	0.89	0.89	15.0	15.0	635	755
16	16	250	35	0.89	0.89	15.0	15.0	635	755
16	16	250	DI	0.70	0.70	15.0	15.0	550	665
18	6	150	30	0.75	0.55	13.0	15.5	480	505
18	6	250	30	0.96	0.55	13.0	15.5	560	585
18	6	250	DI	0.75	0.55	13.0	15.5	480	505
18	8	150	30	0.75	0.60	13.0	15.5	495	535
18	8	250	30	0.96	0.60	13.0	15.5	570	605
18	8	250	DI	0.75	0.60	13.0	15.5	495	535
18	10	150	30	0.75	0.68	13.0	15.5	510	560
18	10	250	30	0.96	0.68	13.0	15.5	585	630
18	10	250	DI	0.75	0.68	13.0	15.5	510	560
18	12	150	30	0.75	0.75	13.0	15.5	535	610
18	12	250	30	0.96	0.75	13.0	15.5	605	670
18	12	250	DI	0.75	0.75	13.0	15.5	535	610
18	14	150	30	0.75	0.66	16.5	16.5	630	720
18	14	250	30	0.96	0.82	16.5	16.5	740	830
18	14	250	DI	0.75	0.66	16.5	16.5	630	720
18	16	150	30	0.96	0.89	16.5	16.5	760	880
18	16	250	35	0.96	0.89	16.5	16.5	760	880
18	16	250	DI	0.75	0.70	16.5	16.5	650	765
18	18	150	30	0.96	0.96	16.5	16.5	785	915
18	18	250	35	0.96	0.96	16.5	16.5	785	915
18	18	250	DI	0.75	0.75	16.5	16.5	665	795
20	6	150	30	0.80	0.55	14.0	17.0	610	635
20	6	250	30	1.03	0.55	14.0	17.0	710	735
20	6	250	DI	0.80	0.55	14.0	17.0	610	635
20	8	150	30	0.80	0.60	14.0	17.0	620	665
20	8	250	30	1.03	0.60	14.0	17.0	720	755
20	8	250	DI	0.80	0.60	14.0	17.0	620	665

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are in Table 13.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

Table continued next page.

Table 16 Flanged tees and crosses (continued)

Size—*in.*		Pressure Rating*	Iron Strength	Dimensions—*in.*†				Weight—*lb*	
Run	Branch	*psi*	*psi* (*1,000s*)	*T*	T_1	*H*	*J*	Tee	Cross
20	10	150	30	0.80	0.68	14.0	17.0	635	685
20	10	250	30	1.03	0.68	14.0	17.0	735	780
20	10	250	DI	0.80	0.68	14.0	17.0	635	685
20	12	150	30	0.80	0.75	14.0	17.0	660	735
20	12	250	30	1.03	0.75	14.0	17.0	755	820
20	12	250	DI	0.80	0.75	14.0	17.0	660	735
20	14	150	30	0.80	0.66	14.0	17.0	665	745
20	14	250	35	1.03	0.82	14.0	17.0	770	850
20	14	250	DI	0.80	0.66	14.0	17.0	665	745
20	16	150	30	0.80	0.70	18.0	18.0	810	915
20	16	250	35	1.03	0.89	18.0	18.0	950	1,065
20	16	250	DI	0.80	0.70	18.0	18.0	810	915
20	18	150	35	1.03	0.96	18.0	18.0	965	1,100
20	18	250	DI	0.80	0.75	18.0	18.0	820	945
20	20	150	35	1.03	1.03	18.0	18.0	1,005	1,175
20	20	250	DI	0.80	0.80	18.0	18.0	855	1,015
24	6	150	30	0.89	0.55	15.0	19.0	845	875
24	6	250	30	1.16	0.55	15.0	19.0	1,000	1,025
24	6	250	DI‡	0.89	0.55	15.0	19.0	845	875
24	8	150	30	0.89	0.60	15.0	19.0	860	895
24	8	250	30	1.16	0.60	15.0	19.0	1,010	1,045
24	8	250	DI	0.89	0.60	15.0	19.0	860	895
24	10	150	30	0.89	0.68	15.0	19.0	880	930
24	10	250	30	1.16	0.68	15.0	19.0	1,020	1,065
24	10	250	DI	0.89	0.68	15.0	19.0	880	930
24	12	150	30	0.89	0.75	15.0	19.0	890	960
24	12	250	30	1.16	0.75	15.0	19.0	1,040	1,100
24	12	250	DI	0.89	0.75	15.0	19.0	890	960
24	14	150	30	0.89	0.66	15.0	19.0	900	975
24	14	250	30	1.16	0.82	15.0	19.0	1,050	1,125
24	14	250	DI	0.89	0.66	15.0	19.0	900	975
24	16	150	30	0.89	0.70	15.0	19.0	915	1,010
24	16	250	35	1.16	0.89	15.0	19.0	1,070	1,160
24	16	250	DI	0.89	0.70	15.0	19.0	915	1,010
24	18	150	30	0.89	0.75	22.0	22.0	1,220	1,365
24	18	250	35	1.16	0.96	22.0	22.0	1,470	1,620
24	18	250	DI	0.89	0.75	22.0	22.0	1,220	1,365
24	20	150	35	1.16	1.03	22.0	22.0	1,510	1,695
24	20	250	DI	0.89	0.80	22.0	22.0	1,255	1,430
24	24	150	35	1.16	1.16	22.0	22.0	1,585	1,850
24	24	250	DI	0.89	0.89	22.0	22.0	1,330	1,570
30	12	150	30	1.03	0.75	18.0	23.0	1,490	1,565
30	12	250	30	1.37	0.75	18.0	23.0	1,780	1,840
30	12	250	DI	1.03	0.75	18.0	23.0	1,490	1,565
30	14	150	30	1.03	0.66	18.0	23.0	1,490	1,570

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are in Table 13.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

Table continued next page.

Table 16 Flanged tees and crosses (continued)

Size—*in.*		Pressure Rating*	Iron Strength	Dimensions—*in.*†				Weight—*lb*	
Run	Branch	*psi*	*psi* (*1,000s*)	*T*	T_1	*H*	*J*	Tee	Cross
30	14	250	30	1.37	0.82	18.0	23.0	1,790	1,865
30	14	250	DI‡	1.03	0.66	18.0	23.0	1,490	1,570
30	16	150	30	1.03	0.70	18.0	23.0	1,505	1,605
30	16	250	30	1.37	0.89	18.0	23.0	1,810	1,900
30	16	250	DI	1.03	0.70	18.0	23.0	1,505	1,605
30	18	150	30	1.03	0.75	18.0	23.0	1,515	1,615
30	18	250	35	1.37	0.96	18.0	23.0	1,815	1,910
30	18	250	DI	1.03	0.75	18.0	23.0	1,515	1,615
30	20	150	30	1.03	0.80	18.0	23.0	1,540	1,670
30	20	250	35	1.37	1.03	18.0	23.0	1,840	1,960
30	20	250	DI	1.03	0.80	18.0	23.0	1,540	1,670
30	24	150	35	1.37	1.16	25.0	25.0	2,475	2,695
30	24	250	DI	1.03	0.89	25.0	25.0	2,025	2,245
30	30	150	35	1.37	1.37	25.0	25.0	2,615	2,980
30	30	250	DI	1.03	1.03	25.0	25.0	2,150	2,500
36	12	150	30	1.15	0.75	20.0	26.0	2,170	2,240
36	12	250	30	1.58	0.75	20.0	26.0	2,670	2,725
36	12	250	DI	1.15	0.75	20.0	26.0	2,170	2,240
36	14	150	30	1.15	0.66	20.0	26.0	2,175	2,240
36	14	250	30	1.58	0.82	20.0	26.0	2,680	2,740
36	14	250	DI	1.15	0.66	20.0	26.0	2,175	2,240
36	16	150	30	1.15	0.70	20.0	26.0	2,185	2,270
36	16	250	30	1.58	0.89	20.0	26.0	2,690	2,765
36	16	250	DI	1.15	0.70	20.0	26.0	2,185	2,270
36	18	150	30	1.15	0.75	20.0	26.0	2,190	2,280
36	18	250	30	1.58	0.96	20.0	26.0	2,695	2,770
36	18	250	DI	1.15	0.75	20.0	26.0	2,190	2,280
36	20	150	30	1.15	0.80	20.0	26.0	2,210	2,325
36	20	250	35	1.58	1.03	20.0	26.0	2,715	2,810
36	20	250	DI	1.15	0.80	20.0	26.0	2,210	2,325
36	24	150	30	1.15	0.89	20.0	26.0	2,255	2,405
36	24	250	35	1.58	1.16	20.0	26.0	2,750	2,880
36	24	250	DI	1.15	0.89	20.0	26.0	2,255	2,405
36	30	150	35	1.58	1.37	28.0	28.0	3,745	4,025
36	30	250	DI	1.15	1.03	28.0	28.0	3,000	3,300
36	36	150	35	1.58	1.58	28.0	28.0	3,930	4,405
36	36	250	DI	1.15	1.15	28.0	28.0	3,160	3,620
42	12	150	30	1.28	0.75	23.0	30.0	3,165	3,240
42	12	250	30	1.78	0.75	23.0	30.0	3,950	4,005
42	12	250	DI	1.28	0.75	23.0	30.0	3,165	3,240
42	14	150	30	1.28	0.66	23.0	30.0	3,170	3,240
42	14	250	30	1.78	0.82	23.0	30.0	3,960	4,020
42	14	250	DI	1.28	0.66	23.0	30.0	3,170	3,240
42	16	150	30	1.28	0.70	23.0	30.0	3,180	3,270
42	16	250	30	1.78	0.89	23.0	30.0	3,970	4,045

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are in Table 13.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

Table continued next page.

Table 16 Flanged tees and crosses (continued)

Size—*in.*		Pressure Rating*	Iron Strength	Dimensions—*in.*†				Weight—*lb*	
Run	Branch	*psi*	*psi* (*1,000s*)	*T*	T_1	*H*	*J*	Tee	Cross
42	16	250	DI‡	1.28	0.70	23.0	30.0	3,180	3,270
42	18	150	30	1.28	0.75	23.0	30.0	3,185	3,275
42	18	250	30	1.78	0.96	23.0	30.0	3,970	4,045
42	18	250	DI	1.28	0.75	23.0	30.0	3,185	3,275
42	20	150	30	1.28	0.80	23.0	30.0	3,205	3,320
42	20	250	30	1.78	1.03	23.0	30.0	3,990	4,080
42	20	250	DI	1.28	0.80	23.0	30.0	3,205	3,320
42	24	150	30	1.78	1.16	23.0	30.0	4,020	4,135
42	24	250	DI	1.28	0.89	23.0	30.0	3,245	3,395
42	30	150	30	1.78	1.37	31.0	31.0	5,225	5,445
42	30	250	DI	1.28	1.03	31.0	31.0	4,125	4,375
42	36	150	DI	1.28	1.15	31.0	31.0	4,265	4,655
42	36	250	DI	1.78	1.58	31.0	31.0	5,360	5,720
42	42	150	DI	1.28	1.28	31.0	31.0	4,470	5,065
42	42	250	DI	1.78	1.78	31.0	31.0	5,580	6,155
48	12	150	30	1.42	0.75	26.0	34.0	4,315	4,390
48	12	250	30	1.96	0.75	26.0	34.0	5,425	5,480
48	12	250	DI	1.42	0.75	26.0	34.0	4,315	4,390
48	14	150	30	1.42	0.66	26.0	34.0	4,315	4,385
48	14	250	30	1.96	0.82	26.0	34.0	5,435	5,495
48	14	250	DI	1.42	0.66	26.0	34.0	4,315	4,385
48	16	150	30	1.42	0.70	26.0	34.0	4,330	4,415
48	16	250	30	1.96	0.89	26.0	34.0	5,445	5,515
48	16	250	DI	1.42	0.70	26.0	34.0	4,330	4,415
48	18	150	30	1.42	0.75	26.0	34.0	4,330	4,420
48	18	250	30	1.96	0.96	26.0	34.0	5,445	5,515
48	18	250	DI	1.42	0.75	26.0	34.0	4,330	4,420
48	20	150	30	1.42	0.80	26.0	34.0	4,350	4,460
48	20	250	30	1.96	1.03	26.0	34.0	5,460	5,545
48	20	250	DI	1.42	0.80	26.0	34.0	4,350	4,460
48	24	150	30	1.42	0.89	26.0	34.0	4,385	4,535
48	24	250	30	1.96	1.16	26.0	34.0	5,485	5,595
48	24	250	DI	1.42	0.89	26.0	34.0	4,385	4,535
48	30	150	30	1.96	1.37	26.0	34.0	5,540	5,705
48	30	250	DI	1.42	1.03	26.0	34.0	4,455	4,670
48	36	150	30	1.96	1.58	34.0	34.0	7,035	7,310
48	36	250	DI	1.42	1.15	34.0	34.0	5,555	5,880
48	42	150	DI	1.42	1.28	34.0	34.0	5,720	6,215
48	42	250	DI	1.96	1.78	34.0	34.0	7,195	7,630
48	48	150	DI	1.42	1.42	34.0	34.0	5,900	6,570
48	48	250	DI	1.96	1.96	34.0	34.0	7,385	8,005

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

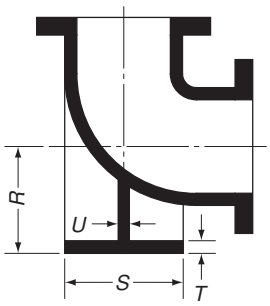
*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are in Table 13.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.



For other dimensions of base bends, see Table 16.

Figure 17 Flanged base bends (see Table 17)

Table 17 Flanged base bends

Size *in.*	Pressure Rating* *psi*	Iron Strength *psi* (*1,000s*)	Dimensions—*in.*				Weight—*lb*	
			R†	*S* Diam.	*T*	*U*	Base Fitting	Base Only
3	250	25/DI‡	4.88	5.00	0.56	0.50	35	10
4	250	25/DI‡	5.50	6.00	0.62	0.50	55	10
6	250	25/DI‡	7.00	7.00	0.69	0.62	85	20
8	250	25/DI‡	8.38	9.00	0.94	0.88	145	40
10	250	25/DI‡	9.75	9.00	0.94	0.88	210	45
12	250	25/DI‡	11.25	11.00	1.00	1.00	300	65
14	150	25	12.50	11.00	1.00	1.00	360	70
14	250	25	12.50	11.00	1.00	1.00	400	70
14	250	DI§	12.50	11.00	1.00	1.00	360	70
16	150	30	13.75	11.00	1.00	1.00	445	75
16	250	30	13.75	11.00	1.00	1.00	505	75
16	250	DI	13.75	11.00	1.00	1.00	445	75
18	150	30	15.00	13.50	1.12	1.12	565	115
18	250	30	15.00	13.50	1.12	1.12	645	115
18	250	DI	15.00	13.50	1.12	1.12	565	115
20	150	30	16.00	13.50	1.12	1.12	700	120
20	250	30	16.00	13.50	1.12	1.12	805	120
20	250	DI	16.00	13.50	1.12	1.12	700	120
24	150	30	18.50	13.50	1.12	1.12	1,030	130
24	250	30	18.50	13.50	1.12	1.12	1,215	130
24	250	DI	18.50	13.50	1.12	1.12	1,030	130
30	150	30	23.00	16.00	1.19	1.15	1,625	190
30	250	30	23.00	16.00	1.19	1.15	1,945	190
30	250	DI	23.00	16.00	1.19	1.15	1,625	190
36	150	30	26.00	19.00	1.25	1.15	2,385	250
36	250	30	26.00	19.00	1.25	1.15	2,940	250
36	250	DI	26.00	19.00	1.25	1.15	2,385	250
42	150	30	30.00	23.50	1.44	1.28	3,465	410
42	250	30	30.00	23.50	1.44	1.28	4,290	410
42	250	DI	30.00	23.50	1.44	1.28	3,465	410
48	150	30	34.00	25.00	1.56	1.42	4,610	515
48	250	30	34.00	25.00	1.56	1.42	5,725	515
48	250	DI	34.00	25.00	1.56	1.42	4,610	515

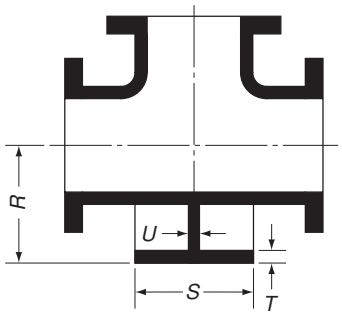
Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension *R* is a finished dimension: unfinished bases will be 1/2 in. (3 mm) longer; details for base drilling are given in Table 14.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.



For other dimensions of base tees see Table 17.

Figure 18 Flanged base tees (see Table 18)

Table 18 Flanged base tees

Size *in.*	Pressure Rating* *psi*	Iron Strength *psi* (*1,000s*)	Dimensions—*in.*				Weight—*lb*	
			R†	*S* Diam.	*T*	*U*	Base Fitting	Base Only
3	250	25/DI‡	4.88	5.00	0.56	0.50	45	5
4	250	25/DI‡	5.50	6.00	0.62	0.50	75	10
6	250	25/DI‡	7.00	7.00	0.69	0.62	110	15
8	250	25/DI‡	8.38	9.00	0.94	0.88	185	30
10	250	25/DI‡	9.75	9.00	0.94	0.88	300	30
12	250	25/DI‡	11.25	11.00	1.00	1.00	430	45
14	150	25	12.50	11.00	1.00	1.00	550	50
14	250	30	12.50	11.00	1.00	1.00	550	50
14	250	DI§	12.50	11.00	1.00	1.00	485	50
16	150	30	13.75	11.00	1.00	1.00	685	50
16	250	35	13.75	11.00	1.00	1.00	685	50
16	250	DI	13.75	11.00	1.00	1.00	600	50
18	150	30	15.00	13.50	1.12	1.12	860	75
18	250	35	15.00	13.50	1.12	1.12	860	75
18	250	DI	15.00	13.50	1.12	1.12	740	75
20	150	35	16.00	13.50	1.12	1.12	1,080	75
20	250	DI	16.00	13.50	1.12	1.12	930	75
24	150	35	18.50	13.50	1.12	1.12	1,665	80
24	150	DI	18.50	13.50	1.12	1.12	1,410	80
30	150	35	23.00	16.00	1.19	1.15	2,735	120
30	250	DI	23.00	16.00	1.19	1.15	2,270	120
36	150	35	26.00	19.00	1.25	1.15	4,090	160
36	250	DI	26.00	19.00	1.25	1.15	3,320	160
42	150	DI	30.00	23.50	1.44	1.28	4,740	270
42	250	DI	30.00	23.50	1.44	1.28	5,850	270
48	150	DI	34.00	25.00	1.56	1.42	6,235	335
48	250	DI	34.00	25.00	1.56	1.42	7,720	335

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension *R* is a finished dimension: unfinished bases will be 1/2 in. (3 mm) longer; details for base drilling are given in Table 14.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

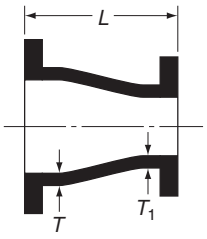


Figure 19 Flanged reducers (see Table 19)

Table 19 Flanged reducers

Size—*in.*				Dimensions—*in.*†			
Large	Small	Pressure Rating* *psi*	Iron Strength *psi* (*1,000s*)	*T* Large End	T_1 Small End	*L*	Wgt. *lb*
4	3	250	25/DI‡	0.52	0.48	7	30
6	3	250	25/DI‡	0.55	0.48	9	40
6	4	250	25/DI‡	0.55	0.52	9	45
8	4	250	25/DI‡	0.60	0.52	11	65
8	6	250	25/DI‡	0.60	0.55	11	75
10	4	250	25/DI‡	0.68	0.52	12	85
10	6	250	25/DI‡	0.68	0.55	12	90
10	8	250	25/DI‡	0.68	0.60	12	110
12	4	250	25/DI‡	0.75	0.52	14	120
12	6	250	25/DI‡	0.75	0.55	14	130
12	8	250	25/DI‡	0.75	0.60	14	145
12	10	250	25/DI‡	0.75	0.68	14	170
14	6	150	25	0.66	0.55	16	155
14	6	250	25	0.82	0.55	16	165
14	6	250	DI§	0.66	0.55	16	155
14	8	150	25	0.66	0.60	16	175
14	8	250	25	0.82	0.60	16	185
14	8	250	DI	0.66	0.60	16	175
14	10	150	25	0.66	0.68	16	190
14	10	250	25	0.82	0.68	16	205
14	10	250	DI	0.66	0.68	16	190
14	12	150	25	0.66	0.75	16	220
14	12	250	25	0.82	0.75	16	235
14	12	250	DI	0.66	0.75	16	220
16	6	150	30	0.70	0.55	18	190
16	6	250	30	0.89	0.55	18	210
16	6	250	DI	0.70	0.55	18	190
16	8	150	30	0.70	0.60	18	210
16	8	250	30	0.89	0.60	18	230
16	8	250	DI	0.70	0.60	18	210
16	10	150	30	0.70	0.68	18	235
16	10	250	30	0.89	0.68	18	255
16	10	250	DI	0.70	0.68	18	235
16	12	150	30	0.70	0.75	18	265
16	12	250	30	0.89	0.75	18	285
16	12	250	DI	0.70	0.75	18	265

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are given in Table 13. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

Table continued next page.

Table 19 Flanged reducers (continued)

Size—*in.*				Dimensions—*in.*†			
Large	Small	Pressure Rating* *psi*	Iron Strength *psi* (*1,000s*)	*T* Large End	T_1 Small End	*L*	Wgt. *lb*
16	14	150	30	0.70	0.66	18	280
16	14	250	30	0.89	0.82	18	315
16	14	250	DI§	0.70	0.66	18	280
18	8	150	30	0.75	0.60	19	240
18	8	250	30	0.96	0.60	19	265
18	8	250	DI	0.75	0.60	29	240
18	10	150	30	0.75	0.68	19	265
18	10	250	30	0.96	0.68	19	290
18	10	250	DI	0.75	0.68	19	265
18	12	150	30	0.75	0.75	19	295
18	12	250	30	0.96	0.75	19	320
18	12	250	DI	0.75	0.75	19	295
18	14	150	30	0.75	0.66	19	310
18	14	250	30	0.96	0.82	19	350
18	14	250	DI	0.75	0.66	19	310
18	16	150	30	0.75	0.70	19	340
18	16	250	30	0.96	0.89	19	385
18	16	250	DI	0.75	0.70	19	340
20	10	150	30	0.80	0.68	20	310
20	10	250	30	1.03	0.68	20	340
20	10	250	DI	0.80	0.68	20	310
20	12	150	30	0.80	0.75	20	345
20	12	250	30	1.03	0.75	20	375
20	12	250	DI	0.80	0.75	20	345
20	14	150	30	0.80	0.66	20	355
20	14	250	30	1.03	0.82	20	405
20	14	250	DI	0.80	0.66	20	355
20	16	150	30	0.80	0.70	20	390
20	16	250	30	1.03	0.89	20	445
20	16	250	DI	0.80	0.70	20	390
20	18	150	30	0.80	0.75	20	410
20	18	250	30	1.03	0.96	20	470
20	18	250	DI	0.80	0.75	20	410
24	12	150	30	0.89	0.75	24	480
24	12	250	30	1.16	0.75	24	535
24	12	250	DI	0.89	0.75	24	480
24	14	150	30	0.89	0.66	24	490
24	14	250	30	1.16	0.82	24	565
24	14	250	DI	0.89	0.66	24	490
24	16	150	30	0.89	0.70	24	525
24	16	250	30	1.16	0.89	24	610
24	16	250	DI	0.89	0.70	24	525
24	18	150	30	0.89	0.75	24	550
24	18	250	30	1.16	0.96	24	645
24	18	250	DI	0.89	0.75	24	550
24	20	150	30	0.89	0.80	24	590
24	20	250	30	1.16	1.03	24	695
24	20	250	DI	0.89	0.80	24	590

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are given in Table 13. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

Table continued next page.

Table 19 Flanged reducers (continued)

Size—*in.*				Dimensions—*in.*†			
Large	Small	Pressure Rating* *psi*	Iron Strength *psi* (*1,000s*)	*T* Large End	T_1 Small End	*L*	Wgt. *lb*
30	18	150	30	1.03	0.75	30	810
30	18	250	30	1.37	0.96	30	970
30	18	250	DI§	1.03	0.75	30	810
30	20	150	30	1.03	0.80	30	870
30	20	250	30	1.37	1.03	30	1,035
30	20	250	DI	1.03	0.80	30	870
30	24	150	30	1.03	0.89	30	970
30	24	250	30	1.37	1.16	30	1,155
30	24	250	DI	1.03	0.89	30	970
36	20	150	30	1.15	0.80	36	1,230
36	20	250	30	1.58	1.03	36	1,495
36	20	250	DI	1.15	0.80	36	1,230
36	24	150	30	1.15	0.89	36	1,345
36	24	250	30	1.58	1.16	36	1,635
36	24	250	DI	1.15	0.89	36	1,345
36	30	150	30	1.15	1.03	36	1,555
36	30	250	30	1.58	1.37	36	1,905
36	30	250	DI	1.15	1.03	36	1,555
42	24	150	30	1.28	0.89	42	1,820
42	24	250	30	1.78	1.16	42	2,235
42	24	250	DI	1.28	0.89	42	1,820
42	30	150	30	1.28	1.03	42	2,060
42	30	250	30	1.78	1.37	42	2,555
42	30	250	DI	1.28	1.03	42	2,060
42	36	150	30	1.28	1.15	42	2,345
42	36	250	30	1.78	1.58	42	2,935
42	36	250	DI	1.28	1.15	42	2,345
48	30	150	30	1.42	1.03	48	2,625
48	30	250	30	1.96	1.37	48	3,270
48	30	250	DI	1.42	1.03	48	2,625
48	36	150	30	1.42	1.15	48	2,950
48	36	250	30	1.96	1.58	48	3,710
48	36	250	DI	1.42	1.15	48	2,950
48	42	150	30	1.42	1.28	48	3,320
48	42	250	30	1.96	1.78	48	4,190
48	42	250	DI	1.42	1.28	48	3,320

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

*Fittings made of ductile iron in the 12-in. and smaller sizes may be rated at 350 psi with the use of a special gasket.

†Dimension details of flanges are given in Table 13. Eccentric reducers with the same dimensions and weights given for concentric reducers are available from most manufacturers if specified on the purchase order.

‡3–12-in. sizes may be gray iron (class 25) or ductile iron.

§Ductile iron.

Flanged ductile-iron fittings in 24-in. (610 mm) and smaller sizes may be rated for 350 psi (2,413 kPa) with the use of special gaskets.

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APPENDIX A

Flanged Fittings—Bolts, Gaskets, and Installation

This appendix is for information only and is not a part of ANSI/AWWA C110/A21.10.

The bolts and gaskets to be used with the flanged fittings are to be selected by the purchaser with due consideration for the particular pressure service and installation requirements.

SECTION A.1: BOLTS AND NUTS

Size, length, and number of bolts are shown in Table 14 of ANSI*/AWWA C110/A21.10. Bolts conform to ASME†/ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws, and nuts conform to ASME/ANSI B18.2.2, Square and Hex Nuts. Bolts smaller than 3/4 in. (19 mm) have either standard square or heavy hex heads and heavy hex nuts. Bolts 3/4 in. (19 mm) and larger have either square or hex heads and either hex or heavy hex nuts. Bolts and nuts are threaded in accordance with ASME/ANSI B1.1, Unified Inch Screw Threads (UN and UNR Thread Form) class 2A external and class 2B internal. Bolts and nuts are low-carbon steel and conform to the chemical and mechanical requirements of ASTM‡ A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength, grade B. The carbon–steel bolts should be used where gray-iron flanges are installed with flat ring gaskets that extend only to the bolts. Higher-strength bolts may properly be used where gray-iron flanges are installed with full-face gaskets. Higher-strength bolts may be used where ductile flanges are installed with either ring or full-face gaskets.

SECTION A.2: GASKETS

Gaskets are synthetic rubber, either ring or full face, and are 1/8 in. (3.2 mm) thick, unless otherwise specified by the purchaser, conforming to the dimensions shown in Table A.1, Flange gasket details. NOTE: When considering the use of

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

†American Society of Mechanical Engineers, Three Park Ave., No. 20, New York, NY 10016.

‡American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428.

gaskets thinner than 1/8 in. (3.2 mm) and/or gaskets of material other than synthetic rubber, the purchaser should contact the fitting manufacturer. Also available for most sizes are specially designed gaskets, either ring or full face, using one or more annular rings molded into the gasket to improve the gasket performance.

SECTION A.3: INSTALLATION

The design, assembly, and installation of the flanged piping system are the responsibility of the purchaser. The following suggestions are for general guidance:

a. The underground use of flanged joints is generally not desirable because of the rigidity of the joint.

b. Flange faces should bear uniformly on the gasket and the bolts tightened in progressive crisscross order, such as by tightening the bottom bolt first; then, the top bolt; next, the bolts at either side; and, finally, the remaining bolts. This process should be repeated until all bolts are sufficiently tight to prevent leakage at the joint.

c. Users of flanged fittings should be careful to prevent bending or torsional strains from being applied to flanges, flanged fittings, or flanged appurtenances. Piping systems must be designed so that piping connected to flanges or flanged fittings is properly anchored, supported, or restrained to prevent breakage of fittings and flanges.

d. Ring gaskets are recommended for 14-in. (350-mm) and larger sizes if flat gaskets are used.

Table A.1 Flange gasket details

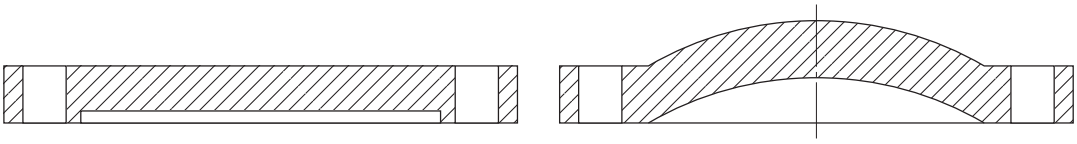
	Dimensions—*in.*						
	Ring		Full Face				
Nom. Size *in.*	Nom. *ID*	*OD*	Nom. *ID*	*OD*	*BC*	Bolt Hole Diam.	No. of Holes
3	3	5 3/8	3	7 1/2	6	3/4	4
4	4	6 7/8	4	9	7 1/2	3/4	8
6	6	8 3/4	6	11	9 1/2	7/8	8
8	8	11	8	13 1/2	11 3/4	7/8	8
10	10	13 3/8	10	16	14 1/4	1	12
12	12	16 1/8	12	19	17	1	12
14	14	17 3/4	14	21	18 3/4	1 1/8	12
16	16	20 1/4	16	23 1/2	21 1/4	1 1/8	16
18	18	21 5/8	18	25	22 3/4	1 1/4	16
20	20	23 7/8	20	27 1/2	25	1 1/4	20
24	24	28 1/4	24	32	29 1/2	1 3/8	20
30	30	34 3/4	30	38 3/4	36	1 3/8	28
36	36	41 1/4	36	46	42 3/4	1 5/8	32
42	42	48	42	53	49 1/2	1 5/8	36
48	48	54 1/2	48	59 1/2	56	1 5/8	44

Metric conversions: Iron strength: psi (1,000s) × 6.89 = MPa; Pressure rating: psi × 0.00689 = MPa; Dimension: in. × 25.4 = mm; Weight: lb × 0.4536 = kg.

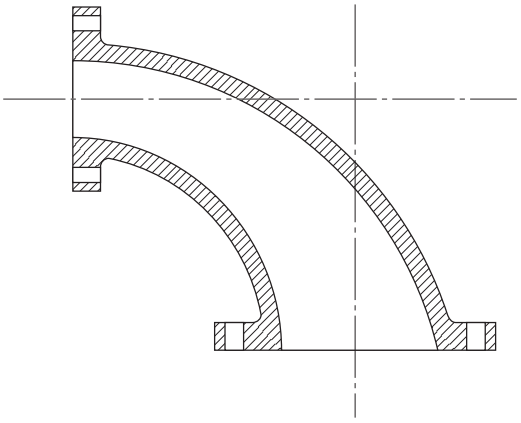
Special Fittings

This appendix is for information only and is not a part of ANSI/AWWA C110/A21.10.

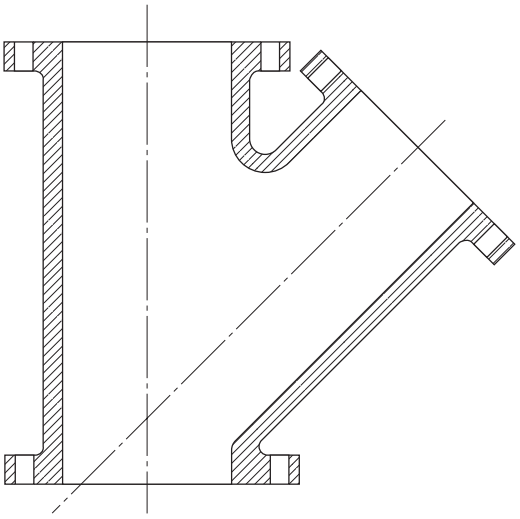
These special fittings are not a part of the standard but may be available from some manufacturers. For dimensions and pressure ratings, the manufacturer should be consulted.



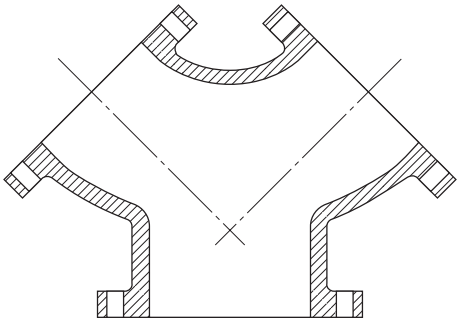
Blind flanges



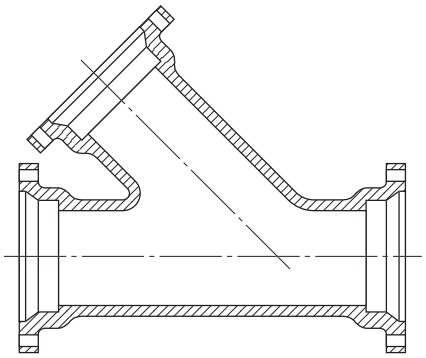
Flanged 90° reducing bend



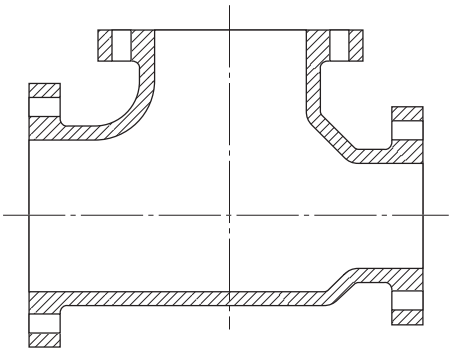
Flanged wye branch



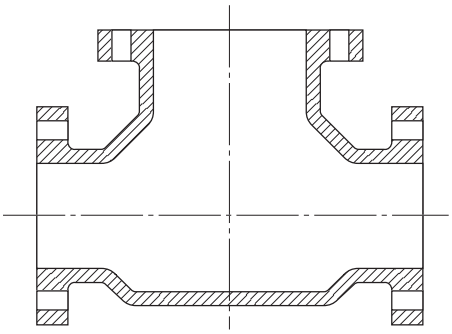
Flanged true wye



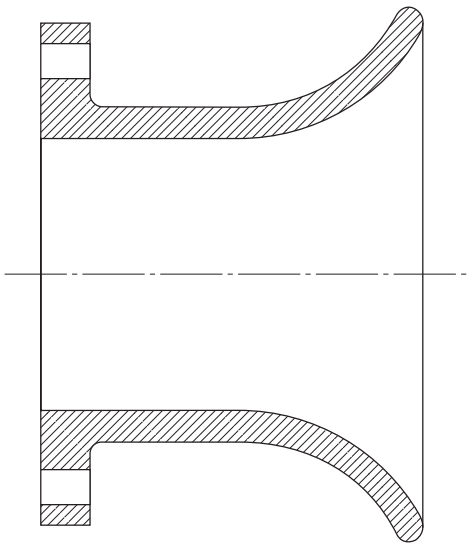
Mechanical-joint wye branch



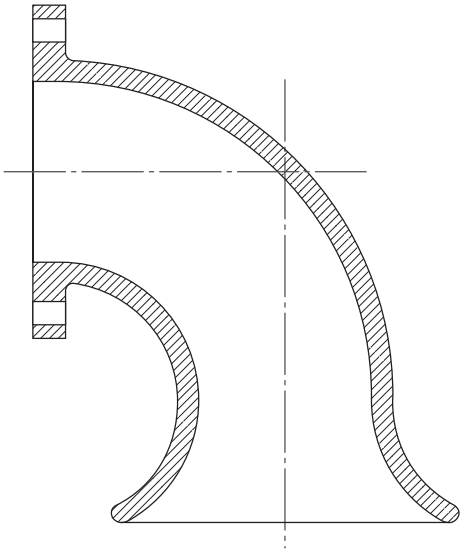
Flanged reducing tee



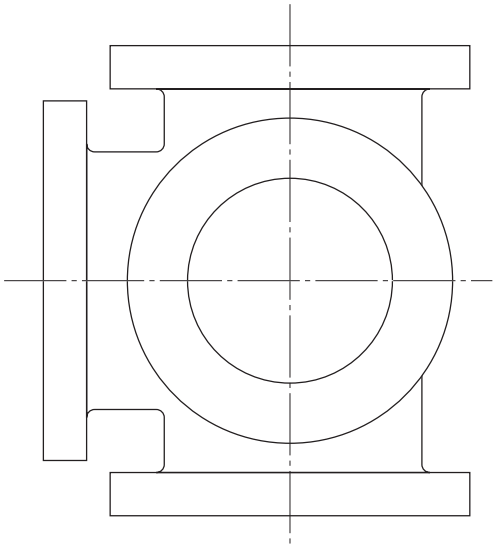
Flanged bullhead tee



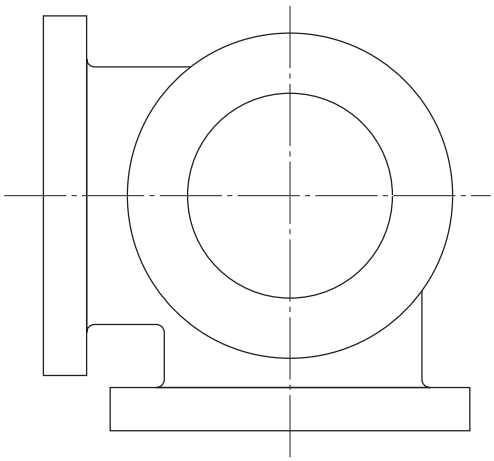
Flange and flare



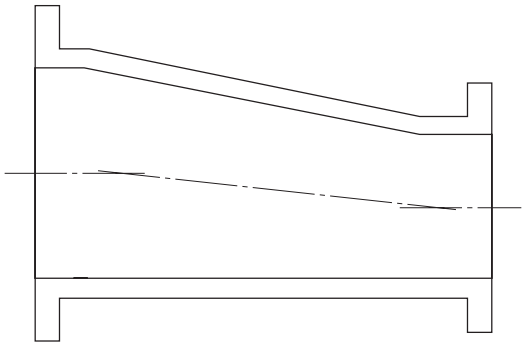
Flange and flare 90° bend



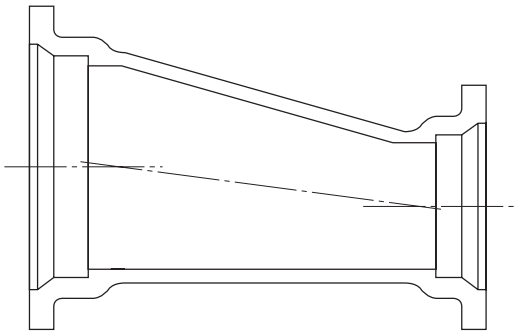
Flanged side-outlet tee



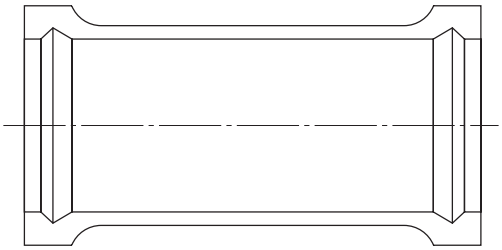
Flanged side-outlet 90° elbow



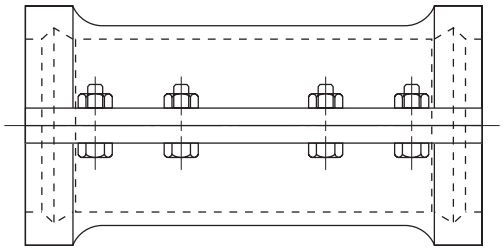
Flanged eccentric reducer



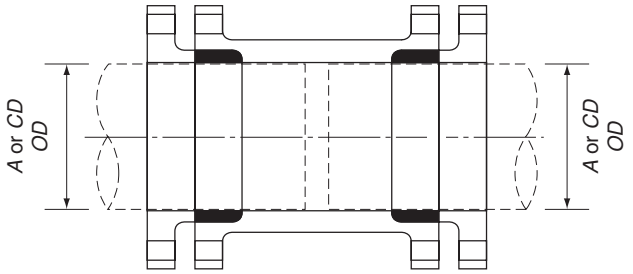
Mechanical-joint eccentric reducer



Caulked-joint sleeve



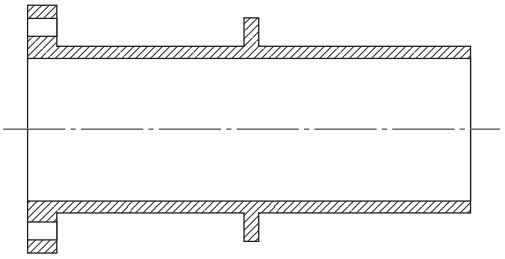
Caulked-joint split sleeve



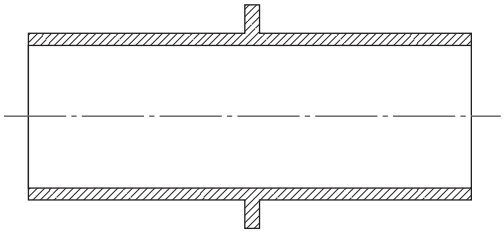
Dual (combination)-purpose modified MJ sleeve

NOTE: The joining of cast-iron pipe of the same nominal size but with different outside diameters can be accomplished with a special dual- or combination-purpose, modified mechanical-joint sleeve. This special sleeve, available from some manufacturers in 4–12-in. (102- to 305-mm) nominal size, is designed for use with pipe having either *A* or *CD* outside diameters. The sleeve employs an identical gasket at each end, which can adapt itself to either *A* or *CD* diameter pipe. These gaskets and the glands used with this sleeve are not the same as and are not interchangeable with gaskets and glands used with ANSI/AWWA C111/A21.11 standardized mechanical joints.

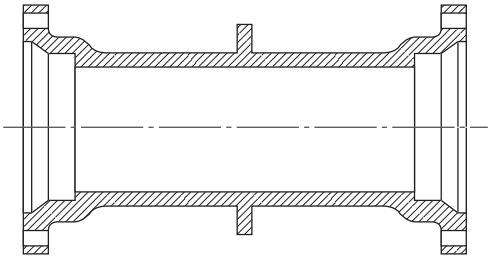
Wall Pipe



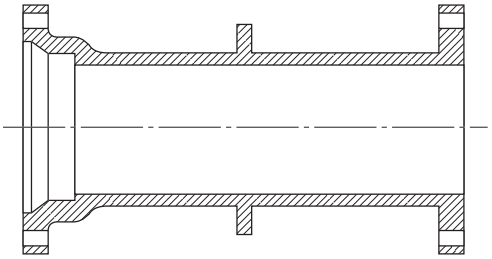
Flange and plain end



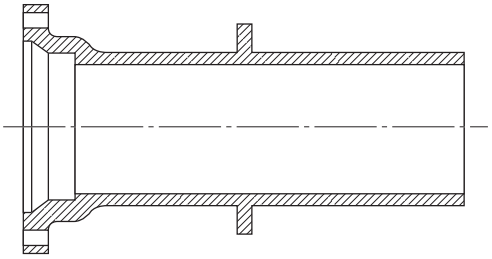
Plain end and plain end



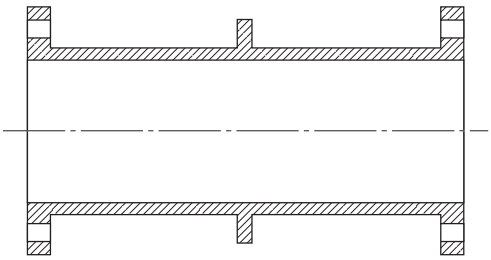
MJ and MJ



MJ and flange

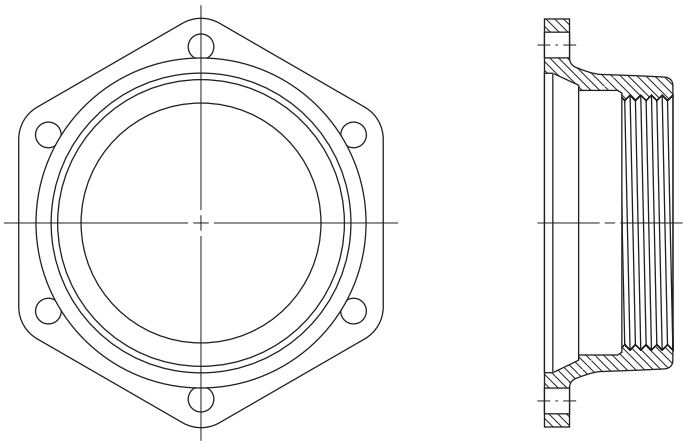


MJ and plain end



Flange and flange

NOTE: Wall pipe with collars and various combinations of ends, including plain end, flange, mechanical joint, and push-on joint, can be furnished. Flanges and mechanical-joint bells can be produced with bolt holes tapped for studs. Sleeves with wall collars are also available on special request.



MJ threaded bell

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