

ASME B16.1-2020
(Revision of ASME B16.1-2015)

Gray Iron Pipe Flanges and Flanged Fittings

Classes 25, 125, and 250

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AN AMERICAN NATIONAL STANDARD



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Mechanical Engineers**

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Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: November 9, 2020

The next edition of this Standard is scheduled for publication in 2025.

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FOREWORD

In 1894, the American Society of Mechanical Engineers (ASME) adopted a standard flange template ("ASME Standard") for low-pressure service. A "Manufacturers Standard" for pressures up to 250 psi followed in 1901. Around 1910, a group of fittings manufacturers formed an organization that was the forerunner of the present Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) and undertook the design of a line of flanged fittings. A document covering this work was published in 1912.

During the years 1912 through 1914, a Joint Committee of the ASME and the Manufacturers Committee formulated compromise standard dimensions for pipe flanges and flanged fittings for use under saturated steam pressures of 125 psi and 250 psi pressure ranges. The Joint Committee's report was accepted at a conference attended by representatives of ASME, the Manufacturers Committee, the U.S. government, and the National Association of Master Steam and Hot Water Fitters. ASME published this report as the "American Standard for Pipe Flanges, Fittings and Their Bolting" in 1914. In 1918, work was started on standards for 50-lb steam flanges and for 800-lb, 1,200-lb, and 3,000-lb hydraulic flanges, which were subsequently approved by this group.

In 1921, the American Engineering Standards Committee, later known as the American Standards Association (ASA), United States of America Standards Institute (USAS), and more recently, the American National Standards Institute (ANSI), organized Sectional Committee B16 to unify and further develop national standards for pipe flanges and fittings (and later for valves and gaskets). Cosponsors of the B16 Committee were ASME, MSS, and the Heating and Piping Contractors Association [now the Mechanical Contractors Association of America (MCAA)]. Work already in progress on flanges and flanged fittings was assigned to Subcommittee 1 (now Subcommittee A). Following approval by the Subcommittee, the B16 Committee, the cosponsors, and ASA, the standards were published in 1928.

In later work, Subcommittee 1 developed the 25-lb Flange and Flanged Fitting Standard (approved in 1931 as ASA B16b2), which replaced the 50-lb standard that had been originally approved in 1918. Work on the 800-lb Hydraulic Flange Standard was published as ASA B16b1 in 1931. Revision of thicknesses, tolerances, and service pressure ratings of the 125-lb and 250-lb flanges and flanged fittings led to approval and publication of ASA B16a-1939.

An American war standard entitled "Pressure Ratings for Cast Iron Flanges and Flanged Fittings, 125 lb" (ASA B16a1) was published in 1943. A complete review of the 125-lb and 250-lb standards resulted in new editions of each: ASA B16.1-1948 and ASA B16.2-1948. In 1960, editions of B16.1 and B16.2 were issued in which ratings were presented in graphic form and special requirements were added for testing flanges.

A review of all gray iron flange and flanged fittings standards initiated in 1962 resulted in the withdrawal of B16.16, "300 lb Refrigerant Flanges and Flanged Fittings," and the combining of the remaining standard into a single document, with B16.1 and B16.2 coming together as USAS B16.1-1967. In this edition, the presentation of ratings was restored to tabular form.

The increasing use of higher grades of gray iron necessitated the establishment of a second set of ratings for the smaller sizes. A revised edition published as ANSI B16.1-1975 incorporated these new ratings along with metric (SI) equivalents for dimensions and minor corrections to the 1967 edition text.

In 1982, American National Standards Committee B16 was recognized as an ASME Committee operating under procedures accredited by ANSI. Following approval by the ASME B16 Subcommittee A and B16 Committee, ANSI approved ASME/ANSI B16.1-1989 on March 8, 1989. Changes included revised marking requirements, revised bolt length increments ($\frac{1}{2}$ in. rather than $\frac{1}{4}$ in.), elimination of metric equivalents, a correction of the Class 800 flange raised-face height to 0.25 in. from the 0.06 in. shown previously, and editorial changes to the text.

In the 1998 edition of ASME B16.1, Reference Standards were updated, a Quality System Program Annex was added, Class 800 was deleted, and several editorial revisions were made. Following approval by ASME B16 Subcommittee B and B16 Main Committee, ANSI approved ASME B16.1-1998 on November 20, 1998.

Work was started in 1999 to revise the standard to include metric units as the primary reference units while maintaining U.S. Customary units in either parenthetical or separate forms. Following approval of the Standard Committee and ASME, approval as an American National Standard was given by ANSI on July 8, 2005, with the new designation ASME B16.1-2005.

In the 2010 edition of ASME B16.1, the Scope was separated into its own paragraph with all following paragraphs renumbered accordingly, references were updated, and several editorial revisions were made. Following approval of the B16 Standards Committee, approval as an American National Standard was given by ANSI on November 17, 2010.

In the 2015 Edition, provisions were made to provide bolt hole tolerances that are appropriate to this Standard. Following the approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on July 29, 2015.

In ASME B16.1-2020, the U.S. Customary tables in former Mandatory Appendix I have been merged with the SI tables in the main text. The tables and figures have been redesignated, former Mandatory Appendix I has been deleted, and the subsequent Mandatory Appendix has been redesignated. Cross-references have been updated accordingly. Also in this edition, entries for NPS 66, 78, and 90 have been added to Table 7.6.1-2 (formerly Tables 9 and I-9), and the references in Mandatory Appendix I (formerly Mandatory Appendix II) have been updated. Following the approval by the ASME B16 Standards Committee, this revision to the 2015 edition was approved as an American National Standard by ANSI on July 24, 2020, with the new designation ASME B16.1-2020.

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Standardization of Valves, Flanges, Fittings, Gaskets, and Valve Actuators

(The following is the roster of the Committee at the time of approval of this Standard.)

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Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
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Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

Interpretations. Upon request, the B16 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B16 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may e-mail the request to the Secretary of the B16 Standards Committee at SecretaryB16@asme.org, or mail it to the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

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ASME B16.1-2020

SUMMARY OF CHANGES

Following approval by the ASME B16 Standards Committee and ASME, and after public review, ASME B16.1-2020 was approved by the American National Standards Institute on July 24, 2020.

In ASME B16.1-2020, the U.S. Customary tables in former Mandatory Appendix I have been merged with the SI tables in the main text. The tables and figures have been redesignated, former Mandatory Appendix I has been deleted, and the subsequent Mandatory Appendix has been redesignated. Cross-references have been updated accordingly. In addition, this edition includes the following changes identified by a margin note, **(20)**. The Record Numbers listed below are explained in more detail in the “List of Changes in Record Number Order” following this Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
30	Table 7.6.1-2	NPS 66, 78, and 90 added (17-547)
36	Mandatory Appendix I	Former Mandatory Appendix II updated (20-863)

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
17-547	Former Tables 9 and I-9 were merged and redesignated as Table 7.6.1-2 and revised to include NPS 66, 78, and 90 for Class 125 flange and bolt dimensions.
20-863	Former Mandatory Appendix II references were updated.

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GRAY IRON PIPE FLANGES AND FLANGED FITTINGS CLASSES 25, 125, AND 250

1 SCOPE

This Standard covers Classes 25, 125, and 250 Gray Iron Pipe Flanges and Flanged Fittings. It includes

- (a) pressure-temperature ratings
- (b) sizes and method of designating openings of reducing fittings
- (c) marking
- (d) materials
- (e) dimensions and tolerances
- (f) bolting and gaskets
- (g) pressure testing

2 GENERAL

2.1 References

Standards and specifications adopted by reference in this Standard are shown in [Mandatory Appendix I](#), which is part of this Standard. It is not considered practical to identify the specific edition of each referenced standard and specification in the text, when referenced. Instead, the specific editions of the referenced standards and specifications are listed in [Mandatory Appendix I](#).

2.2 Quality Systems

Requirements relating to the product manufacturer's Quality System Programs are described in [Nonmandatory Appendix A](#).

2.3 Relevant Units

This Standard states values in both SI and U.S. Customary units. As an exception, diameter of bolts and flange bolt holes are expressed in inch units only. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, it is required that each system of units be used independently of the other. Except for diameter of bolts and flange bolt holes, combining values from the two systems constitutes nonconformance with the Standard.

2.4 Service Conditions

Criteria for selection of materials suitable for particular fluid service are not within the scope of this Standard.

2.5 Convention

For determining conformance with this Standard, the convention for fixing significant digits where limits (maximum and minimum values) are specified shall be as defined in ASTM E29. This requires that an observed or calculated value be rounded off to the nearest unit in the last right-hand digit used for expressing the limit. Decimal values and tolerances do not imply a particular method of measurement.

2.6 Denotation

2.6.1 Pressure Rating Designation. Class, followed by a dimensionless number, is the designation for pressure-temperature ratings as follows:

Class	25	125	250
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2.6.2 Size. NPS, followed by a dimensionless number, is the designation for nominal flange or flange fitting size. NPS is related to the reference nominal diameter, DN, used in international standards. The relationship is, typically, as follows:

NPS	DN
1	25
1 ¹ / ₄	32
1 ¹ / ₂	40
2	50
2 ¹ / ₂	65
3	80
3 ¹ / ₂	...
4	100

GENERAL NOTE: For NPS ≥ 4, the related DN = 25 × (NPS).

3 PRESSURE-TEMPERATURE RATINGS

3.1 General

Pressure-temperature ratings are maximum allowable working pressures in bar (psi) units at the temperature in degrees Celsius (Fahrenheit) shown in Table 3.1-1 for the applicable material and class designation. For intermediate temperatures, linear interpolation is permitted. Interpolation between class designations is not permitted.

3.2 Flanged Joints

A flanged joint is composed of independent interrelated components: the flanges, gasket, and bolting, which are assembled manually. Proper controls must be exercised in the selection and application for these elements to attain a joint that has acceptable leak tightness. Special techniques, such as controlled bolt tightening described in ASME PCC-1, may be used to achieve a tight joint in service.

3.3 Rating Temperature

Temperatures shown for the corresponding pressure rating shall be the material temperature of the pressure-retaining structure. It may be assumed that the material temperature is the same as the fluid temperature. Use of a pressure rating at a material temperature other than that of the contained fluid is the responsibility of the user and subject to the requirements of any applicable code or regulation.

3.4 Low-Temperature Ratings

Pressure ratings for temperatures below -29°C (-20°F) should be determined in accordance with low-temperature properties of gray iron (ASTM A126) as governed by applicable code or regulation.

3.5 Ductility

Gray iron has little ductility; therefore, the resistance of these flanges and flanged fittings to excessive forces and suddenly applied loads is significantly less than for more ductile materials, such as steel. The following precautions are recommended:

(a) These flanges and flanged fittings should not be used where suddenly applied loads such as rapid pressure fluctuation may occur.

(b) Alignment of flange faces is essential along with control of assembly bolt torque so as not to overstress the gray iron flanges. Care should also be exercised to ensure that piping loads transmitted to gray iron flanges are controlled.

4 SIZE

4.1 Nominal Pipe Size

As applied in this Standard, the use of the phrase "nominal pipe size" or the designation NPS followed by a dimensionless number is for the purpose of identifying the end connection of piping, flanges, or flanged fittings. The number is not necessarily the same as the flange or flanged fitting inside diameter.

4.2 Reducing Fittings

Reducing fittings shall be designated by NPS for the openings in the sequence as indicated in the illustrations of Figure 4.2-1.

5 MARKING

5.1 Fittings

The manufacturer's name or trademark and numerals as shown below for each pressure rating class designation shall be cast on the exterior surface of all fittings.

Class	NPS	Numeral
25	All	25
125	≥ 1 but ≤ 12	125
	≥ 14 but ≤ 24	100
	≥ 30 but ≤ 48	50
250	≥ 1 but ≤ 12	250
	≥ 14 but ≤ 24	200
	≥ 30 but ≤ 48	100

5.2 Flanges

The manufacturer's name or trademark shall be cast on all loose flanges. In addition, the numeral 25 shall be cast on Class 25 flanges. Numerals for other classes designations shall be cast on loose flanges in addition to the requirements of para. 5.3.

5.3 Material Class

In those sizes and pressure-rating class designations, where ASTM A126, both Classes A and B iron, can be used, see para. 6.1, letter A or B shall be cast on both flanges and fittings in the proximity of the numerals. Flanges and fittings with no A or B Class iron marking shall be considered as Class A iron for rating purposes.

6 MATERIALS

6.1 Castings

Castings shall meet the requirements of ASTM A126 for both flanges and flanged fittings, as follows:

Class	NPS	Class of Iron ASTM A126
25	All	A
125	≥1 but ≤12	A or B
	≥14	B
250	≥1 but ≤12	A or B
	≥14	B

6.2 Bolting

ASTM A307 Grade B bolting material is recommended for gray iron flange assembly. Where gray iron flanges are bolted to steel flanges, see ASME B16.5 for bolting limitations.

7 FITTING DIMENSIONS AND TOLERANCES

7.1 Wall Thickness

It is recognized that some variations are absolutely unavoidable in the making of patterns and castings. Equipment shall be designed to produce wall thicknesses given in the tables. Wall thickness at no point shall be less than 87.5% of the thickness given in the tables.

7.2 Facing

(a) Classes 25 and 125 gray iron flanges and flanged fittings shall be flat faced (i.e., without projection or raised face) and finished in accordance with MSS SP-6.

(b) Class 250 flanges and flanged fittings shall have a 2 mm (0.06 in.) raised face of the diameters given in Table 7.6.1-3 and finished in accordance with MSS SP-6. The raised face is included in the minimum flange thickness and center-to-face dimension.

7.3 Center-to-Face Dimensions

7.3.1 Side Outlet Fittings. Side outlet elbows, side outlet tees, and side outlet crosses shall have all openings on intersecting centerlines. Long-radius elbows with side outlet shall have the side outlet on the radial centerline of the elbow.

7.3.2 Elbows

(a) The center-to-face dimensions for straight-size 90-deg elbows, 90-deg long-radius elbows, 45-deg elbows, side-outlet 90-deg elbows, and double-branch elbows are shown in Tables 7.3.2-1 through 7.3.2-5.

(b) Reducing 90-deg elbows, reducing 90-deg long-radius elbows, reducing side-outlet 90-deg elbows, and reducing double-branch elbows shall have the same center-to-face dimensions as straight-size fittings shown in Tables 7.3.2-1 through 7.3.2-3 corresponding to the size of the largest opening.

(c) For 90-deg long-radius elbows with side outlet, the center-to-face dimensions of the side outlet shall be the same as dimension A in Tables 7.3.2-1 through 7.3.2-3 for a straight-size 90-deg elbow corresponding to the size of the largest opening.

(d) Special-degree elbows ranging from 1 deg to 45 deg, inclusive, shall have the same center-to-face dimensions as those for 45-deg elbows; those over 45 deg and up to 90 deg, inclusive, shall have the same center-to-face dimensions as those for 90-deg elbows. The angle designation of an elbow is the angle between the flange faces.

7.3.3 Tees, Crosses, and Laterals

(a) The center-to-face dimensions for straight-size tees and crosses, with or without side outlet, and laterals are shown in Tables 7.3.2-1 through 7.3.2-3.

(b) Reducing tees and reducing crosses, with or without side outlet, and reducing laterals, NPS 16 and smaller, shall have the same center-to-face dimensions as straight-size fittings shown in Tables 7.3.2-1 through 7.3.2-3 corresponding to the size of the largest opening. For NPS 18 and larger, if the outlet of a reducing tee; the branch of a reducing lateral; or the largest outlet of a reducing side outlet tee, reducing cross, and reducing side outlet cross is the same size or smaller than given in Tables 7.3.2-1 through 7.3.2-3 (short-body pattern), the center-to-face dimensions shown in these Tables shall be used. If a branch or any outlet is larger than shown in Tables 7.3.2-1 through 7.3.2-3, the center-to-face dimensions shall be the same as for the straight-size fitting shown in Tables 7.3.2-1 through 7.3.2-3 corresponding to the size of the largest opening. Tees, crosses, and laterals, reducing on the run only, shall have the same center-to-face dimensions as straight-size fittings shown in Tables 7.3.2-1 through 7.3.2-3 corresponding to the size of the largest opening.

(c) Tees reducing on both runs are generally known as bull-head tees and have the same center-to-face dimensions as straight-size fittings corresponding to the size of the outlet.

7.3.4 True Y's. Center-to-face dimensions for straight-size true Y's are shown in Tables 7.3.2-2 and 7.3.2-3. Reducing sizes are considered special and should be made to suit conditions.

7.3.5 Reducers and Eccentric Reducers. The face-to-face dimensions for all reductions of reducers and eccentric reducers shall be the same as given in Tables 7.3.2-2 and 7.3.2-3 for the largest opening.

7.4 Center-to-Face Tolerances

The following tolerances shall be permitted on all center-to-contact surface dimensions of fittings. Tolerances for contact surface-to-contact surface dimensions shall be twice those given below. The largest opening in the fitting governs the tolerance to be applied to all openings.

NPS	Tolerance, mm (in.)
≤10	±1.0 (±0.03)
≥12	±1.5 (±0.06)

7.5 Threaded Flanges

7.5.1 General. Flanges shall have a standard taper pipe thread in accordance with ASME B1.20.1. The thread shall be concentric with the axis of the flange, and variations in alignment shall not exceed 5.00 mm/m (0.06 in./ft).

7.5.2 Class 125. Threads shall be countersunk a distance not less than one-half of the pitch of the thread at an angle approximately 45 deg with the axis of the thread for the purpose of easy entrance in making the joint and protection of the threads. Countersinking shall be concentric with the threads. The length of the threads shall be measured to include the countersink.

7.5.3 Class 250. Hub may be recessed. When not recessed, threads shall be countersunk a distance not less than one-half of the pitch of the thread at an angle approximately 45 deg with the axis of the thread at the back of the flange. If hub is recessed, threads shall be 45 deg countersunk to diameter of recess. The purpose is for easier entrance in making a joint and for the protection of the threads. Countersinking shall be concentric with the threads. The length of threads shall be measured to include the countersink.

7.6 Flange Bolt Holes

7.6.1 Flange Bolt Holes. Flange bolt holes shall be in accordance with the dimensions shown in Tables 7.6.1-1 through 7.6.1-3. Pairs of bolt holes shall straddle the centerline.

7.6.2 Flange Bolt Hole Tolerance. Tolerances for bolt hole sizes $\frac{5}{8}$ through $\frac{7}{8}$ shall be -0.000 in. (-0.00 mm), +0.015 in. (+0.38 mm) and for bolt holes sizes 1 through $2\frac{1}{2}$ shall be -0.000 in. (-0.00 mm), +0.031 in. (+0.79 mm).

7.6.3 Bolt Circle Diameter. The required tolerance for a bolt circle diameter is ±1.5 mm (±0.06 in.).

7.6.4 Bolt Hole to Bolt Hole. The required tolerance for the center-to-center of adjacent bolt hole is ±0.8 mm (±0.03 in.).

7.6.5 Bolt Circle Concentricity. The required tolerance for concentricity between the flange bolt circle diameter and machined facing diameters are as follows:

NPS	Tolerance, mm (in.)
≤2½	0.8 (0.03)
≤48	1.5 (0.06)

7.6.6 Tolerance. Tolerances for sizes larger than NPS 48 shall be as agreed between the manufacturer and purchaser.

7.7 Spot Facing

All flanges and flanged fittings covered by this Standard shall have bearing surfaces for bolting that are parallel to the flange face within 3 deg. Any back facing or spot facing required to accomplish parallelism shall not reduce the flange thickness, Q , below the dimensions given in Tables 7.3.2-1 through 7.3.2-3 and 7.6.1-1 through 7.6.1-3. Flange thickness at any point within the spot face area, as defined in MSS SP-9, shall not exceed the required minimum thickness by more than the following amounts:

NPS	Excess Thickness, mm (in.)
≥2 but ≤12	3.0 (0.12)
≥14 but ≤24	4.5 (0.18)
≥30 but ≤96	6.5 (0.25)

When required, all spot facing shall be done in accordance with MSS SP-9. Sharp corners shall be avoided in back facing.

7.8 Crosses and Lateral Reinforcement

Crosses and laterals (Y-branches) both straight and reducing shall be reinforced where necessary to compensate for the inherent weakness in the shape of these fittings.

7.9 Drain Connections

7.9.1 Threaded Connections. Holes may be drilled and tapped in the wall of fittings if the metal thickness is sufficient to provide the effective length of thread as shown in Figure 7.9.1-1 and as specified in Table 7.9.1-1. Where thread length is insufficient due to metal thickness or size of tapping is such that reinforcement of opening is necessary, an integral boss should be added. In no case shall the effective length of thread A be less than that shown in Table 7.9.1-1. These lengths are equal to the effective thread lengths as shown in ASME B1.20.1.

7.9.2 Location Designation. The method of designating the locations of the tapped holes for drains is shown in Figure 7.9.2-1. Each location is designated by a letter so that desired locations for the various types of fittings may be definitely specified without the use

of further illustrations or description. For further tapping details, see MSS SP-45.

8 BOLT, NUT, AND GASKET DIMENSIONS

8.1 Bolting

(a) All bolting materials shall have square, heavy hex, or hex heads and square, heavy hex, or hex nuts with full flat bearing faces as specified in ASME B18.2.1 for bolts and ASME B18.2.2 for nuts. Threads shall be UNC or UN8 and have a thread fit class of 2A for bolts and 2B for nuts. Washer faced bolts or washer faced nuts are prohibited.

(b) Carbon steel bolts 1 in. and smaller shall have square heads (ASME B18.2.1) or heavy hex heads (ASME B18.2.1) and shall have square or heavy hex nuts (ASME B18.2.2).

(c) Carbon steel bolts $1\frac{1}{8}$ in. and larger shall have square heads (ASME B18.2.1), hex heads (ASME B18.2.1), or heavy hex heads (ASME B18.2.1) and shall have hex nuts (ASME B18.2.2) or heavy hex nuts (ASME B18.2.2) or square nuts (ASME B18.2.2). For bolt sizes $1\frac{1}{2}$ in. and larger, stud bolts with a nut on each end are recommended.

8.2 Gaskets

It is recommended that flat ring gaskets be in accordance with dimensions given in ASME B16.21 for nonmetallic gaskets for pipe flanges. Flanges of Class A iron should not be used with gaskets having a gasket factor ("M" as defined in ASME BPVC, Section VIII, Division 1, Mandatory Appendix 2) greater than 2.75.

9 HYDROSTATIC TESTS

(a) *Pressure Testing.* Pressure testing is not required unless specified by the user.

(b) *Fittings.* Fittings shall be capable of withstanding, without showing leaks, the hydrostatic test pressures listed in Table 3.1-1 for the material and maximum allowable working pressure of the item tested. These test pressures are 1.5 times the cold working pressure rate rounded to the next higher 0.5 bar (12 psi) in Table 3.1-1.

(c) *Flanges.* Flanges integral with or attached to equipment may be hydrostatically tested by the purchaser at his responsibility at pressures higher than specified herein.

10 CERTIFICATIONS

The manufacturer shall be able to certify that products are in conformance with the requirements of this Standard when required by the purchase order.

Table 3.1-1 Pressure–Temperature Ratings

Temperature, °C (°F)	Class 125 ASTM A126						Class 250 [Note (2)] ASTM A126					
	Class 25 [Note (1)] ASTM A126 Class A			Class A			Class B			Class A		
	NPS 4–36	NPS 42–96	NPS 1–12	NPS 1–12	NPS 14–24	NPS 30–48	NPS 1–12	NPS 14–24	NPS 30–48	NPS 1–12	NPS 14–24	NPS 30–48
–29 to 65 (–20 to 150)	3.1 (45)	1.7 (25)	12.1 (175)	13.8 (200)	10.3 (150)	10.3 (150)	27.6 (400)	34.5 (500)	20.7 (300)	20.7 (300)	20.7 (300)	20.7 (300)
80 (200)	2.9 (40)	1.7 (25)	11.6 (165)	13.3 (190)	9.8 (135)	9.1 (115)	26.5 (370)	33.0 (460)	20.0 (280)	20.0 (280)	18.9 (250)	18.9 (250)
100 (225)	2.6 (35)	1.7 (25)	11.0 (155)	12.7 (180)	9.2 (130)	7.5 (100)	25.0 (355)	30.9 (440)	19.0 (270)	19.0 (270)	16.4 (225)	16.4 (225)
120 (250)	2.1 (30)	1.7 (25)	10.4 (150)	12.1 (175)	8.6 (125)	5.8 (85)	23.5 (340)	28.8 (415)	18.0 (260)	18.0 (260)	13.9 (200)	13.9 (200)
135 (275)	1.7 (25)	1.7 (25)	... (145)	... (170)	... (120)	... (65)	... (325)	... (395)	... (250)	... (250)	... (175)	... (175)
140 (300)	...	...	9.8 (140)	11.5 (165)	8.0 (110)	4.2 (50)	22.1 (310)	26.7 (375)	17.0 (240)	17.0 (240)	11.5 (150)	11.5 (150)
149 (325)	...	...	... (130)	... (155)	... (105)	3.4 (..)	... (295)	... (355)	... (230)	... (230)	... (125)	... (125)
160 (353) [Note (2)]	...	...	9.2 (125)	10.8 (150)	7.4 (100)	...	20.6 (280)	24.6 (335)	16.1 (220)	16.1 (220)	9.0 (100)	9.0 (100)
178 (375) [Note (3)]	...	...	8.6 (..)	... (145)	6.9 (..)	...	... (265)	... (315)	... (210)	... (210)	6.9 (..)	6.9 (..)
180 (406) [Note (3)]	...	...	...	10.2 (140)	...	...	19.2 (250)	22.5 (290)	15.1 (200)	15.1 (200)	...	...
200 (425)	...	...	...	9.6 (130)	...	...	17.8 (..)	20.5 (270)	14.2 (..)	14.2 (..)	...	...
208 (450) [Note (4)]	...	...	...	... (125)	...	...	17.2 (..)	... (250)	13.8 (..)	13.8 (..)	...	...
220 (..)	...	...	...	9.0 (..)	...	...	...	18.5 (..)	...	...	...	...
232 (..)	...	...	...	8.6 (..)	...	...	...	17.2 (..)	...	...	...	...
Hydrostatic Shell Test Pressures [Note (5)]												
38 (100)	4.8 (70)	2.7 (40)	18.3 (270)	20.7 (300)	15.5 (230)	15.5 (230)	41.4 (600)	51.8 (750)	31.0 (450)	31.0 (450)	31.0 (450)	31.0 (450)

GENERAL NOTE: Pressure is in bar (psi).

NOTES:

(1) When Class 25 flange or flange fittings are used for gaseous service, the maximum pressure shall be limited to 1.7 bar (25 psi).

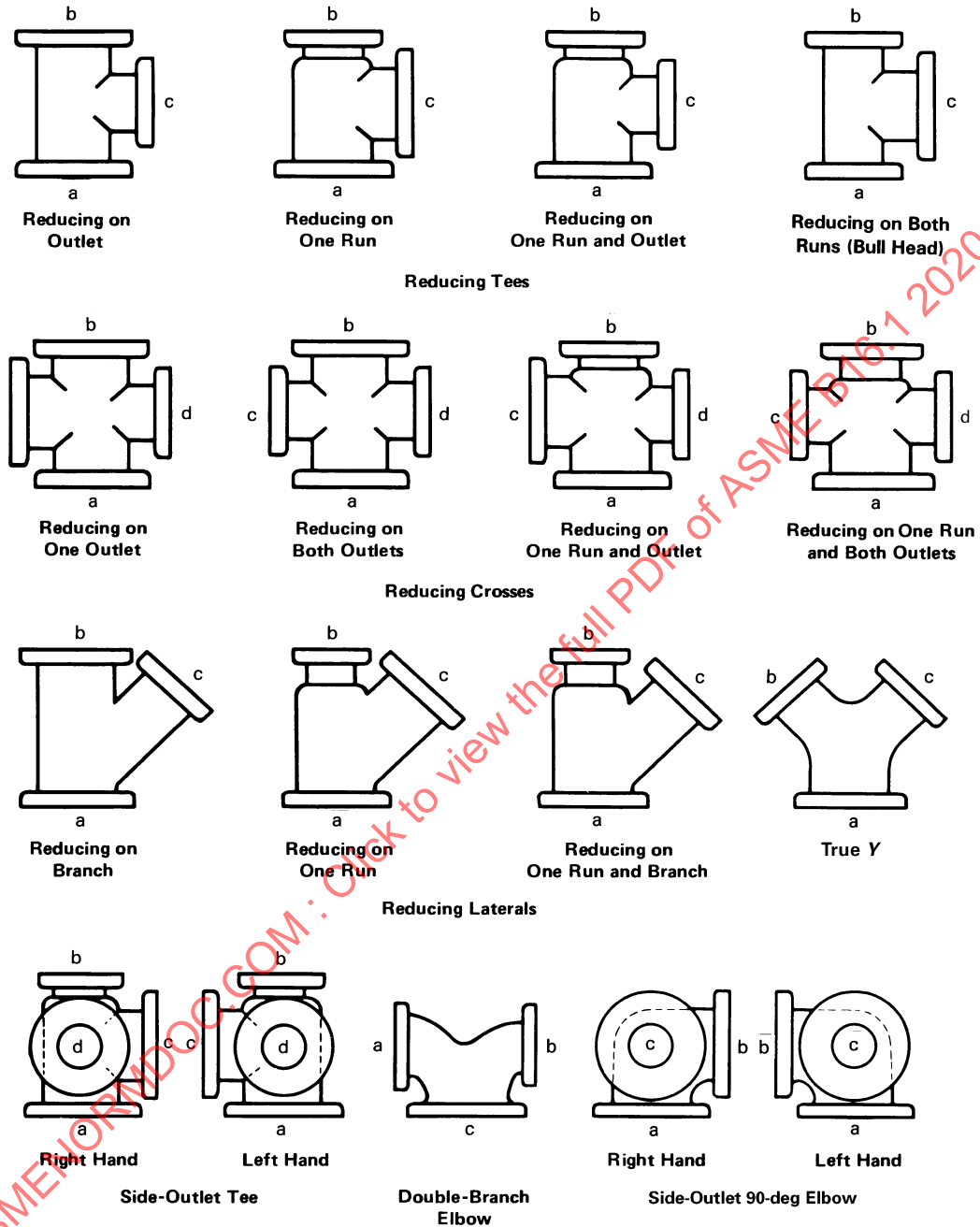
(2) When Class 250 is used for liquid service, the tabulated pressure shall be used. Class 250: When used for liquid service the tabulated pressure–temperature ratings in sizes NPS 14 and larger are applicable to Class 250 flanges only and not to Class 250 fittings.

(3) 178°C (353°F) to reflect the temperature of saturated steam at 8.6 bar (125 psi).

(4) 208°C (406°F) to reflect the temperature of saturated steam at 17.2 bar (250 psi).

(5) See section 9.

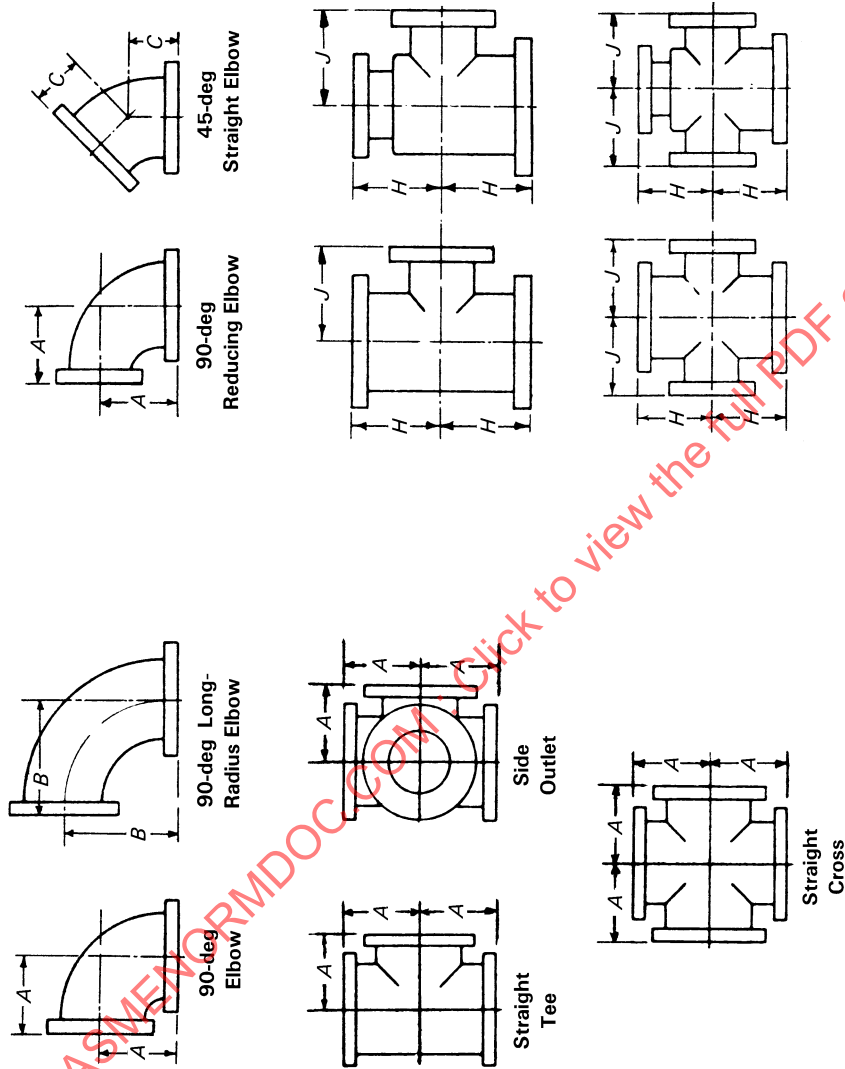
Figure 4.2-1 Method of Designating Outlets of Reducing Fittings in Specifications



GENERAL NOTES:

- The largest opening establishes the basic size of a reducing fitting. The largest opening is named first, except for bull-head tees, which are reducing on both runs, and double-branch elbows where both branches are reducing; the outlet is the largest opening and named last in both cases.
- In designating the openings of reducing fittings, they should be read in the order indicated by the sequence of the letters a, b, c, and d. In designating the outlets of side-outlet reducing fittings, the side outlet is named last; and in the case of the cross (which is not shown), the side outlet is designated by the letter e.

Table 7.3.2-1 Dimensions of Class 25 Gray Iron Flanged Fittings



Straight Fittings

Reducing Fittings

General					Straight Size [Note (5)]		Reducing Tees and Crosses (Short-Body Pattern) [Notes (9)–(11)]		
NPS	Diameter of Flange	Minimum Thickness of Flange	Wall Thickness of Body [Note (1)]	Inside Diameter of Fitting	Center-to-Face Elbow, Tee, and Cross, A	Center-to-Face Long Radius Elbow, B	Center-to-Face 45-deg Elbow, C	NPS Size of Outlet and Smaller, H	Center-to-Face Outlet, J
					[Notes (2)–(4)]	[Notes (6)]	[Note (6)]	[Notes (7) and (8)]	[Note (5)]
4	229 (9.00)	19.0 (0.75)	11 (0.42)	102 (4)	165 (6.5)	229 (9.00)	102 (4.0)	[Note (12)]	[Note (12)]
5	254 (10.00)	19.0 (0.75)	11 (0.44)	127 (5)	191 (7.5)	260 (10.25)	114 (4.5)	[Note (12)]	[Note (12)]
6	279 (11.00)	19.0 (0.75)	11 (0.44)	152 (6)	203 (8.0)	292 (11.50)	127 (5.0)	[Note (12)]	[Note (12)]

Table 7.3.2-1 Dimensions of Class 25 Gray Iron Flanged Fittings (Cont'd)

General				Straight Size [Note (5)]			Reducing Tees and Crosses (Short-Body Pattern)			
NPS	Diameter of Flange	Minimum Thickness of Flange	Wall Thickness of Body of [Note (1)]	Inside Diameter of Fitting	Center-to-Face Elbow, Tee, and Cross, A	Center-to-Face Long Radius Elbow, B	Center-to-Face 45-deg Elbow, C	NPS Size of Outlet and Smaller [Notes (7) and (8)]	Center-to-Face Run, H	Center-to-Face Outlet, J
					[Notes (2)-(4)]		[Note (6)]		[Note (5)]	[Note (5)]
8	343 (13.50)	19.0 (0.75)	12 (0.46)	203 (8)	229 (9.0)	356 (14.00)	140 (5.5)	[Note (12)]	[Note (12)]	[Note (12)]
10	406 (16.00)	22.2 (0.88)	13 (0.50)	254 (10)	279 (11.0)	419 (16.50)	165 (6.5)	[Note (12)]	[Note (12)]	[Note (12)]
12	483 (19.00)	25.4 (1.00)	14 (0.54)	305 (12)	305 (12.0)	483 (19.00)	191 (7.5)	[Note (12)]	[Note (12)]	[Note (12)]
14	533 (21.00)	28.6 (1.12)	15 (0.57)	356 (14)	356 (14.0)	546 (21.50)	191 (7.5)	[Note (12)]	[Note (12)]	[Note (12)]
16	597 (23.50)	28.6 (1.12)	15 (0.60)	406 (16)	381 (15.0)	610 (24.00)	203 (8.0)	[Note (12)]	[Note (12)]	[Note (12)]
18	645 (25.00)	31.8 (1.25)	16 (0.64)	457 (18)	419 (16.5)	673 (26.50)	216 (8.5)	12 (12.0)	330 (13.0)	394 (15.5)
20	698 (27.50)	31.8 (1.25)	17 (0.67)	508 (20)	457 (18.0)	737 (29.00)	241 (9.5)	14 (14.0)	356 (14.0)	432 (17.0)
24	813 (32.00)	34.9 (1.38)	19 (0.76)	610 (24)	559 (22.0)	864 (34.00)	279 (11.0)	16 (16.0)	381 (15.0)	483 (19.0)
30	984 (38.75)	38.1 (1.50)	22 (0.88)	762 (30)	635 (25.0)	1054 (41.50)	381 (15.0)	20 (20.0)	457 (18.0)	584 (23.0)
36	1168 (46.00)	41.3 (1.62)	25 (0.99)	914 (36)	711 (28.0)	1245 (49.00)	457 (18.0)	24 (24.0)	508 (20.0)	660 (26.0)
42	1346 (53.00)	44.5 (1.75)	28 (1.10)	1067 (42)	787 (31.0)	1435 (56.50)	533 (21.0)	24 (24.0)	584 (23.0)	762 (30.0)
48	1511 (59.50)	50.8 (2.00)	32 (1.26)	1219 (48)	864 (34.0)	1626 (64.00)	610 (24.0)	30 (30.0)	660 (26.0)	864 (34.0)
54	1683 (66.25)	57.2 (2.25)	34 (1.35)	1372 (54)	991 (39.0)	1816 (71.50)	686 (27.0)	36 (36.0)	737 (29.0)	940 (37.0)
60	1854 (73.00)	57.2 (2.25)	35 (1.39)	1524 (60)	1118 (44.0)	2007 (79.00)	762 (30.0)	40 (40.0)	838 (33.0)	1041 (41.0)
72	2197 (86.50)	63.5 (2.50)	41 (1.62)	1829 (72)	1346 (53.0)	2388 (94.00)	914 (36.0)	48 (48.0)	1016 (40.0)	1219 (48.0)

GENERAL NOTES:

(a) Dimensions are in millimeters (inches).

(b) For facing, see para. 7.2(a).

(c) For flange bolt holes, refer to Table 7.6.1-1; see also para. 7.6.

(d) For spot facing, see para. 7.7.

(e) For intersecting centerlines of side outlets, see para. 7.3.1.

(f) The flange diameter, bolt circle, and number of bolts are the same in Class 25 as in Class 125. Bolt hole diameters of Class 25 shall not be modified when mated with Class 125 flanges or with steel flanges.

(g) The center-to-face dimensions of fittings are the same as the Class 125.

NOTES:

(1) For wall thickness tolerance, see para. 7.1.

(2) For center-to-face dimensions of reducing elbows and side-outlet elbows, see paras. 7.3.2(b) and 7.3.2(c).

(3) Tees and crosses, reducing on run only, carry same dimensions center-to-face and face-to-face as a straight-size fitting of the larger opening.

(4) For reinforcement of crosses, see para. 7.8.

(5) For center-to-face tolerances, see para. 7.4.

(6) For center-to-face dimensions of special degree elbows, see para. 7.3.2(d).

Table 7.3.2-1 Dimensions of Class 25 Gray Iron Flanged Fittings (Cont'd)**NOTES: (Cont'd)**

- (7) Tees, side-outlet tees, and crosses, NPS 16 and smaller, reducing on the outlet, have the same dimensions center-to-face and face-to-face as straight-size fittings, corresponding to the size of the larger opening. NPS 18 and larger, reducing on the outlet, are made in two lengths, depending on the size of the outlet as given in [Table 7.3.2-1](#).
- (8) Long-body patterns are used when outlets are larger than given above and, therefore, have the same dimensions as straight-size fittings.
- (9) Fittings reducing on the run only carry same dimensions center-to-face and face-to-face as straight-size fittings, corresponding to the size of the larger opening. Tees increasing on outlet, known as bull-head tees, will have same center-to-face and face-to-face dimensions as a straight fitting of the size of the outlet. For example, an NPS 12 × NPS 18 tee will be governed by the dimensions of the NPS 18 long-body tee given in [Table 7.3.2-1](#), namely NPS 16½ center-to-face of all openings and NPS 33 face-to-face.
- (10) Side-outlet tees, with outlet at 90 deg or any other angle, straight or reducing, carry same dimensions center-to-face and face-to-face as regular tees having same reductions.
- (11) In a side outlet tee, the larger of the two side outlets governs the center-to-face dimension *J*.
- (12) All reducing fittings NPS 16 and smaller have the same center-to-face dimensions as straight size fittings.

TABLE STARTS ON NEXT PAGE

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Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings

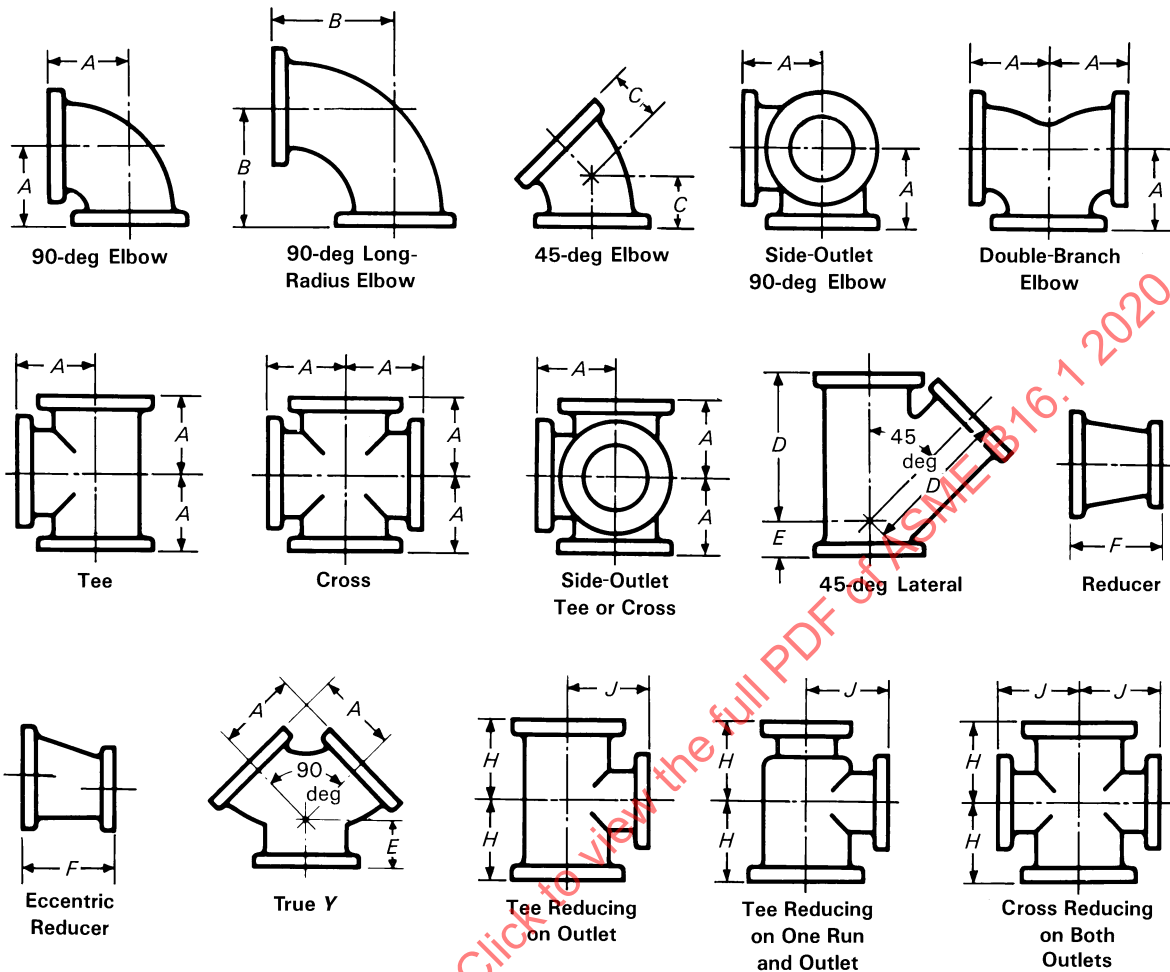


Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings

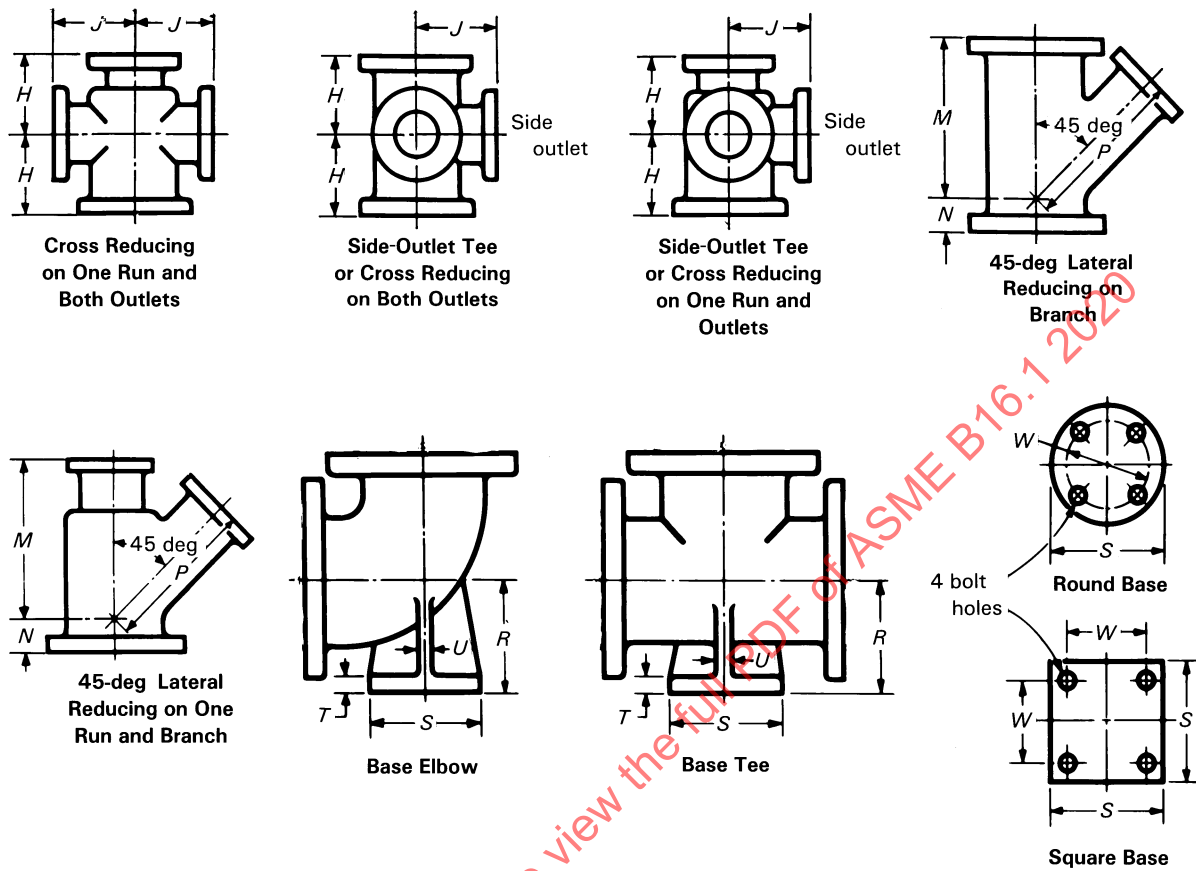


Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings (Cont'd)

Flange [(1)-(3)]		General Fittings			Straight Fittings [(5), (6)]					
NPS	Diameter of Flange	Minimum Thickness of Flange	Inside Diameter of Fittings	Wall Thickness (4)	Center-to-Face 90-deg Elbow, Tees, Crosses, True, Y, and Double-Branch Elbow, A [(6)-(9)]	Center-to-Face 90-deg Long-Radius Elbow, B [(6)-(8)]	Center-to-Face 45-deg Elbow, C (8)	Center-to-Face Lateral, D (9)	Short Center-to-Face True, Y and Lateral, E (9)	Face-to-Face Reducer, F (10)
1	108 (4.25)	11.1 (0.44)	25 (1.00)	7.9 (0.31)	89 (3.50)	127 (5.00)	45 (1.75)	146 (5.75)	45 (1.75)	...
1¼	118 (4.62)	12.7 (0.50)	32 (1.25)	7.9 (0.31)	95 (3.75)	140 (5.50)	51 (2.00)	159 (6.25)	45 (1.75)	...
1½	127 (5.00)	14.3 (0.56)	38 (1.50)	7.9 (0.31)	102 (4.00)	152 (6.00)	57 (2.25)	178 (7.00)	51 (2.00)	...
2	152 (6.00)	15.9 (0.62)	51 (2.00)	7.9 (0.31)	114 (4.50)	165 (6.50)	64 (2.50)	203 (8.00)	64 (2.50)	127 (5.00)
2½	178 (7.00)	17.5 (0.69)	64 (2.50)	7.9 (0.31)	127 (5.00)	178 (7.00)	76 (3.00)	241 (9.50)	64 (2.50)	140 (5.50)
3	191 (7.50)	19.0 (0.75)	76 (3.00)	9.5 (0.38)	140 (5.50)	197 (7.75)	76 (3.00)	254 (10.00)	76 (3.00)	152 (6.00)
3½	216 (8.50)	23.8 (0.81)	89 (3.50)	11.1 (0.44)	152 (6.00)	216 (8.50)	89 (3.50)	292 (11.50)	76 (3.00)	165 (6.50)
4	229 (9.00)	23.8 (0.94)	102 (4.00)	12.7 (0.50)	165 (6.50)	229 (9.00)	102 (4.00)	305 (12.00)	76 (3.00)	178 (7.00)
5	254 (10.00)	23.8 (0.94)	127 (5.00)	12.7 (0.50)	191 (7.50)	260 (10.25)	114 (4.50)	343 (13.50)	89 (3.50)	203 (8.00)
6	279 (11.00)	25.4 (1.00)	152 (6.00)	14.3 (0.56)	203 (8.00)	292 (11.50)	127 (5.00)	368 (14.50)	89 (3.50)	229 (9.00)
8	343 (13.50)	28.6 (1.12)	203 (8.00)	15.9 (0.62)	229 (9.00)	356 (14.00)	140 (5.50)	445 (17.50)	114 (4.50)	279 (11.00)
10	406 (16.00)	30.2 (1.19)	254 (10.00)	19.0 (0.75)	279 (11.00)	419 (16.50)	165 (6.50)	521 (20.50)	127 (5.00)	305 (12.00)
12	483 (19.00)	31.8 (1.25)	305 (12.00)	20.6 (0.81)	305 (12.00)	483 (19.00)	191 (7.50)	622 (24.50)	140 (5.50)	356 (14.00)
14	533 (21.00)	34.9 (1.38)	356 (14.00)	22.2 (0.88)	356 (14.00)	546 (21.50)	191 (7.50)	686 (27.00)	152 (6.00)	406 (16.00)
16	597 (23.50)	36.5 (1.44)	406 (16.00)	25.4 (1.00)	381 (15.00)	610 (24.00)	203 (8.00)	762 (30.00)	165 (6.50)	457 (18.00)
18	635 (25.00)	39.7 (1.56)	457 (18.00)	27.0 (1.06)	419 (16.50)	673 (26.50)	216 (8.50)	813 (32.00)	178 (7.00)	483 (19.00)
20	699 (27.50)	42.9 (1.69)	508 (20.00)	28.6 (1.12)	457 (18.00)	737 (29.00)	241 (9.50)	889 (35.00)	203 (8.00)	508 (20.00)
24	813 (32.00)	47.6 (1.88)	610 (24.00)	31.8 (1.25)	559 (22.00)	864 (34.00)	279 (11.00)	1029 (40.50)	229 (9.00)	610 (24.00)
30	984 (38.75)	54.0 (2.12)	762 (30.00)	36.5 (1.44)	635 (25.00)	1054 (41.50)	381 (15.00)	1245 (49.00)	254 (10.00)	762 (30.00)
36	1168 (46.00)	60.3 (2.38)	914 (36.00)	41.3 (1.62)	711 (28.00)	1245 (49.00)	457 (18.00)	...	...	914 (36.00)
42	1346 (53.00)	66.7 (2.62)	1067 (42.00)	46.0 (1.81)	787 (31.00)	1435 (56.50)	533 (21.00)	...	...	1067 (42.00)
48	1511 (59.50)	69.9 (2.75)	1219 (48.00)	50.8 (2.00)	864 (34.00)	1626 (64.00)	610 (24.00)	...	...	1219 (48.00)

Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings (Cont'd)

Reducing Fittings (Short-Body Patterns) [(11), (12)]							Base Elbows and Tees [(15)–(17)]							
Tees and Crosses [(9), (13), (14)]			Laterals (9)				Base Drilling							
NPS Size of Outlet and Smaller [(6), (10)]	Center-to-Face Run, <i>H</i>	Center-to-Face Outlet or Side Outlet, <i>J</i>	NPS Size of Branch and Smaller	Center-to-Face Run, <i>M</i>	Center-to-Face Run, <i>N</i>	Center-to-Face Branch, <i>P</i>	Center-to-Base, <i>R</i>	Diameter of Round Base or Width of Square Base, <i>S</i> [(18), (19)]	Thick-ness of Base, <i>T</i>	Thick-ness of Ribs, <i>U</i>	NPS Size of Supporting Pipe for Base	Bolt Circle or Bolt Spacing, <i>W</i>	Dia. of Holes	NPS
(20)	(20)	(20)	(21)	(21)	(21)	(21)	89 (3.50)	89 (3.50)	11 (0.44)	10 (0.38)	¾	69.9 (2.75)	⅝	1
(20)	(20)	(20)	(21)	(21)	(21)	(21)	92 (3.62)	89 (3.50)	11 (0.44)	10 (0.38)	¾	69.9 (2.75)	⅝	1¼
(20)	(20)	(20)	(21)	(21)	(21)	(21)	95 (3.75)	108 (4.25)	11 (0.44)	13 (0.50)	1	79.4 (3.12)	⅝	1½
(20)	(20)	(20)	(21)	(21)	(21)	(21)	105 (4.12)	118 (4.62)	13 (0.50)	13 (0.50)	1¼	88.9 (3.50)	⅝	2
(20)	(20)	(20)	(21)	(21)	(21)	(21)	114 (4.50)	118 (4.62)	13 (0.50)	13 (0.50)	1¼	88.9 (3.50)	⅝	2½
(20)	(20)	(20)	(21)	(21)	(21)	(21)	124 (4.88)	127 (5.00)	14 (0.56)	13 (0.50)	1½	98.4 (3.88)	⅝	3
(20)	(20)	(20)	(21)	(21)	(21)	(21)	133 (5.25)	127 (5.00)	14 (0.56)	13 (0.50)	1½	98.4 (3.88)	⅝	3½
(20)	(20)	(20)	(21)	(21)	(21)	(21)	140 (5.50)	152 (6.00)	16 (0.62)	13 (0.50)	2	120.7 (4.25)	¾	4
(20)	(20)	(20)	(21)	(21)	(21)	(21)	159 (6.25)	178 (7.00)	18 (0.69)	16 (0.62)	2½	139.7 (5.50)	¾	5
(20)	(20)	(20)	(21)	(21)	(21)	(21)	178 (7.00)	178 (7.00)	18 (0.69)	16 (0.62)	2½	139.7 (5.50)	¾	6
(20)	(20)	(20)	(21)	(21)	(21)	(21)	213 (8.75)	229 (9.00)	24 (0.94)	22 (0.88)	4	190.5 (7.50)	¾	8
(20)	(20)	(20)	(21)	(21)	(21)	(21)	248 (9.75)	229 (9.00)	24 (0.94)	22 (0.88)	4	190.5 (7.50)	¾	10
(20)	(20)	(20)	(21)	(21)	(21)	(21)	286 (11.25)	279 (11.00)	25 (1.00)	25 (1.00)	6	241.3 (9.50)	⅞	12
(20)	(20)	(20)	(21)	(21)	(21)	(21)	318 (12.50)	279 (11.00)	25 (1.00)	25 (1.00)	6	241.3 (9.50)	⅞	14
(20)	(20)	(20)	(21)	(21)	(21)	(21)	349 (13.75)	279 (11.00)	25 (1.00)	25 (1.00)	6	241.3 (9.50)	⅞	16
12	330 (13.00)	393 (15.50)	8	635 (25.00)	25 (1.00)	699 (27.50)	381 (15.00)	343 (13.50)	29 (1.12)	29 (1.12)	8	298.5 (11.75)	⅞	18
14	356 (14.00)	432 (17.00)	10	686 (27.00)	25 (1.00)	749 (29.50)	406 (16.00)	343 (13.50)	29 (1.12)	29 (1.12)	8	298.5 (11.75)	⅞	20
16	381 (15.00)	483 (19.00)	12	800 (31.50)	13 (0.50)	876 (34.50)	470 (18.50)	343 (13.50)	29 (1.12)	29 (1.12)	8	298.5 (11.75)	⅞	24
20	457 (18.00)	584 (23.00)	14	991 (39.00)	0 (0.00)	1 067 (42.00)	...	...	...	...	...	...	...	30
24	508 (20.00)	660 (26.00)	...	...	...	...	...	...	...	...	...	...	...	...
24	584 (23.00)	762 (30.00)	...	...	...	...	...	...	...	...	...	...	...	...
30	660 (26.00)	864 (34.00)	...	...	...	...	...	...	...	...	...	...	...	...

Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings (Cont'd)

GENERAL NOTE: Dimensions are in millimeters (inches).

NOTES:

- (1) For facing, see [para. 7.2\(a\)](#).
- (2) For flange bolt holes, refer to [Table 7.6.1-2](#) and [para. 7.6](#).
- (3) For spot facing, see [para. 7.7](#).
- (4) For wall thickness tolerances, see [para. 7.1](#).
- (5) For center-to-face tolerances, see [para. 7.4](#).
- (6) For intersecting centerlines of side-outlet fittings, see [para. 7.3.1](#).
- (7) For center-to-face dimensions of reducing elbows and side-outlet elbows, see [paras. 7.3.2\(b\)](#) and [7.3.2\(c\)](#).
- (8) For center-to-face dimensions of special degree elbows, see [para. 7.3.2\(d\)](#).
- (9) For reinforcement of crosses and laterals, see [para. 7.8](#).
- (10) For face-to-face dimensions of reducers and eccentric reducers, see [para. 7.3.5](#).
- (11) For center-to-face dimensions of tees, and crosses having outlets and laterals having branches larger than given above, see [para. 7.3.3\(b\)](#).
- (12) For center-to-face dimensions of tees, crosses, and laterals reducing on run only, see [para. 7.3.3\(b\)](#).
- (13) For center-to-face dimensions of tees reducing on both runs, known as bull-head tees, see [para. 7.3.3\(c\)](#).
- (14) For center-to-face dimensions of reducing side-outlet tees and crosses having two different size reductions on the outlets, see [para. 7.3.3\(b\)](#).
- (15) Bases are furnished only when specified by the purchaser.
- (16) For tees larger than NPS 24, anchorage fittings are recommended. See [Table 7.3.2-4](#).
- (17) The base dimension applies to all straight and reducing sizes.
- (18) For reducing fittings, the size and center-to-face dimensions of base are determined by the size of the largest opening of the fitting. In the case of reducing base elbows, orders shall specify whether the base shall be opposite the larger or smaller opening.
- (19) Bolt hole template shown for round base is the same as for the flange of the supporting pipe size, except using only four holes in all cases so placed as to straddle centerlines. The bases of these fittings are intended for support in compression and are not to be used for anchors or supports in tension or shear.
- (20) All reducing tees and crosses NPS 16 and smaller shall have the same center-to-face dimensions as straight-size fittings, corresponding to the size of the largest opening.
- (21) All reducing laterals NPS 16 and smaller shall have the same center-to-face dimensions as straight-size fittings, corresponding to the size of the largest opening.

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Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings

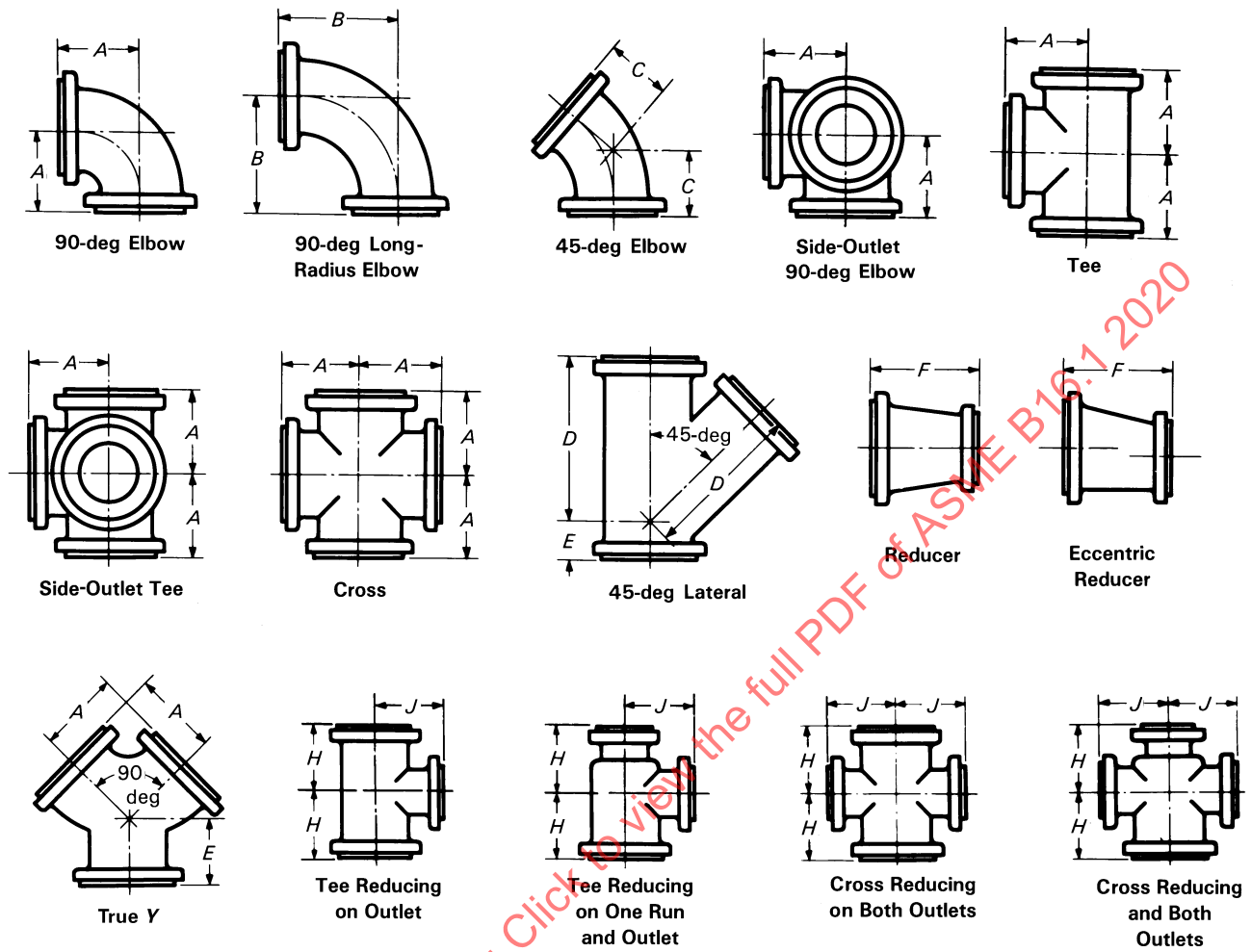


Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings

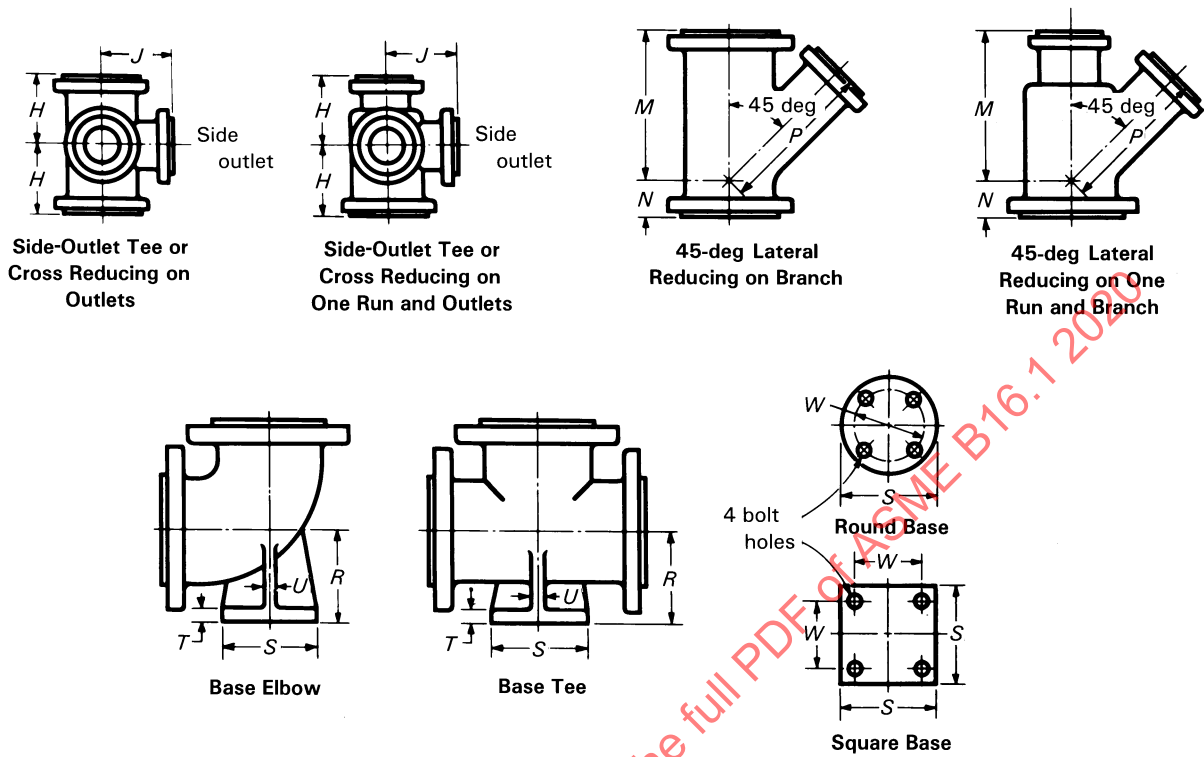


Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)

Flanges [(1)-(3)]			General Fittings [(5), (6)]			Straight Fittings [(5), (6)]					
NPS	Diameter of Flange	Minimum Thickness of Flange, <i>Q</i>	Diameter of Raised Face (4)	Inside Diameter of Fittings	Body Wall Thickness (7)	Center-to-Face 90-deg Elbow, Tees, Crosses, and True, <i>Y, A</i> [(8)-(10)]	Center-to-Face 90-deg Long-Radius Elbow, <i>B</i> [(6), (8), (9)]	Center-to-Face 45-deg Elbow, <i>C</i> , [(9)]	Center-to-Face Lateral, <i>D</i> , [(10), (11)]	Short Center-to-Face True, <i>Y</i> and Lateral, <i>E</i> [(10), (11)]	Face-to-Face Reducer, <i>F</i> (12)
1	124 (4.88)	17.5 (0.69)	68 (2.69)	25 (1.00)	11.1 (0.44)	102 (4.00)	127 (5.00)	51 (2.00)	165 (6.50)	57 (2.00)	...
1¼	133 (5.25)	19.0 (0.75)	78 (3.06)	32 (1.25)	11.1 (0.44)	108 (4.25)	140 (5.50)	64 (2.50)	184 (7.25)	57 (2.25)	...
1½	156 (6.12)	20.6 (0.81)	91 (3.56)	38 (1.50)	11.1 (0.44)	114 (4.50)	152 (6.00)	70 (2.75)	216 (8.50)	64 (2.50)	...
2	165 (6.50)	22.2 (0.88)	106 (4.19)	51 (2.00)	11.1 (0.44)	127 (5.00)	165 (6.50)	76 (3.00)	229 (9.00)	64 (2.50)	127 (5.0)
2½	191 (7.50)	25.4 (1.00)	125 (4.94)	64 (2.50)	12.7 (0.50)	140 (5.50)	178 (7.00)	89 (3.50)	267 (10.50)	64 (2.50)	140 (5.5)
3	210 (8.25)	28.6 (1.12)	144 (5.69)	76 (3.00)	14.3 (0.56)	152 (6.00)	197 (7.75)	89 (3.50)	279 (11.00)	76 (3.00)	152 (6.00)
3½	229 (9.00)	30.2 (1.19)	160 (6.31)	89 (3.50)	14.3 (0.56)	165 (6.50)	216 (8.50)	102 (4.00)	318 (12.50)	76 (3.00)	165 (6.50)
4	254 (10.00)	31.8 (1.25)	176 (6.94)	102 (4.00)	15.9 (0.62)	178 (7.00)	229 (9.00)	114 (4.50)	343 (13.50)	76 (3.00)	178 (7.00)
5	279 (11.00)	34.9 (1.38)	211 (8.31)	127 (5.00)	17.5 (0.69)	203 (8.00)	260 (10.25)	127 (5.00)	381 (15.00)	89 (3.50)	203 (8.00)
6	318 (12.50)	36.5 (1.44)	246 (9.69)	152 (6.00)	19 (0.75)	216 (8.50)	292 (11.50)	140 (5.50)	445 (17.50)	102 (4.00)	229 (9.00)
8	381 (15.00)	41.3 (1.62)	303 (11.94)	203 (8.00)	20.6 (0.81)	254 (10.00)	356 (14.00)	152 (6.00)	521 (20.50)	127 (5.00)	279 (11.00)
10	445 (17.50)	47.6 (1.88)	357 (14.06)	254 (10.00)	23.8 (0.94)	292 (11.50)	419 (16.50)	178 (7.00)	610 (24.00)	140 (5.50)	305 (12.00)
12	521 (20.50)	50.8 (2.00)	418 (16.44)	305 (12.00)	25.4 (1.00)	330 (13.00)	488 (19.00)	203 (8.00)	699 (27.50)	152 (6.00)	356 (14.00)
14	584 (23.00)	54 (2.12)	481 (18.94)	337 (13.25)	28.6 (1.12)	381 (15.00)	546 (21.50)	216 (8.50)	787 (31.00)	165 (6.50)	406 (16.00)
16	648 (25.50)	57.2 (2.25)	535 (21.06)	387 (15.25)	31.8 (1.25)	419 (16.50)	609 (24.00)	241 (9.50)	876 (34.50)	191 (7.50)	457 (18.00)
18	711 (28.00)	60.3 (2.38)	592 (23.31)	432 (17.00)	34.9 (1.38)	457 (18.00)	673 (26.50)	254 (10.00)	953 (37.50)	203 (8.00)	483 (19.00)
20	775 (30.50)	63.5 (2.50)	649 (25.56)	483 (19.00)	38.1 (1.50)	495 (19.50)	737 (29.00)	267 (10.50)	1029 (40.50)	216 (8.50)	508 (20.00)
24	916 (36.00)	69.8 (2.75)	770 (30.31)	584 (23.00)	41.3 (1.62)	572 (22.50)	864 (34.00)	305 (12.00)	1207 (47.50)	254 (10.00)	610 (24.00)
30	1092 (43.00)	76.2 (3.00)	945 (37.19)	737 (29.00)	50.8 (2.00)	699 (27.50)	1054 (41.50)	381 (15.00)	...	...	762 (30.00)

Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)

Reducing Fittings (Short-Body Patterns) [(11), (15)]							Base Elbows and Tees [(15)–(18)]							
Tees and Crosses [(10), (13), (14)]			Laterals (10)				Base Drilling (20)							
NPS Size of Outlet and Smaller [(6), (12)]	Center-to-Face Run, <i>H</i> [(8), (9)]	Center-to-Face Outlet or Side Outlet, <i>J</i>	NPS Size of Branch and Smaller	Center-to-Face Run, <i>M</i>	Center-to-Face Run, <i>N</i>	Center-to-Face Run, <i>P</i>	Center-to-Face Run, <i>R</i>	Diameter of Round Base or Width of Square Base <i>S</i> (19)	Thickness of Base, <i>T</i>	Thickness of Ribs, <i>U</i>	NPS Size of Supporting Pipe for Base	Bolt Circle or Bolt Spacing, <i>W</i>	Diameter of Holes	NPS
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1¼
(21)	(21)	(22)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	114 (4.50)	133 (5.25)	19 (0.75)	13 (0.50)	1¼	98 (3.88)	¾	2
(21)	(21)	(21)	(22)	(22)	(22)	(22)	121 (4.75)	133 (5.25)	19 (0.75)	13 (0.50)	1¼	98 (3.88)	¾	2½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	133 (5.25)	156 (6.12)	21 (0.81)	16 (0.62)	1½	114 (4.50)	7/8	3
(21)	(21)	(21)	(22)	(22)	(22)	(22)	143 (5.62)	156 (6.12)	21 (0.81)	16 (0.62)	1½	114 (4.50)	7/8	3½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	152 (6.00)	165 (6.50)	22 (0.88)	16 (0.62)	2	127 (5.00)	¾	4
(21)	(21)	(21)	(22)	(22)	(22)	(22)	171 (6.75)	191 (7.50)	25 (1.00)	19 (0.75)	2½	149 (5.88)	7/8	5
(21)	(21)	(21)	(22)	(22)	(22)	(22)	191 (7.50)	191 (7.50)	25 (1.00)	19 (0.75)	2½	149 (5.88)	7/8	6
(21)	(21)	(21)	(22)	(22)	(22)	(22)	229 (9.00)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	7/8	8
(21)	(21)	(21)	(22)	(22)	(22)	(22)	267 (10.50)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	7/8	10
(21)	(21)	(21)	(22)	(22)	(22)	(22)	305 (12.00)	318 (10.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	7/8	12
(21)	(21)	(21)	(22)	(22)	(22)	(22)	343 (13.50)	318 (12.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	7/8	14
(21)	(21)	(21)	(22)	(22)	(22)	(22)	375 (14.75)	318 (12.50)	37 (1.44)	29 (1.12)	6	270 (10.62)	7/8	16
12	356 (14.00)	432 (17.00)	8	787 (31.00)	76 (3.00)	826 (32.50)	413 (16.25)	381 (15.00)	41 (1.62)	29 (1.12)	8	330 (13.00)	1	18
14	394 (15.50)	470 (18.50)	10	864 (34.00)	76 (3.00)	914 (36.00)	454 (17.88)	381 (15.00)	41 (1.62)	32 (1.25)	8	330 (13.00)	1	20
16	432 (17.00)	546 (21.50)	12	1041 (41.00)	76 (3.00)	1092 (43.00)	527 (20.75)	445 (17.50)	48 (1.88)	32 (1.25)	10	387 (15.25)	1½	24
20	521 (20.50)	648 (25.50)	...	...	...	...	...	...	...	...	...	...	...	30

Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)

GENERAL NOTE: Dimensions are in millimeters (inches).

NOTES:

- (1) For facing, see [para. 7.2\(b\)](#).
- (2) For flange bolt holes, refer to [Table 7.6.1-3](#) and [para. 7.6](#).
- (3) For spot facing, see [para. 7.7](#).
- (4) Tolerance of the diameter of the raised face is equal to ± 0.8 mm.
- (5) For center-to-face tolerances, see [para. 7.4](#).
- (6) For intersecting centerlines of side-outlet fittings, see [para. 7.3.1](#).
- (7) For wall thickness tolerances, see [para. 7.1](#).
- (8) For center-to-face dimensions of reducing elbows and side-outlet elbows, see [paras. 7.3.2\(b\)](#) and [7.3.2\(c\)](#).
- (9) For center-to-face dimensions of special degree elbows, see [para. 7.3.2\(d\)](#).
- (10) For reinforcement of crosses and laterals, see [para. 7.8](#).
- (11) For center-to-face dimensions of tees and crosses having outlets and laterals having branches larger than given above, see [para. 7.3.3\(b\)](#).
- (12) For face-to-face dimensions of reducers and eccentric reducers, see [para. 7.3.5](#).
- (13) For center-to-face dimensions of tees reducing on both runs, known as bull-head tees, see [para. 7.3.3\(c\)](#).
- (14) For center-to-face dimensions of reducing side-outlet tees and crosses having two different size reductions on the outlet, see [para. 7.3.3\(b\)](#).
- (15) For center-to-face dimensions of tees, crosses, and laterals reducing on run only, see [para. 7.3.3\(b\)](#).
- (16) Bases are furnished only when specified by purchaser.
- (17) The base dimensions apply to all straight and reducing sizes.
- (18) For tees, sizes larger than NPS 24, anchorage fittings are recommended. See [Table 7.3.2-5](#).
- (19) For reducing fittings, the size and center-to-face dimensions of base are determined by the size of the largest opening of the fitting. In the case of reducing base elbows, orders shall specify whether the base shall be opposite the larger or smaller opening.
- (20) Bolt hole template shown for round base is the same as for the flange of the supporting pipe size, except using only four holes in all cases so placed as to straddle centerlines. The bases of these fittings are intended for support in compression and are not to be used for anchors or supports in tension or shear.
- (21) All reducing tees and crosses NPS 16 and smaller shall have the same center-to-face dimensions as straight-size fittings, corresponding to the size of the largest opening.
- (22) All reducing laterals NPS 16 and smaller shall have the same center-to-face dimensions as straight-size fittings, corresponding to the size of the largest opening.

Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees

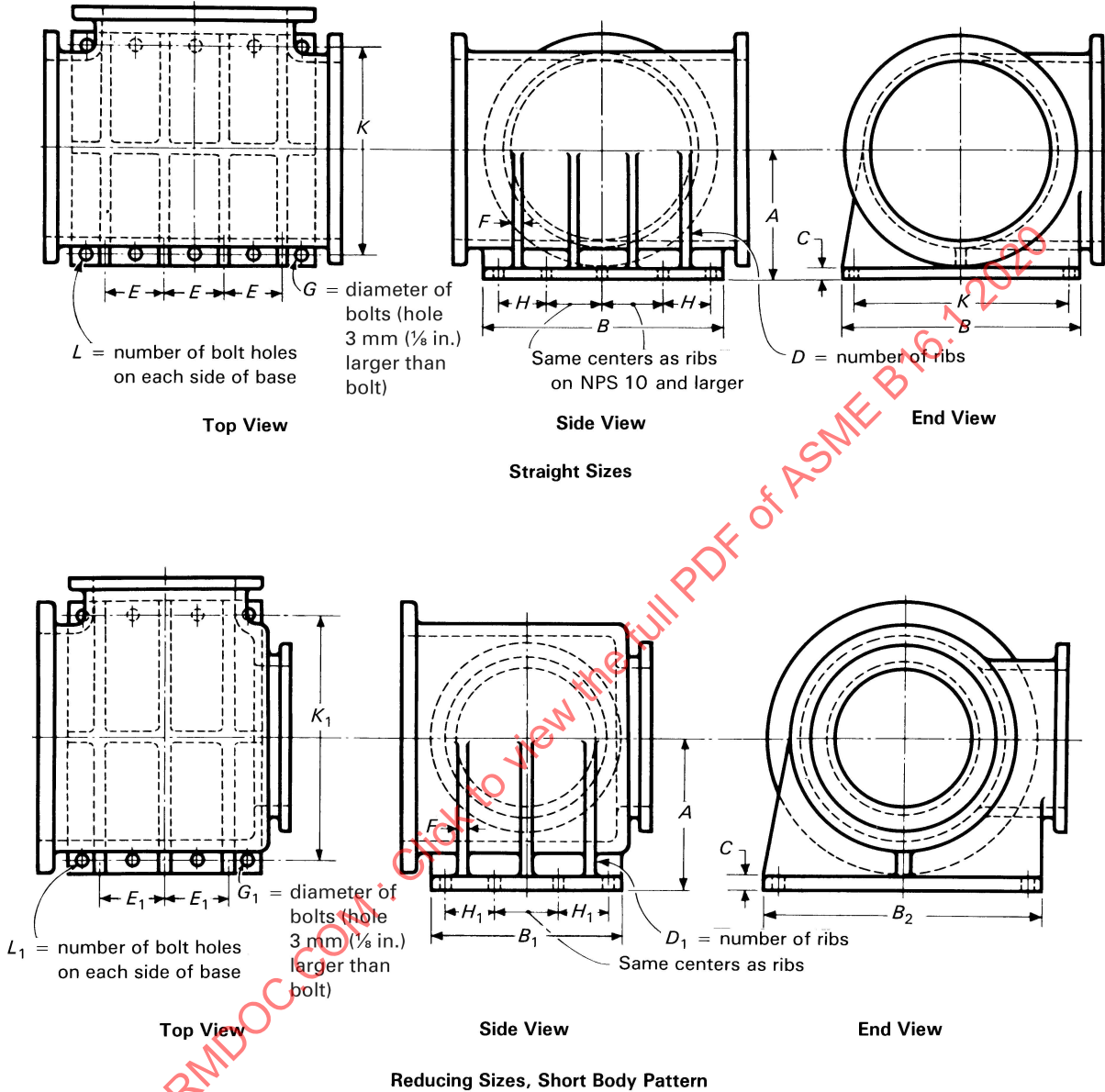


Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees (Cont'd)

NPS	Common to Both Straight Sizes and Reducing Sizes					Straight Sizes				
	Center to Base, A	Thickness of Base, C (1)	Diameter of Bolts, G	Thickness of Ribs, F	Width and Length of Square Base, B	Transverse Bolt Centers, K	Number of Bolt Holes on Each Side of Base, L	Number of Ribs, D	Centers of Ribs and Inside Bolt Holes, E	Longitudinal Centers From End Bolt to Second End, H
2½	114 (4.50)	18 (0.69)	5/8	11 (0.44)	178 (7.00)	114 (4.50)	2	1	...	114 (4.50)
3	124 (4.88)	19 (0.75)	5/8	11 (0.44)	191 (7.50)	127 (5.00)	2	1	...	127 (5.00)
3½	133 (5.25)	21 (0.81)	5/8	11 (0.44)	216 (8.50)	152 (6.00)	2	1	...	152 (6.00)
4	140 (5.50)	24 (0.94)	5/8	13 (0.50)	229 (9.00)	165 (6.50)	3	2	108 (4.25)	83 (3.25)
5	159 (6.25)	24 (0.94)	7/8	13 (0.50)	254 (10.00)	191 (7.50)	3	2	127 (5.00)	95 (3.25)
6	178 (7.00)	25 (1.00)	7/8	14 (0.56)	279 (11.00)	222 (8.75)	3	2	152 (6.00)	111 (4.38)
8	273 (8.38)	29 (1.12)	1	16 (0.62)	343 (13.50)	279 (11.00)	3	2	203 (8.00)	140 (5.50)
10	248 (9.25)	30 (1.19)	1⅛	19 (0.75)	406 (16.00)	340 (13.38)	4	3	124 (4.88)	108 (4.25)
12	286 (11.25)	32 (1.25)	1¼	21 (0.81)	483 (19.00)	394 (15.50)	4	3	146 (5.75)	124 (4.88)
14	318 (12.50)	35 (1.38)	1¼	22 (0.88)	533 (21.00)	451 (17.75)	4	3	172 (6.75)	140 (5.50)
16	349 (13.75)	37 (1.44)	1⅜	25 (1.00)	597 (23.50)	502 (19.75)	4	3	197 (7.75)	152 (6.00)
18	381 (15.00)	40 (1.56)	1⅜	27 (1.06)	635 (25.00)	552 (21.75)	4	3	216 (8.50)	168 (6.62)
20	406 (16.00)	43 (1.69)	1½	29 (1.12)	699 (27.50)	610 (24.00)	4	3	241 (9.50)	184 (7.25)
24	470 (18.50)	48 (1.88)	1⅝	32 (1.25)	813 (32.00)	721 (28.38)	4	3	289 (11.38)	216 (8.50)
30	559 (22.00)	54 (2.12)	1¾	37 (1.44)	984 (38.75)	876 (34.50)	5	4	238 (9.38)	200 (7.88)
36	648 (25.50)	60 (2.38)	1⅞	41 (1.62)	1168 (46.00)	1035 (40.75)	5	4	286 (11.25)	232 (9.12)
42	743 (29.25)	67 (2.62)	2	46 (1.81)	1346 (53.00)	1187 (46.75)	5	4	330 (13.00)	264 (10.38)
48	832 (32.75)	70 (2.75)	2¼	51 (2.00)	1511 (59.50)	1353 (53.25)	5	4	378 (14.88)	298 (11.75)

Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees (Cont'd)

Reducing Sizes (Short-Body Pattern) [(1), (2)]									
NPS Outlet Sizes and Smaller	Length of Base, B_1 (1)	Number of Ribs, D_1	Centers of Ribs, E_1	Diameter of Bolts, G_1	Longitudinal Center From End Bolt to Second Bolt, H_1	Transverse Bolt Centers, K_1	Number of Bolt Holes on Each Side of Base, L_1	Width of Base, B_2	NPS
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	2½
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	3
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	3½
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	4
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	5
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	6
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	8
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	10
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	12
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	14
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	16
12	483 (19.00)	3	133 (5.25)	1¼	130 (5.12)	546 (21.50)	4	629 (24.75)	18
14	533 (21.00)	3	152 (6.00)	1¼	137 (5.38)	591 (23.75)	4	679 (26.75)	20
16	597 (23.50)	3	178 (7.00)	1⅜	159 (6.25)	711 (28.00)	4	803 (31.62)	24
20	699 (27.50)	3	229 (9.00)	1½	184 (7.25)	883 (34.25)	4	991 (39.00)	30
24	813 (32.00)	3	273 (10.75)	1½	213 (8.38)	1054 (41.50)	4	1187 (46.25)	36
24	927 (36.50)	4	216 (8.50)	1⅝	191 (7.50)	1232 (48.50)	5	1391 (54.75)	42
30	1060 (41.75)	4	248 (9.75)	1⅝	210 (8.25)	1365 (53.75)	5	1524 (60.00)	48

Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees (Cont'd)

GENERAL NOTES:

- (a) Dimensions are in millimeters (inches).
- (b) Bases are furnished only when specified by the purchaser.
- (c) For tee dimensions, refer to [Table 7.3.2-2](#).

NOTES:

- (1) For NPS 18 and larger, if the outlet is the same size or smaller than given for reducing tees, the base dimensions shown in this table shall be used. If the outlet is larger than shown for reducing tees, the base dimensions shall be the same as for the straight-size tee, corresponding to the size of the largest opening.
- (2) Tees reducing on run only shall have the same base dimensions as straight-size tees, corresponding to the size of the largest opening.
- (3) Reducing tee sizes NPS 16 and smaller shall have the same base (*B*) dimensions as a straight-size tee, corresponding to the size of the largest opening.

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Table 7.3.2-5 Dimensions of Anchorage Bases for Straight and Reducing Class 250 Tees

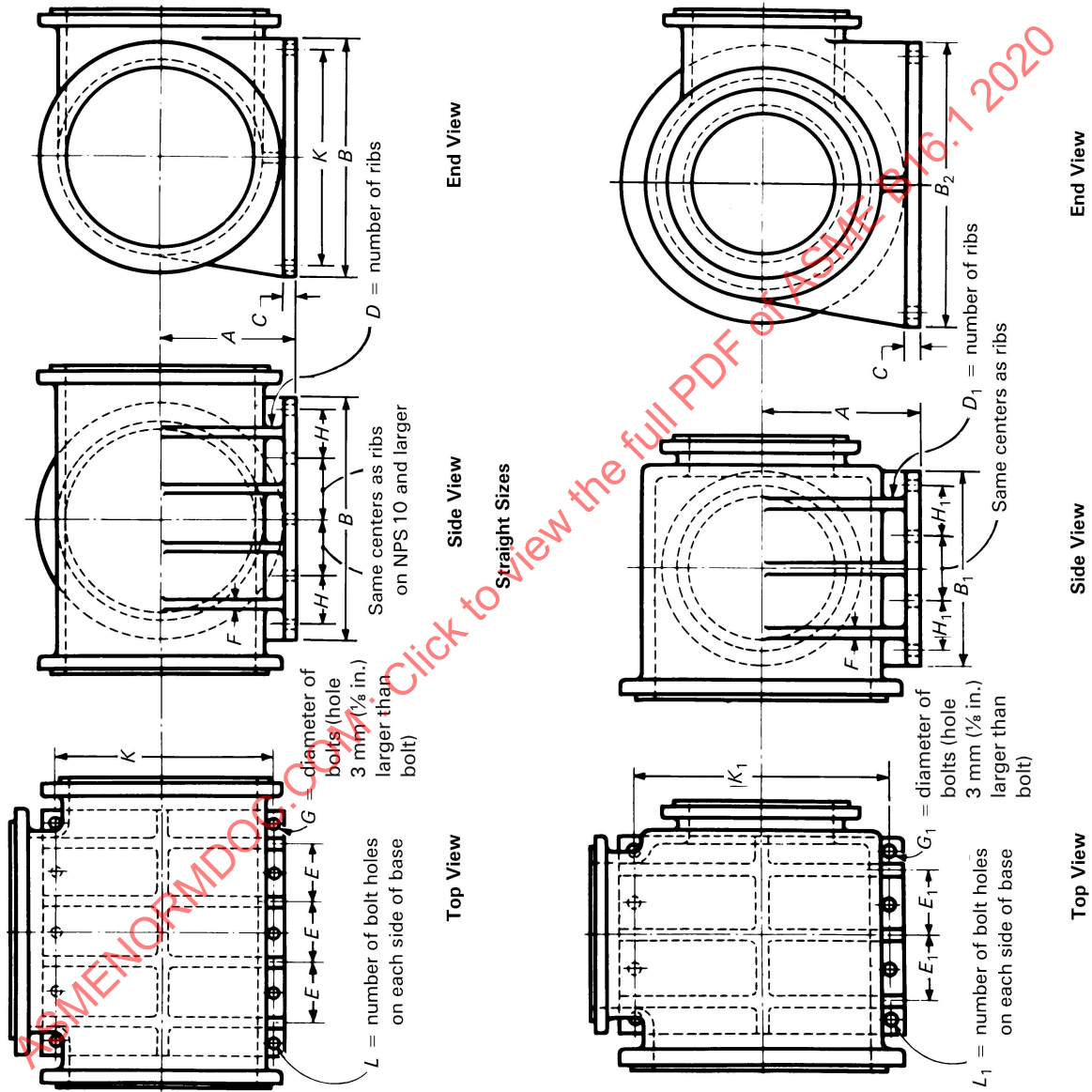


Table 7.3.2-5 Dimensions of Anchorage Bases for Straight and Reducing Class 250 Tees (Cont'd)

Common on Both Straight Sizes and Reducing Sizes				Straight Sizes				Reducing Sizes (Short-Body Pattern) [(2), (3)]									
NPS	Center to Base, A	Thickness of Base, C	Diameter of Bolts, G	F	Width and Length of Square Base, B	Transverse Bolt Centers, K	Number of Bolt Holes on Each Side of Base, L	Centers of Ribs, and Inside Bolt Holes, E	Longitudinal Centers From End Bolt to Second End, H	NPS Outlet Sizes and Smaller, (2)	Length of Base, B ₁	Centers of Ribs, E ₁	Longitudinal Centers From End Bolt to Second End, H ₁			Transverse Bolt Centers, K ₁	Width of Base, B ₂
													H ₁	B ₂	K ₁		
2½	121 (4.75)	19 (0.75)	⅝	14 (0.56)	190 (7.50)	146 (5.75)	2	...	146 (5.75)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
3	133 (5.25)	21 (0.81)	⅝	14 (0.56)	210 (8.25)	165 (6.50)	2	...	165 (6.50)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
3½	143 (5.62)	24 (0.94)	⅝	14 (0.56)	229 (9.00)	184 (7.25)	2	...	184 (7.25)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
4	152 (6.00)	24 (0.94)	⅝	16 (0.62)	254 (10.00)	197 (7.75)	3	102 (4)	98 (3.78)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
5	171 (6.75)	25 (1.00)	⅞	18 (0.69)	279 (11.00)	222 (8.75)	3	127 (5)	111 (4.38)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
6	190 (7.50)	27 (1.06)	⅞	19 (0.75)	318 (12.50)	260 (10.25)	3	152 (6)	130 (5.12)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
8	229 (9.00)	29 (1.12)	1	21 (0.81)	381 (15.00)	318 (12.50)	3	203 (8)	159 (6.25)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
10	267 (10.50)	32 (1.25)	1⅛	24 (0.94)	444 (17.50)	375 (14.75)	4	127 (5)	124 (4.88)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
12	305 (12.00)	32 (1.25)	1¼	25 (1.00)	521 (20.50)	444 (17.50)	4	152 (6)	146 (5.75)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
14	343 (13.50)	35 (1.38)	1½	29 (1.12)	584 (23.00)	508 (20.00)	4	178 (7)	165 (6.50)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
16	375 (14.75)	40 (1.56)	1⅜	32 (1.25)	648 (25.50)	559 (22.00)	4	203 (8)	178 (7.00)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
18	413 (16.25)	43 (1.69)	1⅜	35 (1.38)	711 (28.00)	616 (24.25)	4	229 (9)	194 (7.38)	12	521 (20.50)	165 (6.50)	133 (5.25)	622 (24.50)	718 (28.25)	718 (28.25)	
20	454 (17.88)	48 (1.88)	1½	38 (1.50)	775 (30.50)	679 (26.75)	4	254 (10)	213 (8.38)	14	584 (23.00)	178 (7.00)	152 (6.00)	673 (26.50)	768 (30.25)	768 (30.25)	
24	527 (20.75)	52 (2.06)	1⅝	41 (1.62)	914 (36.00)	806 (31.75)	4	305 (12)	251 (9.88)	16	648 (25.50)	206 (8.12)	170 (6.69)	813 (32.00)	921 (36.25)	921 (36.25)	
30	629 (24.75)	59 (2.31)	1¾	51 (2.00)	1092 (43.00)	965 (38.00)	5	254 (10)	229 (9.00)	20	775 (30.50)	168 (6.62)	156 (6.12)	965 (38.00)	1092 (43.00)	1092 (43.00)	

GENERAL NOTES:

(a) Dimensions are in millimeters (inches).

(b) For tee dimensions, refer to Table 7.3.2-3.

NOTES:

(1) Bases are furnished only when specified by the purchaser.

(2) For NPS 18 and larger, if the outlet is the same size or smaller than given for reducing tees, the base dimensions shown in this table for reducing tees shall be used. If the outlet is larger than shown for reducing tees, the base dimensions shall be the same as for the straight-size tees, corresponding to the size of the largest opening.

(3) Tees reducing on run only shall have the same base dimensions as straight-size tees, corresponding to the size of the largest opening.

(4) Reducing tee sizes NPS 16 and smaller shall have the same base (B) dimensions as a straight-size tee, corresponding to the size of the largest opening.