ASME B16.15-2013
(Revision of ASME B16.15-2011)

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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The next edition of this Standard is scheduled for publication in 2018.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME B16 Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org/ as they are issued.

Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

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The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

CONTENTS

FOREWORD

As early as the spring of 1921, the consolidation and further development of threaded and flanged fittings standards in force in this country 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 acting as joint sponsors.

In June 1927, the Manufacturers Standardization Society of the Valve and Fittings Industry appointed a committee on Nonferrous Screw Fittings for the purpose of developing standards for products commonly designated as threaded pipe fittings of brass, bronze, or 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 over 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 for 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. The 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 new 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, while 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 in order to improve the text. After approval by ASME, ANSI approval was granted on August 25, 2006 with the designation of 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 Standards Committee and the ASME Board on PTCS, 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 this 2013 edition, section 7 was revised and now requires 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 new designation ASME B16.15-2013.

All requests for interpretations or suggestions for revisions should be sent to the Secretary, B16 Committee, The American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

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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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via email to: SecretaryB16@asme.org.

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 for the purpose of providing 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, 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 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.

The request for 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.
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. 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 this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B16 Standards Committee.

ASME B16.15-2013
SUMMARY OF CHANGES

Following approval by the ASME B16 Committee and ASME, and after public review, ASME B16.15-2013 was approved by the American National Standards Institute on July 29, 2013.

ASME B16.15-2013 includes the following changes identified by a margin note, **(13)**.

Page	*Location*	*Change*
2	Section 7	Revised in its entirety
12	Table 9	Note (1) revised
25	Table I-9	Note (1) revised
29	Mandatory Appendix II	ASME B18.2.2 replaced by ASME B18.2.1

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

Mandatory Appendix I provides table values in U.S. Customary units.

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 or in separate tables that appear in Mandatory Appendix I. 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 II.

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 that 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.

3 PRESSURE–TEMPERATURE RATINGS

3.1 General

Pressure–temperature ratings for these pipe fittings are shown in Tables 1 and I-l. 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 following tables 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 Fig. 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, alloy UNS C36000, or ASTM B140, alloy UNS C32000 or UNS C31400.

7 THREADS (13)

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 para. 7.1.3(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 (Tables 2 and I-2), wrought caps (Tables 3 and I-3), and wrought bushings (Tables 4 and I-4) 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.

7.2 Gaging Tolerances

For taper pipe threads, the variation in threading shall be limited to one turn large or 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 one and one-half turns large or small from the gaging notch on the plug when using working gages.

[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.

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

(a) Tables of center-to-end dimensions are given for both straight and reducing pipe fittings. Dimensions and tolerances shown as whole or multiples of 0.5 mm may differ slightly in absolute value from the corresponding dimensions in Mandatory Appendix I. Any dimension that is within tolerance by either SI or Customary measurement is considered to be in conformance with this Standard.

(b) The dimensions shown in Tables 5 through 9 (Tables I-5 through I-9) for fittings 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 bushed to make the reducing pipe fitting wanted. Reducing pipe fitting patterns shall be designed to produce wall thicknesses and detail and dimensions as required for the sizes involved.

(c) The sketches of fittings accompanying Tables 2 through 12 (Tables I-2 through I-12) are representative and are included for the purpose of illustration.

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. 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 13 (Table I-13) 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 two times the 38°C (100°F) pressure rating for the duration of 1 min.

Fig. 1 Identification of Reducing Fittings

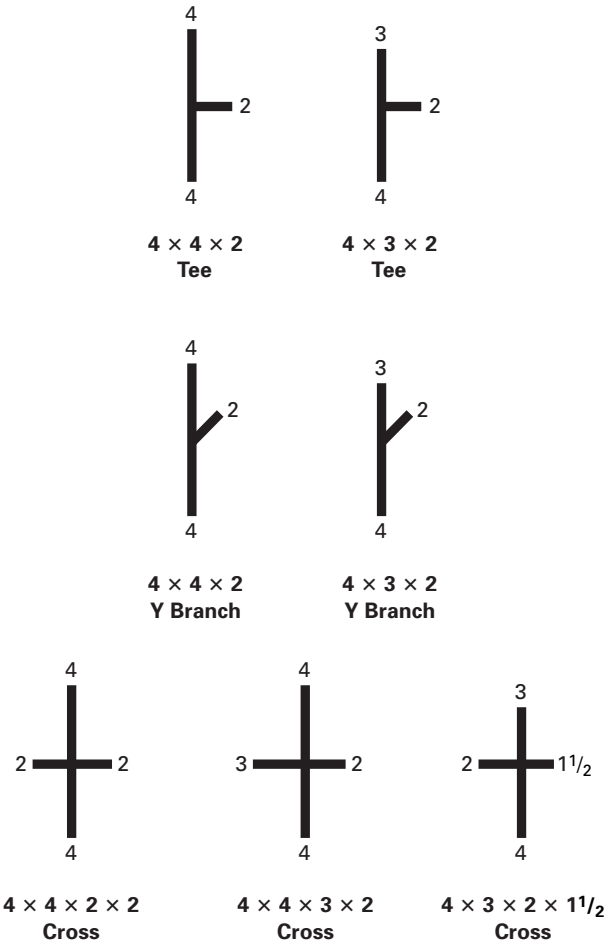
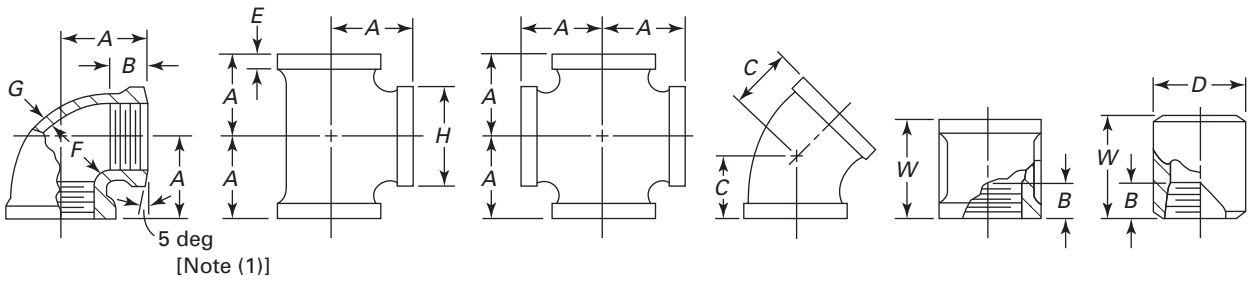


Table 1 Pressure–Temperature Ratings

Temperature, °C	Class 125, bar	Class 250, bar
−29 to 66	13.8	27.6
100	12.9	26.2
125	12.3	24.9
150	11.3	23.0
175	10.4	20.8
200	8.9	17.8

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

Table 2 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*	Minimum Length of Thread, *B* [Note (2)]	Center-to-End, 45-deg Elbows, *C*	Wrought Coupling Diameter, *D* [Note (3)]	Minimum Band Length, *E*	Inside Diameter of Cast Fitting, *F*		Metal Thickness, *G* [Note (4)]	Minimum Band Diameter, *H*	End-to-End Straight Coupling, *W*	
						Min.	Max.			Cast	Wrought
1/8	14	6	11	14	4	10	11	2.0	17	20	21
1/4	18	8	14	17	4	14	15	2.0	21	25	26
3/8	21	9	16	21	4	17	18	2.2	25	27	28
1/2	26	11	20	27	5	21	23	2.2	30	33	35
3/4	30	13	23	33	6	27	28	2.5	36	36	38
1	36	15	27	. . .	7	34	35	2.7	44	43	. . .
1 1/4	43	17	31	. . .	8	42	44	3.0	53	47	. . .
1 1/2	47	18	33	. . .	9	48	50	3.3	60	49	. . .
2	54	19	37	. . .	10	60	62	3.8	74	56	. . .
2 1/2 [Note (5)]	69	23	50	. . .	12	73	76	4.3	89	73	. . .
3	78	25	55	. . .	14	89	91	4.8	107	81	. . .
4	96	27	66	. . .	17	114	117	5.5	135	94	. . .

GENERAL NOTE: Dimensions are in millimeters.

NOTES:

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

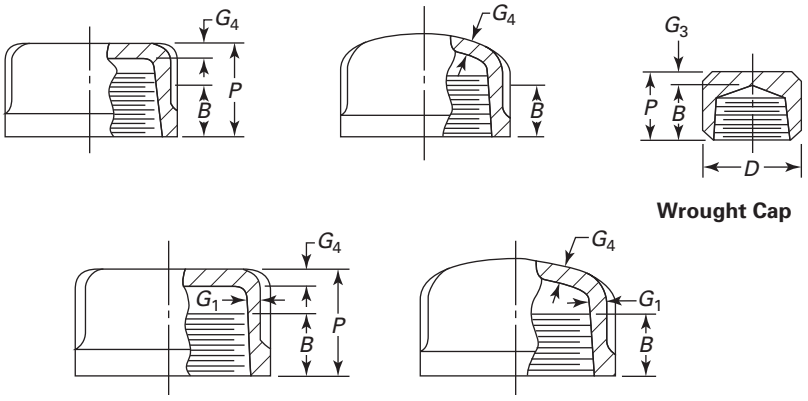
(2) Dimension *B* for wrought couplings includes minimum length of perfect thread. The length of useful thread (*B* plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by ASME B1.20.1. See section 7.

(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 3 Dimensions of Caps — Class 125



Wrought Cap

Cast Caps

NPS	Minimum Length of Thread [Note (1)]		Wrought Cap Diameter, *D* [Note (2)]	Metal Thickness [Note (3)]			Minimum Height of Cap, *P*	
	B	L_2		G_1	G_3	G_4	Cast	Wrought
1/8	6	6.703	14	2.0	2.8	2.3	12	12
1/4	8	10.206	18	2.0	3.3	2.5	15	15
3/8	9	10.358	21	2.3	3.3	2.8	16	17
1/2	11	13.556	27	2.3	3.6	3.0	19	21
3/4	13	13.861	33	2.5	3.8	3.3	21	24
1	15	17.343	...	2.8	...	3.8	25	...
1 1/4	17	17.953	...	3.0	...	4.3	28	...
1 1/2	18	18.377	...	3.3	...	4.8	29	...
2	19	19.215	...	3.8	...	5.6	34	...
2 1/2 [Note (4)]	23	28.892	...	4.3	...	6.3	43	...
3	25	30.480	...	4.8	...	7.4	46	...
4	27	33.020	...	5.6	...	9.1	53	...

GENERAL NOTES:

(a) Dimensions are in millimeters.

(b) For dimensions not given, see Table 2.

NOTES:

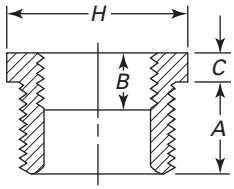
(1) Caps may be made without recess. Caps so made shall be of such height *P* that the length of perfect thread shall be no less than *B*, and the length of useful thread (*B* plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required 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.

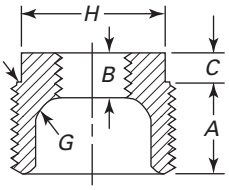
(3) For metal thickness tolerance, see para. 11.2.

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

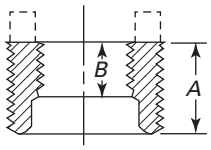
Table 4 Dimensions of Outside Head, Inside Head, and Face Bushings — Class 250



Outside Head



Inside Head



Face [Note (1)]

NPS	Minimum Length of External Thread, *A*	Minimum Length of Internal Thread, *B*	Minimum Height of Head, *C*	Minimum Width of Head, *H* [Note (2)]		Metal Thickness, *G* [Note (3)]
				Outside	Inside	
1/4 × 1/8	11	7 [Note (4)]	4	16 [Note (5)]	...	...
3/8 × 1/4	12	10 [Note (4)]	4	17 [Note (5)]	...	...
3/8 × 1/8	12	6	4	17 [Note (5)]	...	...
1/2 × 3/8	14	10 [Note (4)]	5	22 [Note (5)]	...	...
1/2 × 1/4	14	8	5	22 [Note (5)]	...	...
1/2 × 1/8	14	6	5	22 [Note (5)]	...	...
3/4 × 1/2	16	13 [Note (4)]	6	29 [Note (5)]	...	...
3/4 × 3/8	16	9	6	29 [Note (5)]	...	...
3/4 × 1/4	16	8	6	29 [Note (5)]	...	...
1 × 3/4	19	13	6	36 [Note (5)]	...	...
1 × 1/2	19	11	6	36 [Note (5)]	...	...
1 × 3/8	19	9	8	...	28	...
1 × 1/4	19	8	8	...	28	...
1 1/4 × 1	20	15	7	45	...	...
1 1/4 × 3/4	20	13	7	45	...	...
1 1/4 × 1/2	20	11	9	...	34	4.7
1 1/4 × 3/8	20	9	9	...	28	4.7
1 1/2 × 1 1/4	21	18 [Note (4)]	8	51	...	...
1 1/2 × 1	21	15	8	51	...	...
1 1/2 × 3/4	21	13	9	...	41	5.1
1 1/2 × 1/2	21	11	9	...	34	5.1
2 × 1 1/2	22	18	9	63	...	...
2 × 1 1/4	22	17	9	63	...	...
2 × 1	22	15	10	...	50	5.6
2 × 3/4	22	13	10	...	41	5.6
2 × 1/2	22	11	10	...	34	5.6
2 1/2 × 2	27	19	9	76	...	...
2 1/2 × 1 1/2	27	18	11	68	...	...
2 1/2 × 1 1/4	27	17	11	...	61	6.1
2 1/2 × 1	27	15	11	...	50	6.1
3 × 2 1/2	29	23	10	98	...	...
3 × 2	29	19	12	83	...	...
3 × 1 1/2	29	18	12	...	68	6.6
3 × 1 1/4	29	17	12	...	61	6.6

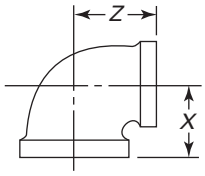
Table 4 Dimensions of Outside Head, Inside Head, and Face Bushings — Class 250 (Cont'd)

NPS	Minimum Length of External Thread, *A*	Minimum Length of Internal Thread, *B*	Minimum Height of Head, *C*	Minimum Width of Head, *H* [Note (2)]		Metal Thickness, *G* [Note (3)]
				Outside	Inside	
4 × 3	31	25	13	117	...	...
4 × 2½	31	23	15	...	98	7.9
4 × 2	31	19	15	...	83	7.9
4 × 1½	31	18	15	...	68	7.9

GENERAL NOTES:
(a) Dimensions are in millimeters.
(b) For pressure class recommendations, see para. 3.3.
(c) 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 bushing.
(5) Bushings in these sizes may be made from regular hexagon or octagon bar stock sizes.

Table 5 Dimensions of 90-deg Elbows (Reducing Sizes) — Class 125



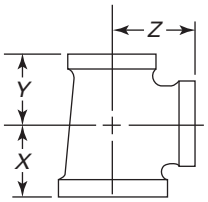
90-deg Elbow, Reducing

NPS	Center-to-End		NPS	Center-to-End	
	X	*Z*		*X*	*Z*
¼ × ⅛	17	15	1¼ × ¾	35	38
⅜ × ¼	19	20	1½ × 1¼	44	46
½ × ⅜	24	23	1½ × 1	39	44
¾ × ½	27	28	2 × 1½	48	53
1 × ¾	33	33	2½ × 2 [Note (1)]	61	66
1 × ½	30	31	3 × 2½	72	76
1¼ × 1	39	41	4 × 3	84	91

GENERAL NOTES:
(a) Dimensions are in millimeters.
(b) See para. 10(b) for requirements concerning patterns for reducing fittings.
(c) For dimensions not given, see Table 2.

NOTE:
(1) The dimensions for NPS 2½ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

Table 6 Dimensions of Tees (Reducing Sizes) — Class 125



Tee, Reducing

NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/4 × 1/4 × 1/8	17	17	15	1 1/4 × 1 × 3/4	35	33	38
3/8 × 3/8 × 1/4	19	19	20	1 1/4 × 3/4 × 1 1/4	43	38	43
3/8 × 1/4 × 3/8	21	20	21	1 1/4 × 1/2 × 1 1/4	43	36	43
3/8 × 1/4 × 1/4	19	18	20	1 × 1 × 1 1/4	41	41	39
1/2 × 1/2 × 3/8	24	24	23	1 1/2 × 1 1/2 × 1 1/4	44	44	46
1/2 × 1/2 × 1/4	22	22	22	1 1/2 × 1 1/2 × 1	39	39	44
1/2 × 3/8 × 1/2	26	23	26	1 1/2 × 1 1/2 × 3/4	36	36	41
1/2 × 3/8 × 3/8	24	21	23	1 1/2 × 1 1/2 × 1/2	34	34	39
3/8 × 3/8 × 1/2	23	23	24	1 1/2 × 1 1/4 × 1 1/2	47	46	47
3/4 × 3/4 × 1/2	27	27	28	1 1/2 × 1 1/4 × 1 1/4	44	43	46
3/4 × 3/4 × 3/8	25	25	25	1 1/2 × 1 1/4 × 1	39	39	44
3/4 × 1/2 × 3/4	30	28	30	1 1/2 × 3/4 × 1 1/2	47	41	47
3/4 × 1/2 × 1/2	27	26	28	1 1/4 × 1 1/4 × 1 1/2	46	46	44
1/2 × 1/2 × 3/4	28	28	27	1 × 1 × 1 1/2	44	44	39
1 × 1 × 3/4	33	33	33	2 × 2 × 1 1/2	48	48	53
1 × 1 × 1/2	30	30	31	2 × 2 × 1 1/4	45	45	52
1 × 1 × 3/8	28	28	29	2 × 2 × 1	40	40	50
1 × 3/4 × 1	36	33	36	2 × 2 × 3/4	37	37	47
1 × 3/4 × 3/4	33	30	33	2 × 1 1/2 × 2	54	53	54
1 × 3/4 × 1/2	30	27	31	2 × 1 1/2 × 1 1/2	48	47	53
1 × 1/2 × 1	36	31	36	1 1/2 × 1 1/2 × 2	53	53	48
1 × 1/2 × 3/4	33	28	33	2 1/2 × 2 1/2 × 2 [Note (1)]	61	61	66
3/4 × 3/4 × 1	33	33	33	2 1/2 × 2 × 2	61	57	66
1 1/4 × 1 1/4 × 1	39	39	41	2 × 2 × 2 1/2	66	66	61
1 1/4 × 1 1/4 × 3/4	35	35	38	3 × 3 × 2 1/2	72	72	76
1 1/4 × 1 1/4 × 1/2	33	33	36	3 × 3 × 2	64	64	73
1 1/4 × 1 × 1 1/4	43	41	43	4 × 4 × 3	84	84	91
1 1/4 × 1 × 1	39	36	41	4 × 4 × 2	70	70	87

GENERAL NOTES:

(a) Dimensions are in millimeters.

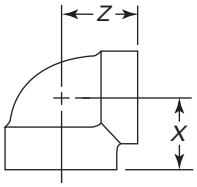
(b) See para. 10(b) for requirements concerning patterns for reducing fittings.

(c) For dimensions not given, see Table 2.

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 7 Dimensions of 90-deg Elbows (Reducing Sizes) — Class 250



90-deg Elbow, Reducing

NPS	Center-to-End	
	X	*Z*
1/2 × 3/8	26	26
3/4 × 1/2	30	31
1 × 3/4	35	37
1 × 1/2	32	35
1 1/4 × 1	40	42
1 1/4 × 3/4	37	41
1 1/2 × 1 1/4	46	48
1 1/2 × 1	42	46
2 × 1 1/2	51	55
2 × 1 1/4	48	53
2 1/2 × 2	61	66
3 × 2 1/2	72	76
3 × 2	64	73
4 × 3	89	91

GENERAL NOTES:

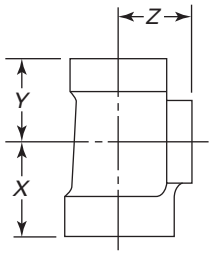
(a) Dimensions are in millimeters.

(b) For dimensions not given, see Table 12.

(c) All dimensions given in Table 7 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.

(d) See para. 10(b) for requirements concerning patterns for reducing fittings.

Table 8 Dimensions of Tees (Reducing Sizes) — Class 250



Tee, Reducing

NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/2 × 1/2 × 3/8	26	26	26	1 1/2 × 1 1/2 × 1	42	42	46
3/4 × 3/4 × 1/2	30	30	31	1 1/2 × 1 1/2 × 3/4	39	39	44
3/4 × 3/4 × 3/8	28	28	29	1 1/2 × 1 1/2 × 1/2	36	36	42
3/4 × 1/2 × 3/4	33	31	33	1 1/2 × 1 1/4 × 1 1/4	46	44	48
3/4 × 1/2 × 1/2	30	28	31	1 1/2 × 1 1/4 × 1	42	40	46
1/2 × 1/2 × 3/4	31	31	30	1 1/2 × 1 × 1 1/2	49	46	49
1 × 1 × 3/4	35	35	37	1 1/4 × 1 1/4 × 1 1/2	48	48	46
1 × 1 × 1/2	32	32	34	2 × 2 × 1 1/2	51	51	55
1 × 3/4 × 1	38	37	38	2 × 2 × 1 1/4	48	48	53
1 × 3/4 × 3/4	34	33	37	2 × 2 × 1	44	44	51
3/4 × 3/4 × 1	37	37	34	2 × 2 × 3/4	41	41	50
1 1/4 × 1 1/4 × 1	40	40	42	2 × 2 × 1/2	38	38	48
1 1/4 × 1 1/4 × 3/4	37	37	41	2 1/2 × 2 1/2 × 2	61	61	66
1 1/4 × 1 1/4 × 1/2	34	34	39	3 × 3 × 2	64	64	73
1 1/4 × 1 × 1 1/4	44	42	44	3 × 2 1/2 × 3	78	76	78
1 1/4 × 1 × 1	40	38	42	3 × 2 × 3	78	73	78
1 1/4 × 3/4 × 1 1/4	44	41	44	4 × 4 × 3	84	84	91
1 × 1 × 1 1/4	42	42	40	4 × 4 × 2	70	70	87
1 1/2 × 1 1/2 × 1 1/4	46	46	48	4 × 3 × 4	96	91	96

GENERAL NOTES:

(a) Dimensions are in millimeters.

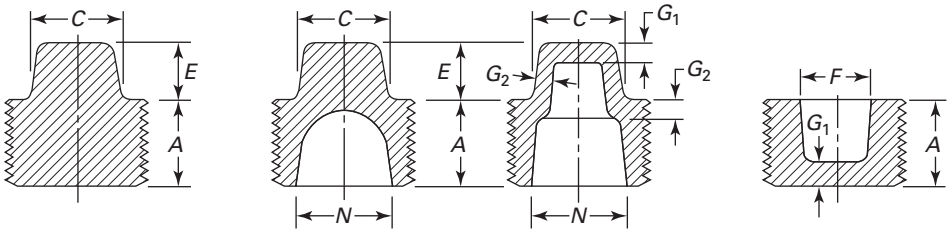
(b) For dimensions not given, see Table 12.

(c) All dimensions given in Table 8 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.

(d) See para. 10(b) for requirements concerning patterns for reducing fittings.

(13)

Table 9 Dimensions of Square Head and Square Socket Plugs



Solid Pattern | Cored Patterns | Countersunk Pattern

NPS	Minimum Thread Length, *A*	Nominal Width Across Flats, *C* [Note (1)]	Minimum Height of Plug Square, *E*	Metal Thickness [Note (2)]		Maximum Inside Diameter of Plug, *N*	Nominal Size of Square Socket, *F* [Note (3)]
				G_1	G_2		
1/8	7	7.1	6	...	...	...	...
1/4	10	9.5	7	...	...	...	...
3/8	10	11.1	8	...	...	...	...
1/2	14	14.3	10	2.3	3.0	13	9.5
3/4	14	15.8	11	2.5	3.3	19	12.7
1	18	20.6	13	2.8	3.6	24	12.7
1 1/4	18	23.8	14	3.0	3.8	32	19.1
1 1/2	19	28.5	16	3.3	4.1	37	19.1
2	19	33.3	17	3.8	4.3	49	22.2
2 1/2	27	38.1	19	4.3	4.6	59	28.6
3	29	42.8	20	4.8	4.8	74	34.9
4 [Note (4)]	31	57.1	23	5.6	5.6	97	50.8

GENERAL NOTES:

(a) Dimensions are in millimeters.

(b) For pressure class recommendations, see para. 3.3.

NOTES:

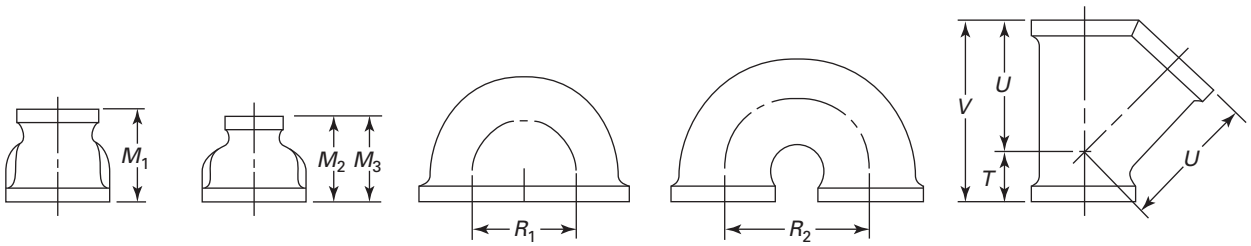
(1) These dimensions for *C* are the nominal size of wrench as given in Table 1 of ASME B18.2.1. Square head plugs are designed to fit these wrenches. Plug squares may have opposite sides tapered a maximum of 4 deg total.

(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 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			Return Bends		45-deg Y Branch		
	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	...	...	...	...	...	...	...
3/8	26	23	...	...	...	13	32	45
1/2	30	29	...	25	38	16	40	56
3/4	35	31	31	32	51	18	48	66
1	40	38	...	38	64	22	59	81
1 1/4	45	42	...	...	76	26	72	93
1 1/2	48	45	45	...	89	28	80	108
2	52	52	52	...	102	31	96	127
2 1/2 [Note (2)]	83	...	...	...	...	...	...	...
3	94	94	...	...	...	...	...	...
4	111	...	...	...	...	...	...	...

GENERAL NOTES:

(a) Dimensions are in millimeters.

(b) See para. 10(b) for requirements concerning patterns for reducing fittings.

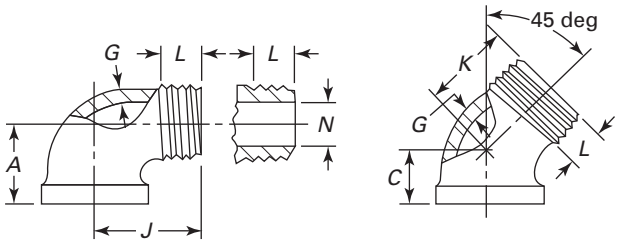
(c) For dimensions not given, see Table 2.

NOTES:

(1) The reduced sizes refer to the indicated nominal sizes listed in the first column, except that dimension 22 mm 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 11 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*	Center-to-Female End, 45-deg Elbows, *C*	Metal Thickness, *G* [Note (1)]	Center-to-Male End, 90-deg Elbows, *J*	Center-to-Male End, 45-deg Elbows, *K*	Minimum Length of Thread Male End, *L*	Maximum Port Diameter Male End, *N*
1/8	14	11	2.0	23	20	7	6
1/4	18	14	2.0	28	22	10	7
3/8	21	16	2.3	31	23	10	10
1/2	26	20	2.3	38	27	14	13
3/4	30	23	2.5	42	31	14	18
1	36	27	2.8	50	36	18	24
1 1/4	43	31	3.0	57	42	18	32
1 1/2	47	33	3.3	62	46	19	37
2	54	37	3.8	73	54	19	49

GENERAL NOTES:

(a) Dimensions are in millimeters.

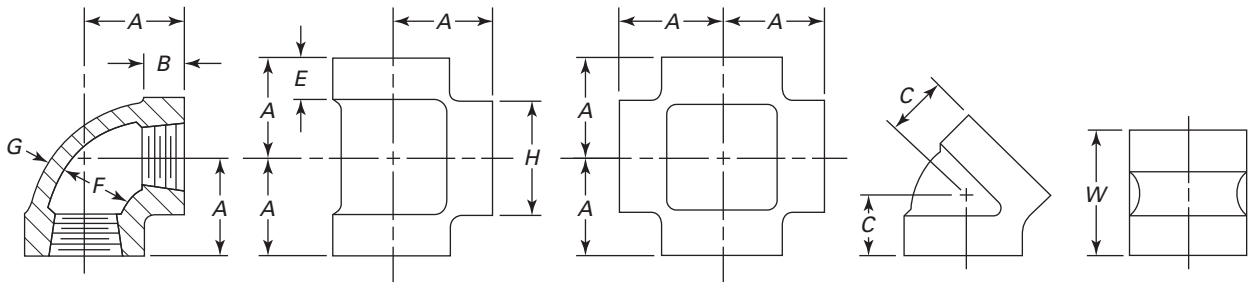
(b) For dimensions not given, see Table 2.

(c) 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 12 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* [Note (1)]	Minimum Length of Thread, *B*	Center-to-End 45-deg Elbows, *C* [Note (1)]	Minimum Width of Band, *E*	Inside Diameter of Fitting, *F*		Metal Thickness, *G* [Note (2)]	Minimum Outside Diameter of Band, *H*	End-to-End Coupling, *W*
					Min.	Max.			
1/4	20	8	19	10	14	15	2.8	24	27
3/8	24	9	20	11	17	18	3.0	28	29
1/2	28	11	22	13	21	23	3.3	34	34
3/4	33	13	25	14	27	28	4.1	41	39
1	38	15	28	16	34	35	4.3	50	42
1 1/4	44	17	33	18	42	44	4.8	61	49
1 1/2	49	18	36	19	48	50	5.1	68	55
2	57	19	43	21	60	62	5.6	83	64
2 1/2	69	23	50	24	73	76	6.1	98	73
3 [Note (3)]	78	25	55	25	89	91	6.6	117	81
4 [Note (3)]	96	27	66	28	114	117	7.9	147	94

GENERAL NOTE: Dimensions are in millimeters.

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 13 Inspection Tolerances, Center-to-End and Center-to-Center

NPS	Tolerance, mm
1/8	±1.0
1/4	±1.0
3/8	±1.5
1/2, 3/4	±1.5
1, 1 1/4	±2.0
1 1/2, 2	±2.0
2 1/2, 3	±2.5
4	±3.0

MANDATORY APPENDIX I
RATINGS AND DIMENSIONS OF FITTINGS IN U.S. CUSTOMARY UNITS

The SI (metric) dimensional requirements specified in the main body of this Standard are derived from the conversion of the U.S. Customary values that appear in this Mandatory Appendix (see Tables I-1 through I-13). The metric values were rounded utilizing a method that accommodates both functionality and safety considerations in the end product.

The SI values were rounded to the nearest whole millimeter in cases where the functionality or safety characteristics of the fittings were not compromised. This was done to facilitate confirmation of compliance to these dimensional requirements through the use of standard measuring tools and instruments. In some cases, tabular information was rounded specifically to assist the logical progression of requirements for specified dimensions and associated tolerances.

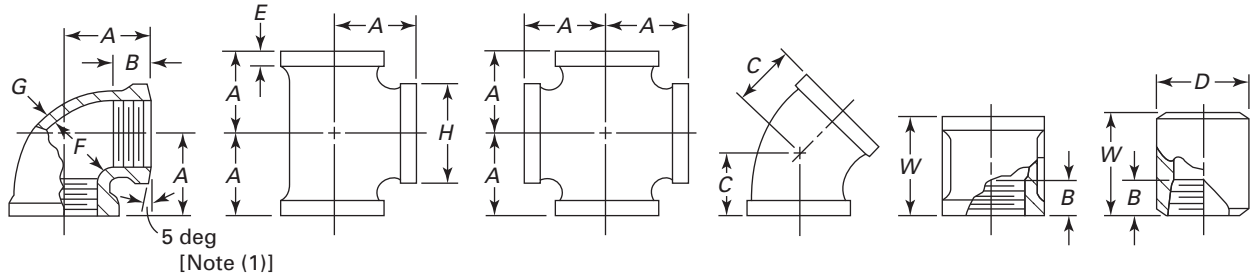
Where the variation between minimum and maximum dimensions would be made greater through such conversion practices, the rounding method was applied with greater precision.

It is the intent of this Standard that the two systems, U.S. Customary or SI specifications, be used independently of the other. Attempts to apply these values otherwise could result in nonconformance with this Standard.

Table I-1 Pressure–Temperature Ratings

Temperature, °F	Class 125, psi	Class 250, psi
−20 to 150	200	400
200	190	385
250	180	365
300	165	335
350	150	300
400	125	250

Table I-2 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*	Minimum Length of Thread, *B* [Note (2)]	Center-to-End, 45-deg Elbows, *C*	Wrought Coupling Diameter, *D* [Note (3)]	Minimum Band Length, *E*	Inside Diameter of Cast Fitting, *F*		Metal Thickness, *G* [Note (4)]	Minimum Band Diameter, *H*	End-to-End Straight Coupling, *W*	
						Min.	Max.			Cast	Wrought
1/8	0.54	0.25	0.42	0.56	0.14	0.41	0.44	0.08	0.67	0.80	0.83
1/4	0.71	0.32	0.56	0.69	0.16	0.54	0.58	0.08	0.81	0.97	1.03
3/8	0.82	0.36	0.63	0.84	0.17	0.68	0.72	0.09	1.00	1.05	1.11
1/2	1.01	0.43	0.78	1.06	0.19	0.84	0.90	0.09	1.17	1.29	1.36
3/4	1.18	0.50	0.89	1.31	0.23	1.05	1.11	0.10	1.42	1.43	1.50
1	1.43	0.58	1.06	. . .	0.27	1.32	1.39	0.11	1.72	1.68	. . .
1 1/4	1.69	0.67	1.22	. . .	0.31	1.66	1.73	0.12	2.10	1.86	. . .
1 1/2	1.84	0.70	1.30	. . .	0.34	1.90	1.97	0.13	2.38	1.92	. . .
2	2.12	0.75	1.45	. . .	0.41	2.38	2.45	0.15	2.92	2.20	. . .
2 1/2 [Note (5)]	2.70	0.92	1.95	. . .	0.48	2.88	2.98	0.17	3.49	2.88	. . .
3	3.08	0.98	2.17	. . .	0.55	3.50	3.60	0.19	4.20	3.18	. . .
4	3.79	1.08	2.61	. . .	0.66	4.50	4.60	0.22	5.31	3.69	. . .

GENERAL NOTE: Dimensions are in inches.

NOTES:

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

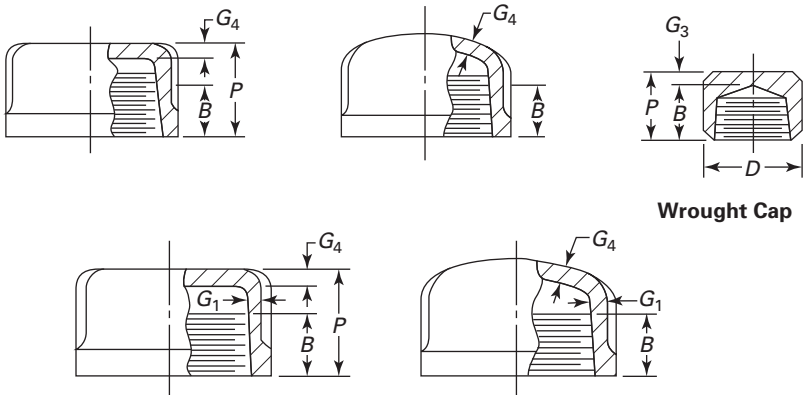
(2) Dimension *B* for wrought couplings includes minimum length of perfect thread. The length of useful thread (*B* plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by ASME B1.20.1. See section 7.

(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 I-3 Dimensions of Caps — Class 125



Wrought Cap

Cast Caps

NPS	Minimum Length of Thread [Note (1)]		Wrought Cap Diameter, *D* [Note (2)]	Metal Thickness [Note (3)]			Minimum Height of Cap, *P*	
	B	L_2		G_1	G_3	G_4	Cast	Wrought
1/8	0.25	0.2639	0.56	0.08	0.11	0.09	0.49	0.49
1/4	0.32	0.4018	0.69	0.08	0.13	0.10	0.59	0.59
3/8	0.36	0.4078	0.84	0.09	0.13	0.11	0.64	0.68
1/2	0.43	0.5337	1.06	0.09	0.14	0.12	0.76	0.84
3/4	0.50	0.5457	1.31	0.10	0.15	0.13	0.84	0.94
1	0.58	0.6828	...	0.11	...	0.15	0.99	...
1 1/4	0.67	0.7068	...	0.12	...	0.17	1.10	...
1 1/2	0.70	0.7235	...	0.13	...	0.19	1.15	...
2	0.75	0.7565	...	0.15	...	0.22	1.32	...
2 1/2 [Note (4)]	0.92	1.1375	...	0.17	...	0.25	1.70	...
3	0.98	1.2000	...	0.19	...	0.29	1.80	...
4	1.08	1.3000	...	0.22	...	0.36	2.08	...

GENERAL NOTES:

(a) Dimensions are in inches.

(b) For dimensions not given, see Table I-2.

NOTES:

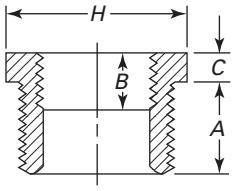
(1) Caps may be made without recess. Caps so made shall be of such height *P* that the length of perfect thread shall be no less than *B*, and the length of useful thread (*B* plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required 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.

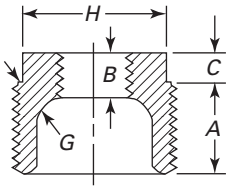
(3) For metal thickness tolerance, see para. 11.2.

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

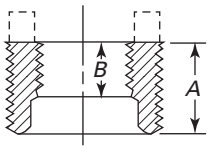
Table I-4 Dimensions of Outside Head, Inside Head, and Face Bushings — Class 250



Outside Head



Inside Head



Face [Note (1)]

NPS	Minimum Length of External Thread, *A*	Minimum Length of Internal Thread, *B*	Minimum Height of Head, *C*	Minimum Width of Head, *H* [Note (2)]		Metal Thickness, *G* [Note (3)]
				Outside	Inside	
1/4 × 1/8	0.44	0.26 [Note (4)]	0.14	0.64 [Note (5)]	...	...
3/8 × 1/4	0.48	0.40 [Note (4)]	0.16	0.68 [Note (5)]	...	...
3/8 × 1/8	0.48	0.25	0.16	0.68 [Note (5)]	...	...
1/2 × 3/8	0.56	0.41 [Note (4)]	0.19	0.87 [Note (5)]	...	...
1/2 × 1/4	0.56	0.32	0.19	0.87 [Note (5)]	...	...
1/2 × 1/8	0.56	0.25	0.19	0.87 [Note (5)]	...	...
3/4 × 1/2	0.63	0.53 [Note (4)]	0.22	1.15 [Note (5)]	...	...
3/4 × 3/8	0.63	0.36	0.22	1.15 [Note (5)]	...	...
3/4 × 1/4	0.63	0.32	0.22	1.15 [Note (5)]	...	...
1 × 3/4	0.75	0.50	0.25	1.42 [Note (5)]	...	...
1 × 1/2	0.75	0.43	0.25	1.42 [Note (5)]	...	...
1 × 3/8	0.75	0.36	0.30	...	1.12	...
1 × 1/4	0.75	0.32	0.30	...	1.12	...
1 1/4 × 1	0.80	0.58	0.28	1.76	...	...
1 1/4 × 3/4	0.80	0.50	0.28	1.76	...	...
1 1/4 × 1/2	0.80	0.43	0.34	...	1.34	0.185
1 1/4 × 3/8	0.80	0.36	0.34	...	1.12	0.185
1 1/2 × 1 1/4	0.83	0.71 [Note (4)]	0.31	2.00	...	...
1 1/2 × 1	0.83	0.58	0.31	2.00	...	...
1 1/2 × 3/4	0.83	0.50	0.37	...	1.63	0.200
1 1/2 × 1/2	0.83	0.43	0.37	...	1.34	0.200
2 × 1 1/2	0.88	0.70	0.34	2.48	...	...
2 × 1 1/4	0.88	0.67	0.34	2.48	...	...
2 × 1	0.88	0.58	0.41	...	1.95	0.220
2 × 3/4	0.88	0.50	0.41	...	1.63	0.220
2 × 1/2	0.88	0.43	0.41	...	1.34	0.220
2 1/2 × 2	1.07	0.75	0.37	2.98	...	...
2 1/2 × 1 1/2	1.07	0.70	0.44	2.68	...	...
2 1/2 × 1 1/4	1.07	0.67	0.44	...	2.39	0.240
2 1/2 × 1	1.07	0.58	0.44	...	1.95	0.240
3 × 2 1/2	1.13	0.92	0.40	3.86	...	...
3 × 2	1.13	0.75	0.48	3.28	...	...
3 × 1 1/2	1.13	0.70	0.48	...	2.68	0.260
3 × 1 1/4	1.13	0.67	0.48	...	2.39	0.260

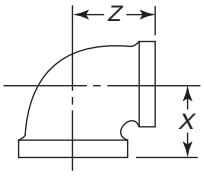
Table I-4 Dimensions of Outside Head, Inside Head, and Face Bushings — Class 250 (Cont'd)

NPS	Minimum Length of External Thread, *A*	Minimum Length of Internal Thread, *B*	Minimum Height of Head, *C*	Minimum Width of Head, *H* [Note (2)]		Metal Thickness, *G* [Note (3)]
				Outside	Inside	
4 × 3	1.22	0.98	0.50	4.62	. . .	. . .
4 × 2½	1.22	0.92	0.60	. . .	3.86	0.310
4 × 2	1.22	0.75	0.60	. . .	3.28	0.310
4 × 1½	1.22	0.70	0.60	. . .	2.68	0.310

GENERAL NOTES:
(a) Dimensions are in inches.
(b) For pressure class recommendations, see para. 3.3.
(c) 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 bushing.
(5) Bushings in these sizes may be made from regular hexagon or octagon bar stock sizes.

Table I-5 Dimensions of 90-deg Elbows (Reducing Sizes) — Class 125



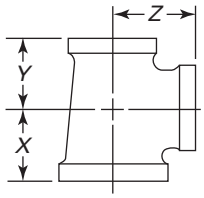
90-deg Elbow, Reducing

NPS	Center-to-End		NPS	Center-to-End	
	X	*Z*		*X*	*Z*
¼ × ⅛	0.65	0.60	1¼ × ¾	1.39	1.48
⅜ × ¼	0.75	0.78	1½ × 1¼	1.72	1.81
½ × ⅜	0.93	0.90	1½ × 1	1.55	1.72
¾ × ½	1.08	1.11	2 × 1½	1.89	2.07
1 × ¾	1.30	1.31	2½ × 2 [Note (1)]	2.39	2.60
1 × ½	1.20	1.24	3 × 2½	2.83	2.99
1¼ × 1	1.52	1.60	4 × 3	3.30	3.60

GENERAL NOTES:
(a) Dimensions are in inches.
(b) See para. 10(b) for requirements concerning patterns for reducing fittings.
(c) For dimensions not given, see Table I-2.

NOTE:
(1) The dimensions for NPS 2½ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

Table I-6 Dimensions of Tees (Reducing Sizes) — Class 125



Tee, Reducing

NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/4 × 1/4 × 1/8	0.65	0.65	0.60	1 1/4 × 1 × 3/4	1.39	1.30	1.48
3/8 × 3/8 × 1/4	0.75	0.75	0.78	1 1/4 × 3/4 × 1 1/4	1.69	1.48	1.69
3/8 × 1/4 × 3/8	0.82	0.78	0.82	1 1/4 × 1/2 × 1 1/4	1.69	1.40	1.69
3/8 × 1/4 × 1/4	0.75	0.71	0.78	1 × 1 × 1 1/4	1.60	1.60	1.52
1/2 × 1/2 × 3/8	0.93	0.93	0.90	1 1/2 × 1 1/2 × 1 1/4	1.72	1.72	1.81
1/2 × 1/2 × 1/4	0.87	0.87	0.87	1 1/2 × 1 1/2 × 1	1.55	1.55	1.72
1/2 × 3/8 × 1/2	1.01	0.90	1.01	1 1/2 × 1 1/2 × 3/4	1.42	1.42	1.60
1/2 × 3/8 × 3/8	0.93	0.82	0.90	1 1/2 × 1 1/2 × 1/2	1.32	1.32	1.53
3/8 × 3/8 × 1/2	0.90	0.90	0.93	1 1/2 × 1 1/4 × 1 1/2	1.84	1.81	1.84
3/4 × 3/4 × 1/2	1.08	1.08	1.11	1 1/2 × 1 1/4 × 1 1/4	1.72	1.69	1.81
3/4 × 3/4 × 3/8	1.00	1.00	1.00	1 1/2 × 1 1/4 × 1	1.55	1.52	1.72
3/4 × 1/2 × 3/4	1.18	1.11	1.18	1 1/2 × 3/4 × 1 1/2	1.84	1.60	1.84
3/4 × 1/2 × 1/2	1.08	1.01	1.11	1 1/4 × 1 1/4 × 1 1/2	1.81	1.81	1.72
1/2 × 1/2 × 3/4	1.11	1.11	1.08	1 × 1 × 1 1/2	1.72	1.72	1.55
1 × 1 × 3/4	1.30	1.30	1.31	2 × 2 × 1 1/2	1.89	1.89	2.07
1 × 1 × 1/2	1.20	1.20	1.24	2 × 2 × 1 1/4	1.77	1.77	2.04
1 × 1 × 3/8	1.12	1.12	1.13	2 × 2 × 1	1.59	1.59	1.95
1 × 3/4 × 1	1.43	1.31	1.43	2 × 2 × 3/4	1.47	1.47	1.84
1 × 3/4 × 3/4	1.30	1.18	1.31	2 × 1 1/2 × 2	2.12	2.07	2.12
1 × 3/4 × 1/2	1.20	1.08	1.24	2 × 1 1/2 × 1 1/2	1.89	1.84	2.07
1 × 1/2 × 1	1.43	1.24	1.43	1 1/2 × 1 1/2 × 2	2.07	2.07	1.89
1 × 1/2 × 3/4	1.30	1.11	1.31	2 1/2 × 2 1/2 × 2 [Note (1)]	2.39	2.39	2.60
3/4 × 3/4 × 1	1.31	1.31	1.30	2 1/2 × 2 × 2	2.39	2.25	2.60
1 1/4 × 1 1/4 × 1	1.52	1.52	1.60	2 × 2 × 2 1/2	2.60	2.60	2.39
1 1/4 × 1 1/4 × 3/4	1.39	1.39	1.48	3 × 3 × 2 1/2	2.83	2.83	2.99
1 1/4 × 1 1/4 × 1/2	1.29	1.29	1.41	3 × 3 × 2	2.52	2.52	2.89
1 1/4 × 1 × 1 1/4	1.69	1.60	1.69	4 × 4 × 3	3.30	3.30	3.60
1 1/4 × 1 × 1	1.52	1.43	1.60	4 × 4 × 2	2.74	2.74	3.41

GENERAL NOTES:

(a) Dimensions are in inches.

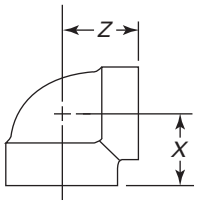
(b) See para. 10(b) for requirements concerning patterns for reducing fittings.

(c) For dimensions not given, see Table I-2.

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 I-7 Dimensions of 90-deg Elbows (Reducing Sizes) — Class 250



90-deg Elbow, Reducing

NPS	Center-to-End	
	X	*Z*
1/2 × 3/8	1.04	1.03
3/4 × 1/2	1.20	1.22
1 × 3/4	1.37	1.45
1 × 1/2	1.26	1.36
1 1/4 × 1	1.58	1.67
1 1/4 × 3/4	1.45	1.62
1 1/2 × 1 1/4	1.82	1.88
1 1/2 × 1	1.65	1.80
2 × 1 1/2	2.02	2.16
2 × 1 1/4	1.90	2.10
2 1/2 × 2	2.39	2.60
3 × 2 1/2	2.83	2.99
3 × 2	2.52	2.89
4 × 3	3.50	3.60

GENERAL NOTES:

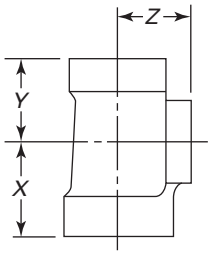
(a) Dimensions are in inches.

(b) For dimensions not given, see Table I-12.

(c) All dimensions given in Table I-7 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.

(d) See para. 10(b) for requirements concerning patterns for reducing fittings.

Table I-8 Dimensions of Tees (Reducing Sizes) — Class 250



Tee, Reducing

NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/2 × 1/2 × 3/8	1.04	1.04	1.03	1 1/2 × 1 1/2 × 1	1.65	1.65	1.80
3/4 × 3/4 × 1/2	1.20	1.20	1.22	1 1/2 × 1 1/2 × 3/4	1.52	1.52	1.75
3/4 × 3/4 × 3/8	1.12	1.12	1.13	1 1/2 × 1 1/2 × 1/2	1.41	1.41	1.66
3/4 × 1/2 × 3/4	1.31	1.22	1.31	1 1/2 × 1 1/4 × 1 1/4	1.82	1.75	1.88
3/4 × 1/2 × 1/2	1.20	1.12	1.22	1 1/2 × 1 1/4 × 1	1.65	1.58	1.80
1/2 × 1/2 × 3/4	1.22	1.22	1.20	1 1/2 × 1 × 1 1/2	1.94	1.80	1.94
1 × 1 × 3/4	1.37	1.37	1.45	1 1/4 × 1 1/4 × 1 1/2	1.88	1.88	1.82
1 × 1 × 1/2	1.26	1.26	1.36	2 × 2 × 1 1/2	2.02	2.02	2.16
1 × 3/4 × 1	1.50	1.45	1.50	2 × 2 × 1 1/4	1.90	1.90	2.10
1 × 3/4 × 3/4	1.37	1.31	1.45	2 × 2 × 1	1.73	1.73	2.02
3/4 × 3/4 × 1	1.45	1.45	1.37	2 × 2 × 3/4	1.60	1.60	1.97
1 1/4 × 1 1/4 × 1	1.58	1.58	1.67	2 × 2 × 1/2	1.49	1.49	1.88
1 1/4 × 1 1/4 × 3/4	1.45	1.45	1.62	2 1/2 × 2 1/2 × 2	2.39	2.39	2.60
1 1/4 × 1 1/4 × 1/2	1.34	1.34	1.53	3 × 3 × 2	2.52	2.52	2.89
1 1/4 × 1 × 1 1/4	1.75	1.67	1.75	3 × 2 1/2 × 3	3.08	2.99	3.08
1 1/4 × 1 × 1	1.58	1.50	1.67	3 × 2 × 3	3.08	2.89	3.08
1 1/4 × 3/4 × 1 1/4	1.75	1.62	1.75	4 × 4 × 3	3.30	3.30	3.60
1 × 1 × 1 1/4	1.67	1.67	1.58	4 × 4 × 2	2.74	2.74	3.41
1 1/2 × 1 1/2 × 1 1/4	1.82	1.82	1.88	4 × 3 × 4	3.79	3.60	3.79

GENERAL NOTES:

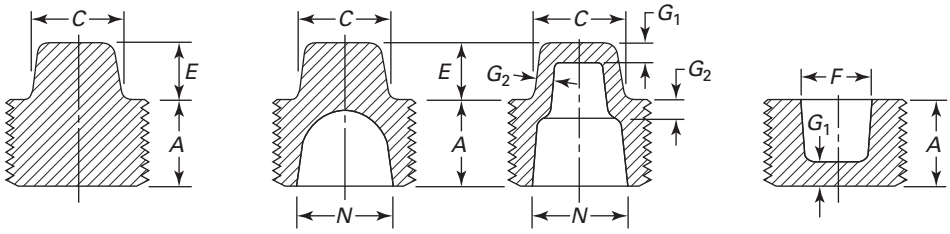
(a) Dimensions are in inches.

(b) For dimensions not given, see Table I-12.

(c) All dimensions given in Table I-8 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.

(d) See para. 10(b) for requirements concerning patterns for reducing fittings.

Table I-9 Dimensions of Square Head and Square Socket Plugs (13)



Solid Pattern **Cored Patterns** **Countersunk Pattern**

NPS	Minimum Thread Length, *A*	Nominal Width Across Flats, *C* [Note (1)]	Minimum Height of Plug Square, *E*	Metal Thickness [Note (2)]		Maximum Inside Diameter of Plug, *N*	Nominal Size of Square Socket, *F* [Note (3)]
				G_1	G_2		
1/8	0.27	9/32	0.24	...	...	...	...
1/4	0.41	3/8	0.28	...	...	...	...
3/8	0.41	7/16	0.31	...	...	...	...
1/2	0.54	9/16	0.38	0.09	0.12	0.53	3/8
3/4	0.55	5/8	0.44	0.10	0.13	0.72	1/2
1	0.69	13/16	0.50	0.11	0.14	0.93	1/2
1 1/4	0.71	15/16	0.56	0.12	0.15	1.25	3/4
1 1/2	0.73	1 1/8	0.62	0.13	0.16	1.47	3/4
2	0.76	1 5/16	0.68	0.15	0.17	1.91	7/8
2 1/2	1.07	1 1/2	0.74	0.17	0.18	2.32	1 1/8
3	1.13	1 11/16	0.80	0.19	0.19	2.90	1 3/8
4 [Note (4)]	1.22	2 1/4	0.92	0.22	0.22	3.83	2

GENERAL NOTES:

(a) Dimensions are in inches.

(b) For pressure class recommendations, see para. 3.3.

NOTES:

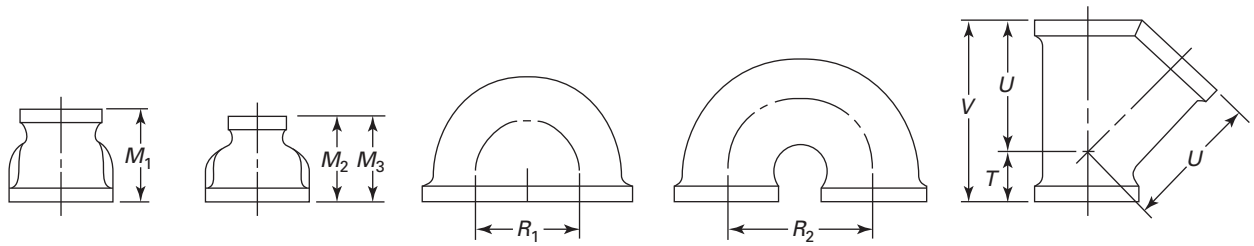
(1) These dimensions for *C* are the nominal size of wrench as given in Table 1 of ASME B18.2.1. Square head plugs are designed to fit these wrenches. Plug squares may have opposite sides tapered a maximum of 4 deg total.

(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 I-10 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

NPS	Reducers: End-to-End Reducing [Note (1)] One Size, M_1	Two Sizes, M_2	Three Sizes, M_3	Return Bends: Center-to-Center Closed Pattern, R_1	Open Pattern, R_2	45-deg Y Branch: Center-to-End Inlet, T	Center-to-End Outlet, U	End-to-End, V
1/4	0.88	...	...	...	...	...	...	...
3/8	1.01	0.92	...	...	...	0.50	1.28	1.78
1/2	1.17	1.13	...	1.00	1.50	0.61	1.58	2.19
3/4	1.36	1.24	1.24	1.25	2.00	0.72	1.90	2.62
1	1.56	1.49	...	1.50	2.50	0.85	2.33	3.18
1 1/4	1.77	1.65	...	...	3.00	1.02	2.83	3.85
1 1/2	1.89	1.80	1.80	...	3.50	1.10	3.14	4.24
2	2.06	2.03	2.03	...	4.00	1.24	3.76	5.00
2 1/2 [Note (2)]	3.25	...	...	...	...	...	...	...
3	3.69	3.69	...	...	...	...	...	...
4	4.38	...	...	...	...	...	...	...

GENERAL NOTES:

(a) Dimensions are in inches.

(b) See para. 10(b) for requirements concerning patterns for reducing fittings.

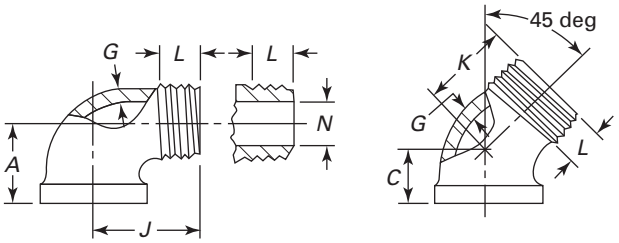
(c) For dimensions not given, see Table I-2.

NOTES:

(1) The reduced sizes refer to the indicated nominal sizes listed in the first column, except that dimension 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 I-11 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*	Center-to-Female End, 45-deg Elbows, C	Metal Thickness, *G* [Note (1)]	Center-to-Male End, 90-deg Elbows, *J*	Center-to-Male End, 45-deg Elbows, *K*	Minimum Length of Thread Male End, *L*	Maximum Port Diameter Male End, *N*
1/8	0.54	0.42	0.08	0.92	0.78	0.27	0.22
1/4	0.71	0.56	0.08	1.11	0.88	0.41	0.28
3/8	0.82	0.63	0.09	1.24	0.92	0.41	0.40
1/2	1.01	0.78	0.09	1.48	1.06	0.54	0.53
3/4	1.18	0.89	0.10	1.65	1.23	0.55	0.72
1	1.43	1.06	0.11	1.98	1.40	0.69	0.93
1 1/4	1.69	1.22	0.12	2.24	1.64	0.71	1.25
1 1/2	1.84	1.30	0.13	2.46	1.80	0.73	1.47
2	2.12	1.45	0.15	2.88	2.14	0.76	1.91

GENERAL NOTES:

(a) Dimensions are in inches.

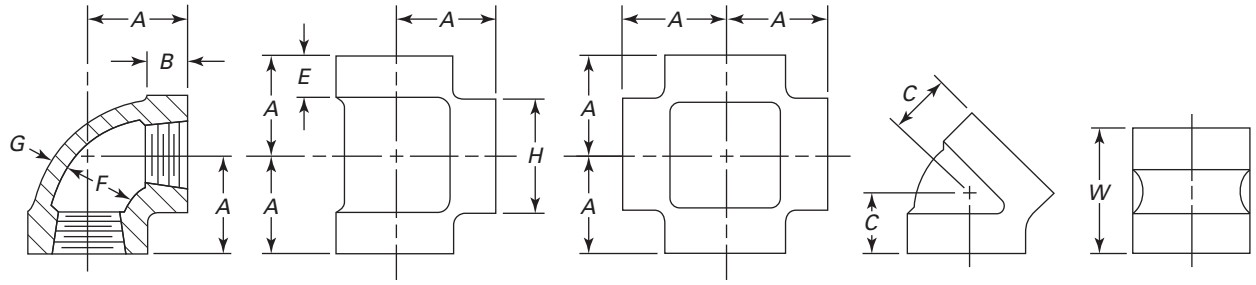
(b) For dimensions not given, see Table I-2.

(c) 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 I-12 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* [Note (1)]	Minimum Length of Thread, *B*	Center-to-End, 45-deg Elbows, *C* [Note (1)]	Minimum Width of Band, *E*	Inside Diameter of Fitting, *F*		Metal Thickness, *G* [Note (2)]	Minimum Outside Diameter of Band, *H*	End-to-End Coupling, *W*
					Min.	Max.			
1/4	0.81	0.32	0.73	0.38	0.54	0.58	0.11	0.93	1.06
3/8	0.95	0.36	0.80	0.44	0.68	0.72	0.12	1.12	1.16
1/2	1.12	0.43	0.88	0.50	0.84	0.90	0.13	1.34	1.34
3/4	1.31	0.50	0.98	0.56	1.05	1.11	0.16	1.63	1.52
1	1.50	0.58	1.12	0.62	1.32	1.38	0.17	1.95	1.67
1 1/4	1.75	0.67	1.29	0.69	1.66	1.73	0.19	2.39	1.93
1 1/2	1.94	0.70	1.43	0.75	1.90	1.97	0.20	2.68	2.15
2	2.25	0.75	1.68	0.84	2.38	2.45	0.22	3.28	2.53
2 1/2	2.70	0.92	1.95	0.94	2.88	2.98	0.24	3.86	2.88
3 [Note (3)]	3.08	0.98	2.17	1.00	3.50	3.60	0.26	4.62	3.18
4 [Note (3)]	3.79	1.08	2.61	1.12	4.50	4.60	0.31	5.79	3.69

GENERAL NOTE: Dimensions are in inches.

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 I-13 Inspection Tolerances, Center-to-End and Center-to-Center

NPS	Tolerance, in.
1/8	±0.03
1/4	±0.04
3/8	±0.05
1/2, 3/4	±0.06
1, 1 1/4	±0.07
1 1/2, 2	±0.08
2 1/2, 3	±0.10
4	±0.12

MANDATORY APPENDIX II
REFERENCES

(13)

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)

ASME B16.3, Malleable Iron Threaded Fittings, Classes 150 and 300

ASME B16.4, Gray Iron Threaded Fittings, Classes 125 and 250

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)

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ASTM B16/B16M-10, Specification for Free Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines

ASTM B62-09, Specification for Composition Bronze or Ounce Metal Castings

ASTM B140/B140M-07, Specification for Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar, and Shapes

ASTM B584-09a, Standard Specification for Copper Alloy Sand Castings for General Applications

ASTM E29-08, Standard Practice for Using Significant Digits in Test Data to Determine Conformance With Specifications

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: 2005, Quality management systems — Fundamentals and vocabulary[1]

ISO 9001: 2008/Cor 1:2009, Quality management systems — Requirements[1]

ISO 9004: 2009, Managing for the sustained success of an organization — A quality management approach[1]

Publisher: International Organization for Standardization (ISO), Central Secretariat, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Genève 20, Switzerland/Suisse (www.iso.org)

[1] May also be obtained from American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036.

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 standard of the series is listed under References in Mandatory Appendix II.

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

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