

ASME B16.12-2019

[Revision of ASME B16.12-2009 (R2014)]

Cast Iron Threaded Drainage Fittings

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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Two Park Avenue • New York, NY • 10016 USA

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FOREWORD

Screw joint drainage fittings were developed in about 1880 by the Durham House Drainage Co. of New York and are often referred to as Durham fittings. At that time, soil pipes and drains in New York had been required to be of plumber's cast iron soil pipe, whereas Chicago's soil pipes were required to be of lead or plumber's cast iron pipe.

To form a continuous passageway with no pockets or obstructions where foreign matter could collect and gradually accumulate, it was necessary to design a special type of screw fitting. Inside diameters of the fittings are about the nominal size of standard weight wrought steel pipe (Schedule 40). The thread chamber is designed so that when the pipe is tightly screwed into the fitting, its end nearly abuts the shoulder of the fitting, thereby making a practically continuous passage. The threading of these fittings required special care, and the threads on the pipe were cut to suit the threads in the fitting.

With the passage of time, manufacturers' practices began to diverge in regard to center-to-end dimensions and other features. The Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) studied the situation, developed a standard practice for these fittings, and published MSS SP-8, Cast Iron Drainage Fittings, in 1929. Subsequently, for better coordination with other screwed fitting standards under the jurisdiction of the B16 Sectional Committee of the American Standards Association (ASA), the subject was assigned to Subcommittee 2 of B16.

Many drafts of the proposed standard were developed, and printer's proofs were distributed to industry for criticism and comment in May 1940. A revised proposal dated July 1941 was submitted to the members of the Sectional Committee for letter ballot vote. Following its approval by that body, it was submitted to the sponsors and to ASA with recommendations for approval as an American Standard. This was granted in February 1942, with the designation ASA B16.12-1942.

The MSS Ferrous Screw Fittings Committee made a thorough study of the 1942 Standard and recommended that several changes be made to bring the data in line with current production and usage of this type of fitting. To comply with the recommendations, Subcommittee 2 of the B16 Sectional Committee revised portions of the text and illustrations and added dimensional tables for Tucker connections, roof connections, and Tucker Y-branches, as well as dimensions for P-traps, bath traps, and running traps.

A draft, dated September 1952, was presented to the Sectional Committee for letter ballot vote. After the committee and other sponsor organizations approved the draft, it was presented to ASA, and approval of ASA B16.12-1953 was granted on September 11, 1953.

Subcommittee 2 reviewed the document from 1963 to 1964. The Sectional Committee approved several minor changes in format and wording, changing the title to Cast Iron Threaded Drainage Fittings. ASA B16.12-1965 was approved on November 12, 1965.

In 1970, further review was initiated by Subcommittee 2, now an American National Standards Institute (ANSI) Committee, and ANSI B16.12-1971 was granted approval on November 1, 1971.

The Standard was updated, and metric (SI) dimensions were added in ANSI B16.12-1977, approved on February 4, 1977.

In 1982, American Standards Committee B16 was reorganized as the ASME B16 Standards Committee under procedures accredited by ANSI. Also in 1982, Subcommittee B (formerly Subcommittee 2) updated reference standards, and the revision was approved on July 20, 1983, as ANSI B16.12-1983.

In the 1991 edition of ASME B16.12, reference standards were updated, and the metric dimensions were deleted. Following approval by ASME, ANSI approved the edition on January 4, 1991.

In the 1998 edition of ASME B16.12, reference standards were updated, a quality system program annex was added, and several editorial revisions were made. Following approval by ASME B16 Subcommittee B and the B16 Main Committee, ANSI approved the edition on November 20, 1998.

Work started during 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.

In the 2009 edition, metric dimensions became the primary units, and inch dimensions were incorporated as secondary units and shown in parentheses. The added inch dimensions constituted an independent but equal standard to the metric units. ANSI approved the edition on April 6, 2009.

In this edition, Mandatory Appendix I has been revised to include updates to the referenced standards. In addition, the U.S. Customary tables formerly in Mandatory Appendix II have been merged with the SI tables in the main text; the tables and figures have been redesignated; Mandatory Appendix II has been deleted; and the cross-references have been updated accordingly.

Following approval by the ASME B16 Standards Committee, ANSI approved this edition as an American National Standard, with the designation ASME B16.12-2019, on July 29, 2019.

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Standardization of Valves, Flanges, Fittings, and Gaskets

(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
Two Park Avenue
New York, NY 10016-5990
<http://go.asme.org/Inquiry>

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.

Attending Committee Meetings. The B16 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B16 Standards Committee.

ASME B16.12-2019 SUMMARY OF CHANGES

Following approval by the ASME B16 Committee and ASME, and after public review, ASME B16.12-2019 was approved by the American National Standards Institute on July 29, 2019.

In ASME B16.12-2019, the U.S. Customary tables formerly in Mandatory Appendix II have been merged with the SI tables in the main text; the tables and figures have been redesignated; Mandatory Appendix II has been deleted; and the cross-references have been updated accordingly. In addition, this edition includes the following change identified by a margin note, **(19)**. The Record Number listed below is 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>
14	Mandatory Appendix I	Updated (19-596)

LIST OF CHANGES IN RECORD NUMBER ORDER

<u>Record Number</u>	<u>Change</u>
19-596	Updated Mandatory Appendix I.

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CAST IRON THREADED DRAINAGE FITTINGS

1 SCOPE AND GENERAL

1.1 Scope

This Standard for cast iron threaded drainage fittings covers

- (a) sizes and method of designating openings in reducing fittings
- (b) marking
- (c) material
- (d) dimensions and tolerances
- (e) threading
- (f) ribs
- (g) coatings
- (h) face bevel

1.2 Applicability

This Standard covers fittings intended for use in gravity drainage systems subject only to the gravity head of waste liquids at temperatures from ambient to approximately 100°C (212°F). The use of this Standard for pressurized waste handling systems is the responsibility of the user and is subject to the requirements of any applicable code.

1.3 Quality Systems

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

1.4 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 SIZE

2.1 Nominal Pipe Size

The size of the fittings scheduled in [Tables 2.1-1](#) and [2.1-2](#) is identified by the corresponding nominal pipe size (NPS). For reducing tees, Y-branches, or crosses, the largest run opening shall be given first. The straight-line sketches ([Figure 2.1-1](#)) illustrate how the reducing fittings are read.

2.2 Denotation

NPS, followed by a dimensionless number, is the designation for nominal 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 MARKING

Each fitting shall be marked with the manufacturer's name or trademark in accordance with the requirements of MSS Standard Practice No. SP-25.

4 MATERIALS

4.1 Castings

The dimensions prescribed in this Standard ([Tables 4.1-1](#) through [4.1-11](#)) are based on gray iron castings of high quality produced under regular control of chemical and physical properties by a recognized process. The manufacturer shall be prepared to certify that the product has been so produced and that its chemical and physical properties, as proved by test specimens, are equal to the requirements specified in ASTM A126.

4.2 Optional Material

Drainage fittings are regularly made of cast iron. At the option of the manufacturer, drainage fittings may be furnished of malleable iron complying with the minimum physical requirements of ASTM A197.

5 DIMENSIONS AND TOLERANCES

5.1 Dimensions

This Standard states values in both SI (metric) and U.S. Customary units. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses. The

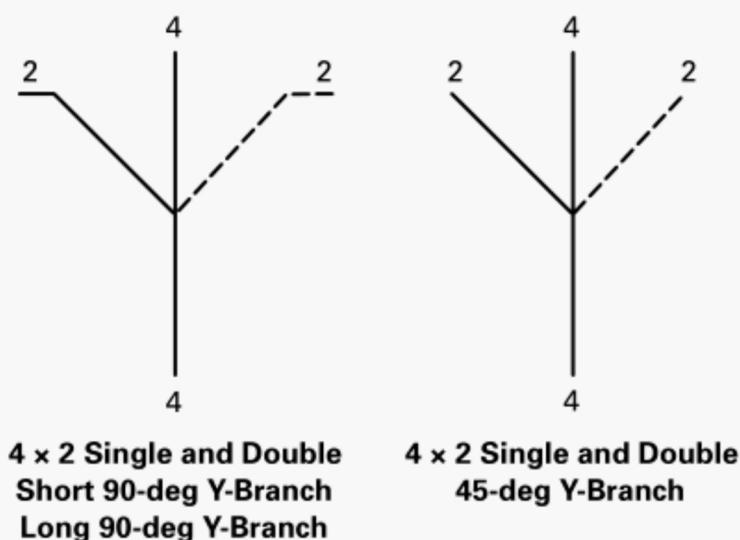
Table 2.1-1 Inspection Limits for Diameter and Width of Band

NPS	Diameter and Width of Band, Minus, mm (in.)
1 $\frac{1}{4}$	1.0 (0.04)
1 $\frac{1}{2}$	1.0 (0.04)
2	1.0 (0.04)
2 $\frac{1}{2}$	1.3 (0.05)
3	1.3 (0.05)
4	1.6 (0.06)
5	1.6 (0.06)
6	1.8 (0.07)
8	2.3 (0.09)

Table 2.1-2 Inspection Limits for Center-to-End Dimensions

NPS	Center-to-End, Plus or Minus, mm (in.)
1 $\frac{1}{4}$	1.8 (0.07)
1 $\frac{1}{2}$	2.0 (0.08)
2	2.0 (0.08)
2 $\frac{1}{2}$	2.5 (0.10)
3	2.5 (0.10)
4	3.0 (0.12)
5	3.0 (0.12)
6	3.6 (0.14)
8	4.1 (0.16)

GENERAL NOTE: The above limits apply to all fittings covered by this Standard. Inspection limits for end-to-end dimensions shall be double the limits for center-to-end dimensions. The largest opening in the fitting governs the tolerance to be applied to all openings.

Figure 2.1-1 Identification of Reducing Fittings

values stated in each system are not exact equivalents; therefore, it is required that each system of units be used independently of the other. Combining values from the two systems constitutes nonconformance with the Standard. Some dimensions of steel pipe from ASME B36.10M are listed for convenience in [Nonmandatory Appendix B](#) in inches only. Tolerances applicable to dimensions of fittings are specified in [paras. 5.2 through 5.6](#).

5.2 Metal Thickness

At no point in the castings shall the metal thickness be less than 90% of the values listed in [Table 4.1-1](#).

5.3 Thread Chamber

The length of thread and total length of thread chamber to shoulder shall not vary from the dimensions shown in the tables by more than plus or minus the equivalent of the pitch of one thread.

5.4 Outside Diameter and Width of Band

The minus tolerances given in [Table 2.1-1](#) are permitted on inspection to apply to the diameter of the band and the width of the band.

5.5 Inside Diameter of Fitting

The inside diameter shall not vary from dimensions shown by more than the following:

- (a) ± 0.8 mm (0.03 in.) for NPS 1 $\frac{1}{2}$ to 4, inclusive
- (b) ± 1.6 mm (0.06 in.) for NPS 5 to 8, inclusive

5.6 Center-to-End

The center-to-end dimensions shall not vary from the given dimensions by more than the values given in [Table 2.1-2](#).

5.7 Shoulder

These fittings are provided with shoulders so that when used with Standard Wall Pipe (ASME B36.10M), the end of the pipe practically meets the shoulder as the joint is made up, thereby forming a smooth passageway.

6 THREADING

(a) All fittings (except roof connections) shall be threaded with American National Standard Taper Pipe Threads (ASME B1.20.1), and the variations in threading shall be limited to one turn small and no turn large. Threaded openings without shoulder, however, shall be limited to one turn large and one turn small from the gaging notch on the plug when using working gages. Roof connections may have taper threads as above or American National Standard Straight Pipe

Threads, Free Fitting Mechanical Joint NPSM (ASME B1.20.1).

(b) When gaging internal threads, the notch shall be flush with the bottom of the chamfer, which shall be considered as being the intersection of the chamfer cone and the pitch cone of the thread. This depth is approximately equal to one-half thread from the face of the fitting.

(c) All threads shall be countersunk a distance not less than one-half thread at an angle approximately 45 deg with the axis of the thread, both for easier entrance in making a joint and for protection of the thread. Countersinking shall be concentric with the thread.

(d) The length of thread specified in this Standard shall be measured to include the countersink.

(e) The maximum allowable variation in the alignment of threads of all openings of threaded fittings shall be 5 mm/m (0.06 in./ft).

(f) All fittings having openings of 90 deg nominal angle shall be tapped with a pitch of 21 mm/m (0.25 in./ft), with the pitch in the direction shown in [Figure 6-1](#).

7 RIBS

The addition of ribs or lugs shall be allowed on any drainage fittings.

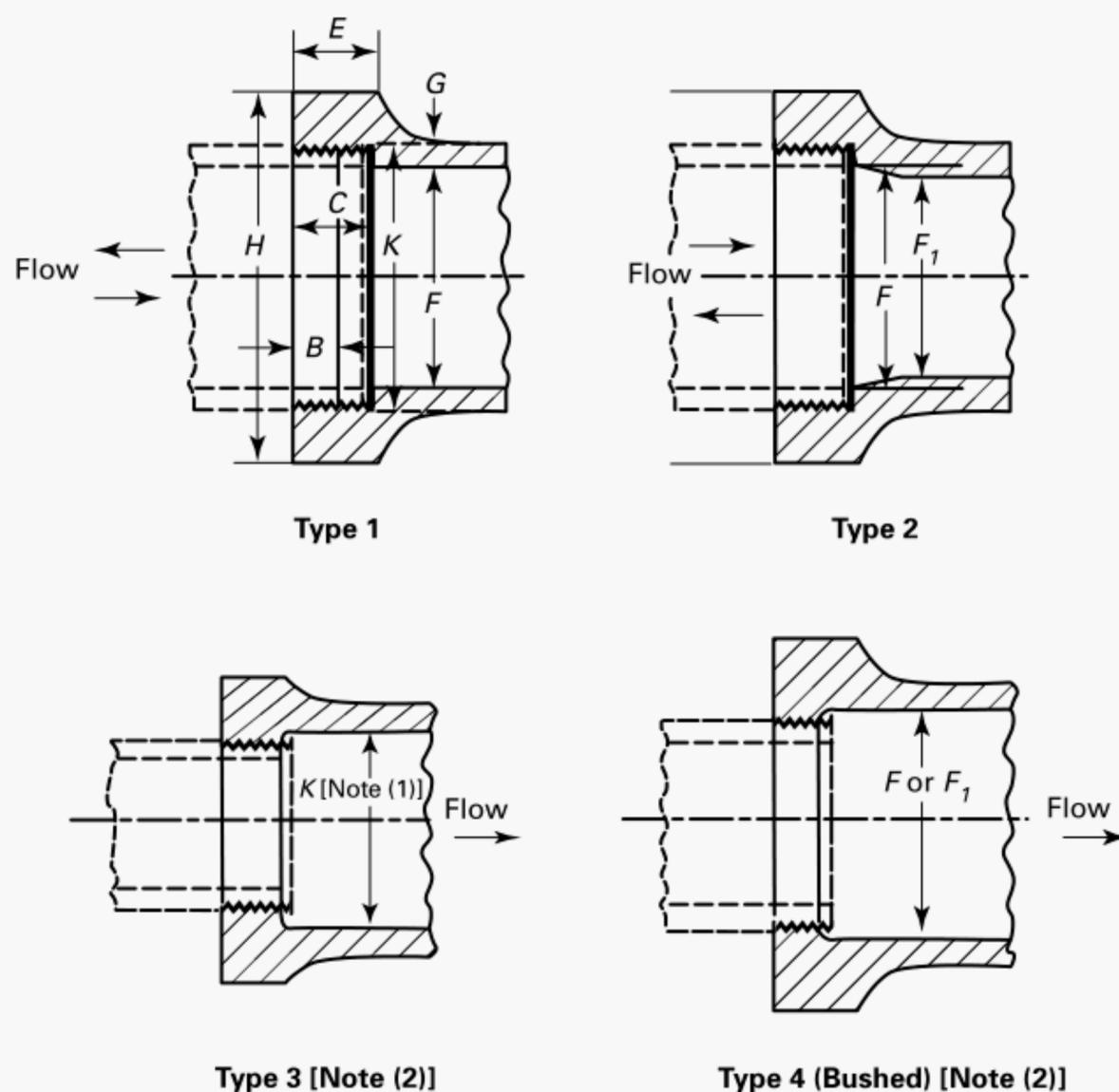
8 COATINGS

Fittings may be furnished uncoated or may be coated with a bituminous composition or zinc coated by the hot dipped process. The coatings shall be applied prior to threading.

9 FACE BEVEL

A bevel not exceeding 5 deg is permitted on the faces of fitting openings. Center-to-end, end-to-end, and width-of-band dimensions may include or exclude the bevel.

Table 4.1-1 Wall Thickness and Threaded End Dimensions



NPS	Length of Threads, <i>B</i> , mm (in.)	Total Length of Thread Chamber to Shoulder, <i>C</i> , mm (in.)	Width of Band, <i>E</i> , mm (in.)	Inside Diameter of Fitting		Nominal Metal Thickness, <i>G</i> , mm (in.)	Outside Diameter of Band, <i>H</i> , mm (in.)	Recess Diameter, <i>K</i> , mm (in.)	
				<i>F</i>	<i>F</i> ₁			Maximum	Minimum
1¼	10.7 (0.42)	18.0 (0.71)	18.0 (0.71)	35.1 (1.38)	31.8 (1.25)	4.7 (0.18)	60.7 (2.39)	43.9 (1.73)	42.2 (1.66)
1½	10.7 (0.42)	18.4 (0.72)	18.3 (0.72)	40.9 (1.61)	38.1 (1.50)	5.1 (0.20)	68.1 (2.68)	50.0 (1.97)	48.3 (1.90)
2	11.1 (0.44)	19.2 (0.76)	19.3 (0.76)	52.6 (2.07)	50.8 (2.00)	5.6 (0.22)	83.3 (3.28)	62.2 (2.44)	60.5 (2.37)
2½	17.3 (0.68)	28.9 (1.14)	29.0 (1.14)	62.7 (2.47)	63.5 (2.50)	6.1 (0.24)	98.0 (3.86)	75.7 (2.97)	73.2 (2.87)
3	19.5 (0.77)	30.5 (1.20)	30.5 (1.20)	78.0 (3.07)	76.2 (3.00)	6.6 (0.26)	117.3 (4.62)	91.4 (3.60)	88.9 (3.50)
4	21.4 (0.84)	33.0 (1.30)	33.0 (1.30)	102.4 (4.03)	101.6 (4.00)	7.9 (0.31)	147.1 (5.79)	116.8 (4.60)	114.3 (4.50)
5	23.8 (0.94)	35.7 (1.41)	35.8 (1.41)	128.3 (5.05)	127.0 (5.00)	9.7 (0.38)	179.1 (7.05)	143.8 (5.66)	141.2 (5.56)
6	24.3 (0.96)	38.4 (1.51)	38.4 (1.51)	154.2 (6.06)	152.4 (6.00)	10.9 (0.43)	210.3 (8.28)	170.9 (6.72)	168.4 (6.62)
8	27.0 (1.06)	43.5 (1.71)	43.4 (1.71)	202.7 (7.98)	203.2 (8.00)	14.0 (0.55)	270.0 (10.63)	221.7 (8.72)	219.2 (8.62)

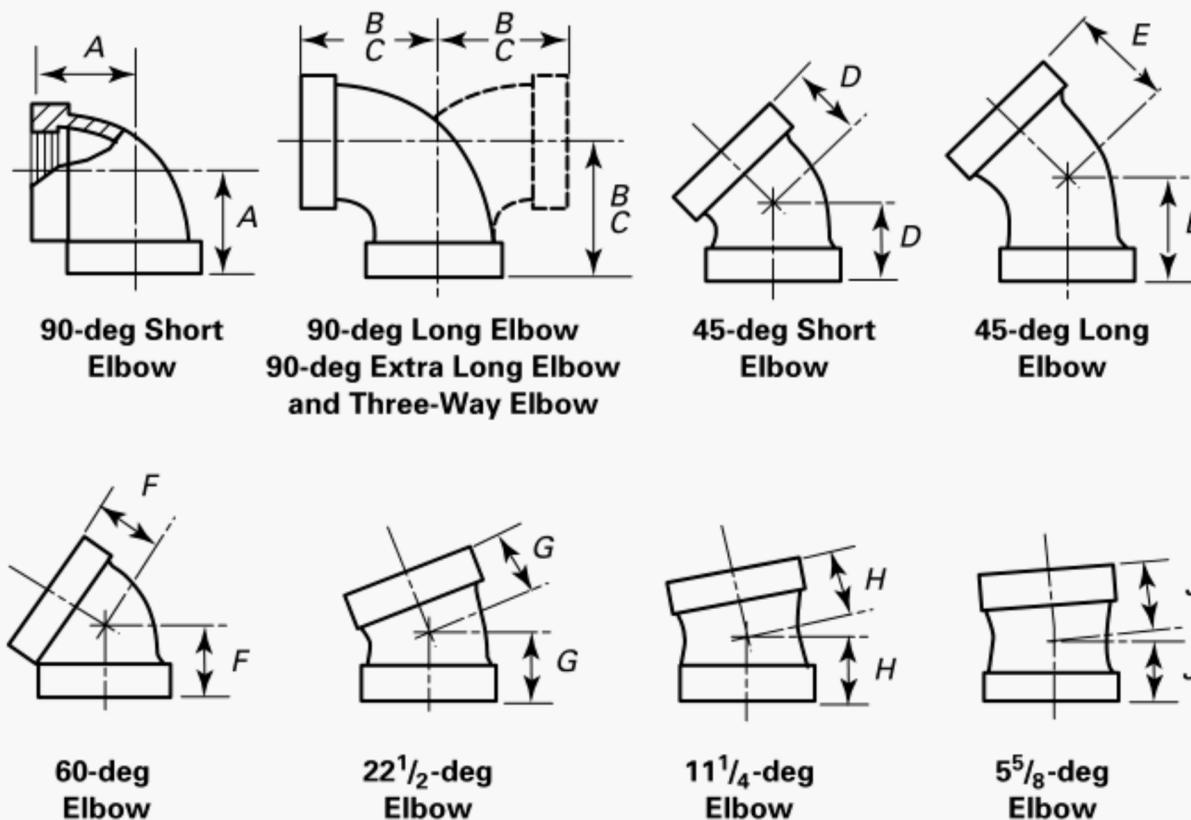
GENERAL NOTES:

- (a) For tolerances, see [section 5](#).
 (b) Type 2 fittings having diameters *F* and *F*₁ shall be tapered as shown.
 (c) The shoulder and groove, Types 1 and 2, are required on outlet connections. They are also required on inlet connections that are the same size as the outlet connections. Inlet connections that are smaller than the outlet connections may be made as shown in Type 3 or Type 4, at the manufacturer's option.

NOTES:

- (1) Values for *K* correspond to reduced size inlet.
 (2) The openings for Types 3 and 4 are reduced size inlet.

Table 4.1-2 Center-to-End Dimensions of Elbows



NSP	90-deg Elbow			45-deg Elbow		60-deg Elbow, F, mm (in.)	22 ¹ / ₂ -deg Elbow, G, mm (in.)	11 ¹ / ₄ -deg Elbow, H, mm (in.)	5 ⁵ / ₈ -deg Elbow, J, mm (in.)
	Short, A, mm (in.) [Note (1)]	Long and Three-Way, B, mm (in.) [Note (2)]	Extra Long, C, mm (in.)	Short, D, mm (in.) [Note (1)]	Long, E, mm (in.)				
1 ¹ / ₄	44.5 (1.75)	57.2 (2.25)	76.2 (3.00)	33.3 (1.31)	44.5 (1.75)	39.6 (1.56)	28.7 (1.13)	26.9 (1.06)	30.2 (1.19)
1 ¹ / ₂	49.3 (1.94)	63.5 (2.50)	88.9 (3.50)	36.6 (1.44)	47.8 (1.88)	44.5 (1.75)	31.8 (1.25)	31.8 (1.25)	33.3 (1.31)
2	57.2 (2.25)	77.7 (3.06)	101.6 (4.00)	42.9 (1.69)	57.2 (2.25)	52.3 (2.06)	36.6 (1.44)	35.1 (1.38)	38.1 (1.50)
2 ¹ / ₂	68.3 (2.69)	93.7 (3.69)	114.3 (4.50)	49.3 (1.94)	66.8 (2.63)	63.5 (2.50)	44.5 (1.75)	41.4 (1.63)	41.4 (1.63)
3	77.7 (3.06)	108.0 (4.25)	133.4 (5.25)	55.6 (2.19)	74.7 (2.94)	73.2 (2.88)	50.8 (2.00)	46.0 (1.81)	44.5 (1.75)
4	96.8 (3.81)	131.8 (5.19)	158.8 (6.25)	66.8 (2.63)	88.9 (3.50)	85.9 (3.38)	58.7 (2.31)	50.8 (2.00)	47.8 (1.88)
5	114.3 (4.50)	155.7 (6.13)	...	77.7 (3.06)	104.9 (4.13)	98.6 (3.88)	66.8 (2.63)	57.2 (2.25)	50.8 (2.00)
6	130.3 (5.13)	181.1 (7.13)	...	87.4 (3.44)	124.0 (4.88)	108.0 (4.25)	74.7 (2.94)	60.5 (2.38)	57.2 (2.25)
8	166.6 (6.56)	228.6 (9.00)	...	108.0 (4.25)	...	...	...	...	...

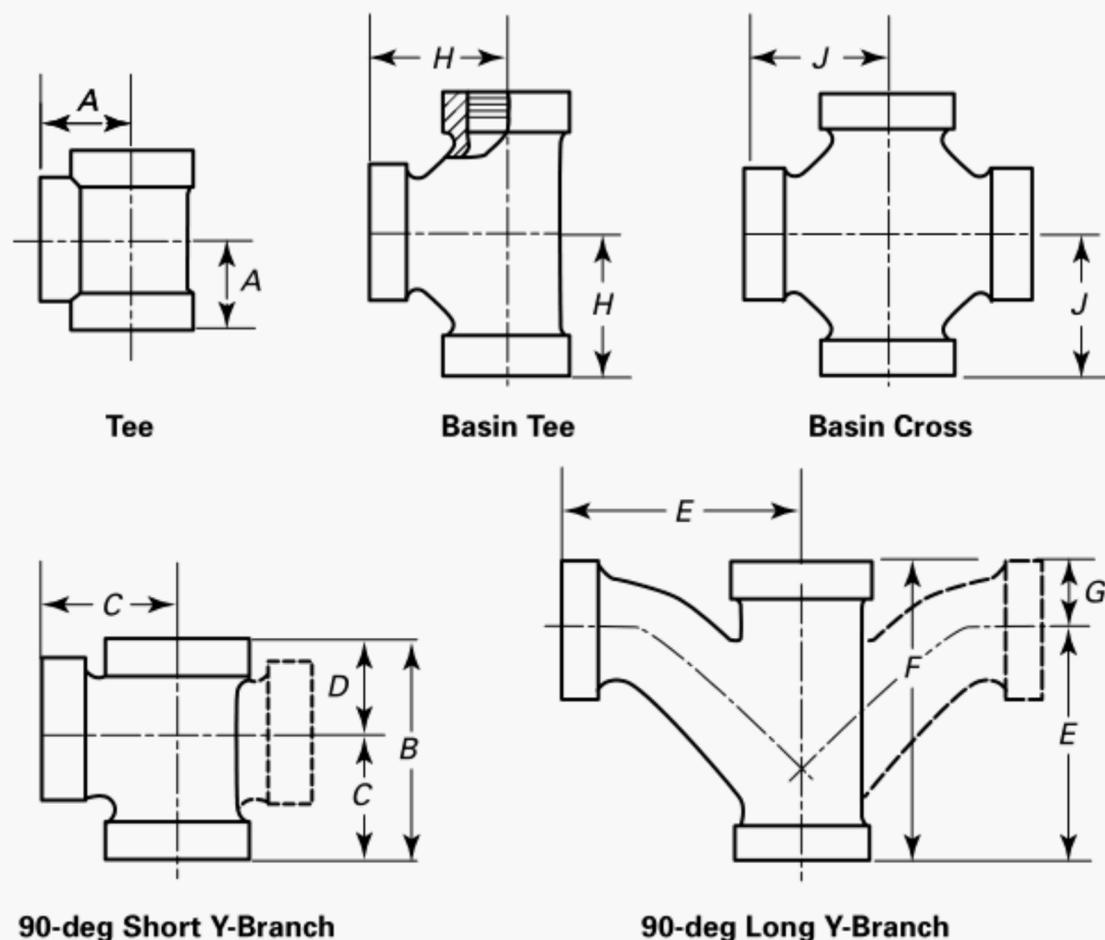
GENERAL NOTE: For tolerances, see Table 2.1-2.

NOTES:

(1) Same dimensions as adopted for Class 125 Cast Iron Threaded Fittings (ASME B16.4).

(2) Three-way elbows have the same dimensions as 90-deg long radius elbows.

Table 4.1-3 Dimensions of Tees, Crosses, and Y-Branched

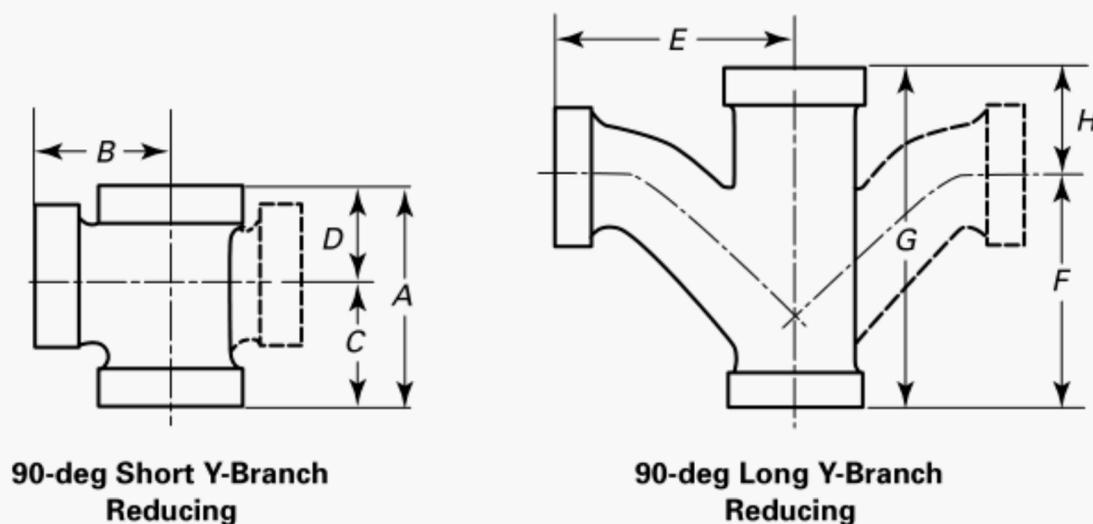


NPS	90-deg Short Y-Branch [Note (2)]				90-deg Long Y-Branch [Note (2)]			Center-to-End of Basin Tee, H, mm (in.)	Center-to-End of Basin Cross, J, mm (in.)
	Center-to-End of Tee, A, mm (in.) [Note (1)]	End-to-End, B, mm (in.)	Center-to-End, C, mm (in.)	Center-to-End, D, mm (in.)	Center-to-End, E, mm (in.)	Center-to-End, F, mm (in.)	Center-to-End, G, mm (in.)		
1¼	44.5 (1.75)	95.3 (3.75)	57.2 (2.25)	38.1 (1.50)	92.2 (3.63)	120.7 (4.75)	28.7 (1.13)	58.7 (2.31)	58.7 (2.31)
1½	49.3 (1.94)	108.0 (4.25)	63.5 (2.50)	44.5 (1.75)	104.9 (4.13)	136.7 (5.38)	31.8 (1.25)	68.3 (2.69)	68.3 (2.69)
2	57.2 (2.25)	131.8 (5.19)	77.7 (3.06)	54.1 (2.13)	133.4 (5.25)	177.8 (7.00)	44.5 (1.75)	88.9 (3.50)	88.9 (3.50)
2½	68.6 (2.70)	160.3 (6.31)	93.7 (3.69)	66.8 (2.63)	158.8 (6.25)	209.6 (8.25)	50.8 (2.00)	108.0 (4.25)	...
3	78.2 (3.08)	184.2 (7.25)	108.0 (4.25)	76.2 (3.00)	190.5 (7.50)	251.0 (9.88)	60.5 (2.38)	...	...
4	96.3 (3.79)	222.3 (8.75)	131.8 (5.19)	90.4 (3.56)	251.0 (9.88)	330.2 (13.00)	79.5 (3.13)	...	...
5	114.3 (4.50)	261.9 (10.31)	155.7 (6.13)	106.4 (4.19)	311.2 (12.25)	400.1 (15.75)	88.9 (3.50)	...	...
6	130.3 (5.13)	303.3 (11.94)	181.1 (7.13)	122.2 (4.81)	371.6 (14.63)	476.3 (18.75)	104.9 (4.13)	...	...
8	166.6 (6.56)	...	...	...	...	...	...	...	...

GENERAL NOTE: For tolerances, see Table 2.1-2.

NOTES:

- (1) Same dimensions as adopted for Class 125 Cast Iron Threaded Fittings (ASME B16.4).
- (2) Double Y-branches have the same dimensions as single Y-branches.

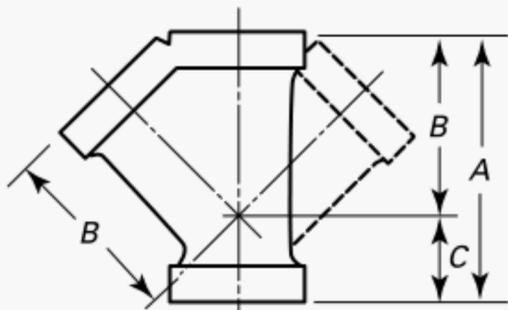
Table 4.1-4 Dimensions of Y-Branches (Reducing Sizes)**90-deg Short Y-Branch Reducing****90-deg Long Y-Branch Reducing**

NPS	90-deg Short Y-Branch				90-deg Long Y-Branch			
	End-to-End, A, mm (in.)	Center-to-End, B, mm (in.)	Center-to-End, C, mm (in.)	Center-to-End, D, mm (in.)	End-to-End, G, mm (in.)	Center-to-End, E, mm (in.)	Center-to-End, F, mm (in.)	Center-to-End, H, mm (in.)
1½ × 1¼	98.6 (3.88)	63.5 (2.50)	60.5 (2.38)	38.1 (1.50)	130.3 (5.13)	98.6 (3.88)	100.1 (3.94)	30.2 (1.19)
2 × 1½	117.6 (4.63)	74.7 (2.94)	68.3 (2.69)	49.3 (1.94)	146.1 (5.75)	111.3 (4.38)	112.8 (4.44)	33.3 (1.31)
2½ × 1½	124.0 (4.88)	77.7 (3.06)	71.4 (2.81)	52.3 (2.06)	146.1 (5.75)	115.8 (4.56)	112.8 (4.44)	33.3 (1.31)
2½ × 2	139.7 (5.50)	84.1 (3.31)	82.6 (3.25)	57.2 (2.25)	187.5 (7.38)	146.1 (5.75)	146.1 (5.75)	41.4 (1.63)
3 × 1½	128.5 (5.06)	84.1 (3.31)	74.7 (2.94)	54.1 (2.13)	150.9 (5.94)	127.0 (5.00)	117.6 (4.63)	33.3 (1.31)
3 × 2	144.5 (5.69)	92.2 (3.63)	84.1 (3.31)	60.5 (2.38)	192.0 (7.56)	153.9 (6.06)	150.9 (5.94)	41.4 (1.63)
4 × 1½	133.4 (5.25)	96.8 (3.81)	76.2 (3.00)	57.2 (2.25)	153.9 (6.06)	138.2 (5.44)	120.7 (4.75)	33.3 (1.31)
4 × 2	147.6 (5.81)	103.1 (4.06)	85.9 (3.38)	62.0 (2.44)	195.3 (7.69)	168.4 (6.63)	153.9 (6.06)	41.4 (1.63)
4 × 2½	168.4 (6.63)	112.8 (4.44)	96.8 (3.81)	71.4 (2.81)	219.2 (8.63)	179.3 (7.06)	168.4 (6.63)	50.8 (2.00)
4 × 3	187.5 (7.38)	120.7 (4.75)	109.5 (4.31)	77.7 (3.06)	254.0 (10.00)	204.7 (8.06)	193.8 (7.63)	60.5 (2.38)
5 × 1½	141.2 (5.56)	111.3 (4.38)	81.0 (3.19)	60.5 (2.38)	160.3 (6.31)	152.4 (6.00)	125.5 (4.94)	35.1 (1.38)
5 × 2	155.7 (6.13)	117.6 (4.63)	90.4 (3.56)	65.0 (2.56)	196.9 (7.75)	181.1 (7.13)	155.7 (6.13)	41.4 (1.63)
5 × 3	196.9 (7.75)	133.4 (5.25)	114.3 (4.50)	82.5 (3.25)	260.4 (10.25)	219.2 (8.63)	200.2 (7.88)	60.5 (2.38)
5 × 4	231.9 (9.13)	144.5 (5.69)	136.7 (5.38)	95.3 (3.75)	330.2 (13.00)	265.2 (10.44)	257.3 (10.13)	73.2 (2.88)
6 × 2	158.8 (6.25)	130.3 (5.13)	92.2 (3.63)	66.8 (2.63)	201.7 (7.94)	196.9 (7.75)	160.3 (6.31)	41.4 (1.63)
6 × 3	200.2 (7.88)	146.1 (5.75)	115.8 (4.56)	84.1 (3.31)	263.7 (10.38)	231.9 (9.13)	204.7 (8.06)	58.7 (2.31)
6 × 4	235.0 (9.25)	157.2 (6.19)	138.2 (5.44)	96.8 (3.81)	331.7 (13.06)	279.4 (11.00)	258.8 (10.19)	73.2 (2.88)
6 × 5	268.2 (10.56)	168.4 (6.63)	158.8 (6.25)	109.5 (4.31)	407.9 (16.06)	325.4 (12.81)	318.0 (12.56)	88.9 (3.50)

GENERAL NOTES:

(a) For tolerances, see [Table 2.1-2](#).

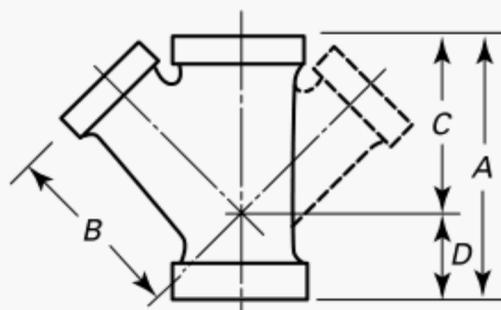
(b) Double Y-branches have the same dimensions as single Y-branches.

Table 4.1-5 Dimensions of 45-deg Y-Branches

NPS	End-to-End, A, mm (in.)	Center-to-End, B, mm (in.)	Center-to-End, C, mm (in.)
1 $\frac{1}{4}$	127.0 (5.00)	82.6 (3.25)	44.5 (1.75)
1 $\frac{1}{2}$	139.7 (5.50)	92.2 (3.63)	47.8 (1.88)
2	165.1 (6.50)	111.3 (4.38)	54.1 (2.13)
2 $\frac{1}{2}$	200.2 (7.88)	136.7 (5.38)	63.5 (2.50)
3	228.6 (9.00)	157.2 (6.19)	71.4 (2.81)
4	276.4 (10.88)	195.3 (7.69)	81.0 (3.19)
5	328.7 (12.94)	233.4 (9.10)	95.3 (3.75)
6	378.0 (14.88)	273.1 (10.75)	104.9 (4.13)
8	477.8 (18.81)	344.4 (13.56)	133.4 (5.25)

GENERAL NOTES:

- (a) For tolerances, see [Table 2.1-2](#).
 (b) Double Y-branches have the same dimensions as single Y-branches.

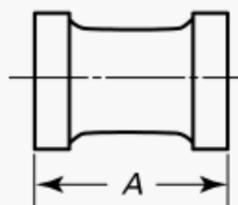
Table 4.1-6 Dimensions of 45-deg Y-Branches (Reducing Sizes)

NPS	End-to-End, A, mm (in.)	Center-to-End, B, mm (in.)	Center-to-End, C, mm (in.)	Center-to-End, D, mm (in.)
1½ × 1¼	133.4 (5.25)	87.4 (3.44)	88.9 (3.50)	44.5 (1.75)
2 × 1½	149.4 (5.88)	104.9 (4.13)	103.1 (4.06)	46.0 (1.81)
2½ × 1½	163.6 (6.44)	117.6 (4.63)	115.8 (4.56)	47.8 (1.88)
2½ × 2	179.3 (7.06)	130.3 (5.13)	125.5 (4.94)	54.1 (2.13)
3 × 1½	168.4 (6.63)	128.5 (5.06)	125.5 (4.94)	42.9 (1.69)
3 × 2	187.5 (7.38)	136.7 (5.38)	134.9 (5.31)	52.3 (2.06)
3 × 2½	203.2 (8.00)	147.6 (5.81)	144.5 (5.69)	58.7 (2.31)
4 × 1½	182.6 (7.19)	153.9 (6.06)	146.1 (5.75)	36.6 (1.44)
4 × 2	195.3 (7.69)	160.3 (6.31)	152.4 (6.00)	42.9 (1.69)
4 × 3	235.0 (9.25)	182.6 (7.19)	174.8 (6.88)	60.5 (2.38)
5 × 2	209.6 (8.25)	182.6 (7.19)	174.8 (6.88)	35.1 (1.38)
5 × 3	249.2 (9.81)	200.2 (7.88)	193.8 (7.63)	55.6 (2.19)
5 × 4	289.1 (11.38)	215.9 (8.50)	214.4 (8.44)	74.7 (2.94)
6 × 2	214.4 (8.44)	204.7 (8.06)	192.0 (7.56)	22.4 (0.88)
6 × 3	254.0 (10.00)	222.3 (8.75)	211.1 (8.31)	42.9 (1.69)
6 × 4	301.8 (11.88)	238.3 (9.38)	230.1 (9.06)	71.4 (2.81)
6 × 5	330.8 (13.00)	254.0 (10.00)	249.2 (9.81)	81.0 (3.19)
8 × 4	290.6 (11.44)	279.4 (11.00)	265.2 (10.44)	25.4 (1.00)
8 × 6	379.5 (14.94)	314.5 (12.38)	301.8 (11.88)	77.7 (3.06)

GENERAL NOTES:

- (a) For tolerances, see [Table 2.1-2](#).
 (b) Double Y-branches have the same dimensions as single Y-branches.

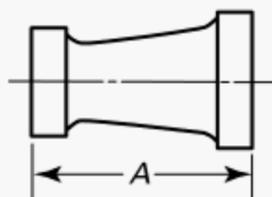
Table 4.1-7 Dimensions of Couplings



NPS	End-to-End, A, mm (in.)
1 ¹ / ₄	76.2 (3.00)
1 ¹ / ₂	85.9 (3.38)
2	95.3 (3.75)
2 ¹ / ₂	101.6 (4.00)
3	108.0 (4.25)
4	114.3 (4.50)
5	120.7 (4.75)
6	127.0 (5.00)
8	142.7 (5.62)

GENERAL NOTE: For tolerances, see [Table 2.1-2](#).

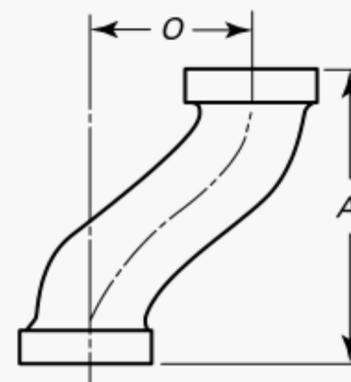
Table 4.1-8 Dimensions of Increases



NPS	End-to-End, A, mm (in.)
1 ¹ / ₂ × 2	228.6 (9.00)
2 × 2 ¹ / ₂	228.6 (9.00)
2 × 3	228.6 (9.00)
2 ¹ / ₂ × 3	228.6 (9.00)
2 × 4	228.6 (9.00)
2 × 5	228.6 (9.00)
3 × 4	228.6 (9.00)
3 × 5	228.6 (9.00)
4 × 5	228.6 (9.00)
4 × 6	228.6 (9.00)
4 × 8	228.6 (9.00)
5 × 6	228.6 (9.00)
5 × 8	228.6 (9.00)
6 × 8	228.6 (9.00)

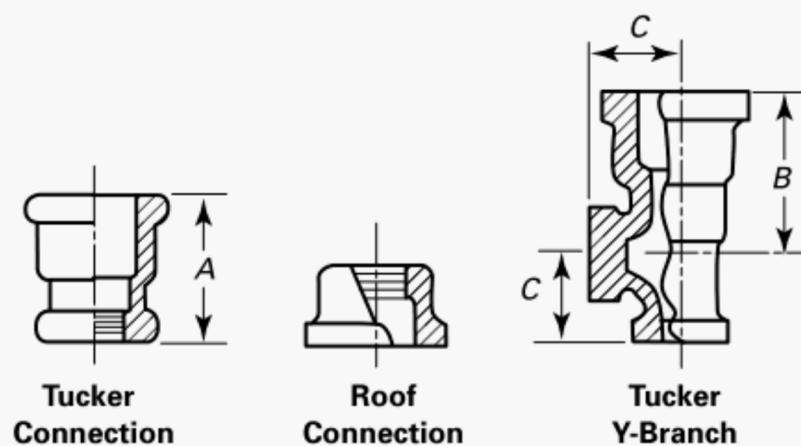
GENERAL NOTE: For tolerances, see [Table 2.1-2](#).

Table 4.1-9 Dimensions of Offsets



NPS	Offset, O, mm (in.)	End-to-End, A, mm (in.)
2	101.6 (4.00)	190.5 (7.50)
2	152.4 (6.00)	241.3 (9.50)
2	203.2 (8.00)	292.1 (11.50)
2	254.0 (10.00)	342.9 (13.50)
3	101.6 (4.00)	222.3 (8.75)
3	152.4 (6.00)	273.1 (10.75)
3	203.2 (8.00)	323.9 (12.75)
3	254.0 (10.00)	374.7 (14.75)
4	101.6 (4.00)	247.7 (9.75)
4	152.4 (6.00)	298.5 (11.75)
4	203.2 (8.00)	349.3 (13.75)
4	254.0 (10.00)	400.1 (15.75)
4	304.8 (12.00)	250.9 (17.75)
5	152.4 (6.00)	320.8 (12.63)
5	203.2 (8.00)	371.6 (14.63)
5	254.0 (10.00)	422.4 (16.63)
5	304.8 (12.00)	473.2 (18.63)
6	152.4 (6.00)	346.2 (13.63)
6	203.2 (8.00)	397.0 (15.63)
6	254.0 (10.00)	447.8 (17.63)
6	304.8 (12.00)	498.6 (19.63)

GENERAL NOTE: For tolerances, see [Table 2.1-2](#).

Table 4.1-10 Dimensions of Tucker Connections, Roof Connections, and Tucker Y-Branched

NPS	Length, <i>A</i> , mm (in.)	Center-to-Tucker End, <i>B</i> , mm (in.)	Center-to-Threaded End, <i>C</i> , mm (in.)
1 ¹ / ₄	95.3 (3.75)	100.1 (3.94)	57.2 (2.25)
1 ¹ / ₂	101.6 (4.00)	108.0 (4.25)	63.5 (2.50)
2 [Note (1)]	114.3 (4.50)	119.1 (4.69)	77.7 (3.06)
3	120.7 (4.75)	136.7 (5.38)	108.0 (4.25)
4 [Note (2)]	177.8 (7.00)	...	...
5 [Note (2)]	177.8 (7.00)	...	...
6 [Note (2)]	177.8 (7.00)	...	...

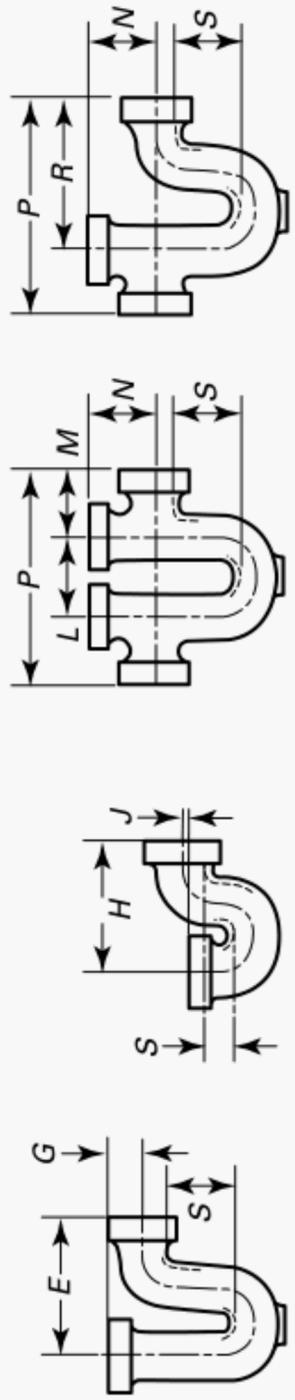
GENERAL NOTES:

- (a) For tolerances, see [Table 2.1-2](#).
 (b) The hubs on Tucker connections, roof connections, and Tucker Y-branches are designed to be used with wrought iron and steel pipe of the nominal pipe size.
 (c) For pitch of Tucker Y-branch, see [Figure 6-1](#) and [para. 6\(f\)](#).
 (d) Roof connections are not made to standard dimensions, except for the thread, which may be either straight or tapered [see [para. 6\(a\)](#)].

NOTES:

- (1) The size 2 Tucker connection may be made of malleable iron, having a diameter to fit within a nominal 100-mm (3.93-in.) building wall.
 (2) These sizes are provided with loose rings to slip into hubs over wrought pipe. Other sizes may be provided with loose rings at the option of the manufacturer.

Table 4.1-11 Dimensions of P-Traps, Bath P-Traps, and Running Traps

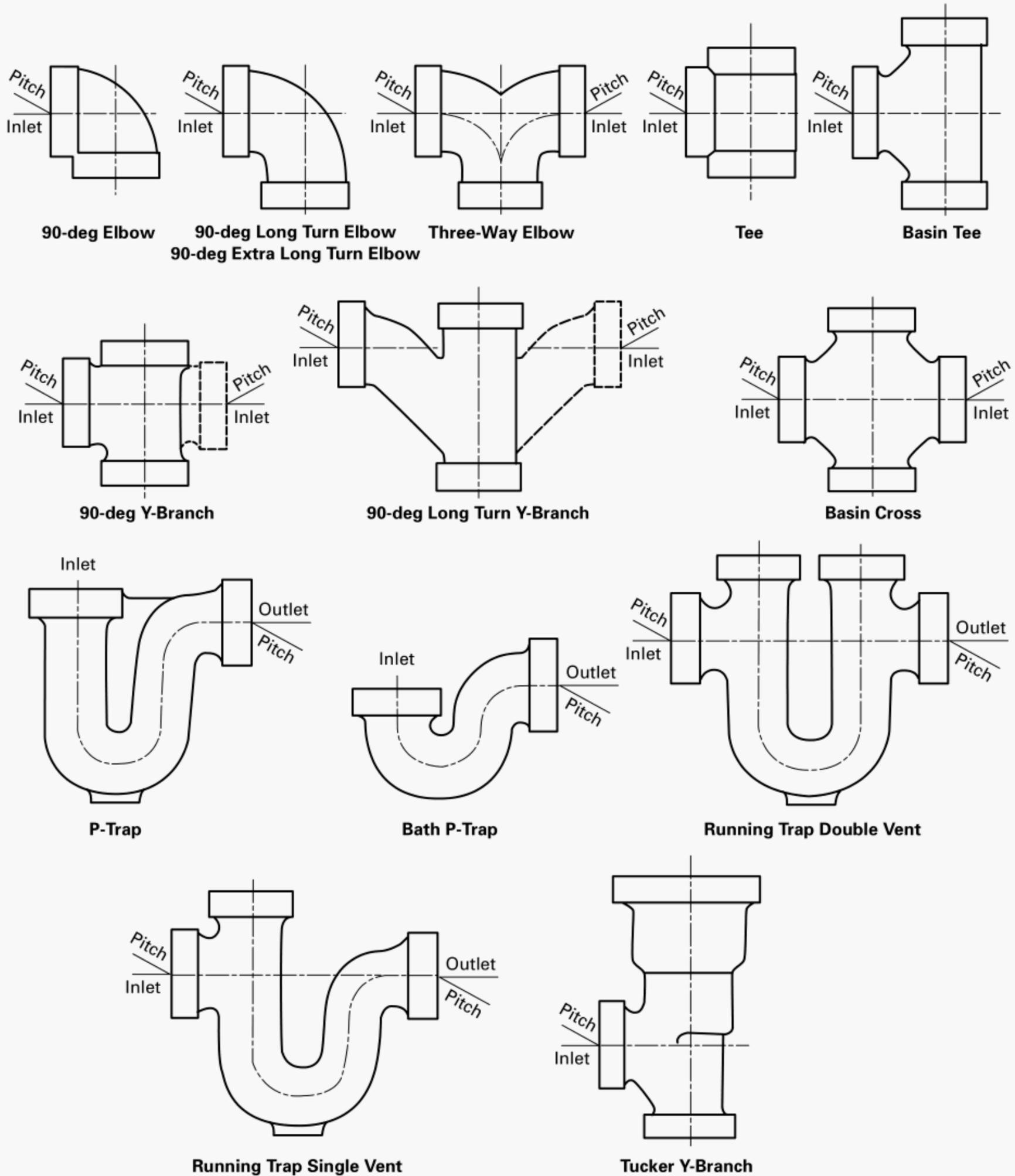


NPS	P-Traps		Bath P-Traps		Running Traps				Min. Water Seal,		
	E, mm (in.)	G, mm (in.)	H, mm (in.)	J, mm (in.)	P, mm (in.)	L, mm (in.)	M, mm (in.)	N, mm (in.)	R, mm (in.)	S, mm (in.)	Cleanout, NPS
1 1/4	100.1 (3.94)	19.1 (0.75)	...	...	196.9 (7.75)	79.5 (3.13)	58.7 (2.31)	50.8 (2.00)	138.2 (5.44)	50.8 (2.00)	3/4
1 1/2	111.3 (4.38)	22.4 (0.88)	114.3 (4.50)	6.4 (0.25)	212.9 (8.38)	85.9 (3.38)	63.5 (2.50)	57.2 (2.25)	149.2 (5.88)	50.8 (2.00)	1
2	134.9 (5.31)	22.4 (0.88)	134.9 (5.31)	0 (0)	257.3 (10.13)	101.6 (4.00)	77.7 (3.06)	65.0 (2.56)	179.3 (7.06)	50.8 (2.00)	1
3	181.1 (7.13)	30.2 (1.19)	...	...	349.3 (13.75)	136.7 (5.38)	106.4 (4.19)	88.9 (3.50)	242.8 (9.56)	63.5 (2.50)	1 1/4
4	235.0 (9.25)	38.1 (1.50)	...	...	438.2 (17.25)	177.8 (7.00)	130.3 (5.13)	106.4 (4.19)	308.1 (12.13)	63.5 (2.50)	2

GENERAL NOTES:

- (a) For tolerances, see Table 2.1-2.
- (b) For pitch of traps, see Figure 6-1.

Figure 6-1 Types of Fittings Tapped to Provide 21 mm/m (0.25 in./ft) Pitch



GENERAL NOTE: Inlets of all drainage fittings have openings of 90-deg nominal angle; outlets of P-traps and bath P-traps, and both inlets and outlets of running traps are tapped, pitched 21 mm/m (0.25 in./ft) with the pitch in the direction shown (exaggerated for illustration). The faces of bands of pitched openings may be perpendicular to the pitch line. Similar types of reducing fittings are tapped and pitched likewise.

MANDATORY APPENDIX I REFERENCES

(19)

The following is a list of publications referenced in this Standard. Unless otherwise stated, the latest edition of ASME publications shall apply. Materials manufactured to other editions of the referenced ASTM standards may be used to manufacture fittings meeting the requirements of this Standard as long as the fitting manufacturer verifies the material meets the requirements of the referenced edition.

ASME B1.20.1, Pipe Threads, General Purpose (Inch)
 ASME B16.4, Gray Iron Threaded Fittings
 ASME B36.10M, Welded and Seamless Wrought Steel Pipe
 Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

ASTM A126-04(2014), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 ASTM A197/A197M-00(2015), Specification for Cupola Malleable Iron

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

ISO 9000:2015, Quality management systems — Fundamentals and vocabulary

ISO 9001:2015, Quality management systems — Requirements

ISO 9004:2018, Quality management systems — Guidelines for performance improvements

Publisher: International Organization for Standardization (ISO), Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

MSS SP-25:2018, Standard Marking System for Valves, Fittings, Flanges, and Unions

Publisher: Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS), 127 Park Street, NE, Vienna, VA 22180 (www.msshq.org)

NONMANDATORY APPENDIX A QUALITY SYSTEM PROGRAM

The products manufactured in accordance with this Standard shall be produced under a quality system program following the principles of an appropriate standard from the ISO 9000 series.¹ A determination of the need for registration and/or certification of the product manufacturer's quality system program by an independent organization shall be the responsibility of the manufacturer. Detailed documentation demonstrating

program compliance shall be available to the purchaser at the manufacturer's facility. A written, summarized description of the program used by the product manufacturer shall be available to the purchaser upon request. The product manufacturer is defined as the entity whose name or trademark appears on the product in accordance with the marking or identification requirements of this Standard.

¹The series is also available from the American National Standards Institute (ANSI) and the American Society for Quality (ASQ) as American National Standards that are identified by a prefix "Q" replacing the prefix "ISO." Each standard of the series is listed under References in [Mandatory Appendix I](#).

NONMANDATORY APPENDIX B

DIMENSIONS OF WELDED AND SEAMLESS STEEL PIPE (ASME B36.10M)

Table B-1 Dimensions of Welded and Seamless Steel Pipe

NPS	Outside Diameter, in.	Nominal Wall Thickness, Standard Wall, in. [Note (1)]
1/8	0.405	0.068
1/4	0.540	0.088
3/8	0.675	0.091
1/2	0.840	0.109
3/4	1.050	0.113
1	1.315	0.133
1 1/4	1.660	0.140
1 1/2	1.900	0.145
2	2.375	0.154
2 1/2	2.875	0.203
3	3.500	0.216
3 1/2	4.000	0.226
4	4.500	0.237
5	5.563	0.258
6	6.625	0.280
8	8.625	0.322
10	10.750	0.365
12	12.750	0.375
14 outside diameter	14.000	0.375
16 outside diameter	16.000	0.375
18 outside diameter	18.000	0.375
20 outside diameter	20.000	0.375
24 outside diameter	24.000	0.375

GENERAL NOTE: The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions. For tolerances on wall thickness, see appropriate material specification.

NOTE: (1) Thicknesses shown in boldface type are identical to corresponding thicknesses for Schedule 40 pipe.

B16 AMERICAN NATIONAL STANDARDS FOR PIPING, PIPE FLANGES, FITTINGS, AND VALVES

B16.1-2015	Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250)
B16.3-2016	Malleable Iron Threaded Fittings: Classes 150 and 300
B16.4-2016	Gray Iron Threaded Fittings: Classes 125 and 250
B16.5-2017	Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard
B16.9-2018	Factory-Made Wrought Buttwelding Fittings
B16.10-2017	Face-to-Face and End-to-End Dimensions of Valves
B16.11-2016	Forged Fittings, Socket-Welding and Threaded
B16.12-2019	Cast Iron Threaded Drainage Fittings
B16.14-2018	Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads
B16.15-2018	Cast Copper Alloy Threaded Fittings
B16.18-2018	Cast Copper Alloy Solder Joint Pressure Fittings
B16.20-2017	Metallic Gaskets for Pipe Flanges
B16.21-2016	Nonmetallic Flat Gaskets for Pipe Flanges
B16.22-2018	Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
B16.23-2016	Cast Copper Alloy Solder Joint Drainage Fittings: DWV
B16.24-2016	Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500, and 2500
B16.25-2017	Buttwelding Ends
B16.26-2018	Cast Copper Alloy Fittings for Flared Copper Tubes
B16.29-2017	Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings — DWV
B16.33-2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS ½ Through NPS 2)
B16.34-2017	Valves — Flanged, Threaded, and Welding End
B16.36-2015	Orifice Flanges
B16.38-2012 (R2017)	Large Metallic Valves for Gas Distribution: Manually Operated, NPS 2½ (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum
B16.39-2014	Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300
B16.40-2019	Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
B16.42-2016	Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300
B16.44-2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems Up to 5 psi
B16.47-2017	Large Diameter Steel Flanges NPS 26 Through NPS 60 Metric/Inch Standard
B16.48-2015	Line Blanks
B16.49-2017	Factory-Made, Wrought Steel, Buttwelding Induction Bends for Transportation and Distribution Systems
B16.50-2018	Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
B16.51-2018	Copper and Copper Alloy Press-Connect Pressure Fittings
B16.52-2018	Forged Nonferrous Fittings, Socket-Welding and Threaded (Titanium, Titanium Alloys, Aluminum, and Aluminum Alloys)

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