

ASME B16.15-2006
(Revision of ANSI/ASME B16.15-1985)

Cast Copper Alloy Threaded Fittings

Classes 125 and 250

AN AMERICAN NATIONAL STANDARD



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Mechanical Engineers**

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Three Park Avenue • New York, NY 10016

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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 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-year 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, nominal size (DN) according to ISO 6078 was addressed as SI values were positioned in the main text; U.S. Customary values were positioned in Appendix I. The reference for gaging internal fitting threads was made clearer by using the wording from ANSI/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 new designation of ASME B16.15-2006.

All requests for interpretations or suggestions for revisions should be sent to the Secretary B16, The American Society of Mechanical Engineers, Three Park Avenue, New York, N.Y. 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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J. K. Schultz, Conine Manufacturing Co., Inc.

CORRESPONDENCE WITH THE B16 COMMITTEE

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
Three Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via e-mail 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.

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, which 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.

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

- (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.

1.1 Convention

For the purpose of determining conformance with this Standard, the convention for fixing significant digits where limits, maximum or minimum values, are specified shall be rounded as defined in ASTM E 29. This requires that an observed or calculated value shall 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.

1.2 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 the standard. Within the text the Customary units are shown in parentheses or in separate tables in Mandatory Appendix I. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 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.

1.4 Quality Systems

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

1.5 Denotation

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

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

1.6 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.

1.7 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.

1.8 Service Conditions

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

2 PRESSURE–TEMPERATURE RATINGS

2.1 General

Pressure–temperature ratings for these pipe fittings are shown in Tables 1 and I-1. All pressures are gage.

2.2 Rating

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

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)

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.

2.3 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.

3 SIZE**3.1 Nominal Pipe Size**

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

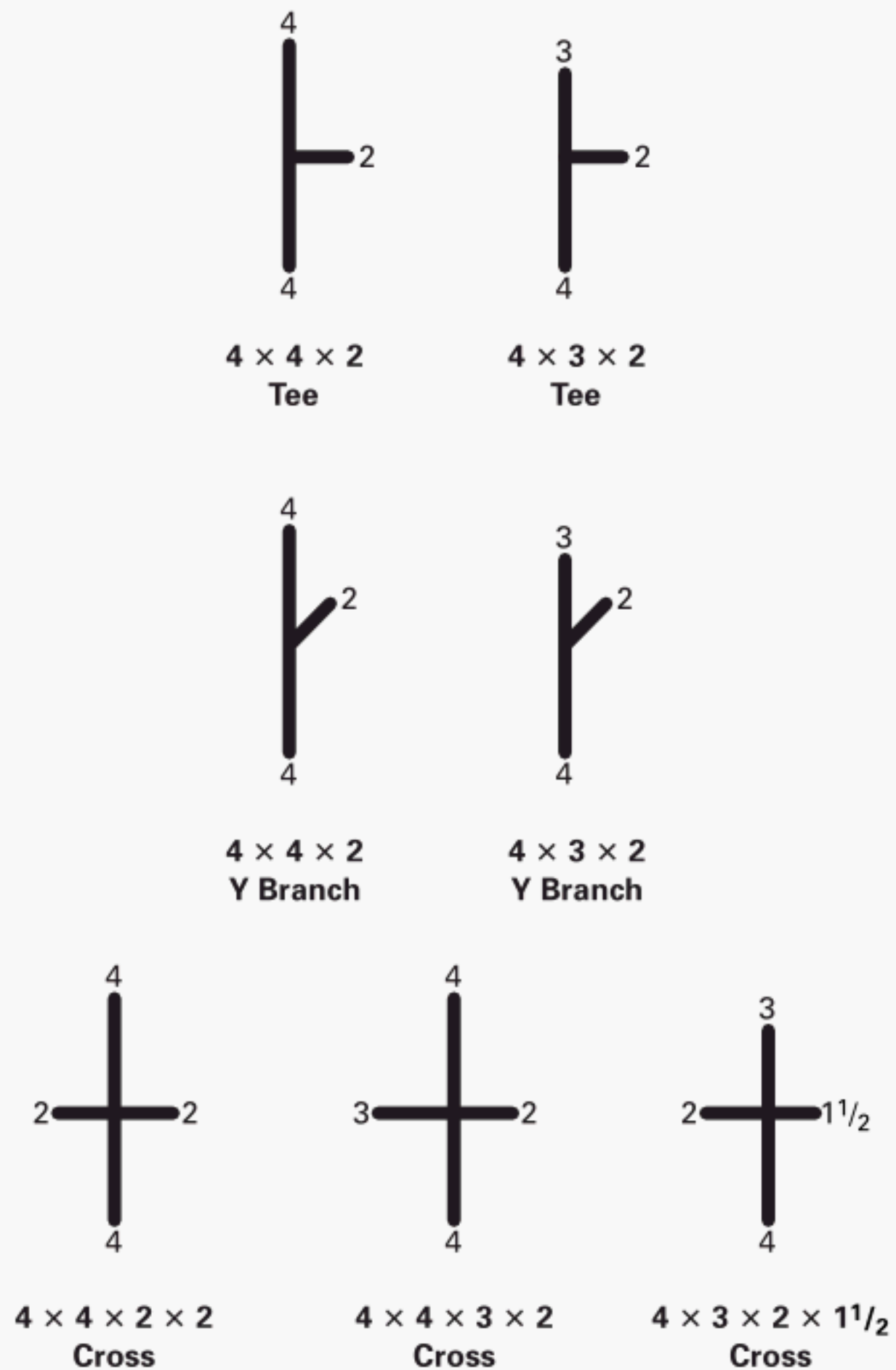
3.2 Reducing Sizes

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.

4 MARKING**4.1 Class 125 Fitting**

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

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.

Fig. 1 Identification of Reducing Fittings**4.2 Class 250 Fitting**

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

4.3 Exceptions

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

5 MATERIAL

(a) Castings shall be produced to meet the requirements of ASTM B 62, Alloy C83600 or the chemical and tensile requirements of ASTM B 584, Alloys C83800 or C84400; and in all other respects shall conform to the requirements of ASTM B 62.

(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 B 16, Alloy C36000 or ASTM B 140, Alloy C32000 or C31400.

6 THREADING

6.1 Types of Threads

All pipe fittings shall be threaded with ANSI/ASME B1.20.1 general purpose pipe threads and shall have taper threads, except wrought couplings (Tables 2 and I-2), wrought caps (Tables 3 and I-3), and wrought bushings (Tables 4 and I-4) in NPS $\frac{1}{8}$, NPS $\frac{1}{4}$, NPS $\frac{3}{8}$, and NPS $\frac{1}{2}$, which may have straight internal threads.

6.2 Tolerances

The permissible tolerance in taper threading shall be limited to one turn large or one turn small from the gaging face on ring and gaging notch on plug, when using working gages. The variations in straight threading shall be limited to one and one-half turns large or small from gaging notch on plug, when using taper pipe thread working gage. The reference point for gaging internal fittings threads depends upon the chamfer diameter. When the internal chamfer diameter exceeds the major diameter of the internal thread, the reference point is the last thread scratch on the chamfer cone. When the internal chamfer diameter does not exceed the major diameter of the internal thread, the reference point is the end of the fitting.

6.3 Countersink or Chamfer

All internal threads shall not be countersunk a distance of less than one-half the pitch of the thread at an angle of approximately 45 deg with the axis of the thread, and all external threads shall be chamfered at an angle of 30 deg to 45 deg with the axis, both for the purpose of easier entrance in making a joint, and for protection of the thread. Countersinking and chamfering shall be concentric with the threads.

6.4 Length of Thread

The length of threads specified in all tables shall be measured to include the countersink or chamfer.

6.5 Alignment

The maximum allowable variation in the alignment of threads of all openings of threaded pipe fittings shall be 1 mm/m (0.06 in./ft) or 0.5%.

6.6 Bushings

All bushings shall be threaded with American National Standard taper pipe threads, except those sizes of wrought bushings listed in para. 6.1 which may have straight internal threads. Gaging of all threads shall comply with ANSI/ASME B1.20.1 except those sizes of outside bushings where the external thread lengths are shorter than required by ANSI/ASME B1.20.1. These bushings should be threaded so that when making up the joint, the shoulder of the head will not interfere. To ensure this, the threads, when made to the minimum

length, shall be gaged as listed below with a tolerance of one turn large or small.

- (a) NPS $\frac{1}{4}$ to NPS $1\frac{1}{2}$ included, 1 turn large
- (b) NPS 2, $1\frac{1}{2}$ turns large
- (c) NPS $2\frac{1}{2}$ to NPS 8 included, 2 turns large

An outside bushing is one having any part of the hexagon or octagon protruding beyond the outside diameter of the large end of the external thread.

7 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.

8 SURFACE FINISH

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

9 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.

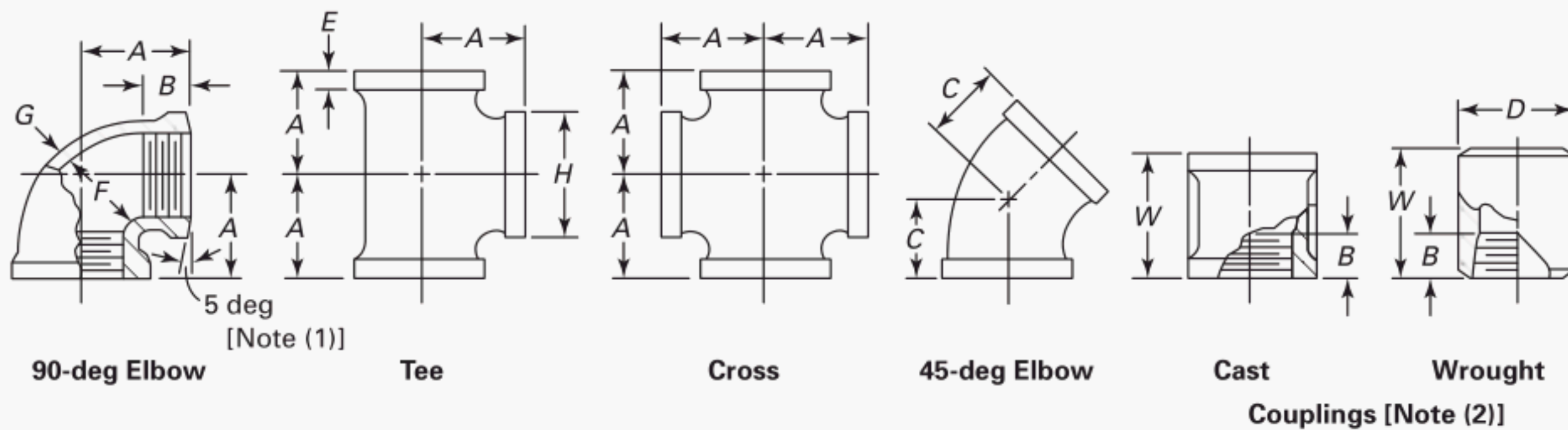
(b) The dimensions shown in Tables 5, 6, 7, 8, and 9 (Tables I-5, I-6, I-7, I-8, and I-9) for fittings are for use only when making patterns for the specific reducing pipe fitting in question and do not apply when a larger size pattern is bushed to make the reducing pipe fitting wanted. Reducing pipe 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.

10 TOLERANCES

10.1 Metal Thickness

Dimensional variations are unavoidable in the casting process. Patterns shall be designed to produce castings

Table 2 Dimensions of 90-deg Elbows, Tees, Crosses, 45-deg Elbows, and Couplings (Straight Sizes) — Class 125

| 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 ANSI/ASME B1.20.1. See section 6.
- (3) Couplings sizes NPS 3/4 and smaller may be cast or made from bar at the option of the manufacturer. Diameters D are commercial bar sizes.
- (4) For metal thickness tolerance, see para. 10.1.
- (5) The dimensions for NPS 2 1/2 and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

of metal thicknesses given in the tables. Metal thickness at no point shall be less than 90% of the thicknesses given in the tables.

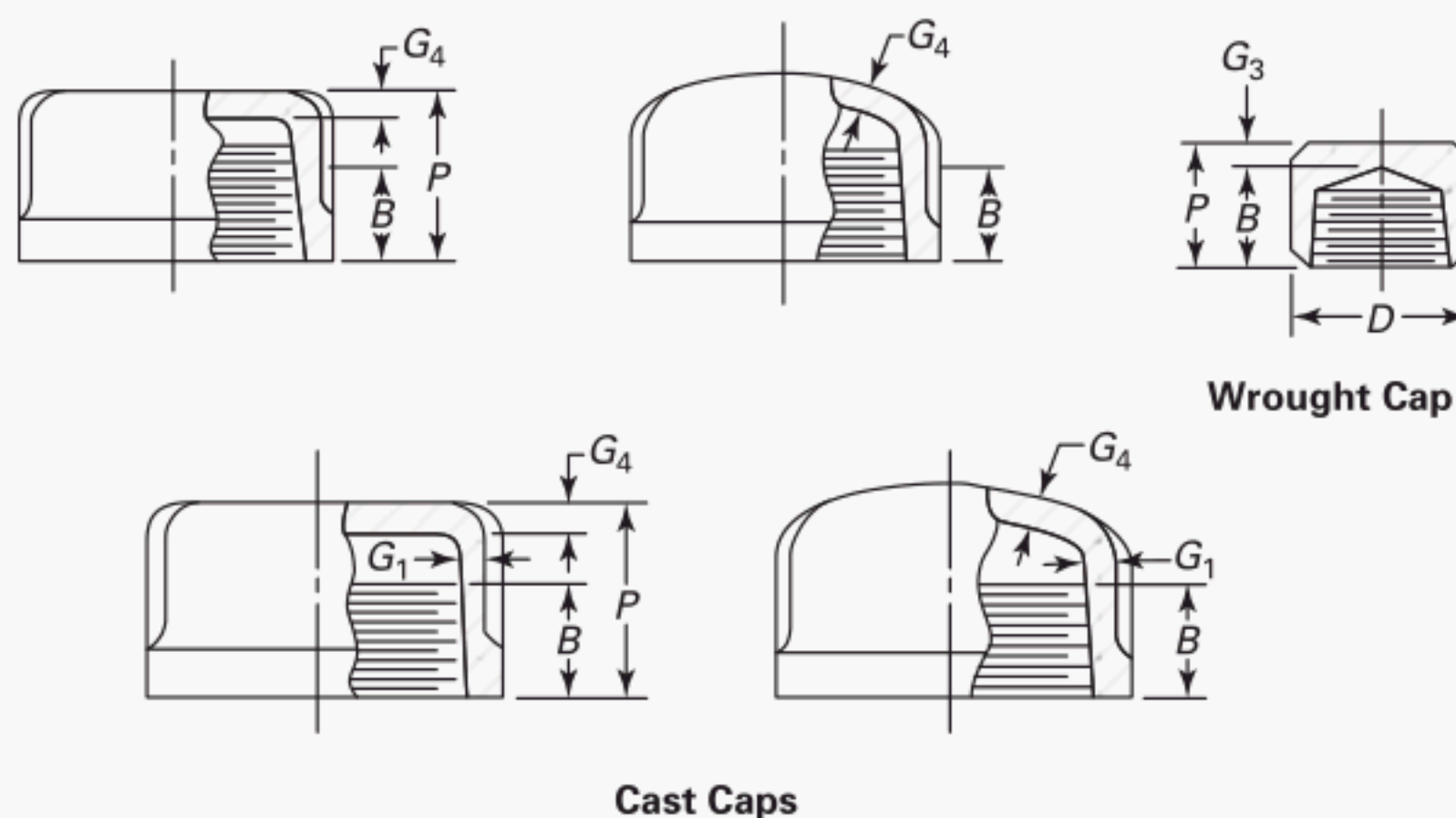
10.2 Dimensions

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.

11 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 minute.

Table 3 Dimensions of Caps — Class 125

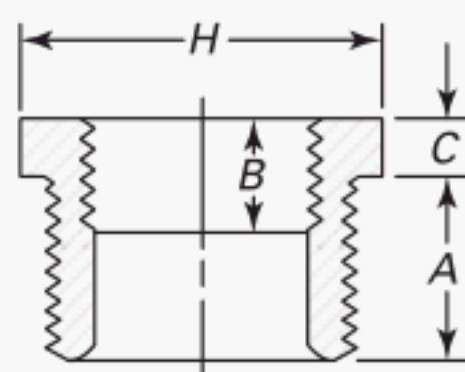
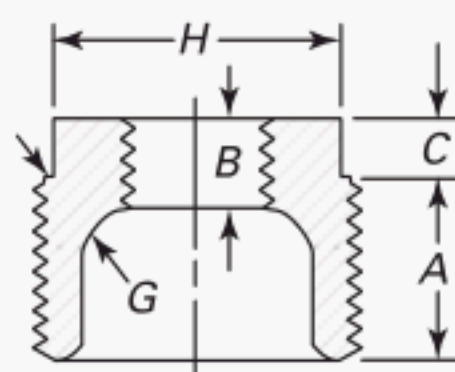
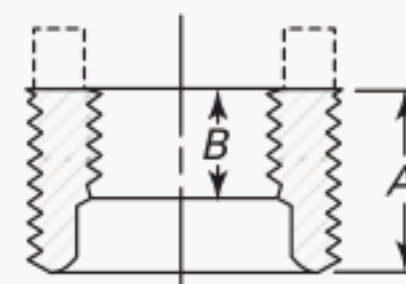
| NPS | Minimum Length of Thread [Note (1)] | | Wrought Cap Diameter, D [Note (2)] | Metal Thickness [Note (3)] | | | Minimum Height of Cap, P | |
|---------------------------|-------------------------------------|--------|--------------------------------------|----------------------------|-------|-------|----------------------------|---------|
| | B | L_2 | | G_1 | G_3 | G_4 | Cast | Wrought |
| $\frac{1}{8}$ | 6 | 6.703 | 14 | 2.0 | 2.8 | 2.3 | 12 | 12 |
| $\frac{1}{4}$ | 8 | 10.206 | 18 | 2.0 | 3.3 | 2.5 | 15 | 15 |
| $\frac{3}{8}$ | 9 | 10.358 | 21 | 2.3 | 3.3 | 2.8 | 16 | 17 |
| $\frac{1}{2}$ | 11 | 13.556 | 27 | 2.3 | 3.6 | 3.0 | 19 | 21 |
| $\frac{3}{4}$ | 13 | 13.861 | 33 | 2.5 | 3.8 | 3.3 | 21 | 24 |
| 1 | 15 | 17.343 | ... | 2.8 | ... | 3.8 | 25 | ... |
| $1\frac{1}{4}$ | 17 | 17.953 | ... | 3.0 | ... | 4.3 | 28 | ... |
| $1\frac{1}{2}$ | 18 | 18.377 | ... | 3.3 | ... | 4.8 | 29 | ... |
| 2 | 19 | 19.215 | ... | 3.8 | ... | 5.6 | 34 | ... |
| $2\frac{1}{2}$ [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 ANSI/ASME B1.20.1. All other dimensions shall be as specified for other caps.
 (2) Caps NPS $\frac{3}{4}$ and smaller may be cast or made from bar at the option of the manufacturer. Dimensions D are commercial bar sizes.
 (3) For metal thickness tolerance, see para. 10.1.
 (4) The dimensions for NPS $2\frac{1}{2}$ 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 | |
| $\frac{1}{4} \times \frac{1}{8}$ | 11 | 7 [Note (4)] | 4 | 16 [Note (5)] | ... | ... |
| $\frac{3}{8} \times \frac{1}{4}$ | 12 | 10 [Note (4)] | 4 | 17 [Note (5)] | ... | ... |
| $\frac{3}{8} \times \frac{1}{8}$ | 12 | 6 | 4 | 17 [Note (5)] | ... | ... |
| $\frac{1}{2} \times \frac{3}{8}$ | 14 | 10 [Note (4)] | 5 | 22 [Note (5)] | ... | ... |
| $\frac{1}{2} \times \frac{1}{4}$ | 14 | 8 | 5 | 22 [Note (5)] | ... | ... |
| $\frac{1}{2} \times \frac{1}{8}$ | 14 | 6 | 5 | 22 [Note (5)] | ... | ... |
| $\frac{3}{4} \times \frac{1}{2}$ | 16 | 13 [Note (4)] | 6 | 29 [Note (5)] | ... | ... |
| $\frac{3}{4} \times \frac{3}{8}$ | 16 | 9 | 6 | 29 [Note (5)] | ... | ... |
| $\frac{3}{4} \times \frac{1}{4}$ | 16 | 8 | 6 | 29 [Note (5)] | ... | ... |
| $1 \times \frac{3}{4}$ | 19 | 13 | 6 | 36 [Note (5)] | ... | ... |
| $1 \times \frac{1}{2}$ | 19 | 11 | 6 | 36 [Note (5)] | ... | ... |
| $1 \times \frac{3}{8}$ | 19 | 9 | 8 | ... | 28 | ... |
| $1 \times \frac{1}{4}$ | 19 | 8 | 8 | ... | 28 | ... |
| $1\frac{1}{4} \times 1$ | 20 | 15 | 7 | 45 | ... | ... |
| $1\frac{1}{4} \times \frac{3}{4}$ | 20 | 13 | 7 | 45 | ... | ... |
| $1\frac{1}{4} \times \frac{1}{2}$ | 20 | 11 | 9 | ... | 34 | 4.7 |
| $1\frac{1}{4} \times \frac{3}{8}$ | 20 | 9 | 9 | ... | 28 | 4.7 |
| $1\frac{1}{2} \times 1\frac{1}{4}$ | 21 | 18 [Note (4)] | 8 | 51 | ... | ... |
| $1\frac{1}{2} \times 1$ | 21 | 15 | 8 | 51 | ... | ... |
| $1\frac{1}{2} \times \frac{3}{4}$ | 21 | 13 | 9 | ... | 41 | 5.1 |
| $1\frac{1}{2} \times \frac{1}{2}$ | 21 | 11 | 9 | ... | 34 | 5.1 |
| $2 \times 1\frac{1}{2}$ | 22 | 18 | 9 | 63 | ... | ... |
| $2 \times 1\frac{1}{4}$ | 22 | 17 | 9 | 63 | ... | ... |
| 2×1 | 22 | 15 | 10 | ... | 50 | 5.6 |
| $2 \times \frac{3}{4}$ | 22 | 13 | 10 | ... | 41 | 5.6 |
| $2 \times \frac{1}{2}$ | 22 | 11 | 10 | ... | 34 | 5.6 |
| $2\frac{1}{2} \times 2$ | 27 | 19 | 9 | 76 | ... | ... |
| $2\frac{1}{2} \times 1\frac{1}{2}$ | 27 | 18 | 11 | 68 | ... | ... |
| $2\frac{1}{2} \times 1\frac{1}{4}$ | 27 | 17 | 11 | ... | 61 | 6.1 |
| $2\frac{1}{2} \times 1$ | 27 | 15 | 11 | ... | 50 | 6.1 |
| $3 \times 2\frac{1}{2}$ | 29 | 23 | 10 | 98 | ... | ... |
| 3×2 | 29 | 19 | 12 | 83 | ... | ... |
| $3 \times 1\frac{1}{2}$ | 29 | 18 | 12 | ... | 68 | 6.6 |
| $3 \times 1\frac{1}{4}$ | 29 | 17 | 12 | ... | 61 | 6.6 |

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

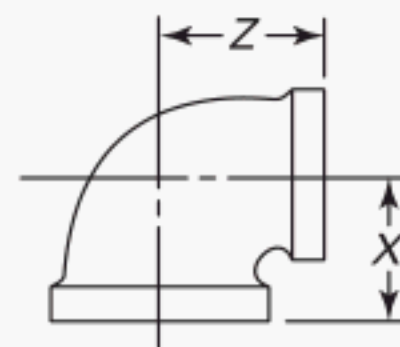
| NPS | Minimum Length of External Thread, <i>A</i> | Minimum Length of Internal Thread, <i>B</i> | Minimum Height of Head, <i>C</i> | Minimum Width of Head, <i>H</i> [Note (2)] | | Metal Thickness, <i>G</i> [Note (3)] |
|--------|---|---|--|---|--------|---|
| | | | | Outside | Inside | |
| 4 × 3 | 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. 2.3.
 (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. 10.1.
 (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**

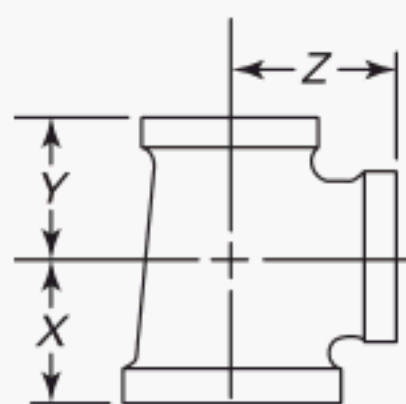
| NPS | Center-to-End | | NPS | Center-to-End | |
|--------|---------------|----------|-------------------|---------------|----------|
| | <i>X</i> | <i>Z</i> | | <i>X</i> | <i>Z</i> |
| ¼ × ⅛ | 17 | 15 | 1¼ × ¾ | 35 | 38 |
| ⅜ × ¼ | 19 | 20 | 1½ × 1¼ | 44 | 46 |
| ½ × ⅜ | 24 | 23 | 1½ × 1 | 39 | 44 |
| 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. 9(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**

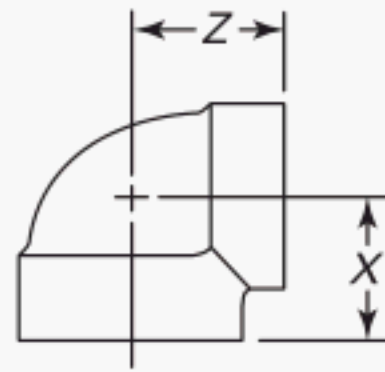
| Center-to-End | | | | Center-to-End | | | |
|---|----|----|----|--|----|----|----|
| NPS | X | Y | Z | NPS | X | Y | Z |
| $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{8}$ | 17 | 17 | 15 | $\frac{1}{4} \times 1 \times \frac{3}{4}$ | 35 | 33 | 38 |
| $\frac{3}{8} \times \frac{3}{8} \times \frac{1}{4}$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

GENERAL NOTES:

- (a) Dimensions are in millimeters.
 (b) See para. 9(b) for requirements concerning patterns for reducing fittings.
 (c) For dimensions not given, see Table 2.

NOTE:

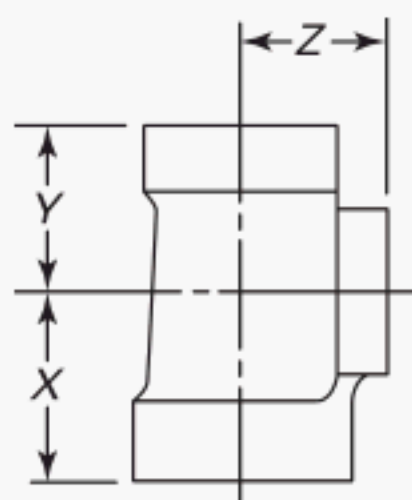
- (1) The dimensions for NPS $2\frac{1}{2}$ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

Table 7 Dimensions of 90-deg Elbows (Reducing Sizes) — Class 250**90-deg Elbow,
Reducing**

| NPS | Center-to-End | |
|------------------------------------|---------------|----|
| | X | Z |
| $\frac{1}{2} \times \frac{3}{8}$ | 26 | 26 |
| $\frac{3}{4} \times \frac{1}{2}$ | 30 | 31 |
| $1 \times \frac{3}{4}$ | 35 | 37 |
| $1 \times \frac{1}{2}$ | 32 | 35 |
| $1\frac{1}{4} \times 1$ | 40 | 42 |
| $1\frac{1}{4} \times \frac{3}{4}$ | 37 | 41 |
| $1\frac{1}{2} \times 1\frac{1}{4}$ | 46 | 48 |
| $1\frac{1}{2} \times 1$ | 42 | 46 |
| $2 \times 1\frac{1}{2}$ | 51 | 55 |
| $2 \times 1\frac{1}{4}$ | 48 | 53 |
| $2\frac{1}{2} \times 2$ | 61 | 66 |
| $3 \times 2\frac{1}{2}$ | 72 | 76 |
| 3×2 | 64 | 73 |
| 4×3 | 89 | 91 |

GENERAL NOTES:

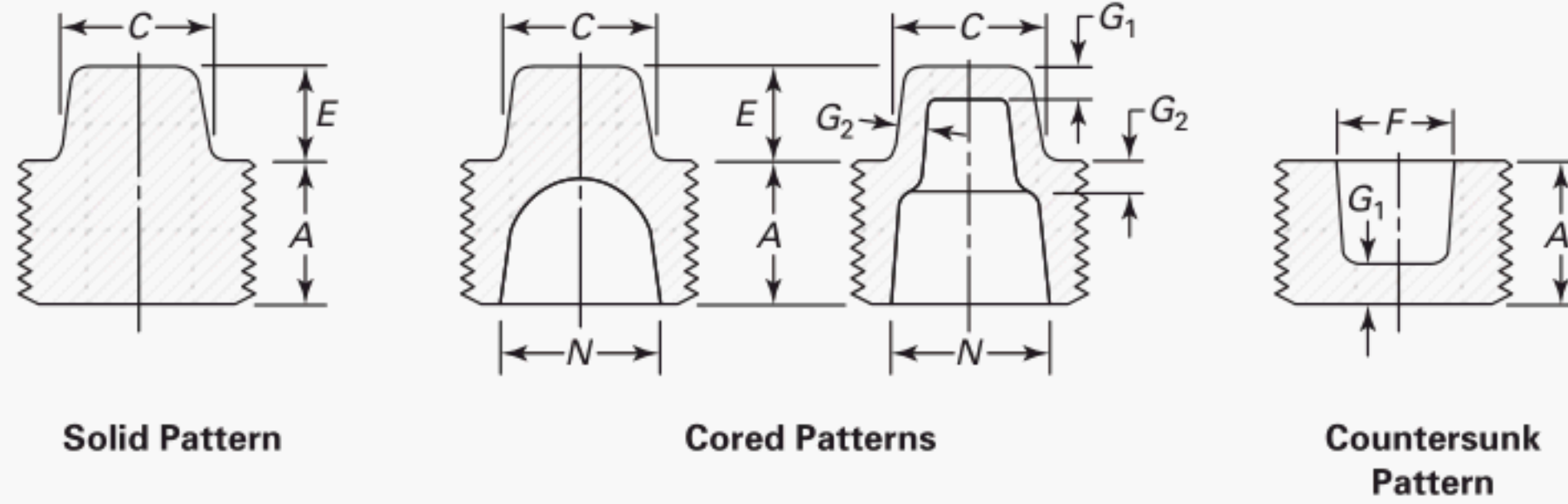
- (a) Dimensions are in millimeters.
- (b) For dimensions not given, see Table 12.
- (c) All dimensions given in Table 7 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
- (d) See para. 9(b) for requirements concerning patterns for reducing fittings.

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 |
| $\frac{1}{2} \times \frac{1}{2} \times \frac{3}{8}$ | 26 | 26 | 26 | $1\frac{1}{2} \times 1\frac{1}{2} \times 1$ | 42 | 42 | 46 |
| $\frac{3}{4} \times \frac{3}{4} \times \frac{1}{2}$ | 30 | 30 | 31 | $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{4}$ | 39 | 39 | 44 |
| $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{8}$ | 28 | 28 | 29 | $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ | 36 | 36 | 42 |
| $\frac{3}{4} \times \frac{1}{2} \times \frac{3}{4}$ | 33 | 31 | 33 | $1\frac{1}{2} \times 1\frac{1}{4} \times 1\frac{1}{4}$ | 46 | 44 | 48 |
| $\frac{3}{4} \times \frac{1}{2} \times \frac{1}{2}$ | 30 | 28 | 31 | $1\frac{1}{2} \times 1\frac{1}{4} \times 1$ | 42 | 40 | 46 |
| $\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$ | 31 | 31 | 30 | $1\frac{1}{2} \times 1 \times 1\frac{1}{2}$ | 49 | 46 | 49 |
| $1 \times 1 \times \frac{3}{4}$ | 35 | 35 | 37 | $1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{2}$ | 48 | 48 | 46 |
| $1 \times 1 \times \frac{1}{2}$ | 32 | 32 | 34 | $2 \times 2 \times 1\frac{1}{2}$ | 51 | 51 | 55 |
| $1 \times \frac{3}{4} \times 1$ | 38 | 37 | 38 | $2 \times 2 \times 1\frac{1}{4}$ | 48 | 48 | 53 |
| $1 \times \frac{3}{4} \times \frac{3}{4}$ | 34 | 33 | 37 | $2 \times 2 \times 1$ | 44 | 44 | 51 |
| $\frac{3}{4} \times \frac{3}{4} \times 1$ | 37 | 37 | 34 | $2 \times 2 \times \frac{3}{4}$ | 41 | 41 | 50 |
| $1\frac{1}{4} \times 1\frac{1}{4} \times 1$ | 40 | 40 | 42 | $2 \times 2 \times \frac{1}{2}$ | 38 | 38 | 48 |
| $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{4}$ | 37 | 37 | 41 | $2\frac{1}{2} \times 2\frac{1}{2} \times 2$ | 61 | 61 | 66 |
| $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{2}$ | 34 | 34 | 39 | $3 \times 3 \times 2$ | 64 | 64 | 73 |
| $1\frac{1}{4} \times 1 \times 1\frac{1}{4}$ | 44 | 42 | 44 | $3 \times 2\frac{1}{2} \times 3$ | 78 | 76 | 78 |
| $1\frac{1}{4} \times 1 \times 1$ | 40 | 38 | 42 | $3 \times 2 \times 3$ | 78 | 73 | 78 |
| $1\frac{1}{4} \times \frac{3}{4} \times 1\frac{1}{4}$ | 44 | 41 | 44 | $4 \times 4 \times 3$ | 84 | 84 | 91 |
| $1 \times 1 \times 1\frac{1}{4}$ | 42 | 42 | 40 | $4 \times 4 \times 2$ | 70 | 70 | 87 |
| $1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{4}$ | 46 | 46 | 48 | $4 \times 3 \times 4$ | 96 | 91 | 96 |

GENERAL NOTES:

- Dimensions are in millimeters.
- For dimensions not given, see Table 12.
- All dimensions given in Table 8 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
- See para. 9(b) for requirements concerning patterns for reducing fittings.

Table 9 Dimensions of Square Head and Square Socket Plugs — Class 250

| 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 |

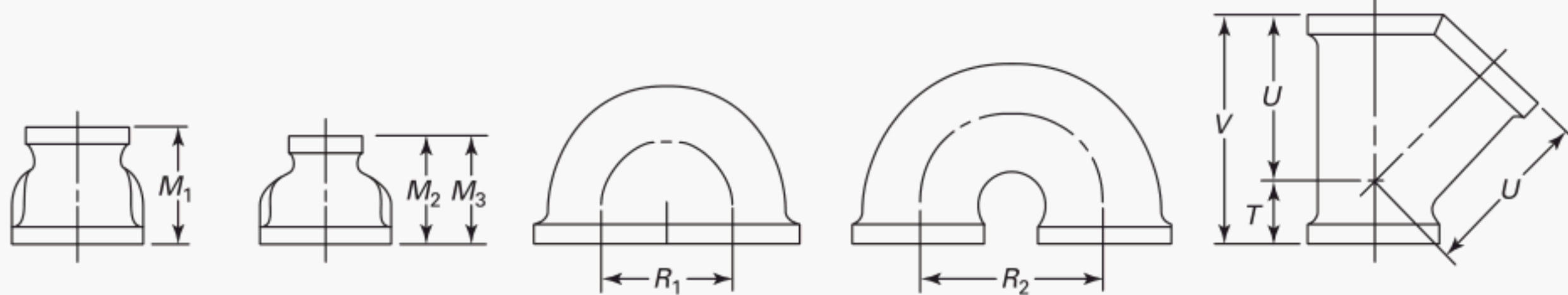
GENERAL NOTES:

- (a) Dimensions are in millimeters.
 (b) For pressure class recommendations, see para. 2.3.

NOTES:

- (1) These dimensions C are the nominal size of wrench as given in Appendix V, Wrench Openings of ASME B18.2.1 Square and Hex Bolts and Screws. 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. 10.1.
 (3) Square socket of countersunk plugs shall have dimensions 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

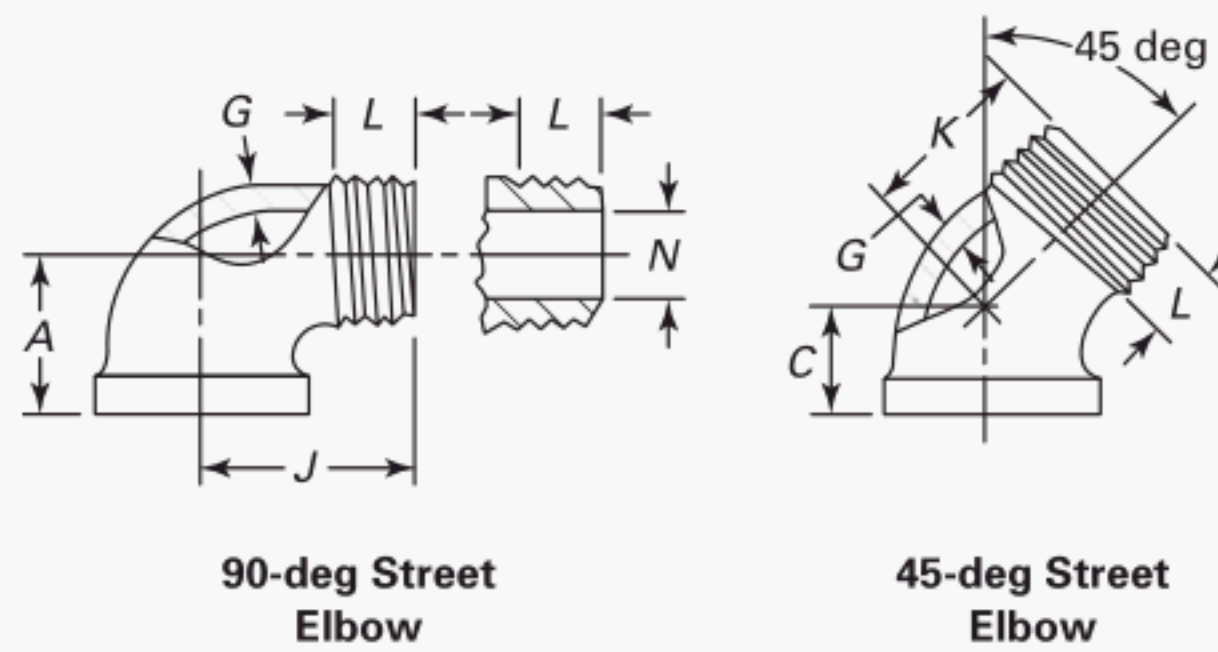
|  | | | | | | | | | |
|--|-----------------------------------|------------------------------------|---------------------------------------|--|--|--------------------------------------|---------------------------------------|--------------------------|-----|
| | Reducer (1 Size) | Reducer (2 and 3 Sizes) | Closed Pattern Return Bend | Open Pattern Return Bend | 45-deg Y Branch Straight | | | | |
| NPS | Reducers | | | Return Bends | | 45-deg Y Branch | | | |
| | End-to-End Reducing [Note (1)] | | | Center-to-Center | | Center- to-End Inlet, <i>T</i> | Center- to-End Outlet, <i>U</i> | End-to- End, <i>V</i> | |
| | One Size, <i>M</i> ₁ | Two Sizes, <i>M</i> ₂ | Three Sizes, <i>M</i> ₃ | Closed Pattern, <i>R</i> ₁ | Open Pattern, <i>R</i> ₂ | | | | |
| 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. 9(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 × NPS 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

| NPS | Center-to-Female End, 90-deg Elbows, <i>A</i> | Center-to-Female End, 45-deg Elbows, <i>C</i> | Metal Thickness, <i>G</i> [Note (1)] | Center-to-Male End, 90-deg Elbows, <i>J</i> | Center-to-Male End, 45-deg Elbows, <i>K</i> | Minimum Length of Thread Male End, <i>L</i> | Maximum Port Diameter Male End, <i>N</i> |
|----------------|---|---|--------------------------------------|---|---|---|--|
| $\frac{1}{8}$ | 14 | 11 | 2.0 | 23 | 20 | 7 | 6 |
| $\frac{1}{4}$ | 18 | 14 | 2.0 | 28 | 22 | 10 | 7 |
| $\frac{3}{8}$ | 21 | 16 | 2.3 | 31 | 23 | 10 | 10 |
| $\frac{1}{2}$ | 26 | 20 | 2.3 | 38 | 27 | 14 | 13 |
| $\frac{3}{4}$ | 30 | 23 | 2.5 | 42 | 31 | 14 | 18 |
| 1 | 36 | 27 | 2.8 | 50 | 36 | 18 | 24 |
| $1\frac{1}{4}$ | 43 | 31 | 3.0 | 57 | 42 | 18 | 32 |
| $1\frac{1}{2}$ | 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 $2\frac{1}{2}$ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

NOTE:

- (1) For metal thickness tolerance, see para. 10.1.

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. 10.1.
- (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

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 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

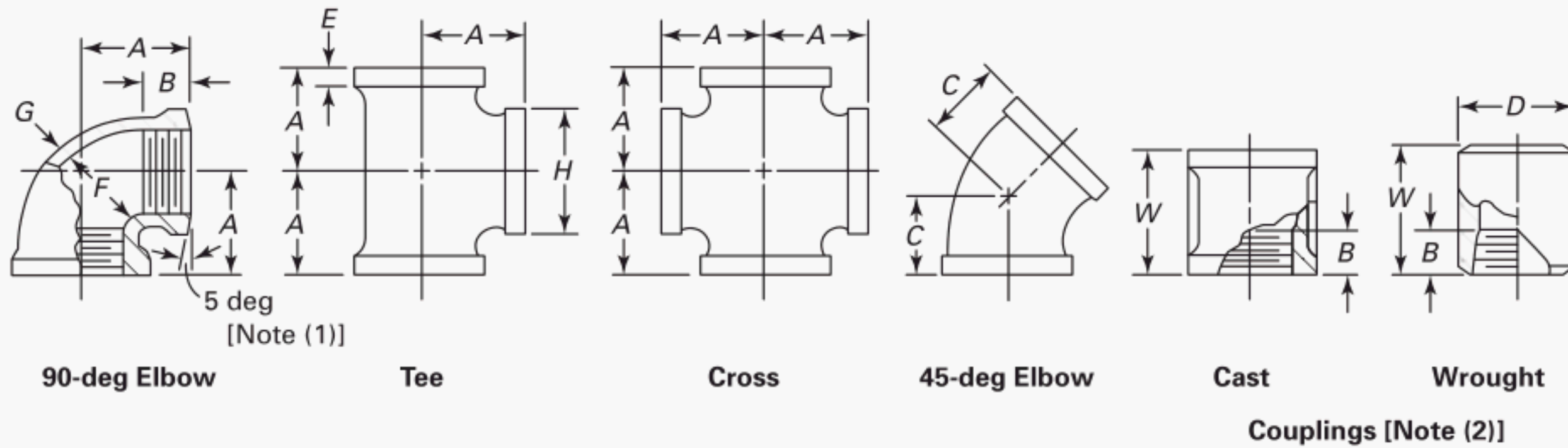
Table I-1 Pressure–Temperature Ratings

| 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 |

conversion practices, the rounding method was applied with greater precision.

Each system's values should be used independently of the other. 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-2 Dimensions of 90-deg Elbows, Tees, Crosses, 45-deg Elbows, and Couplings (Straight Sizes) — Class 125

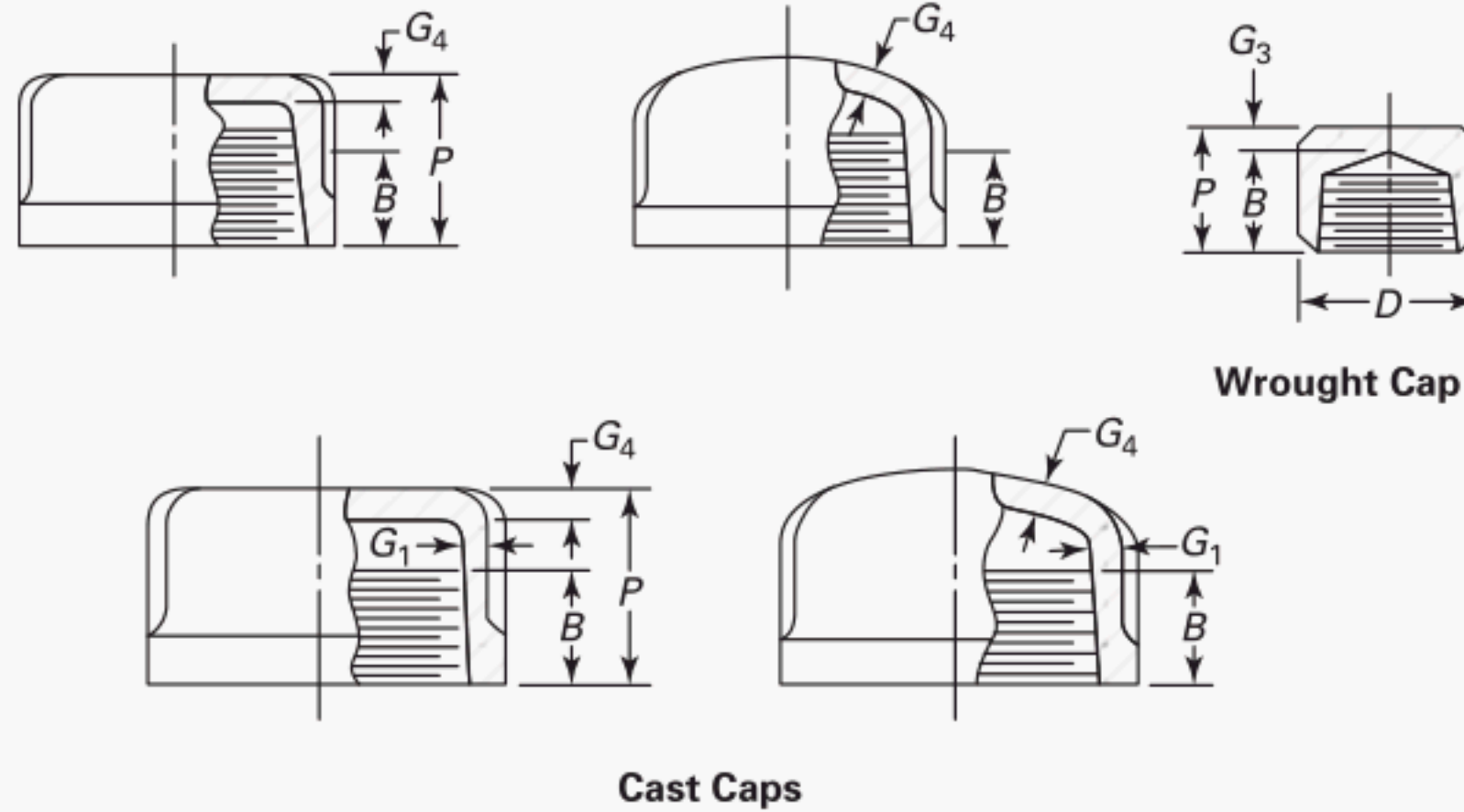


| NPS | Center-to-End Elbows, Tees, and Crosses, <i>A</i> | Minimum Length of Thread, <i>B</i> [Note (2)] | Center-to-End, 45-deg Elbows, <i>C</i> | Wrought Coupling Diameter, <i>D</i> [Note (3)] | Minimum Band Length, <i>E</i> | Inside Diameter of Cast Fitting, <i>F</i> | | Metal Thickness, <i>G</i> [Note (4)] | Minimum Band Diameter, <i>H</i> | End-to-End Straight Coupling, <i>W</i> | |
|------------------|---|---|--|--|-------------------------------|---|------|--------------------------------------|---------------------------------|--|---------|
| | | | | | | 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 include 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 ANSI/ASME B1.20.1. See section 6.
- (3) Couplings sizes NPS 3/4 and smaller may be cast or made from bar at the option of the manufacturer. Diameters *D* are commercial bar sizes.
- (4) For metal thickness tolerance, see para. 10.1.
- (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

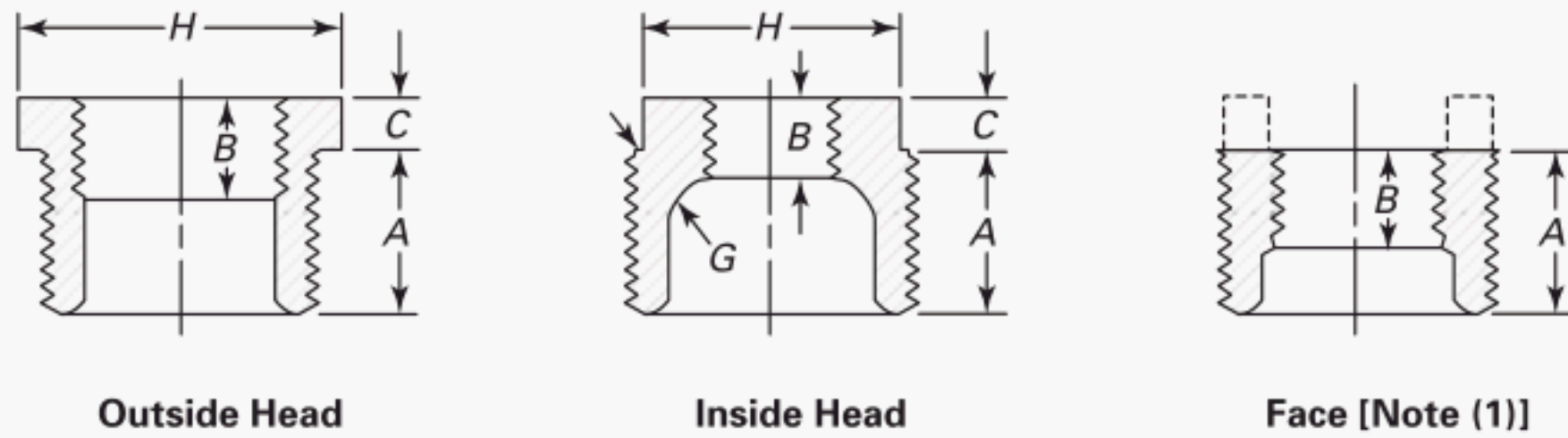
| NPS | Minimum Length of Thread [Note (1)] | | Wrought Cap Diameter, D [Note (2)] | Metal Thickness [Note (3)] | | | Minimum Height of Cap, P | |
|---------------------------|-------------------------------------|--------|---|----------------------------|-------|-------|----------------------------|---------|
| | B | L_2 | | G_1 | G_3 | G_4 | Cast | Wrought |
| $\frac{1}{8}$ | 0.25 | 0.2639 | 0.56 | 0.08 | 0.11 | 0.09 | 0.49 | 0.49 |
| $\frac{1}{4}$ | 0.32 | 0.4018 | 0.69 | 0.08 | 0.13 | 0.10 | 0.59 | 0.59 |
| $\frac{3}{8}$ | 0.36 | 0.4078 | 0.84 | 0.09 | 0.13 | 0.11 | 0.64 | 0.68 |
| $\frac{1}{2}$ | 0.43 | 0.5337 | 1.06 | 0.09 | 0.14 | 0.12 | 0.76 | 0.84 |
| $\frac{3}{4}$ | 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 | ... |
| $1\frac{1}{4}$ | 0.67 | 0.7068 | ... | 0.12 | ... | 0.17 | 1.10 | ... |
| $1\frac{1}{2}$ | 0.70 | 0.7235 | ... | 0.13 | ... | 0.19 | 1.15 | ... |
| 2 | 0.75 | 0.7565 | ... | 0.15 | ... | 0.22 | 1.32 | ... |
| $2\frac{1}{2}$ [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 ANSI/ASME B1.20.1. All other dimensions shall be as specified for other caps.
 (2) Caps NPS $\frac{3}{4}$ and smaller may be cast or made from bar at the option of the manufacturer. Dimensions D are commercial bar sizes.
 (3) For metal thickness tolerance, see para. 10.1.
 (4) The dimensions for NPS $2\frac{1}{2}$ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

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

| 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 | |
| $\frac{1}{4} \times \frac{1}{8}$ | 0.44 | 0.26 [Note (4)] | 0.14 | 0.64 [Note (5)] | ... | ... |
| $\frac{3}{8} \times \frac{1}{4}$ | 0.48 | 0.40 [Note (4)] | 0.16 | 0.68 [Note (5)] | ... | ... |
| $\frac{3}{8} \times \frac{1}{8}$ | 0.48 | 0.25 | 0.16 | 0.68 [Note (5)] | ... | ... |
| $\frac{1}{2} \times \frac{3}{8}$ | 0.56 | 0.41 [Note (4)] | 0.19 | 0.87 [Note (5)] | ... | ... |
| $\frac{1}{2} \times \frac{1}{4}$ | 0.56 | 0.32 | 0.19 | 0.87 [Note (5)] | ... | ... |
| $\frac{1}{2} \times \frac{1}{8}$ | 0.56 | 0.25 | 0.19 | 0.87 [Note (5)] | ... | ... |
| $\frac{3}{4} \times \frac{1}{2}$ | 0.63 | 0.53 [Note (4)] | 0.22 | 1.15 [Note (5)] | ... | ... |
| $\frac{3}{4} \times \frac{3}{8}$ | 0.63 | 0.36 | 0.22 | 1.15 [Note (5)] | ... | ... |
| $\frac{3}{4} \times \frac{1}{4}$ | 0.63 | 0.32 | 0.22 | 1.15 [Note (5)] | ... | ... |
| $1 \times \frac{3}{4}$ | 0.75 | 0.50 | 0.25 | 1.42 [Note (5)] | ... | ... |
| $1 \times \frac{1}{2}$ | 0.75 | 0.43 | 0.25 | 1.42 [Note (5)] | ... | ... |
| $1 \times \frac{3}{8}$ | 0.75 | 0.36 | 0.30 | ... | 1.12 | ... |
| $1 \times \frac{1}{4}$ | 0.75 | 0.32 | 0.30 | ... | 1.12 | ... |
| $1\frac{1}{4} \times 1$ | 0.80 | 0.58 | 0.28 | 1.76 | ... | ... |
| $1\frac{1}{4} \times \frac{3}{4}$ | 0.80 | 0.50 | 0.28 | 1.76 | ... | ... |
| $1\frac{1}{4} \times \frac{1}{2}$ | 0.80 | 0.43 | 0.34 | ... | 1.34 | 0.185 |
| $1\frac{1}{4} \times \frac{3}{8}$ | 0.80 | 0.36 | 0.34 | ... | 1.12 | 0.185 |
| $1\frac{1}{2} \times 1\frac{1}{4}$ | 0.83 | 0.71 [Note (4)] | 0.31 | 2.00 | ... | ... |
| $1\frac{1}{2} \times 1$ | 0.83 | 0.58 | 0.31 | 2.00 | ... | ... |
| $1\frac{1}{2} \times \frac{3}{4}$ | 0.83 | 0.50 | 0.37 | ... | 1.63 | 0.200 |
| $1\frac{1}{2} \times \frac{1}{2}$ | 0.83 | 0.43 | 0.37 | ... | 1.34 | 0.200 |
| $2 \times 1\frac{1}{2}$ | 0.88 | 0.70 | 0.34 | 2.48 | ... | ... |
| $2 \times 1\frac{1}{4}$ | 0.88 | 0.67 | 0.34 | 2.48 | ... | ... |
| 2×1 | 0.88 | 0.58 | 0.41 | ... | 1.95 | 0.220 |
| $2 \times \frac{3}{4}$ | 0.88 | 0.50 | 0.41 | ... | 1.63 | 0.220 |
| $2 \times \frac{1}{2}$ | 0.88 | 0.43 | 0.41 | ... | 1.34 | 0.220 |
| $2\frac{1}{2} \times 2$ | 1.07 | 0.75 | 0.37 | 2.98 | ... | ... |
| $2\frac{1}{2} \times 1\frac{1}{2}$ | 1.07 | 0.70 | 0.44 | 2.68 | ... | ... |
| $2\frac{1}{2} \times 1\frac{1}{4}$ | 1.07 | 0.67 | 0.44 | ... | 2.39 | 0.240 |
| $2\frac{1}{2} \times 1$ | 1.07 | 0.58 | 0.44 | ... | 1.95 | 0.240 |
| $3 \times 2\frac{1}{2}$ | 1.13 | 0.92 | 0.40 | 3.86 | ... | ... |
| 3×2 | 1.13 | 0.75 | 0.48 | 3.28 | ... | ... |
| $3 \times 1\frac{1}{2}$ | 1.13 | 0.70 | 0.48 | ... | 2.68 | 0.260 |
| $3 \times 1\frac{1}{4}$ | 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)

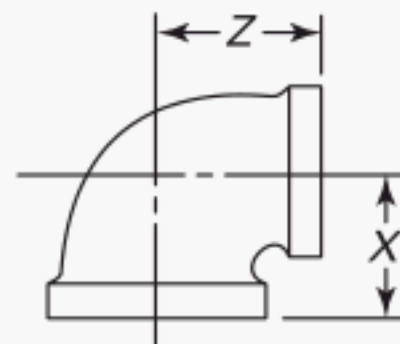
| NPS | Minimum Length of External Thread, <i>A</i> | Minimum Length of Internal Thread, <i>B</i> | Minimum Height of Head, <i>C</i> | Minimum Width of Head, <i>H</i> [Note (2)] | | Metal Thickness, <i>G</i> [Note (3)] |
|--------|---|---|----------------------------------|---|--------|---|
| | | | | 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. 2.3.
 (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. 10.1.
 (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**

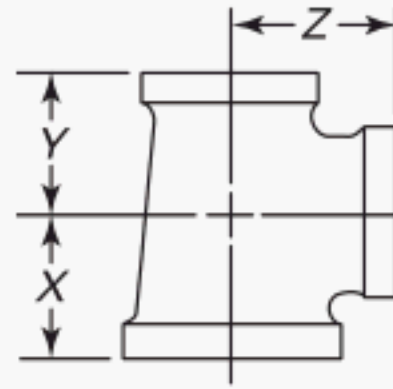
| NPS | Center-to-End | | NPS | Center-to-End | |
|--------|---------------|----------|-------------------|---------------|----------|
| | <i>X</i> | <i>Z</i> | | <i>X</i> | <i>Z</i> |
| ¼ × ⅛ | 0.65 | 0.60 | 1¼ × ¾ | 1.39 | 1.48 |
| ⅜ × ¼ | 0.75 | 0.78 | 1½ × 1¼ | 1.72 | 1.81 |
| ½ × ⅜ | 0.93 | 0.90 | 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. 9(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**

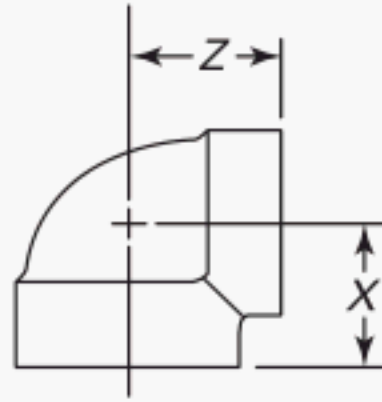
| NPS | Center-to-End | | | NPS | Center-to-End | | |
|---|---------------|------|------|--|---------------|------|------|
| | X | Y | Z | | X | Y | Z |
| $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{8}$ | 0.65 | 0.65 | 0.60 | $1\frac{1}{4} \times 1 \times \frac{3}{4}$ | 1.39 | 1.30 | 1.48 |
| $\frac{3}{8}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

GENERAL NOTES:

- (a) Dimensions are in inches.
 (b) See para. 9(b) for requirements concerning patterns for reducing fittings.
 (c) For dimensions not given, see Table I-2.

NOTE:

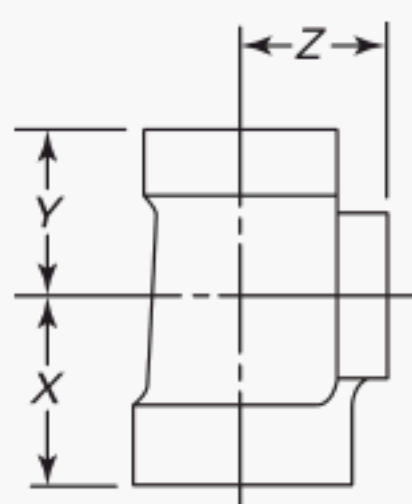
- (1) The dimensions for NPS $2\frac{1}{2}$ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

**Table I-7 Dimensions of 90-deg Elbows
(Reducing Sizes) — Class 250****90-deg Elbow,
Reducing**

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

GENERAL NOTES:

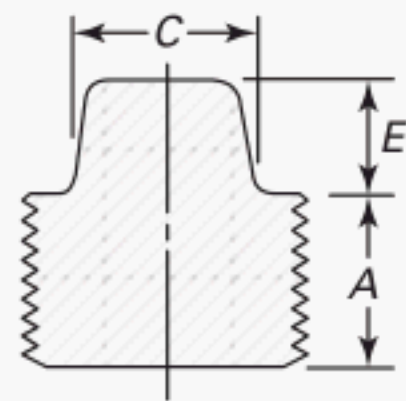
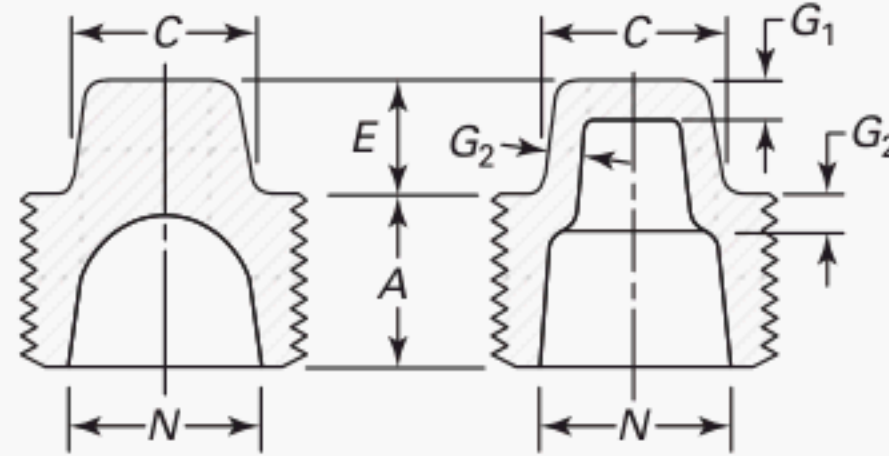
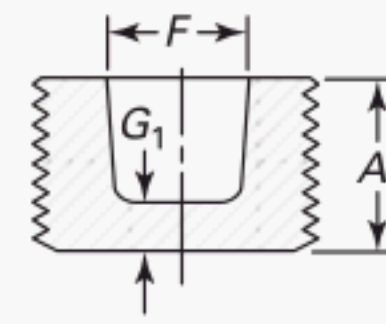
- (a) Dimensions are in inches.
- (b) For dimensions not given, see Table I-12.
- (c) All dimensions given in Table I-7 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
- (d) See para. 9(b) for requirements concerning patterns for reducing fittings.

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 |
| $\frac{1}{2} \times \frac{1}{2} \times \frac{3}{8}$ | 1.04 | 1.04 | 1.03 | $1\frac{1}{2} \times 1\frac{1}{2} \times 1$ | 1.65 | 1.65 | 1.80 |
| $\frac{3}{4} \times \frac{3}{4} \times \frac{1}{2}$ | 1.20 | 1.20 | 1.22 | $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{4}$ | 1.52 | 1.52 | 1.75 |
| $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{8}$ | 1.12 | 1.12 | 1.13 | $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ | 1.41 | 1.41 | 1.66 |
| $\frac{3}{4} \times \frac{1}{2} \times \frac{3}{4}$ | 1.31 | 1.22 | 1.31 | $1\frac{1}{2} \times 1\frac{1}{4} \times 1\frac{1}{4}$ | 1.82 | 1.75 | 1.88 |
| $\frac{3}{4} \times \frac{1}{2} \times \frac{1}{2}$ | 1.20 | 1.12 | 1.22 | $1\frac{1}{2} \times 1\frac{1}{4} \times 1$ | 1.65 | 1.58 | 1.80 |
| $\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$ | 1.22 | 1.22 | 1.20 | $1\frac{1}{2} \times 1 \times 1\frac{1}{2}$ | 1.94 | 1.80 | 1.94 |
| $1 \times 1 \times \frac{3}{4}$ | 1.37 | 1.37 | 1.45 | $1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{2}$ | 1.88 | 1.88 | 1.82 |
| $1 \times 1 \times \frac{1}{2}$ | 1.26 | 1.26 | 1.36 | $2 \times 2 \times 1\frac{1}{2}$ | 2.02 | 2.02 | 2.16 |
| $1 \times \frac{3}{4} \times 1$ | 1.50 | 1.45 | 1.50 | $2 \times 2 \times 1\frac{1}{4}$ | 1.90 | 1.90 | 2.10 |
| $1 \times \frac{3}{4} \times \frac{3}{4}$ | 1.37 | 1.31 | 1.45 | $2 \times 2 \times 1$ | 1.73 | 1.73 | 2.02 |
| $\frac{3}{4} \times \frac{3}{4} \times 1$ | 1.45 | 1.45 | 1.37 | $2 \times 2 \times \frac{3}{4}$ | 1.60 | 1.60 | 1.97 |
| $1\frac{1}{4} \times 1\frac{1}{4} \times 1$ | 1.58 | 1.58 | 1.67 | $2 \times 2 \times \frac{1}{2}$ | 1.49 | 1.49 | 1.88 |
| $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{4}$ | 1.45 | 1.45 | 1.62 | $2\frac{1}{2} \times 2\frac{1}{2} \times 2$ | 2.39 | 2.39 | 2.60 |
| $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{2}$ | 1.34 | 1.34 | 1.53 | $3 \times 3 \times 2$ | 2.52 | 2.52 | 2.89 |
| $1\frac{1}{4} \times 1 \times 1\frac{1}{4}$ | 1.75 | 1.67 | 1.75 | $3 \times 2\frac{1}{2} \times 3$ | 3.08 | 2.99 | 3.08 |
| $1\frac{1}{4} \times 1 \times 1$ | 1.58 | 1.50 | 1.67 | $3 \times 2 \times 3$ | 3.08 | 2.89 | 3.08 |
| $1\frac{1}{4} \times \frac{3}{4} \times 1\frac{1}{4}$ | 1.75 | 1.62 | 1.75 | $4 \times 4 \times 3$ | 3.30 | 3.30 | 3.60 |
| $1 \times 1 \times 1\frac{1}{4}$ | 1.67 | 1.67 | 1.58 | $4 \times 4 \times 2$ | 2.74 | 2.74 | 3.41 |
| $1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{4}$ | 1.82 | 1.82 | 1.88 | $4 \times 3 \times 4$ | 3.79 | 3.60 | 3.79 |

GENERAL NOTES:

- Dimensions are in inches.
- For dimensions not given, see Table I-12.
- All dimensions given in Table I-8 are in accordance with ASME B16.4 for Class 125 cast iron threaded fittings.
- See para. 9(b) for requirements concerning patterns for reducing fittings.

Table I-9 Dimensions of Square Head and Square Socket Plugs — Class 250**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 |

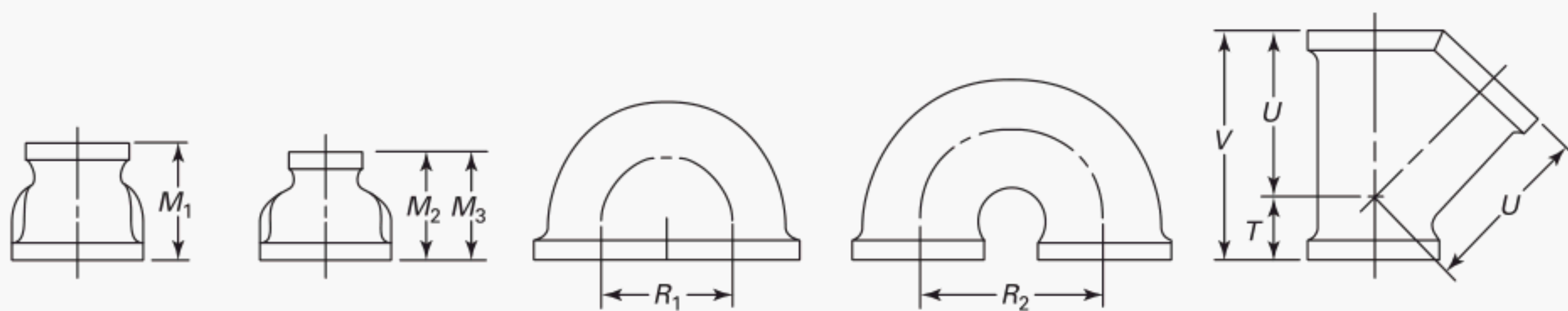
GENERAL NOTES:

- (a) Dimensions are in inches.
 (b) For pressure class recommendations, see para. 2.3.

NOTES:

- (1) These dimensions C are the nominal size of wrench as given in Appendix V, Wrench Openings of ASME B18.2.1 Square and Hex Bolts and Screws. 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. 10.1.
 (3) Square socket of countersunk plugs shall have dimensions 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

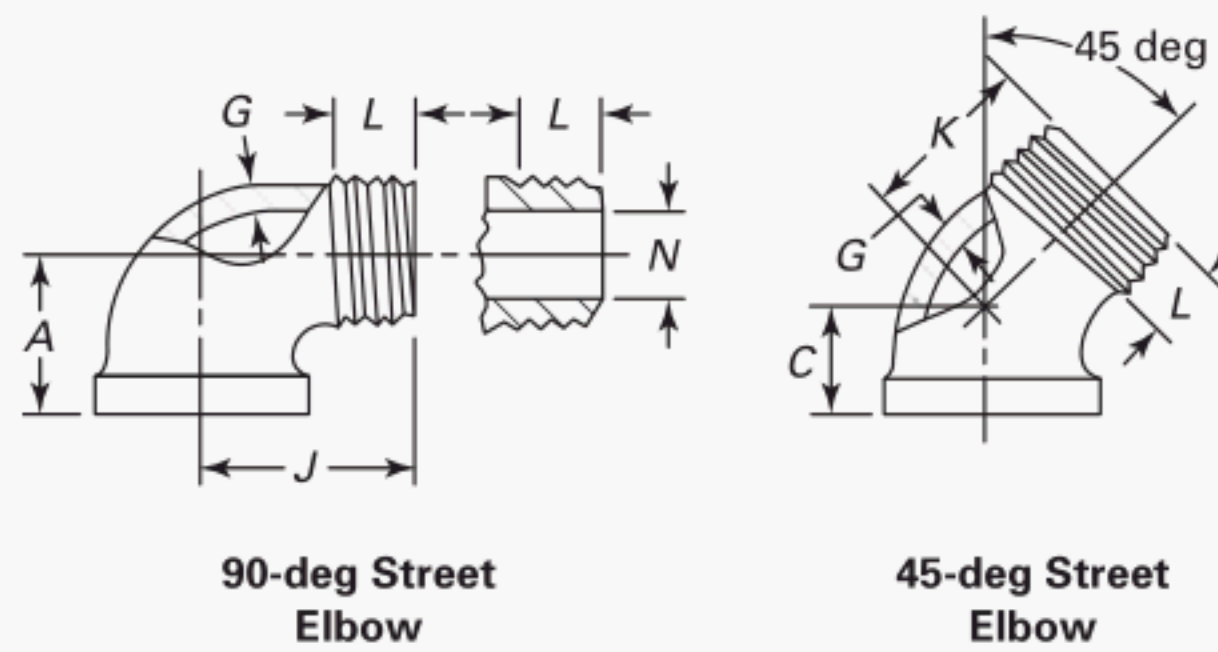
|  | | | | | | | | |
|--|------------------------------------|----------------------------------|------------------------------------|--|--|--------------------------------------|---------------------------------------|--------------------------|
| Reducer (1 Size) | Reducer (2 and 3 Sizes) | | | Closed Pattern Return Bend | Open Pattern Return Bend | 45-deg Y Branch Straight | | |
| NPS | Reducers | | | Return Bends | | 45-deg Y Branch | | |
| | End-to-End Reducing [Note (1)] | | | Center-to-Center | | Center- to-End Inlet, <i>T</i> | Center- to-End Outlet, <i>U</i> | End-to- End, <i>V</i> |
| | One Size, <i>M</i> ₁ | Two Sizes, <i>M</i> ₂ | Three Sizes, <i>M</i> ₃ | Closed Pattern, <i>R</i> ₁ | Open Pattern, <i>R</i> ₂ | | | |
| 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. 9(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 × NPS 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

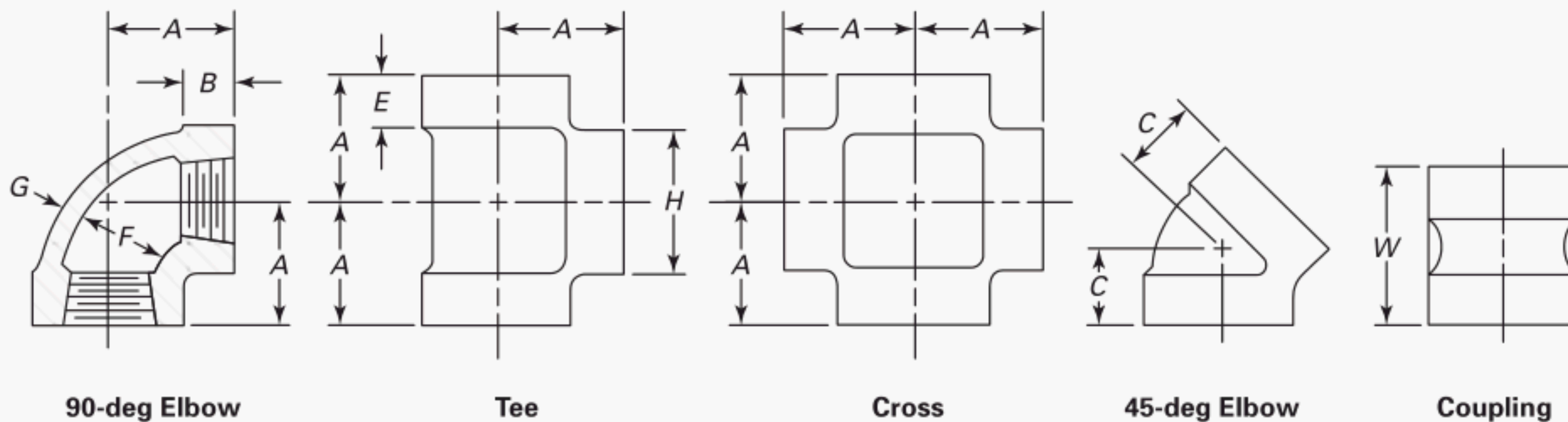
| NPS | Center-to-Female End, 90-deg Elbows, A | Center-to-Female End, 45-deg Elbows, C | Metal Thickness, G [Note (1)] | Center-to-Male End, 90-deg Elbows, J | Center-to-Male End, 45-deg Elbows, K | Minimum Length of Thread Male End, L | Maximum Port Diameter Male End, N |
|----------------|--|--|-------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|
| $\frac{1}{8}$ | 0.54 | 0.42 | 0.08 | 0.92 | 0.78 | 0.27 | 0.22 |
| $\frac{1}{4}$ | 0.71 | 0.56 | 0.08 | 1.11 | 0.88 | 0.41 | 0.28 |
| $\frac{3}{8}$ | 0.82 | 0.63 | 0.09 | 1.24 | 0.92 | 0.41 | 0.40 |
| $\frac{1}{2}$ | 1.01 | 0.78 | 0.09 | 1.48 | 1.06 | 0.54 | 0.53 |
| $\frac{3}{4}$ | 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 |
| $1\frac{1}{4}$ | 1.69 | 1.22 | 0.12 | 2.24 | 1.64 | 0.71 | 1.25 |
| $1\frac{1}{2}$ | 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 $2\frac{1}{2}$ and larger are in accordance with ASME B16.3 for Class 150 malleable iron threaded fittings.

NOTE:

- (1) For metal thickness tolerance, see para. 10.1.

Table I-12 Dimensions of 90-deg Elbows, Tees, Crosses, 45-deg Elbows, and Couplings (Straight Sizes) — Class 250

| 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. 10.1.
- (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

The following is a list of Standards and Specifications referenced in this Standard.

ANSI/ASME B1.20.1-1983 (R2001), Pipe Threads, General Purpose (Inch)¹

ASME B16.3-1998, Malleable Iron Threaded Fittings, Classes 150 and 300¹

ASME B16.4-1998, Cast Iron Threaded Fittings, Classes 125 and 250¹

ASME B18.2.2-1987, Square and Hex Nuts¹

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2300, Fairfield, NJ 07007-2300

ASTM B 16/B 16M-00, Specification for Free Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines

ASTM B 62-02, Specification for Composition Bronze or Ounce Metal Castings

ASTM B 140/B 140M-01, Specification for Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar, and Shapes

ASTM B 584-04, Specification for Copper Alloy Sand Castings for General Applications

ASTM E 29-01^{E1}, Practice for Using Significant Digits in Test Data to Determine Conformance With Specifications

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ISO 9000-2000, Quality Management Systems — Fundamentals and Vocabulary

ISO 9001-2000, Quality Management Systems — Requirements

ISO 9004-2000, Quality Management Systems — Guidelines for Performance Improvements

Publisher: International Organization for Standardization (ISO), 1 ch. de la Voie-Creuse, Case Postale 56, CH-1211, Geneva 20, Switzerland

¹ May also be obtained from the 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 ISO 9001.¹ A determination of the need for registration and/or certification of the product manufacturer's quality system program

¹ ISO 9001 is also available from the American National Standards Institute (ANSI) and the American Society for Quality (ASQ) as American National Standards that are identified by a prefix "Q" replacing the prefix "ISO." ISO 9001 is listed in Mandatory Appendix II.

by an independent organization shall be the responsibility of the manufacturer. The detailed documentation demonstrating program compliance shall be available to the purchaser at the manufacturer's facility. A written summary description of the program utilized 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.

ASME B16.15 INTERPRETATIONS

Replies to Technical Inquiries July 1, 1985 Through July 31, 2006

FOREWORD

This publication includes all of the written replies issued between the indicated dates by the Secretary, speaking for the ASME B16 Committee, Standardization of Valves, Flanges, Fittings, and Gaskets, to inquiries concerning interpretations of technical aspects of B16.15, Cast Copper Alloy Threaded Fittings.

These replies are taken verbatim from the original letters except for a few typographical corrections and some minor editorial corrections made for the purpose of improved clarity. In some few instances, a review of the interpretation follows immediately after the original reply.

These interpretations were prepared in accordance with the accredited ASME procedures. ASME procedures provide for reconsideration of these interpretations when or if additional information is available that the inquirer believes might affect the interpretation. Further, persons aggrieved by this 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.

Interpretation: 15-2

Subject: Cast Bronze Unions

Date Issued: February 3, 1993

File: B16-92-012

Question: Does ANSI/ASME B16.15-1985 cover cast bronze unions?

Reply: No. ANSI/ASME B16.15-1985 does not cover bronze unions.

Interpretation: 15-3

Subject: External Thread Dimensions

Date Issued: July 12, 1993

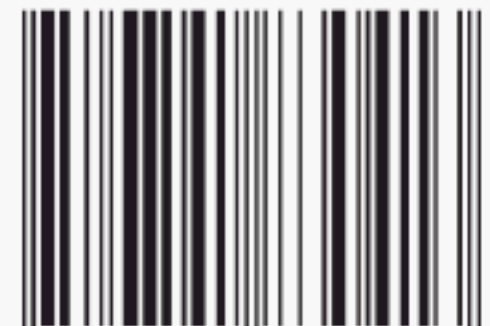
File: B16-93-004

Question: With reference to ANSI/ASME B16.15-1985 Table 13, is dimension "A" the minimum length of external thread?

Reply: Yes.

ASME B16.15-2006

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