ASME B16.15-2024
(Revision of ASME B16.15-2018)

Cast Copper Alloy Threaded Fittings

Classes 125 and 250

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

As early as the spring of 1921, the consolidation and further development of threaded and flanged fittings standards in force in the United States seemed desirable. To meet this need, the American Standards Association (ASA) [now the American National Standards Institute (ANSI)] authorized the organization of a Sectional Committee on the Standardization of Pipe Flanges and Flanged Fittings (B16), with the Heating, Piping, and Air Conditioning Contractors' National Association (now known as the Mechanical Contractors Association of America), the Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), and The American Society of Mechanical Engineers (ASME) acting as joint sponsors.

In June 1927, the MSS appointed a committee on Nonferrous Screw Fittings for the purpose of developing standards for products commonly designated as threaded pipe fittings of brass, bronze, and other nonferrous materials. At the time, brass threaded fittings were furnished from a number of different patterns with wide variations in dimensions and weights.

MSS SP-10 for 125-lb bronze screwed fittings and MSS SP-11 for 250-lb bronze screwed fittings were developed and adopted by the MSS in September 1930. The lighter fittings were patterned after malleable iron threaded fittings, then standardized in ASA B16c, while the heavier products were patterned after the cast iron threaded fittings covered by ASA B16d. Thus, a practice was standardized that had been found satisfactory in the valve and fittings industry for many years.

Following the publication of revised editions in 1941 and 1943, SP-10 was submitted to Subcommittee No. 2 of ASA Sectional Committee B16 for adoption as an American Standard. Final approval of that edition was granted on January 23, 1947, with the designation ASA B16.15. A reaffirmation of the Standard was granted in 1952, and a complete revision updating the Standard was approved by ASA on March 25, 1958.

After revision in 1944, SP-11 was submitted to Subcommittee No. 2 in August 1947, and ASA granted the approval of B16.17 on April 6, 1949.

In 1961, Subcommittee No. 2 reviewed the two Standards and noted that the historical reason for their separate existence no longer applied. Accordingly, the two were combined into ASA B16.15 with final ASA approval granted on February 6, 1964.

In 1969, the document was reviewed by Subcommittee No. 2, and minor changes were proposed. Final ANSI approval was granted on April 14, 1971.

In 1977, the MSS submitted a proposed revision to Subcommittee B (formerly No. 2) for B16 review and approval. Changes included the addition of metric (SI) units and editorial updating. ANSI granted final approval on December 4, 1978.

In 1982, American National Standards Committee B16 was reorganized as the ASME B16 Committee, operating under procedures accredited by ANSI. A revision, following regular 5-yr review by Subcommittee B, involved rationalization of metric equivalent dimensions and updating of reference standards. Following approval within ASME, ANSI approval was granted on July 30, 1985, with the designation ANSI/ASME B16.15-1985.

In 1994, and again in 2004, the document was reaffirmed.

In 2005, Subcommittee B of the ASME B16 Committee changed the title to Cast Copper Alloy Threaded Fittings, a section on leakage capacity was added, and nominal size (DN) according to ISO 6078 was addressed as SI values were positioned in the main text and U.S. Customary values were positioned in Mandatory Appendix I. The reference for gaging internal fitting threads was made clearer by using the wording from ASME B1.20.1, Pipe Threads, General Purpose (Inch). Many clarifying and editorial revisions were made to improve the text. After approval by ASME, ANSI approval was granted on August 25, 2006, with the designation ASME B16.15-2006.

In 2011, references to ASME standards were revised to no longer list specific edition years; the latest edition of ASME publications applies unless stated otherwise. Materials manufactured to other editions of the referenced ASTM standards have been permitted to 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. Following approval by the ASME B16 Standards Committee, the revision to the 2006 edition was approved as an American National Standard by ANSI on August 9, 2011, with the designation ASME B16.15-2011.

In the 2013 edition, section 7 was revised to require threads and gaging practices to be as per and identical with ASME B1.20.1 and other B16 standards. Following approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on July 29, 2013, with the designation ASME B16.15-2013.

In the 2018 edition, the U.S. Customary tables formerly in Mandatory Appendix I were merged with the SI tables in the main text; the tables and figure were redesignated, Mandatory Appendix I was deleted, and the cross-references were updated accordingly. In addition, section 10 was revised to add clarification to the wall thickness requirements in the transitional area of a reducing fitting in which there is a change from one size of end connection to another, and all reference standards in what was formerly Mandatory Appendix II were updated. Following approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on August 3, 2018, with the new designation ASME B16.15-2018.

In the 2024 edition, definitions for the terms “may,” “shall,” and “should” were added, and the references in Mandatory Appendix I were updated. Following approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on May 28, 2024, with the new designation ASME B16.15-2024.

ASME B16 COMMITTEE
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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Revisions and Errata. The committee processes revisions to this Standard on a continuous basis 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 in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Standard.

(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number

(4) the editions of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

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ASME B16.15-2024
SUMMARY OF CHANGES

Following approval by the ASME B16 Committee and ASME, and after public review, ASME B16.15-2024 was approved by the American National Standards Institute on May 28, 2024.

ASME B16.15-2024 includes the following changes identified by a margin note, **(24)**. The Record Numbers listed below are explained in more detail in the "List of Changes in Record Number Order" following this Summary of Changes.

Page	*Location*	*Change (Record Number)*
1	2.8	Added *(23-2141)*
17	Mandatory Appendix I	Updated *(23-592 and 23-2139)*

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
23-592	References updated.
23-2139	References updated.
23-2141	Definitions of the terms “may,” “shall,” and “should” added.

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CAST COPPER ALLOY THREADED FITTINGS
Classes 125 and 250

1 SCOPE

This Standard covers cast Classes 125 and 250 copper alloy threaded pipe fittings with provisions for substituting wrought copper alloys for plugs, bushings, caps, and couplings in small sizes. This Standard includes the following:

(a) pressure–temperature ratings

(b) size and method of designating openings of reducing pipe fittings

(c) marking requirements

(d) minimum requirements for casting quality and materials

(e) dimensions and tolerances in SI (metric) and U.S. Customary units

(f) threading requirements

(g) pressure test requirements

2 GENERAL

2.1 Relevant Units

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 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.

2.2 References

Standards and specifications containing provisions to the extent referenced herein constitute requirements of this Standard. These referenced documents are listed in Mandatory Appendix I.

2.3 Quality Systems

Requirements relating to the product manufacturer's Quality System Programs are described in Nonmandatory Appendix A.

2.4 Denotation

2.4.1 Pressure Rating Designation. Class followed by a dimensionless number is the designation for pressure–temperature ratings, e.g., Class 125 and Class 250.

2.4.2 Size. NPS followed by a dimensionless number is the designation for nominal fittings size, e.g., NPS 2.

2.5 Time of Purchase, Manufacture, or Installation

The pressure–temperature ratings in this Standard are applicable upon its publication to all fittings within its scope that otherwise meet its requirements. For unused fittings maintained in inventory, the manufacturer of the fittings may certify conformance to this edition provided it can be demonstrated that all requirements of this edition have been met. Where such components were installed in accordance with the pressure–temperature ratings of an earlier edition of this Standard, those ratings are applicable except as may be governed by the applicable code or regulation.

2.6 User Accountability

This Standard cites responsibilities that are to be assumed by the fitting user in the areas of the temperature at which the pressure rating is taken.

2.7 Service Conditions

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

2.8 Definitions (24)

may: a term used to denote permission, neither a requirement nor a recommendation.

shall: a term used to denote a requirement.

should: a term used to denote a recommendation.

3 PRESSURE–TEMPERATURE RATINGS

3.1 General

Pressure–temperature ratings for these pipe fittings are shown in Table 3.1-1. All pressures are gage.

3.2 Rating

Pressure–temperature ratings are independent of the contained fluid and are the maximum allowable pressures at the tabulated temperatures. Intermediate ratings may be obtained by linear interpolation between the temperatures shown.

The temperature 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 codes and regulations.

3.3 Limitations

Use of cored plugs and hexagon or octagon head bushings should be limited to Class 125 pipe fittings. Solid plugs and face bushings are recommended for use with Class 250 pipe fittings.

4 SIZE

4.1 Nominal Pipe Size

The size of the pipe fittings scheduled in the tables herein is identified by the corresponding nominal pipe size (NPS).[1]

4.2 Reducing Sizes

In the case of reducing tees, crosses, and Y branches (laterals), the NPS of the largest run opening shall be given first, followed by the NPS of the opening at the opposite end of the run. Where the pipe fitting is a tee or Y branch (lateral), the NPS of the outlet is given last. Where the pipe fitting is a cross, the largest side-outlet opening is the third dimension given, followed by the opening opposite. The straight line sketches of Figure 4.2-1 illustrate how the reducing pipe fittings are read.

5 MARKING

5.1 Class 125 Fitting

Each Class 125 pipe fitting shall be marked for identification with the manufacturer's name or trademark.

5.2 Class 250 Fitting

Each Class 250 pipe fitting shall be marked for identification with the manufacturer's name or trademark and the numerals “250.”

5.3 Exceptions

Omission of markings is permissible when fittings are too small to provide sufficient marking area.

6 MATERIAL

(a) Castings shall be produced to meet the requirements of ASTM B62, alloy UNS C83600, or the chemical and tensile requirements of ASTM B584, alloys UNS C83800 or UNS C84400, and in all other respects shall conform to the requirements of ASTM B62.

(b) Bar stock, when used for manufacturing smaller sizes of wrought plugs, bushings, caps, and couplings, shall be in accordance with the requirements of ASTM B16/B16M, alloy UNS C36000, or ASTM B140/B140M, alloy UNS C32000 or UNS C31400.

7 THREADS

7.1 Thread Form

All threads shall be in accordance with ASME B1.20.1.

7.1.1 Countersinks and Chamfers. All internal taper pipe threads shall be countersunk or chamfered a distance not less than one-half the pitch of the thread at an angle of approximately 45 deg with the axis of the thread. External taper pipe threads shall be chamfered at an angle between 30 deg and 45 deg with the axis for easier entrance in making a joint and protection of the thread. Countersinking and chamfering shall be concentric with the threads. The length of threads specified in all tables shall be measured to include the countersink or chamfer.

7.1.2 Alignment. The maximum allowable variation in the alignment of threads of all openings shall be 5.0 mm/m (0.06 in./ft).

7.1.3 Internal Threading

(a) All fittings with internal threads except as allowed in (b) shall be threaded with ASME B1.20.1 NPT threads. The reference point for gaging is the starting end of the fitting, provided the chamfer does not exceed the major diameter of the internal thread. When a chamfer on the internal thread exceeds this limit, the reference point becomes the last thread scratch on the chamfer cone.

(b) Wrought couplings (Table 7.1.3-1), wrought caps (Table 7.1.3-2), and wrought bushings (Table 7.1.3-3) in sizes NPS $\frac{1}{8}$, NPS $\frac{1}{4}$, NPS $\frac{3}{8}$, and NPS $\frac{1}{2}$ shall have NPT or NPSC internal threads.

7.1.4 External Threading. All externally threaded fittings shall be threaded with ASME B1.20.1 NPT threads. The reference point for gaging is the end of the thread, provided the chamfer is not smaller than the minor diameter of the external thread. When a chamfer on the external thread exceeds this limit, the reference point becomes the last thread scratch on the chamfer cone.

[1] The use of the word “nominal” as a modifier of a dimension or size is intended to indicate that the stated dimension or size is used for purposes of designation.

7.2 Gaging Tolerances

For taper pipe threads, the variation in threading shall be limited to one turn large or one turn small from the gaging notch on the plug or the gaging face of the ring when using working gages. For straight pipe threads, the variation in threading shall be limited to $1\frac{1}{2}$ turns large or $1\frac{1}{2}$ turns small from the gaging notch on the plug when using working gages.

8 RIBS

The addition of ribs or lugs is permitted on threaded pipe fittings. Where ribs are used, it is recommended that their thickness be the same as specified for the metal thickness of the pipe fitting.

(a) Right-hand couplings shall not have more than two ribs.

(b) Right- and left-hand couplings shall have four or more ribs unless the left-hand opening is clearly marked "L," in which case the use of ribs is optional with the manufacturer.

(c) Wrought couplings do not require opening markings.

9 SURFACE FINISH

Cast pipe fittings shall be furnished with a rough exterior surface, free of sand inclusions, fins, and gate protrusions.

10 FITTING DIMENSIONS

10.1 General

10.1.1 Tables of center-to-end dimensions are given for both straight and reducing pipe fittings. The SI dimensions and tolerances shown as whole or multiples of 0.5 mm in tables may differ slightly in absolute value from the corresponding U.S. Customary dimensions in parentheses. Any dimension that is within tolerance by either SI or U.S. Customary measurement is considered to be in conformance with this Standard.

10.1.2 The sketches of fittings accompanying Tables 7.1.3-1 through 7.1.3-3 and Tables 10.1.2-1 through 10.1.2-8 are representative and are included for the purpose of illustration.

10.2 Reducing Fittings

10.2.1 The dimensions of reducing fittings shown in Tables 10.1.2-1 through 10.1.2-4 and Table 10.1.2-6 are for use only when making patterns for the specific reducing pipe fitting in question and do not apply when a larger size pattern is reduced (i.e., "bushed") to make the reduction or reductions in the fitting. Reducing pipe fitting patterns shall be designed to produce wall thicknesses and detail and dimensions as required for the sizes involved.

10.2.2 The transition in wall thickness from one end size to another shall be in a manner that minimizes the addition of stress caused by sudden changes in direction or wall thickness.

10.2.3 Proof of design shall be verified by a hydrostatic pressure test made at ambient temperature in which pressure is applied for a continuous period of not less than 1 min and at a constant minimum pressure of not less than 4 times the pressure rating of the largest size of end connection in the reducing fitting. Testing is considered successful only when no evidence of cracking, fracturing, or leakage is exhibited after holding for at least the minimum time at or above the required pressure.

11 TOLERANCES

11.1 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.

11.2 Metal Thickness

Dimensional variations are unavoidable in the casting process. Patterns shall be designed to produce castings of metal thicknesses given in the tables herein. Metal thickness at no point shall be less than 90% of the thicknesses given in the tables.

11.3 Dimensions

The tolerances shown in Table 11.3-1 shall be permitted in center-to-end and center-to-center dimensions of fittings; tolerances for end-to-end dimensions shall be twice those given. The largest opening in reducing pipe fittings governs the tolerances to be applied to all openings.

12 PRESSURE TEST

Pressure testing is not required; however, the fittings shall be capable of withstanding, without leakage, an internal fluid pressure of 2 times the 38°C (100°F) pressure rating for 1 min.

Table 3.1-1
Pressure–Temperature Ratings

Temperature, °C (°F)	Class 125, bar (psi)	Class 250, bar (psi)
−29 to 66 (−20 to 150)	13.8 (200)	27.6 (400)
100 (200)	12.9 (190)	26.2 (385)
125 (250)	12.3 (180)	24.9 (365)
150 (300)	11.3 (165)	23.0 (335)
175 (350)	10.4 (150)	20.8 (300)
200 (400)	8.9 (125)	17.8 (250)

GENERAL NOTES:
(a) 1 bar = 14.5 psi = 10^5 Pa.
(b) °C = 0.5556(°F − 32).

Figure 4.2-1
Identification of Reducing Fittings

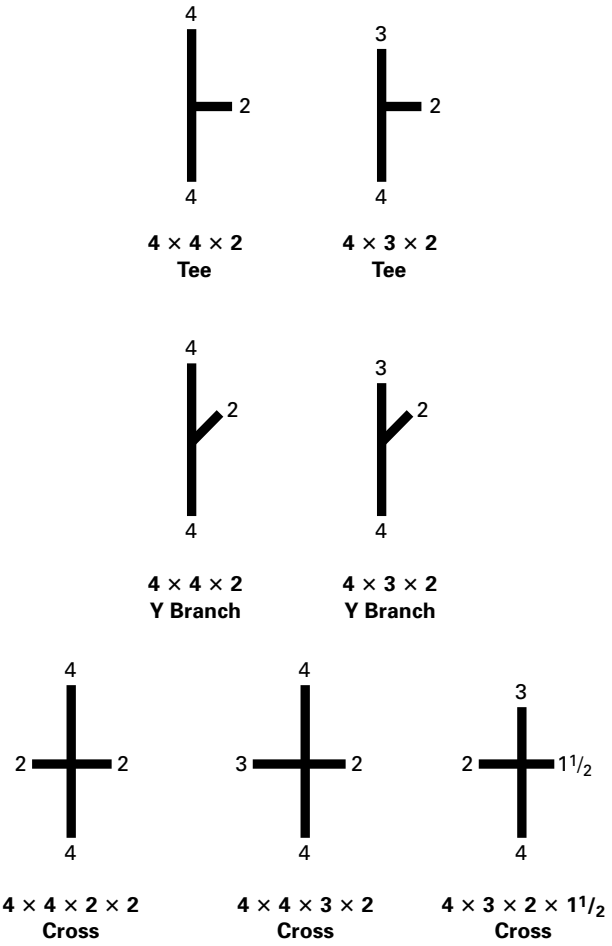
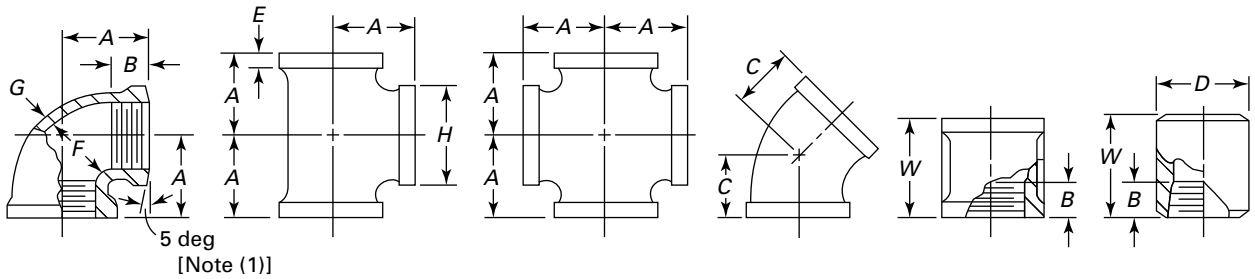


Table 7.1.3-1
Dimensions of 90-deg Elbows, Tees, Crosses, 45-deg Elbows, and Couplings (Straight Sizes) — Class 125



90-deg Elbow | Tee | Cross | 45-deg Elbow | Cast | Wrought

Couplings [Note (2)]

NPS	Center-to-End Elbows, Tees, and Crosses, *A*, mm (in.)	Minimum Length of Thread, *B*, mm (in.) [Note (2)]	Center-to-End, 45-deg Elbows, *C*, mm (in.)	Wrought Coupling Diameter, *D*, mm (in.) [Note (3)]	Minimum Band Length, *E*, mm (in.)	Inside Diameter of Cast Fitting, *F*, mm (in.)		Metal Thickness, *G*, mm (in.) [Note (4)]	Minimum Band Diameter, *H*, mm (in.)	End-to-End Straight Coupling, *W*, mm (in.)	
						Min.	Max.			Cast	Wrought
1/8	14 (0.54)	6 (0.25)	11 (0.42)	14 (0.56)	4 (0.14)	10 (0.41)	11 (0.44)	2.0 (0.08)	17 (0.67)	20 (0.80)	21 (0.83)
1/4	18 (0.71)	8 (0.32)	14 (0.56)	17 (0.69)	4 (0.16)	14 (0.54)	15 (0.58)	2.0 (0.08)	21 (0.81)	25 (0.97)	26 (1.03)
3/8	21 (0.82)	9 (0.36)	16 (0.63)	21 (0.84)	4 (0.17)	17 (0.68)	18 (0.72)	2.2 (0.09)	25 (1.00)	27 (1.05)	28 (1.11)
1/2	26 (1.01)	11 (0.43)	20 (0.78)	27 (1.06)	5 (0.19)	21 (0.84)	23 (0.90)	2.2 (0.09)	30 (1.17)	33 (1.29)	35 (1.36)
3/4	30 (1.18)	13 (0.50)	23 (0.89)	33 (1.31)	6 (0.23)	27 (1.05)	28 (1.11)	2.5 (0.10)	36 (1.42)	36 (1.43)	38 (1.50)
1	36 (1.43)	15 (0.58)	27 (1.06)	...	7 (0.27)	34 (1.32)	35 (1.39)	2.7 (0.11)	44 (1.72)	43 (1.68)	...
1 1/4	43 (1.69)	17 (0.67)	31 (1.22)	...	8 (0.31)	42 (1.66)	44 (1.73)	3.0 (0.12)	53 (2.10)	47 (1.86)	...
1 1/2	47 (1.84)	18 (0.70)	33 (1.30)	...	9 (0.34)	48 (1.90)	50 (1.97)	3.3 (0.13)	60 (2.38)	49 (1.92)	...
2	54 (2.12)	19 (0.75)	37 (1.45)	...	10 (0.41)	60 (2.38)	62 (2.45)	3.8 (0.15)	74 (2.92)	56 (2.20)	...
2 1/2 [Note (5)]	69 (2.70)	23 (0.92)	50 (1.95)	...	12 (0.48)	73 (2.88)	76 (2.98)	4.3 (0.17)	89 (3.49)	73 (2.88)	...
3	78 (3.08)	25 (0.98)	55 (2.17)	...	14 (0.55)	89 (3.50)	91 (3.60)	4.8 (0.19)	107 (4.20)	81 (3.18)	...
4	96 (3.79)	27 (1.08)	66 (2.61)	...	17 (0.66)	114 (4.50)	117 (4.60)	5.5 (0.22)	135 (5.31)	94 (3.69)	...

NOTES:

(1) A 5-deg bevel on the face is optional.

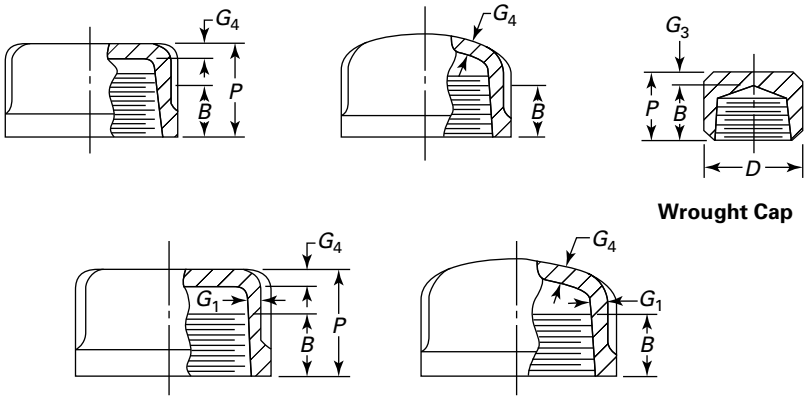
(2) Dimension *B* for wrought couplings includes minimum length of perfect thread. The length of useful thread (*B* plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by ASME B1.20.1. See section 7.

(3) Couplings size NPS 3/4 and smaller may be cast or made from bar at the option of the manufacturer. Diameter, *D*, is in commercial bar sizes.

(4) For metal thickness tolerance, see para. 11.2.

(5) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

Table 7.1.3-2
Dimensions of Caps — Class 125



Wrought Cap

Cast Caps

NPS	Minimum Length of Thread, mm (in.) [Note (1)]		Wrought Cap Diameter, *D*, mm (in.) [Note (2)]	Metal Thickness, mm (in.) [Note (3)]			Minimum Height of Cap, *P*, mm (in.)	
	B	L_2		G_1	G_3	G_4	Cast	Wrought
1/8	6 (0.25)	6.703 (0.2639)	14 (0.56)	2.0 (0.08)	2.8 (0.11)	2.3 (0.09)	12 (0.49)	12 (0.49)
1/4	8 (0.32)	10.206 (0.4018)	18 (0.69)	2.0 (0.08)	3.3 (0.13)	2.5 (0.10)	15 (0.59)	15 (0.59)
3/8	9 (0.36)	10.358 (0.4078)	21 (0.84)	2.3 (0.09)	3.3 (0.13)	2.8 (0.11)	16 (0.64)	17 (0.68)
1/2	11 (0.43)	13.556 (0.5337)	27 (1.06)	2.3 (0.09)	3.6 (0.14)	3.0 (0.12)	19 (0.76)	21 (0.84)
3/4	13 (0.50)	13.861 (0.5457)	33 (1.31)	2.5 (0.10)	3.8 (0.15)	3.3 (0.13)	21 (0.84)	24 (0.94)
1	15 (0.58)	17.343 (0.6828)	...	2.8 (0.11)	...	3.8 (0.15)	25 (0.99)	...
1 1/4	17 (0.67)	17.953 (0.7068)	...	3.0 (0.12)	...	4.3 (0.17)	28 (1.10)	...
1 1/2	18 (0.70)	18.377 (0.7235)	...	3.3 (0.13)	...	4.8 (0.19)	29 (1.15)	...
2	19 (0.75)	19.215 (0.7565)	...	3.8 (0.15)	...	5.6 (0.22)	34 (1.32)	...
2 1/2 [Note (4)]	23 (0.92)	28.892 (1.1375)	...	4.3 (0.17)	...	6.3 (0.25)	43 (1.70)	...
3	25 (0.98)	30.480 (1.2000)	...	4.8 (0.19)	...	7.4 (0.29)	46 (1.80)	...
4	27 (1.08)	33.020 (1.3000)	...	5.6 (0.22)	...	9.1 (0.36)	53 (2.08)	...

GENERAL NOTE: For dimensions not given, see Table 7.1.3-1.

NOTES:

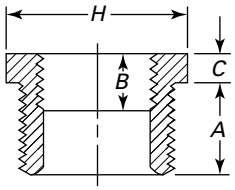
(1) Caps may be made without recess. Caps so made shall be of such height, *P*, that the length of perfect thread shall not be less than *B*, and the length of useful thread (*B* plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread), as required by ASME B1.20.1. All other dimensions shall be as specified for other caps.

(2) Caps NPS 3/4 and smaller may be cast or made from bar at the option of the manufacturer. Diameter, *D*, is in commercial bar sizes.

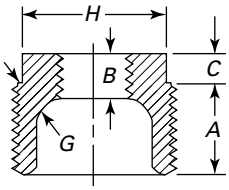
(3) For metal thickness tolerance, see para. 11.2.

(4) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

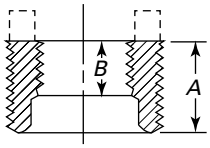
Table 7.1.3-3
Dimensions of Outside Head, Inside Head, and Face Bushings — Class 250



Outside Head



Inside Head



Face [Note (1)]

NPS	Minimum Length of External Thread, *A*, mm (in.)	Minimum Length of Internal Thread, *B*, mm (in.)	Minimum Height of Head, *C*, mm (in.)	Minimum Width of Head, *H*, mm (in.) [Note (2)]		Metal Thickness, *G*, mm (in.) [Note (3)]
				Outside	Inside	
1/4 × 1/8	11 (0.44)	7 (0.26) [Note (4)]	4 (0.14)	16 (0.64) [Note (5)]	...	...
3/8 × 1/4	12 (0.48)	10 (0.40) [Note (4)]	4 (0.16)	17 (0.68) [Note (5)]	...	...
3/8 × 1/8	12 (0.48)	6 (0.25)	4 (0.16)	17 (0.68) [Note (5)]	...	...
1/2 × 3/8	14 (0.56)	10 (0.41) [Note (4)]	5 (0.19)	22 (0.87) [Note (5)]	...	...
1/2 × 1/4	14 (0.56)	8 (0.32)	5 (0.19)	22 (0.87) [Note (5)]	...	...
1/2 × 1/8	14 (0.56)	6 (0.25)	5 (0.19)	22 (0.87) [Note (5)]	...	...
3/4 × 1/2	16 (0.63)	13 (0.53) [Note (4)]	6 (0.22)	29 (1.15) [Note (5)]	...	...
3/4 × 3/8	16 (0.63)	9 (0.36)	6 (0.22)	29 (1.15) [Note (5)]	...	...
3/4 × 1/4	16 (0.63)	8 (0.32)	6 (0.22)	29 (1.15) [Note (5)]	...	...
1 × 3/4	19 (0.75)	13 (0.50)	6 (0.25)	36 (1.42) [Note (5)]	...	...
1 × 1/2	19 (0.75)	11 (0.43)	6 (0.25)	36 (1.42) [Note (5)]	...	...
1 × 3/8	19 (0.75)	9 (0.36)	8 (0.30)	...	28 (1.12)	...
1 × 1/4	19 (0.75)	8 (0.32)	8 (0.30)	...	28 (1.12)	...
1 1/4 × 1	20 (0.80)	15 (0.58)	7 (0.28)	45 (1.76)	...	...
1 1/4 × 3/4	20 (0.80)	13 (0.50)	7 (0.28)	45 (1.76)	...	...
1 1/4 × 1/2	20 (0.80)	11 (0.43)	9 (0.34)	...	34 (1.34)	4.7 (0.185)
1 1/4 × 3/8	20 (0.80)	9 (0.36)	9 (0.34)	...	28 (1.12)	4.7 (0.185)
1 1/2 × 1 1/4	21 (0.83)	18 (0.71) [Note (4)]	8 (0.31)	51 (2.00)	...	...
1 1/2 × 1	21 (0.83)	15 (0.58)	8 (0.31)	51 (2.00)	...	...
1 1/2 × 3/4	21 (0.83)	13 (0.50)	9 (0.37)	...	41 (1.63)	5.1 (0.200)
1 1/2 × 1/2	21 (0.83)	11 (0.43)	9 (0.37)	...	34 (1.34)	5.1 (0.200)
2 × 1 1/2	22 (0.88)	18 (0.70)	9 (0.34)	63 (2.48)	...	...
2 × 1 1/4	22 (0.88)	17 (0.67)	9 (0.34)	63 (2.48)	...	...
2 × 1	22 (0.88)	15 (0.58)	10 (0.41)	...	50 (1.95)	5.6 (0.220)
2 × 3/4	22 (0.88)	13 (0.50)	10 (0.41)	...	41 (1.63)	5.6 (0.220)
2 × 1/2	22 (0.88)	11 (0.43)	10 (0.41)	...	34 (1.34)	5.6 (0.220)
2 1/2 × 2	27 (1.07)	19 (0.75)	9 (0.37)	76 (2.98)	...	...
2 1/2 × 1 1/2	27 (1.07)	18 (0.70)	11 (0.44)	68 (2.68)	...	...
2 1/2 × 1 1/4	27 (1.07)	17 (0.67)	11 (0.44)	...	61 (2.39)	6.1 (0.240)
2 1/2 × 1	27 (1.07)	15 (0.58)	11 (0.44)	...	50 (1.95)	6.1 (0.240)
3 × 2 1/2	29 (1.13)	23 (0.92)	10 (0.40)	98 (3.86)	...	...
3 × 2	29 (1.13)	19 (0.75)	12 (0.48)	83 (3.28)	...	...

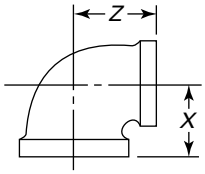
Table 7.1.3-3
Dimensions of Outside Head, Inside Head, and Face Bushings — Class 250 (Cont'd)

NPS	Minimum Length of External Thread, *A*, mm (in.)	Minimum Length of Internal Thread, *B*, mm (in.)	Minimum Height of Head, *C*, mm (in.)	Minimum Width of Head, *H*, mm (in.) [Note (2)]		Metal Thickness, *G*, mm (in.) [Note (3)]
				Outside	Inside	
3 × 1½	29 (1.13)	18 (0.70)	12 (0.48)	...	68 (2.68)	6.6 (0.260)
3 × 1¼	29 (1.13)	17 (0.67)	12 (0.48)	...	61 (2.39)	6.6 (0.260)
4 × 3	31 (1.22)	25 (0.98)	13 (0.50)	117 (4.62)	...	...
4 × 2½	31 (1.22)	23 (0.92)	15 (0.60)	...	98 (3.86)	7.9 (0.310)
4 × 2	31 (1.22)	19 (0.75)	15 (0.60)	...	83 (3.28)	7.9 (0.310)
4 × 1½	31 (1.22)	18 (0.70)	15 (0.60)	...	68 (2.68)	7.9 (0.310)

GENERAL NOTES:
(a) For pressure class recommendations, see para. 3.3.
(b) Bushings reducing to pipe sizes smaller than given are bushed from the smallest reduction appearing in the table.

NOTES:
(1) The addition of lugs on face bushings is not prohibited.
(2) Heads of bushings shall be hexagonal or octagonal.
(3) Metal thickness, *G*, is the same as Class 125 cast iron threaded fittings of ASME B16.4. For tolerance, see para. 11.2.
(4) To provide proper metal thickness, these sizes shall not be cored out to diameters greater than the root diameter of the internal thread. The length of the internal thread may be equal to the minimum dimension, *B,* or greater, up to the full length of the bushing.
(5) Bushings in these sizes may be made from regular hexagon or octagon bar stock sizes.

Table 10.1.2-1
Dimensions of 90-deg Elbows (Reducing Sizes) — Class 125



90-deg Elbow, Reducing

NPS	Center-to-End, mm (in.)	
	X	*Z*
1/4 × 1/8	17 (0.65)	15 (0.60)
3/8 × 1/4	19 (0.75)	20 (0.78)
1/2 × 3/8	24 (0.93)	23 (0.90)
3/4 × 1/2	27 (1.08)	28 (1.11)
1 × 3/4	33 (1.30)	33 (1.31)
1 × 1/2	30 (1.20)	31 (1.24)
1 1/4 × 1	39 (1.52)	41 (1.60)
1 1/4 × 3/4	35 (1.39)	38 (1.48)
1 1/2 × 1 1/4	44 (1.72)	46 (1.81)
1 1/2 × 1	39 (1.55)	44 (1.72)
2 × 1 1/2	48 (1.89)	53 (2.07)
2 1/2 × 2 [Note (1)]	61 (2.39)	66 (2.60)
3 × 2 1/2	72 (2.83)	76 (2.99)
4 × 3	84 (3.30)	91 (3.60)

GENERAL NOTES:

(a) See para. 10.2 for requirements concerning patterns for reducing fittings.

(b) For dimensions not given, see Table 7.1.3-1.

NOTE: (1) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

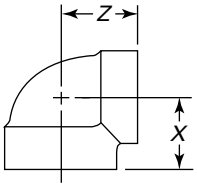
Table 10.1.2-2
Dimensions of Tees (Reducing Sizes) — Class 125

NPS	Center-to-End, mm (in.)			NPS	Center-to-End, mm (in.)		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/4 × 1/4 × 1/8	17 (0.65)	17 (0.65)	15 (0.60)	1 1/4 × 1 × 3/4	35 (1.39)	33 (1.30)	38 (1.48)
3/8 × 3/8 × 1/4	19 (0.75)	19 (0.75)	20 (0.78)	1 1/4 × 3/4 × 1 1/4	43 (1.69)	38 (1.48)	43 (1.69)
3/8 × 1/4 × 3/8	21 (0.82)	20 (0.78)	21 (0.82)	1 1/4 × 1/2 × 1 1/4	43 (1.69	36 (1.40)	43 (1.69)
3/8 × 1/4 × 1/4	19 (0.75)	18 (0.71)	20 (0.78)	1 × 1 × 1 1/4	41 (1.60)	41 (1.60)	39 (1.52)
1/2 × 1/2 × 3/8	24 (0.93)	24 (0.93)	23 (0.90)	1 1/2 × 1 1/2 × 1 1/4	44 (1.72)	44 (1.72)	46 (1.81)
1/2 × 1/2 × 1/4	22 (0.87)	22 (0.87)	22 (0.87)	1 1/2 × 1 1/2 × 1	39 (1.55)	39 (1.55)	44 (1.72)
1/2 × 3/8 × 1/2	26 (1.01)	23 (0.90)	26 (1.01)	1 1/2 × 1 1/2 × 3/4	36 (1.42)	36 (1.42)	41 (1.60)
1/2 × 3/8 × 3/8	24 (0.93)	21 (0.82)	23 (0.90)	1 1/2 × 1 1/2 × 1/2	34 (1.32)	34 (1.32)	39 (1.53)
3/8 × 3/8 × 1/2	23 (0.90)	23 (0.90)	24 (0.93)	1 1/2 × 1 1/4 × 1 1/2	47 (1.84)	46 (1.81)	47 (1.84)
3/4 × 3/4 × 1/2	27 (1.08)	27 (1.08)	28 (1.11)	1 1/2 × 1 1/4 × 1 1/4	44 (1.72)	43 (1.69)	46 (1.81)
3/4 × 3/4 × 3/8	25 (1.00)	25 (1.00)	25 (1.00)	1 1/2 × 1 1/4 × 1	39 (1.55)	39 (1.52)	44 (1.72)
3/4 × 1/2 × 3/4	30 (1.18)	28 (1.11)	30 (1.18)	1 1/2 × 3/4 × 1 1/2	47 (1.84)	41 (1.60)	47 (1.84)
3/4 × 1/2 × 1/2	27 (1.08)	26 (1.01)	28 (1.11)	1 1/4 × 1 1/4 × 1 1/2	46 (1.81)	46 (1.81)	44 (1.72)
1/2 × 1/2 × 3/4	28 (1.11)	28 (1.11)	27 (1.08)	1 × 1 × 1 1/2	44 (1.72)	44 (1.72)	39 (1.55)
1 × 1 × 3/4	33 (1.30)	33 (1.30)	33 (1.31)	2 × 2 × 1 1/2	48 (1.89)	48 (1.89)	53 (2.07)
1 × 1 × 1/2	30 (1.20)	30 (1.20)	31 (1.24)	2 × 2 × 1 1/4	45 (1.77)	45 (1.77)	52 (2.04)
1 × 1 × 3/8	28 (1.12)	28 (1.12)	29 (1.13)	2 × 2 × 1	40 (1.59)	40 (1.59)	50 (1.95)
1 × 3/4 × 1	36 (1.43)	33 (1.31)	36 (1.43)	2 × 2 × 3/4	37 (1.47)	37 (1.47)	47 (1.84)
1 × 3/4 × 3/4	33 (1.30)	30 (1.18)	33 (1.31)	2 × 1 1/2 × 2	54 (2.12)	53 (2.07)	54 (2.12)
1 × 3/4 × 1/2	30 (1.20)	27 (1.08)	31 (1.24)	2 × 1 1/2 × 1 1/2	48 (1.89)	47 (1.84)	53 (2.07)
1 × 1/2 × 1	36 (1.43)	31 (1.24)	36 (1.43)	1 1/2 × 1 1/2 × 2	53 (2.07)	53 (2.07)	48 (1.89)
1 × 1/2 × 3/4	33 (1.30)	28 (1.11)	33 (1.31)	2 1/2 × 2 1/2 × 2 [Note (1)]	61 (2.39)	61 (2.39)	66 (2.60)
3/4 × 3/4 × 1	33 (1.31)	33 (1.31)	33 (1.30)	2 1/2 × 2 × 2	61 (2.39)	57 (2.25)	66 (2.60)
1 1/4 × 1 1/4 × 1	39 (1.52)	39 (1.52)	41 (1.60)	2 × 2 × 2 1/2	66 (2.60)	66 (2.60)	61 (2.39)
1 1/4 × 1 1/4 × 3/4	35 (1.39)	35 (1.39)	38 (1.48)	3 × 3 × 2 1/2	72 (2.83)	72 (2.83)	76 (2.99)
1 1/4 × 1 1/4 × 1/2	33 (1.29)	33 (1.29)	36 (1.41)	3 × 3 × 2	64 (2.52)	64 (2.52)	73 (2.89)
1 1/4 × 1 × 1 1/4	43 (1.69)	41 (1.60)	43 (1.69)	4 × 4 × 3	84 (3.30)	84 (3.30)	91 (3.60)
1 1/4 × 1 × 1	39 (1.52)	36 (1.43)	41 (1.60)	4 × 4 × 2	70 (2.74)	70 (2.74)	87 (3.41)

GENERAL NOTES:
(a) See para. 10.2 for requirements concerning patterns for reducing fittings.
(b) For dimensions not given, see Table 7.1.3-1.

NOTE: (1) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

Table 10.1.2-3
Dimensions of 90-deg Elbows (Reducing Sizes) — Class 250

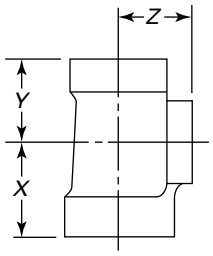


90-deg Elbow, Reducing

NPS	Center-to-End, mm (in.)	
	X	*Z*
1/2 × 3/8	26 (1.04)	26 (1.03)
3/4 × 1/2	30 (1.20)	31 (1.22)
1 × 3/4	35 (1.37)	37 (1.45)
1 × 1/2	32 (1.26)	35 (1.36)
1 1/4 × 1	40 (1.58)	42 (1.67)
1 1/4 × 3/4	37 (1.45)	41 (1.62)
1 1/2 × 1 1/4	46 (1.82)	48 (1.88)
1 1/2 × 1	42 (1.65)	46 (1.80)
2 × 1 1/2	51 (2.02)	55 (2.16)
2 × 1 1/4	48 (1.90)	53 (2.10)
2 1/2 × 2	61 (2.39)	66 (2.60)
3 × 2 1/2	72 (2.83)	76 (2.99)
3 × 2	64 (2.52)	73 (2.89)
4 × 3	89 (3.50)	91 (3.60)

GENERAL NOTES:
(a) For dimensions not given, see Table 10.1.2-8.
(b) All dimensions given in this table are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
(c) See para. 10.2 for requirements concerning patterns for reducing fittings.

Table 10.1.2-4
Dimensions of Tees (Reducing Sizes) — Class 250

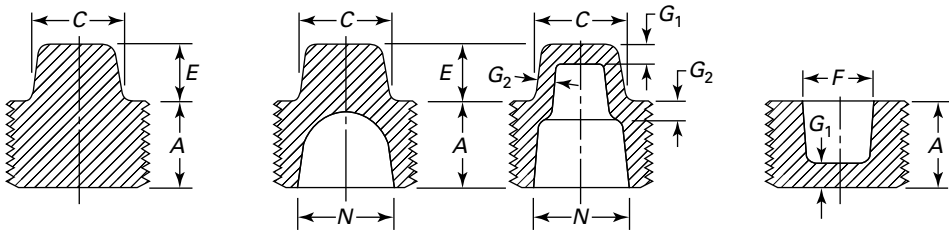


Tee, Reducing

NPS	Center-to-End, mm (in.)			NPS	Center-to-End, mm (in.)		
	X	*Y*	*Z*		*X*	*Y*	*Z*
½ × ½ × ⅜	26 (1.04)	26 (1.04)	26 (1.03)	1½ × 1½ × 1	42 (1.65)	42 (1.65)	46 (1.80)
¾ × ¾ × ½	30 (1.20)	30 (1.20)	31 (1.22)	1½ × 1½ × ¾	39 (1.52)	39 (1.52)	44 (1.75)
¾ × ¾ × ⅜	28 (1.12)	28 (1.12)	29 (1.13)	1½ × 1½ × ½	36 (1.41)	36 (1.41)	42 (1.66)
¾ × ½ × ¾	33 (1.31)	31 (1.22)	33 (1.31)	1½ × 1¼ × 1¼	46 (1.82)	44 (1.75)	48 (1.88)
¾ × ½ × ½	30 (1.20)	28 (1.12)	31 (1.22)				
½ × ½ × ¾	31 (1.22)	31 (1.22)	30 (1.20)	1½ × 1¼ × 1	42 (1.65)	40 (1.58)	46 (1.80)
				1½ × 1 × 1½	49 (1.94)	46 (1.80)	49 (1.94)
1 × 1 × ¾	35 (1.37)	35 (1.37)	37 (1.45)	1¼ × 1¼ × 1½	48 (1.88)	48 (1.88)	46 (1.82)
1 × 1 × ½	32 (1.26)	32 (1.26)	34 (1.36)	2 × 2 × 1½	51 (2.02)	51 (2.02)	55 (2.16)
1 × ¾ × 1	38 (1.50)	37 (1.45)	38 (1.50)	2 × 2 × 1¼	48 (1.90)	48 (1.90)	53 (2.10)
1 × ¾ × ¾	34 (1.37)	33 (1.31)	37 (1.45)				
¾ × ¾ × 1	37 (1.45)	37 (1.45)	34 (1.37)	2 × 2 × 1	44 (1.73)	44 (1.73)	51 (2.02)
				2 × 2 × ¾	41 (1.60)	41 (1.60)	50 (1.97)
1¼ × 1¼ × 1	40 (1.58)	40 (1.58)	42 (1.67)	2 × 2 × ½	38 (1.49)	38 (1.49)	48 (1.88)
1¼ × 1¼ × ¾	37 (1.45)	37 (1.45)	41 (1.62)	2½ × 2½ × 2	61 (2.39)	61 (2.39)	66 (2.60)
1¼ × 1¼ × ½	34 (1.34)	34 (1.34)	39 (1.53)	3 × 3 × 2	64 (2.52)	64 (2.52)	73 (2.89)
1¼ × 1 × 1¼	44 (1.75)	42 (1.67)	44 (1.75)				
1¼ × 1 × 1	40 (1.58)	38 (1.50)	42 (1.67)	3 × 2½ × 3	78 (3.08)	76 (2.99)	78 (3.08)
1¼ × ¾ × 1¼	44 (1.75)	41 (1.62)	44 (1.75)	3 × 2 × 3	78 (3.08)	73 (2.89)	78 (3.08)
				4 × 4 × 3	84 (3.30)	84 (3.30)	91 (3.60)
1 × 1 × 1¼	42 (1.67)	42 (1.67)	40 (1.58)	4 × 4 × 2	70 (2.74)	70 (2.74)	87 (3.41)
1½ × 1½ × 1¼	46 (1.82)	46 (1.82)	48 (1.88)	4 × 3 × 4	96 (3.79)	91 (3.60)	96 (3.79)

GENERAL NOTES:
(a) For dimensions not given, see Table 10.1.2-8.
(b) All dimensions given in this table are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
(c) See para. 10.2 for requirements concerning patterns for reducing fittings.

Table 10.1.2-5
Dimensions of Square Head and Square Socket Plugs



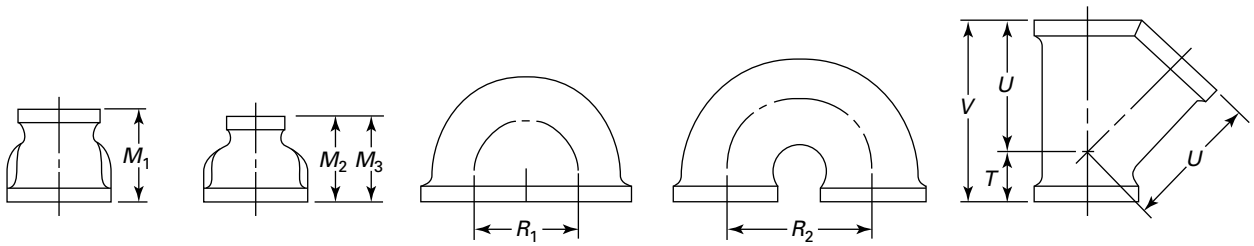
Solid Pattern | Cored Patterns | Countersunk Pattern

NPS	Minimum Thread Length, *A*, mm (in.)	Nominal Width Across Flats, *C*, mm (in.) [Note (1)]	Minimum Height of Plug Square, *E*, mm (in.)	Metal Thickness, mm (in.) [Note (2)]		Maximum Inside Diameter of Plug, *N*, mm (in.)	Nominal Size of Square Socket, *F*, mm (in.) [Note (3)]
				G_1	G_2		
1/8	7 (0.27)	7.1 (9/32)	6 (0.24)	...	...	...	...
1/4	10 (0.41)	9.5 (3/8)	7 (0.28)	...	...	...	...
3/8	10 (0.41)	11.1 (7/16)	8 (0.31)	...	...	...	...
1/2	14 (0.54)	14.3 (9/16)	10 (0.38)	2.3 (0.09)	3.0 (0.12)	13 (0.53)	9.5 (3/8)
3/4	14 (0.55)	15.8 (5/8)	11 (0.44)	2.5 (0.10)	3.3 (0.13)	19 (0.72)	12.7 (1/2)
1	18 (0.69)	20.6 (13/16)	13 (0.50)	2.8 (0.11)	3.6 (0.14)	24 (0.93)	12.7 (1/2)
1 1/4	18 (0.71)	23.8 (15/16)	14 (0.56)	3.0 (0.12)	3.8 (0.15)	32 (1.25)	19.1 (3/4)
1 1/2	19 (0.73)	28.5 (1 1/8)	16 (0.62)	3.3 (0.13)	4.1 (0.16)	37 (1.47)	19.1 (3/4)
2	19 (0.76)	33.3 (1 5/16)	17 (0.68	3.8 (0.15)	4.3 (0.17)	49 (1.91)	22.2 (7/8)
2 1/2	27 (1.07)	38.1 (1 1/2)	19 (0.74)	4.3 (0.17)	4.6 (0.18)	59 (2.32)	28.6 (1 1/8)
3	29 (1.13)	42.8 (1 11/16)	20 (0.80)	4.8 (0.19)	4.8 (0.19)	74 (2.90)	34.9 (1 3/8)
4 [Note (4)]	31 (1.22)	57.1 (2 1/4)	23 (0.92)	5.6 (0.22)	5.6 (0.22)	97 (3.83)	50.8 (2)

GENERAL NOTE: For pressure class recommendations, see para. 3.3.

NOTES:
(1) These dimensions for *C* are the nominal size of wrench as given in Table 1 of ASME B18.2.1. Square head plugs are designed to fit these wrenches. Plug squares may have opposite sides tapered a maximum of 4 deg total.
(2) For metal thickness tolerance, see para. 11.2.
(3) Square socket of countersunk plugs shall have dimension *F* to fit commercial square bars of sizes indicated. Countersunk square sockets may have opposite sides tapered a maximum of 4 deg total.
(4) Solid pattern type having nominal pipe size greater than NPS 3 is not covered by this Standard.

Table 10.1.2-6
Dimensions of Reducers, Closed and Open Pattern Return Bends, and 45-deg Y Branches (Straight Sizes) — Class 125



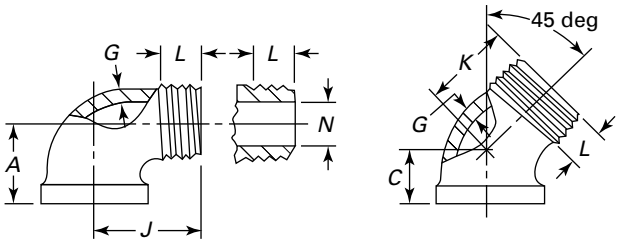
Reducer (1 Size) | Reducer (2 and 3 Sizes) | Closed Pattern Return Bend | Open Pattern Return Bend | 45-deg Y Branch Straight

	Reducers, mm (in.)			Return Bends, mm (in.)		45-deg Y Branch, mm (in.)		
	End-to-End Reducing [Note (1)]			Center-to-Center				
NPS	One Size, M_1	Two Sizes, M_2	Three Sizes, M_3	Closed Pattern, R_1	Open Pattern, R_2	Center-to-End Inlet, T	Center-to-End Outlet, U	End-to-End, V
1/4	22 (0.88)	...	...	...	...	...	...	...
3/8	26 (1.01)	23 (0.92)	...	...	...	13 (0.50)	32 (1.28)	45 (1.78)
1/2	30 (1.17)	29 (1.13)	...	25 (1.00)	38 (1.50)	16 (0.61)	40 (1.58)	56 (2.19)
3/4	35 (1.36)	31 (1.24)	31 (1.24)	32 (1.25)	51 (2.00)	18 (0.72)	48 (1.90)	66 (2.62)
1	40 (1.56)	38 (1.49)	...	38 (1.50)	64 (2.50)	22 (0.85)	59 (2.33)	81 (3.18)
1 1/4	45 (1.77)	42 (1.65)	...	...	76 (3.00)	26 (1.02)	72 (2.83)	93 (3.85)
1 1/2	48 (1.89)	45 (1.80)	45 (1.80)	...	89 (3.50)	28 (1.10)	80 (3.14)	108 (4.24)
2	52 (2.06)	52 (2.03)	52 (2.03)	...	102 (4.00)	31 (1.24)	96 (3.76)	127 (5.00)
2 1/2 [Note (2)]	83 (3.25)	...	...	...	...	...	...	...
3	94 (3.69)	94 (3.69)	...	...	...	...	...	...
4	111 (4.38)	...	...	...	...	...	...	...

GENERAL NOTES:
(a) See para. 10.2 for requirements concerning patterns for reducing fittings.
(b) For dimensions not given, see Table 7.1.3-1.

NOTES:
(1) The reduced sizes refer to the indicated nominal sizes listed in the first column, except that dimension 22 mm (0.88 in.) in the second column refers to the NPS 1/4 × 1/8 reducer.
(2) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

Table 10.1.2-7
Dimensions of 90-deg and 45-deg Street Elbows — Class 125



90-deg Street Elbow | 45-deg Street Elbow

NPS	Center-to-Female-End, 90-deg Elbows, *A*, mm (in.)	Center-to-Female-End, 45-deg Elbows, *C*, mm (in.)	Metal Thickness, *G*, mm (in.) [Note (1)]	Center-to-Male-End, 90-deg Elbows, *J*, mm (in.)	Center-to-Male-End, 45-deg Elbows, *K*, mm (in.)	Minimum Length of Thread, Male End, *L*, mm (in.)	Maximum Port Diameter, Male End, *N*, mm (in.)
1/8	14 (0.54)	11 (0.42)	2.0 (0.08)	23 (0.92)	20 (0.78)	7 (0.27)	6 (0.22)
1/4	18 (0.71)	14 (0.56)	2.0 (0.08)	28 (1.11)	22 (0.88)	10 (0.41)	7 (0.28)
3/8	21 (0.82)	16 (0.63)	2.3 (0.09)	31 (1.24)	23 (0.92)	10 (0.41)	10 (0.40)
1/2	26 (1.01)	20 (0.78)	2.3 (0.09)	38 (1.48)	27 (1.06)	14 (0.54)	13 (0.53)
3/4	30 (1.18)	23 (0.89)	2.5 (0.10)	42 (1.65)	31 (1.23)	14 (0.55)	18 (0.72)
1	36 (1.43)	27 (1.06)	2.8 (0.11)	50 (1.98)	36 (1.40)	18 (0.69)	24 (0.93)
1 1/4	43 (1.69)	31 (1.22)	3.0 (0.12)	57 (2.24)	42 (1.64)	18 (0.71)	32 (1.25)
1 1/2	47 (1.84)	33 (1.30)	3.3 (0.13)	62 (2.46)	46 (1.80)	19 (0.73)	37 (1.47)
2	54 (2.12)	37 (1.45)	3.8 (0.15)	73 (2.88)	54 (2.14)	19 (0.76)	49 (1.91)

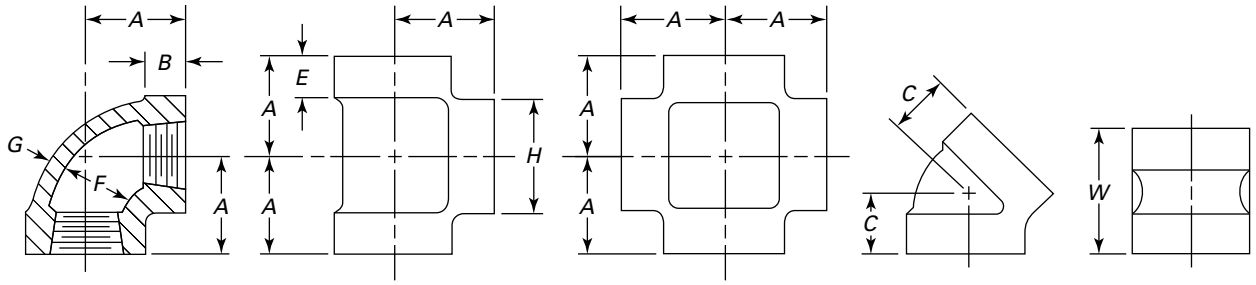
GENERAL NOTES:

(a) For dimensions not given, see Table 7.1.3-1.

(b) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

NOTE: (1) For metal thickness tolerance, see para. 11.2.

Table 10.1.2-8
Dimensions of 90-deg Elbows, Tees, Crosses, 45-deg Elbows, and Couplings (Straight Sizes) — Class 250



90-deg Elbow | Tee | Cross | 45-deg Elbow | Coupling

NPS	Center-to-End Elbows, Tees, and Crosses, *A*, mm (in.) [Note (1)]	Minimum Length of Thread, *B*, mm (in.)	Center-to-End 45-deg Elbows, *C*, mm (in.) [Note (1)]	Minimum Width of Band, *E*, mm (in.)	Inside Diameter of Fitting, *F*, mm (in.)		Metal Thickness, *G*, mm (in.) [Note (2)]	Minimum Outside Diameter of Band, *H*, mm (in.)	End-to-End Coupling, *W*, mm (in.)
					Min.	Max.			
1/4	20 (0.81)	8 (0.32)	19 (0.73)	10 (0.38)	14 (0.54)	15 (0.58)	2.8 (0.11)	24 (0.93)	27 (1.06)
3/8	24 (0.95)	9 (0.36)	20 (0.80)	11 (0.44)	17 (0.68)	18 (0.72)	3.0 (0.12)	28 (1.12)	29 (1.16)
1/2	28 (1.12)	11 (0.43)	22 (0.88)	13 (0.50)	21 (0.84)	23 (0.90)	3.3 (0.13)	34 (1.34)	34 (1.34)
3/4	33 (1.31)	13 (0.50)	25 (0.98)	14 (0.56)	27 (1.05)	28 (1.11)	4.1 (0.16)	41 (1.63)	39 (1.52)
1	38 (1.50)	15 (0.58)	28 (1.12)	16 (0.62)	34 (1.32)	35 (1.38)	4.3 (0.17)	50 (1.95)	42 (1.67)
1 1/4	44 (1.75)	17 (0.67)	33 (1.29)	18 (0.69)	42 (1.66)	44 (1.73)	4.8 (0.19)	61 (2.39)	49 (1.93)
1 1/2	49 (1.94)	18 (0.70)	36 (1.43)	19 (0.75)	48 (1.90)	50 (1.97)	5.1 (0.20)	68 (2.68)	55 (2.15)
2	57 (2.25)	19 (0.75)	43 (1.68)	21 (0.84)	60 (2.38)	62 (2.45)	5.6 (0.22)	83 (3.28)	64 (2.53)
2 1/2	69 (2.70)	23 (0.92)	50 (1.95)	24 (0.94)	73 (2.88)	76 (2.98)	6.1 (0.24)	98 (3.86)	73 (2.88)
3 [Note (3)]	78 (3.08)	25 (0.98)	55 (2.17)	25 (1.00)	89 (3.50)	91 (3.60)	6.6 (0.26)	117 (4.62)	81 (3.18)
4 [Note (3)]	96 (3.79)	27 (1.08)	66 (2.61)	28 (1.12)	114 (4.50)	117 (4.60)	7.9 (0.31)	147 (5.79)	94 (3.69)

NOTES:
(1) The dimensions for 90-deg elbows, tees, crosses, and 45-deg elbows are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
(2) For metal thickness tolerance, see para. 11.2.
(3) Class 250 crosses having nominal pipe size greater than NPS 2 1/2 are not covered by this Standard.

Table 11.3-1
Inspection Tolerances, Center-to-End and Center-to-Center

NPS	Tolerance, mm (in.)
1/8	±1.0 (±0.03)
1/4	±1.0 (±0.04)
3/8	±1.5 (±0.05)
1/2, 3/4	±1.5 (±0.06)
1, 1 1/4	±2.0 (±0.07)
1 1/2, 2	±2.0 (±0.08)
2 1/2, 3	±2.5 (±0.10)
4	±3.0 (±0.12)

MANDATORY APPENDIX I
REFERENCES

(24)

The following is a list of publications referenced in this Standard. Unless otherwise specified, 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). The American Society of Mechanical Engineers.

ASME B16.3. Malleable Iron Threaded Fittings, Classes 150 and 300. The American Society of Mechanical Engineers.

ASME B16.4. Gray Iron Threaded Fittings, Classes 125 and 250. The American Society of Mechanical Engineers.

ASME B18.2.1. Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series). The American Society of Mechanical Engineers.

ASTM B16/B16M-19. Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines. ASTM International.

ASTM B62-17. Standard Specification for Composition Bronze or Ounce Metal Castings. ASTM International.

ASTM B140/B140M-22. Standard Specification for Copper-Zinc-Lead (Red Brass or Hardware Bronze) Rod, Bar, and Shapes. ASTM International.

ASTM B584-22. Standard Specification for Copper Alloy Sand Castings for General Applications. ASTM International.

ASTM E29-22. Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications. ASTM International.

ISO 9000:2015. Quality management systems — Fundamentals and vocabulary.[1] International Organization for Standardization.

ISO 9001:2015. Quality management systems — Requirements.[1] International Organization for Standardization.

ISO 9004:2018. Quality management — Quality of an organization — Guidance to achieve sustained success.[1] International Organization for Standardization.

[1] This publication may be obtained from the American National Standards Institute (ANSI): www.ansi.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 summary 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.

[1] The 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 the prefix "Q," replacing the prefix "ISO." Each applicable standard of the series is listed under References in Mandatory Appendix I.

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

B16.1-2020	Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
B16.3-2021	Malleable Iron Threaded Fittings: Classes 150 and 300
B16.4-2021	Gray Iron Threaded Fittings: Classes 125 and 250
B16.5-2020	Pipe Flanges and Flanged Fittings: NPS $\frac{1}{2}$ Through NPS 24 Metric/Inch Standard
B16.9-2024	Factory-Made Wrought Buttwelding Fittings
B16.10-2022	Face-to-Face and End-to-End Dimensions of Valves
B16.11-2021	Forged Fittings, Socket-Welding and Threaded
B16.12-2019	Cast Iron Threaded Drainage Fittings
B16.14-2024	Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads
B16.15-2024	Cast Copper Alloy Threaded Fittings
B16.18-2021	Cast Copper Alloy Solder Joint Pressure Fittings
B16.20-2023	Metallic Gaskets for Pipe Flanges
B16.21-2021	Nonmetallic Flat Gaskets for Pipe Flanges
B16.22-2021	Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
B16.23-2021	Cast Copper Alloy Solder Joint Drainage Fittings: DWV
B16.24-2021	Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500, and 2500
B16.25-2022	Buttwelding Ends
B16.26-2018	Cast Copper Alloy Fittings for Flared Copper Tubes
B16.29-2022	Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings — DWV
B16.33-2024	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS $\frac{1}{2}$ Through NPS 2)
B16.34-2020	Valves — Flanged, Threaded, and Welding End
B16.36-2020	Orifice Flanges
B16.38-2023	Large Metallic Valves for Gas Distribution: Manually Operated, NPS $2\frac{1}{2}$ (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum
B16.39-2019	Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300
B16.40-2019	Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
B16.42-2021	Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300
B16.44-2023	Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems Up to 5 psi
B16.47-2020	Large Diameter Steel Flanges: NPS 26 Through NPS 60 Metric/Inch Standard
B16.48-2020	Line Blanks
B16.49-2023	Factory-Made, Wrought Steel, Buttwelding Induction Bends for Transportation and Distribution Systems
B16.50-2021	Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
B16.51-2021	Copper and Copper Alloy Press-Connect Pressure Fittings
B16.52-2024	Forged Nonferrous Fittings, Socket-Welding and Threaded (Titanium, Titanium Alloys, Aluminum, and Aluminum Alloys)

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