ASME B16.4-2016

(Revision of ASME B16.4-2011)

Gray Iron 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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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.

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

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FOREWORD

In the spring of 1921, when the unification and extension of the flanged and threaded fittings standards in force in this country seemed desirable, the American Engineering Standards Committee [subsequently the American Standards Association and currently the American National Standards Institute (ANSI)] authorized the organization of a Sectional Committee on the Standardization of Pipe Flanges and Flanged Fittings. The following organizations served as joint sponsors: Heating, Piping, and Air Conditioning Contractors National Association (later the Mechanical Contractors Association of America), Manufacturers Standardization Society of the Valve and Fittings Industry, and the American Society of Mechanical Engineers.

At the second meeting of the Sectional Committee held in New York on December 16, 1921, a report was submitted by the Subcommittee on Threaded Fittings. It indicated clearly that good progress was already being made toward the development of an American Standard for cast iron threaded fittings intended for services of 125-lb and 250-lb steam pressure. The review of the proposals of the manufacturer's Committee of Five was assigned to the Subcommittee on Threaded Fittings, and after a thorough study, it made its report to the Sectional Committee. The Standard was finally completed, approved, and published in December 1927 with the designation ASA B16d-1927.

To bring this Standard in line with the best current practice, a revision was begun in September 1936, providing for hydraulic service ratings, material specifications, tolerances on alignment, threading of fittings, and dimensions of some additional sizes, as well as dimensional tables covering reducing couplings, caps, and closed and open-pattern return bends. The revision was approved in March 1941.

The Standard was reviewed in 1947 and was approved by the Sectional Committee. Following approval of the sponsor bodies, the standard was presented for approval as an American Standard. It received that approval in December 1949 and was given the new designation ASA B16.4-1949.

A review was started in 1961 by Subcommittee No. 2. A draft involving only minor changes was approved by the Sectional Committee and sponsor bodies. Final ASA approval was granted on December 26, 1963.

As the changes in organization occurred and standards designation increased, Subcommittee No. 2 began a review in 1967. Minor changes included updating references and bringing the Standard into conformance with adopted policies of the B16 Committee. Final approval was granted by ANSI on January 20, 1971.

In 1975, Subcommittee B (formerly 2), in its regular five-year review of the document, recommended the addition of metric (SI) equivalents and updating of referenced standards. The revised edition received approval by ANSI on August 30, 1977.

In 1982, American National Standards Committee B16 became the ASME B16 Standards Committee, operating with the same scope under ASME procedures accredited by ANSI. A new revision of the standard, including rationalization of metric equivalent dimensions and updating of referenced standards, was approved and published as ANSI/ASME B16.4-1985.

The 1992 edition of B16.4 omitted metric units, established U.S. customary units as the standard, and provided for electrodeposition as an alternative to hot dipping for zinc coating. Editorial revisions were made to clarify and correct the text. Following approval by the Standards Committee and ASME, approval as an American National Standard was given on December 2, 1992, with the designation ASME B16.4-1992.

In the 1998 edition of ASME B16.4, the list of referenced standards was updated, a Quality System Program Annex added, an issued Interpretation included, and several editorial revisions made. Following approval by ASME B16 Subcommittee B and B16 Standards Committee, ANSI approved this American National Standard on November 20, 1998.

Work started during 1999 to revise the Standard to include metric units as the primary reference units while maintaining U.S. Customary units in either parenthetical or separate forms. Following

approval by the Standards Committee and the ASME Board, the revision to the 1998 edition of this Standard was approved as an American National Standard by ANSI on November 9, 2006.

In the 2011 edition, 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 new designation, ASME B16.4-2011.

In this 2016 edition, provisions have been made to revise the dimension and tolerance verbiage. Following approval by the ASME B16 Standards Committee, ANSI approved this edition on September 23, 2016, with the new designation ASME B16.4-2016.

Requests for interpretation or suggestions for revision should be sent to the Secretary, B16 Standards 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 or a case, 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
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

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

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

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

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

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

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

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

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

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

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

ASME B16.4-2016
SUMMARY OF CHANGES

Following approval by the ASME B16 Committee and ASME, and after public review, ASME B16.4-2016 was approved by the American National Standards Institute on September 23, 2016.

ASME B16.4-2016 includes the following change identified by a margin note, **(16)**. The Record Number listed below is explained in more detail in the "List of Changes in Record Number Order" following this Summary of Changes.

Page	*Location*	*Change (Record Number)*
2	Section 7	Revised *(12-580)*

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
12-580	Section 7, Dimensions and Tolerances, revised

GRAY IRON THREADED FITTINGS
Classes 125 and 250

1 SCOPE

This Standard for gray iron threaded fittings, Classes 125 and 250, covers

(a) pressure–temperature ratings

(b) sizes and method of designating openings of reducing fittings

(c) marking

(d) material

(e) dimensions and tolerances

(f) threading

(g) coatings

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

2 GENERAL

2.1 References

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

2.2 Quality Systems

Requirements relating to the product manufacturers' quality system programs are described in Nonmandatory Appendix A.

2.3 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.

2.4 Service Conditions

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

2.5 Convention

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

2.6 Denotation

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

(a) Class 125

(b) Class 250

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

NPS	DN
1	25
1¼	32
1½	40
2	50
2½	65
3	80
3½	...
4	100

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

3 PRESSURE–TEMPERATURE RATINGS

(a) Pressure–temperature ratings for these fittings are shown in Tables 1 and I-1.

(b) All ratings are independent of the contained fluid and are themaximum allowable working gage pressures at the tabulated temperatures. Intermediate ratings may be obtained by linear interpolation between the temperatures shown.

(c) The temperatures shown for the corresponding pressure rating shall be the material temperature of the pressure-retaining structure. It may be assumed that the material temperature is the same as the fluid temperature. Use of a pressure rating at a material temperature

Table 1 Pressure–Temperature Ratings

Temperature, °C	Working Pressure, bar	
	Class 125	Class 250
−29 to 66	12.1	27.6
100	11.1	25.0
125	10.2	23.1
150	9.8	21.2
175	8.7 [Note (1)]	19.4
200	. . .	17.5 [Note (2)]

NOTES:
(1) Permissible for service temperature up to 178°C, reflecting the temperature of saturated steam at 8.6 bar.
(2) Permissible for service temperature up to 208°C, reflecting the temperature of saturated steam at 17.2 bar.

other than that of thecontained fluid is the responsibility of the user and subject to the requirements of any applicable code.

4 SIZE

4.1 Nominal Pipe Size

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

4.2 Reducing Fittings

For reducing tees and crosses, the size of the largest run opening shall be given first, followed by the size of the opening at the opposite end of the run. Where the fitting is a tee, the size of the outlet is given last. Where the fitting is a cross, the largest side-outlet opening is the third dimension given, followed by the opposite opening. The straight-line sketches of Fig. 1 illustrate how the reducing fittings are read.

5 MARKING

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

(b) Each Class 250 fitting shall be marked for identification with

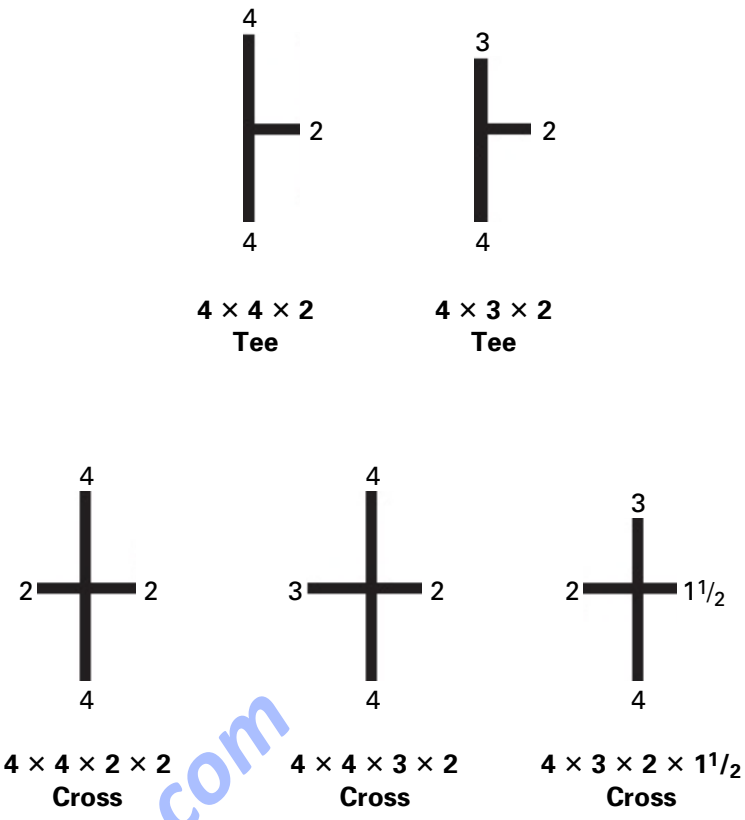
(1) the manufacturer's name or trademark

(2) the numerals "250"

6 MATERIAL

Castings shall be produced to meet the requirements of ASTM A126, Class A, B, or C. The manufacturer shall be prepared to certify that the product has been so produced and that the chemical and physical properties thereof, as proved by test specimens, are equal to these requirements.

Fig. 1 Identification of Reducing Fittings



7 DIMENSIONS AND TOLERANCES (16)

7.1 General

Center-to-end dimensions in millimeters are given for standard straight and reducing fittings in Tables 2 through 6 (Tables I-2 through I-6 are in U.S. Customary units). The sketches of fittings shown in the Standard are representative and for the purpose of illustration.

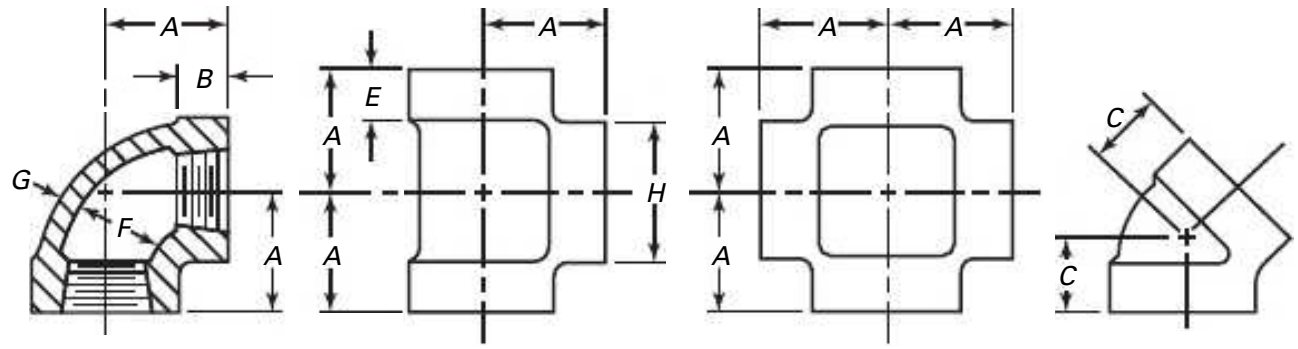
7.2 Reducing Fittings

7.2.1 The dimensions of reduced fittings shown in Tables 3 and 4 (Tables I-3 and I-4) are for use only when making patterns for the specific reducing fitting in question and do not apply when a larger size pattern is reduced (i.e., "bushed") to make the reduction or reductions in the fitting. Reducing pipe fitting patterns shall be designed to produce wall thicknesses, detail, and dimensions as required for the sizes involved.

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

7.2.3 Proof of design shall be verified by a hydrostatic pressure test made at ambient temperature in which pressure is applied for a continuous period of no less than one (1) min and of no less than five (5) times the pressure rating of the largest size of end connection in the reducing fitting. Testing is considered successful only when no evidence of cracking, fracturing, or leakage is exhibited after holding for at least the minimum time at or above the required pressure.

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



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

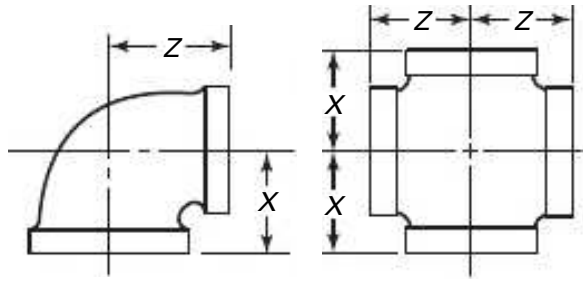
NPS	Center-to-End Elbows, Tees, and Crosses, *A* [Note (1)]	Center-to-End, 45 deg Elbows, *C*	Minimum Length of Thread, *B*	Minimum Width of Band, *E*	Inside Diameter of Fitting, *F*		Metal Thickness, *G*	Minimum Outside Diameter of Band, *H*
					Min.	Max.		
1/4	20.5	18.5	8.0	9.0	13.7	14.8	3.0	24
3/8	24.0	20.5	9.0	11.0	17.1	18.3	3.0	28
1/2	28.5	22.5	11.0	12.5	21.3	22.8	3.5	34
3/4	33.5	25.0	12.5	14.0	26.7	28.1	4.0	41
1	38.0	28.5	14.5	15.5	33.4	35.2	4.5	50
1 1/4	44.5	33.0	17.0	17.5	42.2	43.9	4.5	61
1 1/2	49.5	36.5	18.0	19.0	48.3	50.0	5.0	68
2	57.0	42.5	19.0	21.5	60.3	62.1	5.5	83
2 1/2	68.5	49.5	23.5	24.0	73.0	75.6	6.0	98
3	78.0	55.0	25.0	25.5	88.9	91.4	6.5	117
3 1/2	87.0	60.5	26.0	27.0	101.6	104.1	7.0	132
4	96.5	66.5	27.5	28.5	114.4	116.8	8.0	147
5	114.5	77.5	30.0	30.0	141.3	143.8	9.5	179
6	130.5	88.0	31.5	31.5	168.3	170.8	11.0	210
8	166.5	108.5	37.5	37.5	219.2	221.7	14.0	270
10	205.0	131.0	42.5	42.5	273.1	275.6	17.5	333
12	241.5	151.5	48.0	48.0	323.8	326.4	20.5	393

GENERAL NOTE: Dimensions are in millimeters.

NOTE:

(1) Dimensions for reducing elbows and reducing crosses are given in Table 3 and reducing tees in Table 4.

Table 3 Dimensions of Class 125, 90-deg Elbows and Crosses (Reducing Sizes)

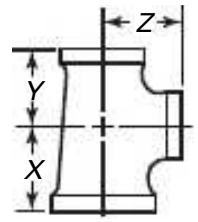


Elbow Cross

Elbows			Crosses		
	Center-to-End			Center-to-End	
NPS	X	Z	NPS	X	Z
1/2 × 3/8	26.5	26.0	3/4 × 3/4 × 1/2 × 1/2	30.5	31.0
3/4 × 1/2	30.5	31.0	1 × 1 × 3/4 × 3/4	35.0	37.0
1 × 3/4	35.0	37.0	1 1/4 × 1 1/4 × 1 × 1	40.0	42.5
1 × 1/2	32.0	35.5	1 1/4 × 1 1/4 × 3/4 × 3/4	37.0	41.0
1 1/4 × 1	40.0	42.5	1 1/2 × 1 1/2 × 1 1/4 × 1 1/	46.0	48.0
1 1/4 × 3/4	36.0	41.0	1 1/2 × 1 1/2 × 1 × 1	42.0	45.5
1 1/4 × 1/2	34.0	39.0	1 1/2 × 1 1/2 × 3/4 × 3/4	38.5	44.5
1 1/2 × 1 1/4	46.0	48.0	2 × 2 × 1 1/2 × 1 1/2	51.5	55.0
1 1/2 × 1	42.0	45.5	2 × 2 × 1 1/4 × 1 1/4	48.5	53.5
1 1/2 × 3/4	38.5	44.5	2 × 2 × 1 × 1	44.0	51.5
1 1/2 × 1/2	36.0	42.5	2 × 2 × 3/4 × 3/4	40.5	50.0
2 × 1 1/2	51.5	55.0	2 1/2 × 2 1/2 × 2 × 2	60.5	56.0
2 × 1 1/4	48.5	53.5	2 1/2 × 2 1/2 × 1 1/2 × 1 1/2	55.0	64.0
2 × 1	44.0	51.5	2 1/2 × 2 1/2 × 1 1/4 × 1 1/4	52.0	62.0
2 × 3/4	40.5	50.0	2 1/2 × 2 1/2 × 1 × 1	47.5	60.0
2 × 1/2	38.0	48.0	3 × 3 × 2 × 2	65.5	73.5
2 1/2 × 2	60.5	66.0	3 × 3 × 1 1/2 × 1 1/2	58.0	71.0
2 1/2 × 1 1/2	55.0	64.0	3 × 3 × 1 1/4 × 1 1/4	55.0	69.5
2 1/2 × 1 1/4	52.0	62.0	3 × 3 × 1 × 1	51.0	67.5
2 1/2 × 1	47.5	60.0	3 1/2 × 3 1/2 × 2 1/2 × 2 1/2	74.5	82.5
3 × 2 1/2	72.0	76.0	3 1/2 × 3 1/2 × 2 × 2	66.5	80.0
3 × 2	64.0	73.5	3 1/2 × 3 1/2 × 1 1/2 × 1 1/2	60.5	77.5
3 × 1 1/2	58.0	71.0	4 × 4 × 3 × 3	84.0	91.5
3 × 1 1/4	55.0	69.5	4 × 4 × 2 1/2 × 2 1/2	77.5	89.0
3 1/2 × 3	81.0	84.5	4 × 4 × 2 × 2	69.5	86.5
4 × 3 1/2	90.0	93.5	4 × 4 × 1 1/2 × 1 1/2	63.5	84.5
4 × 3	84.0	91.5	5 × 5 × 4 × 4	101.5	112.0
4 × 2 1/2	77.5	89.0	5 × 5 × 3 × 3	89.0	107.0
4 × 2	69.5	86.5	5 × 5 × 2 × 2	75.0	102.5
5 × 4	101.5	112.0	6 × 6 × 4 × 4	105.0	125.5
5 × 3	89.0	107.0	6 × 6 × 3 × 3	92.5	120.5
5 × 2 1/2	83.0	105.0	6 × 6 × 2 1/2 × 2 1/2	86.0	118.5
6 × 5	117.5	128.0	6 × 6 × 2 × 2	78.0	116.0
6 × 4	105.0	125.5	8 × 8 × 6 × 6	141.0	162.0
6 × 3	92.5	120.5	8 × 8 × 4 × 4	114.5	156.5
8 × 6	141.0	162.0			

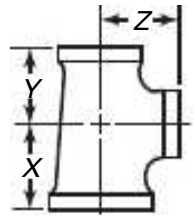
GENERAL NOTES:
(a) Dimensions are in millimeters.
(b) For dimensions not given, see Table 2.

Table 4 Dimensions of Class 125 Tees (Reducing Sizes)



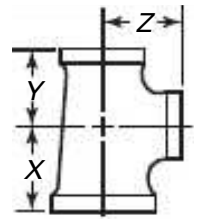
NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/2 × 1/2 × 3/8	26.5	26.5	26.0	1 1/2 × 1 1/4 × 1/2	36.0	34.0	42.0
1/2 × 1/2 × 1/4	24.5	24.5	25.0	1 1/2 × 1 × 1 1/2	49.5	45.5	49.5
3/4 × 3/4 × 1/2	30.5	30.5	31.0	1 1/2 × 1 × 1 1/4	46.0	42.5	47.5
3/4 × 3/4 × 3/8	28.5	28.5	28.5	1 1/2 × 1 × 1	42.0	38.0	45.5
3/4 × 3/4 × 1/4	26.5	26.5	27.5	1 1/2 × 3/4 × 1 1/2	49.5	44.5	49.5
3/4 × 1/2 × 3/4	33.5	31.0	33.5	1 1/2 × 3/4 × 1 1/4	46.0	41.0	48.0
3/4 × 1/2 × 1/2	30.5	28.5	31.0	1 1/2 × 1/2 × 1 1/2	49.5	42.0	49.5
1/2 × 1/2 × 3/4	31.0	31.0	30.5	1 1/4 × 1 1/4 × 1 1/4	48.0	48.0	46.0
1 × 1 × 3/4	35.0	35.0	37.0	1 1/4 × 1 × 1 1/2	48.0	45.5	46.0
1 × 1 × 1/2	32.0	32.0	35.5	1 × 1 × 1 1/4	45.5	45.5	42.0
1 × 1 × 3/8	30.0	30.0	32.5	2 × 2 × 1 1/2	51.5	51.5	55.0
1 × 3/4 × 1	38.0	37.0	38.0	2 × 2 × 1 1/4	48.5	48.5	53.5
1 × 3/4 × 3/4	35.0	33.5	37.0	2 × 2 × 1	44.0	44.0	51.5
1 × 3/4 × 1/2	32.0	30.5	35.5	2 × 2 × 3/4	40.5	40.5	50.0
1 × 1/2 × 1	38.0	35.5	38.0	2 × 2 × 1/2	38.0	38.0	48.0
1 × 1/2 × 3/4	35.0	31.0	3[illegible]	2 × 1 1/2 × 2	57.0	55.0	57.0
1 × 1/2 × 1/2	32.0	28.5	3[illegible]	2 × 1 1/2 × 1 1/2	51.5	49.5	55.0
1 × 3/8 × 1	38.0	32.5	38.0	2 × 1 1/2 × 1 1/4	48.5	46.0	53.5
3/4 × 3/4 × 1	37.0	37.0	35.0	2 × 1 1/2 × 1	44.0	42.0	51.5
1 1/4 × 1 1/4 × 1	40.0	40.0	42.5	2 × 1 1/2 × 3/4	40.5	38.5	50.0
1 1/4 × 1 1/4 × 3/4	37.0	[illegible]	41.0	2 × 1 1/2 × 1/2	38.0	36.0	48.0
1 1/4 × 1 1/4 × 1/2	34.0	[illegible]	39.0	2 × 1 1/4 × 2	57.0	53.5	57.0
1 1/4 × 1 × 1 1/4	44.5	42.5	44.5	2 × 1 1/4 × 1 1/2	51.5	48.0	55.0
1 1/4 × 1 × 1	40.0	38.0	42.5	2 × 1 1/4 × 1 1/4	48.5	44.5	53.5
1 1/4 × 1 × 3/4	37.0	35.0	41.0	2 × 1 1/4 × 1	44.0	40.0	51.5
1 1/4 × 1 × 1/2	34.0	32.0	39.0	2 × 1 × 2	57.0	51.5	57.0
1 1/4 × 3/4 × 1 1/4	44.5	41.0	44.5	2 × 1 × 1 1/2	51.5	45.5	55.0
1 1/4 × 3/4 × 1	40.0	37.0	42.5	2 × 1 × 1 1/4	48.5	42.5	53.5
1 1/4 × 3/4 × 3/4	37.0	33.5	41.0	2 × 3/4 × 2	57.0	50.0	57.0
1 1/4 × 1/2 × 1 1/4	44.5	39.0	44.5	2 × 1/2 × 2	57.0	48.0	57.0
1 1/4 × 1/2 × 1	40.0	33.5	42.5	1 1/2 × 1 × 2	55.0	51.5	51.5
1 × 1 × 1 1/4	42.5	42.5	40.0	1 1/4 × 1 1/4 × 2	53.5	53.5	48.5
1 1/2 × 1 1/2 × 1 1/4	46.0	46.0	48.0	1 1/2 × 1 1/2 × 2	55.0	55.0	51.5
1 1/2 × 1 1/2 × 1	42.0	42.0	45.5	1 1/2 × 1 1/4 × 2	55.0	53.5	51.5
1 1/2 × 1 1/2 × 3/4	38.5	38.5	44.5	2 1/2 × 2 1/2 × 2	60.5	60.5	66.0
1 1/2 × 1 1/2 × 1/2	36.0	36.0	42.0	2 1/2 × 2 1/2 × 1 1/2	55.0	55.0	64.0
1 1/2 × 1 1/4 × 1 1/2	49.5	47.5	49.5	2 1/2 × 2 1/2 × 1 1/4	52.0	52.0	62.0
1 1/2 × 1 1/4 × 1 1/4	46.0	44.5	48.0	2 1/2 × 2 1/2 × 1	47.5	47.5	60.0
1 1/2 × 1 1/4 × 1	42.0	40.0	45.5	2 1/2 × 2 1/2 × 3/4	44.0	44.0	60.0
1 1/2 × 1 1/4 × 3/4	38.5	37.0	44.5	2 1/2 × 2 1/2 × 1/2	41.5	41.5	56.5

Table 4 Dimensions of Class 125 Tees (Reducing Sizes) (Cont'd)



NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
2½ × 2 × 2½	68.5	66.0	68.5	3 × ¾ × 3	78.0	66.5	78.0
2½ × 2 × 2	60.5	57.0	66.0	2½ × 2½ × 3	76.0	76.0	72.0
2½ × 2 × 1½	55.0	51.5	64.0	2½ × 2 × 3	76.0	73.5	72.0
2½ × 2 × 1¼	52.0	48.5	62.0	2 × 2 × 3	73.5	73.5	64.0
2½ × 2 × 1	47.5	44.0	60.0	3½ × 3½ × 3	81.0	81.0	84.5
2½ × 2 × ¾	44.5	40.5	59.0	3½ × 3½ × 2½	74.5	74.5	82.5
2½ × 2 × ½	41.5	38.0	56.5	3½ × 3½ × 2	66.5	66.5	80.0
2½ × 1½ × 2½	68.5	64.0	68.5	3½ × 3½ × 1½	60.5	60.5	77.5
2½ × 1½ × 2	60.5	55.0	66.0	3½ × 3½ × 1¼	56.5	56.5	76.0
2½ × 1½ × 1½	55.0	49.5	64.0	3½ × 3½ × 1	53.5	53.5	74.0
2½ × 1¼ × 2½	68.5	62.0	68.5	3½ × 3 × 3	81.0	78.0	84.5
2½ × 1¼ × 2	60.5	53.5	66.0	3½ × 3 × 2½	74.5	72.0	82.5
2½ × 1 × 2½	68.5	60.5	68.5	3½ × 3 × 2	66.5	64.0	80.0
2½ × 1 × 2	60.5	51.5	66.0	3½ × 3 × 1½	60.5	58.0	77.5
2½ × ¾ × 2½	68.5	59.0	68.5	3½ × 2½ × 3½	87.0	82.5	87.0
2½ × ½ × 2½	68.5	56.5	68.5	3½ × 2½ × 3	81.0	76.0	84.5
2 × 2 × 2½	66.0	66.0	60.5	3½ × 2½ × 2½	74.5	68.5	82.5
2 × 1½ × 2½	66.0	64.0	60.5	3½ × 2 × 3½	87.0	80.0	87.0
2 × 1¼ × 2½	66.0	62.0	60.5	3½ × 1½ × 3½	87.0	77.5	87.0
1½ × 1½ × 2½	64.0	64.0	57.0	3½ × 1¼ × 3½	87.0	76.0	87.0
3 × 3 × 2½	72.0	72.0	76.0	3½ × 1 × 3½	87.0	74.0	87.0
3 × 3 × 2	64.0	64.0	73.5	3 × 3 × 3½	84.5	84.5	81.0
3 × 3 × 1½	58.0	58.0	71.0	4 × 4 × 3½	90.0	90.0	93.5
3 × 3 × 1¼	55.0	55.0	69.5	4 × 4 × 3	84.0	84.0	91.5
3 × 3 × 1	51.0	51.0	67.5	4 × 4 × 2½	77.5	77.5	89.0
3 × 3 × ¾	47.5	47.5	66.5	4 × 4 × 2	69.5	69.5	86.5
3 × 3 × ½	44.5	44.5	64.0	4 × 4 × 1½	64.0	64.0	84.5
3 × 2½ × 3	78.5	76.0	78.0	4 × 4 × 1¼	60.5	60.5	83.0
3 × 2½ × 2½	72.0	68.5	76.0	4 × 4 × 1	56.5	56.5	81.0
3 × 2½ × 2	64.0	60.5	73.5	4 × 4 × ¾	53.0	53.0	79.5
3 × 2½ × 1½	58.0	55.0	71.0	4 × 3½ × 4	96.5	93.5	96.5
3 × 2½ × 1¼	55.0	52.0	69.5	4 × 3½ × 3½	90.0	87.0	93.5
3 × 2½ × 1	51.0	47.5	67.5	4 × 3½ × 3	84.0	81.0	91.5
3 × 2 × 3	78.0	73.5	78.0	4 × 3½ × 2½	77.5	77.5	89.0
3 × 2 × 2½	72.0	66.0	76.0	4 × 3½ × 2	69.5	66.5	86.5
3 × 2 × 2	64.0	57.0	73.5	4 × 3½ × 1½	64.0	60.5	84.5
3 × 2 × 1½	58.0	51.5	71.0	4 × 3½ × 1¼	60.5	57.5	83.0
3 × 1½ × 3	78.0	71.0	78.0	4 × 3 × 4	96.5	91.5	96.5
3 × 1¼ × 3	78.0	69.5	78.0	4 × 3 × 3	84.0	78.0	91.5
3 × 1 × 3	78.0	67.5	78.0	4 × 3 × 2½	77.5	72.0	89.0

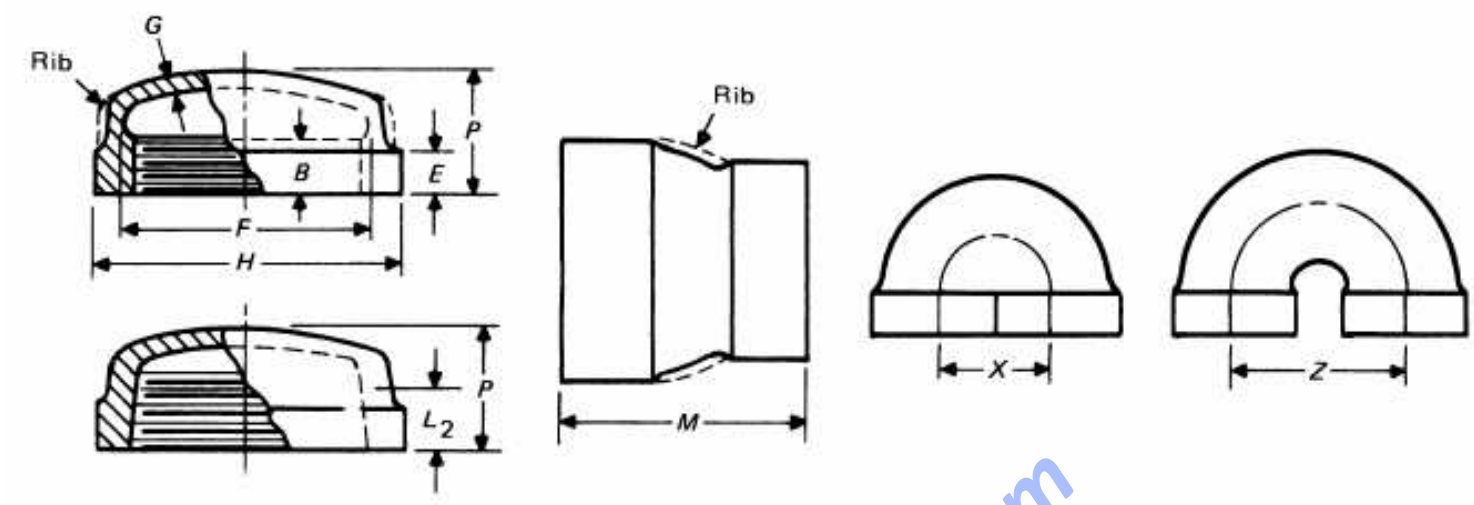
Table 4 Dimensions of Class 125 Tees (Reducing Sizes) (Cont'd)



NPS	Center-to-End			NPS	Center-to-End		
	X	Y	Z		X	Y	Z
4 × 3 × 2	69.5	64.0	86.5	6 × 6 × 5	117.5	117.5	128.0
4 × 2½ × 4	96.5	89.2	96.5	6 × 6 × 4	105.0	105.0	125.5
4 × 2½ × 3	84.0	76.0	91.5	6 × 6 × 3	92.5	92.5	120.5
4 × 2½ × 2½	77.5	68.5	89.0	6 × 6 × 2½	86.0	86.0	118.5
4 × 2 × 4	96.5	86.5	96.5	6 × 6 × 2	78.0	78.0	116.0
4 × 2 × 3	84.0	73.5	91.5	6 × 6 × 1½	72.5	72.5	113.5
4 × 2 × 2	69.5	57.0	86.5	6 × 6 × 1¼	69.5	69.5	112.0
4 × 1½ × 4	96.5	84.5	96.5	6 × 6 × 1	65.0	65.0	110.0
4 × 1¼ × 4	96.5	83.0	96.5	6 × 5 × 6	130.5	128.0	130.5
4 × 1 × 4	96.5	81.0	96.5	6 × 5 × 5	117.5	114.5	128.0
3½ × 3½ × 4	93.5	93.5	90.0	6 × 5 × 4	105.0	101.5	125.5
3 × 3 × 4	91.5	91.5	84.0	6 × 5 × 3	92.5	89.0	120.5
2½ × 2½ × 4	89.0	89.0	77.5	6 × 5 × 2½	86.0	83.0	118.5
2 × 2 × 4	86.5	86.5	69.5	6 × 5 × 2	78.0	75.0	116.0
5 × 5 × 4	101.5	101.5	112.0	6 × 4 × 6	130.5	125.5	130.5
5 × 5 × 3½	95.5	95.5	109.5	6 × 4 × 5	117.5	112.0	128.0
5 × 5 × 3	89.0	89.0	107.0	6 × 4 × 4	105.0	96.5	125.5
5 × 5 × 2½	83.0	83.0	105.0	6 × 3 × 6	130.5	120.5	130.5
5 × 5 × 2	75.0	75.0	102.5	6 × 3 × 3	92.5	78.0	120.5
5 × 5 × 1½	69.0	69.0	100.0	6 × 2½ × 6	130.5	118.5	130.5
5 × 5 × 1¼	66.0	66.0	98.5	6 × 2 × 6	130.5	116.0	130.5
5 × 5 × 1	61.5	61.5	96.5	5 × 5 × 6	128.0	128.0	117.5
5 × 4 × 5	114.5	112.0	114.5	5 × 3 × 6	128.0	120.5	117.5
5 × 4 × 4	101.5	96.5	112.0	4 × 4 × 6	125.5	125.5	105.0
5 × 4 × 3½	95.5	90.0	109.5	8 × 8 × 6	141.0	141.0	162.0
5 × 4 × 3	89.0	84.0	107.0	8 × 8 × 5	128.0	128.0	159.5
5 × 4 × 2½	83.0	77.5	105.0	8 × 8 × 4	114.5	114.5	156.5
5 × 4 × 2	75.0	69.5	102.5	8 × 8 × 3	101.5	101.5	154.0
5 × 4 × 1½	69.0	64.0	100.0	8 × 8 × 2½	93.5	93.5	152.5
5 × 3 × 5	114.5	107.0	114.5	8 × 8 × 2	87.5	87.5	148.5
5 × 3 × 4	101.5	91.5	112.0	8 × 6 × 8	166.5	162.0	166.5
5 × 3 × 3	89.0	78.0	107.0	8 × 6 × 6	141.0	130.5	162.0
5 × 2½ × 5	114.5	105.0	114.5	8 × 4 × 8	166.5	156.5	166.5
5 × 2 × 5	114.5	102.5	114.5	6 × 6 × 8	162.0	162.0	141.0
4 × 4 × 5	112.0	112.0	101.5				

GENERAL NOTES:
(a) Dimensions are in millimeters.
(b) For dimensions not given, see Table 2.

Table 5 Dimensions of Class 125 Caps, Reducing Couplings, and Closed- and Open-Pattern Return Bends



NPS	Minimum Length of Thread [Note (1)]		Minimum Width of Band, *E*	Inside Diameter of Fitting, *F* [Note (1)]		Metal Thick-ness, *G*	Minimum Outside Diameter of Band, *H*	Length of Reducing Concentric Couplings, *M* [Note (2)]	Minimum Height, *P* [Note (1)]	Center-to-Center	
	B	L_2		Min.	Max.					Closed, *X*	Open, *Z*
½	11.0	. . .	12.5	21.3	22.8	[illegible]5	34	35	. . .	32.0	44.5
¾	12.5	. . .	14.0	26.7	28.1	4.0	41	38	. . .	38.0	48.0
1	14.5	. . .	16.0	33.4	35.2	4.5	50	43	. . .	44.5	63.5
1¼	17.0	. . .	17.5	42.4	44.1	4.5	61	54	. . .	52.0	76.0
1½	18.0	. . .	19.0	48.3	50.0	5.0	68	57	. . .	63.5	89.0
2	19.0	. . .	21.5	60.3	62.1	5.0	83	59	. . .	82.5	114.5
2½	23.5	29.0	30.0	73.0	75.6	6.0	98	67	46.0	95.5	139.5
3	25.0	30.5	25.5	88.9	91.4	6.5	117	73	48.5	114.5	165.0
3½	26.0	32.0	27.0	101.6	104.1	7.0	132	80	51.5	. . .	. . .
4	27.5	33.0	28.5	114.4	116.8	8.0	147	86	56.5	152.5	190.5
5	30.0	36.0	30.0	141.3	143.8	9.5	179	91	60.5	. . .	. . .
6	32.5	38.5	32.5	168.3	170.8	11.0	210	97	67.0	. . .	. . .
8	37.5	43.5	37.5	219.2	221.7	14.0	270	133	73.0	. . .	. . .
10	42.5	49.0	42.5	273.1	275.6	17.5	333	. . .	89.0	. . .	. . .
12	48.0	54.0	48.0	323.8	326.4	20.5	393	. . .	98.5	. . .	. . .

GENERAL NOTES:

(a) Dimensions are in millimeters.

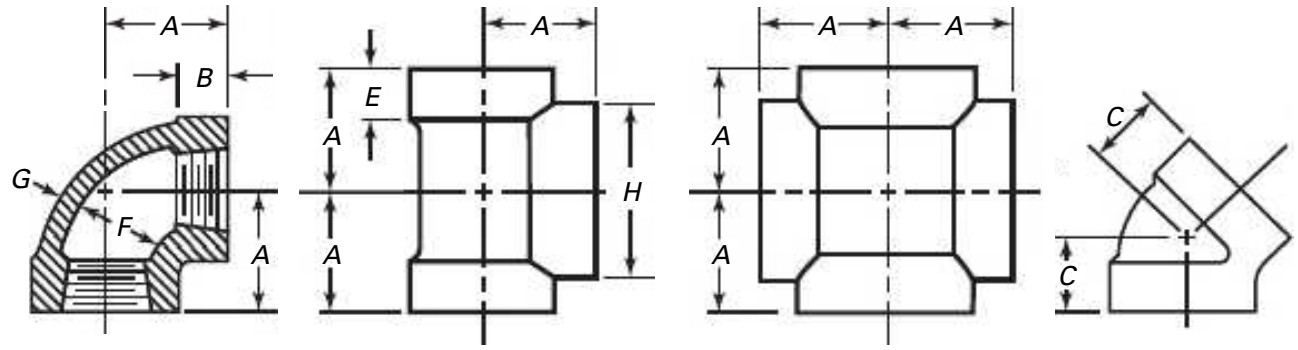
(b) Caps may be made flat or with a radius as shown in the illustrations.

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 not less than *B*, and the length of useful thread (*B* plus threads with fully formed roots and flat crests) shall be not less than *L* (effective length of external thread) required by ASME B1.20.1.

(2) Dimension *M* for all reduction of reducing couplings (concentric only) shall be the same as shown for the largest opening. Dimension *M* for eccentric couplings is not standard and such information should be obtained from the manufacturer.

Table 6 Dimensions of Class 250, 90-deg and 45-deg Elbows, Tees, and Crosses (Straight Sizes)



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

NPS	Center-to-End Elbows, Tees, and Crosses, *A*	Center-to-End, 45-deg Elbows, *C*	Minimum Length of Thread, *B*	Minimum Width of Band, *E*	Inside Diameter of Fitting, *F*		Metal Thickness, *G*	Minimum Outside Diameter of Band, *H*
					Min.	Max.		
1/4	24.0	20.5	11.0	12.5	13.7	14.8	4.5	30
3/8	27.0	22.5	12.0	14.0	17.1	18.3	4.5	36
1/2	32.0	25.5	14.5	15.0	21.3	22.8	5.0	40
3/4	36.5	28.5	16.5	17.5	26.7	28.1	6.0	48
1	41.5	33.5	19.0	19.5	33.4	35.2	7.0	57
1 1/4	49.5	38.0	21.5	22.5	42.2	43.9	8.5	69
1 1/2	54.0	43.0	22.0	24.5	48.3	50.0	9.0	78
2	63.5	51.0	25.5	28.5	60.3	62.1	10.0	95
2 1/2	74.5	57.0	29.5	33.0	73.0	75.6	11.0	117
3	86.0	63.5	31.0	36.5	88.9	91.4	12.0	136
3 1/2	95.5	67.0	32.5	38.0	101.6	104.1	13.0	152
4	105.0	71.5	34.0	40.0	114.4	116.8	14.0	168
5	124.0	81.0	36.5	44.0	141.3	143.8	17.0	201
6	143.0	89.0	39.0	48.5	168.3	170.8	19.0	235
8	178.0	109.5	43.5	57.0	219.2	221.7	23.0	298
10	219.0	132.9	49.0	65.5	273.1	275.6	27.5	365
12	254.0	152.5	54.0	74.0	323.8	326.4	31.5	428

GENERAL NOTES:
(a) Dimensions are in millimeters.
(b) The Class 250 standard for threaded fittings covers only the straight sizes of 90-deg and 45-deg elbows, tees, and crosses.

7.3 Tolerances

The following tolerances shall be permitted:

(a) Metal Thickness Tolerances. Metal thickness at no point in the castings shall be less than 90% of the value given in Tables 2 through 6 (Tables I-2 through I-6).

(b) Center-to-End Tolerances. Permitted tolerances on the center-to-end dimensions of the fittings are shown in Tables 7 and I-7. Tolerances for end-to-end dimensions and lengths of couplings and reducers shall be twice those given. The largest opening in a reducing fitting governs the tolerances to be applied to all openings. These tolerances do not apply to return bends and caps.

8 THREADING

(a) All fittings shall be threaded according to ASME B1.20.1, and the variations in threading shall be limited to one turn large or one turn small from the gaging notch on the plug when using working gages.

(b) 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 (see Fig. 2).

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

Table 7 Inspection Tolerances

NPS	Tolerance, mm
1/4	±1.0
3/8	±1.3
1/2, 3/4	±1.5
1, 1 1/4	±1.8
1 1/2, 2	±2.0
2 1/2, 3, 3 1/2	±2.5
4, 5	±3.0
6	±3.6
8	±4.1
10	±4.8
12	±5.3

(d) The length of the threads specified in all tables shall be measured to include the countersink.

(e) The maximum allowable variation in the alignment of threads of all openings of threaded fittings shall be 5.0 mm/m (0.06 in./ft) (0.5% slope).

9 RIBS

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

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

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

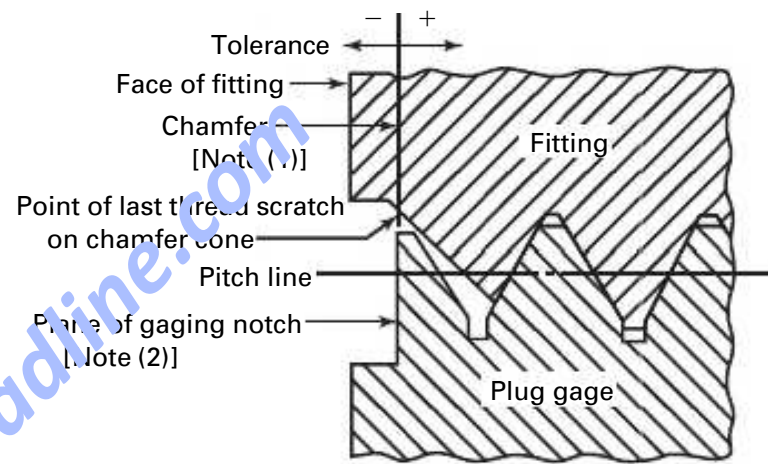
10 PLUGS, BUSHINGS, AND LOCKNUTS

For dimensions of plugs, bushings, and locknuts to be used in connection with Classes 125 and 250 gray iron threaded fittings, see ASME B16.14.

11 FACE BEVEL

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

Fig. 2 Gaging of Chamfered Internal Threads



GENERAL NOTE: Enlarged view showing chamfered internal thread of basic size with chamfer exceeding the major diameter.

NOTES:

(1) The chamfer illustrated is at a 45-deg angle and is approximately 3/8 pitch in depth. However, these details are not requirements and are given only for information on the illustration shown.

(2) Plane of gaging notch should intersect crest of thread on gage.

12 COATINGS

When gray iron fittings are zinc coated, they shall be hot dipped in accordance with ASTM A153 or have an electrodeposited zinc coating conforming to ASTM B633, Type I, Service Condition 4. Hot-dipped coatings shall be 0.0864 mm (0.0034 in.) minimum thickness and applied prior to threading. Electrodeposited zinc shall be 0.025 mm (0.001 in.) minimum thickness and may be applied either before or after threading.

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

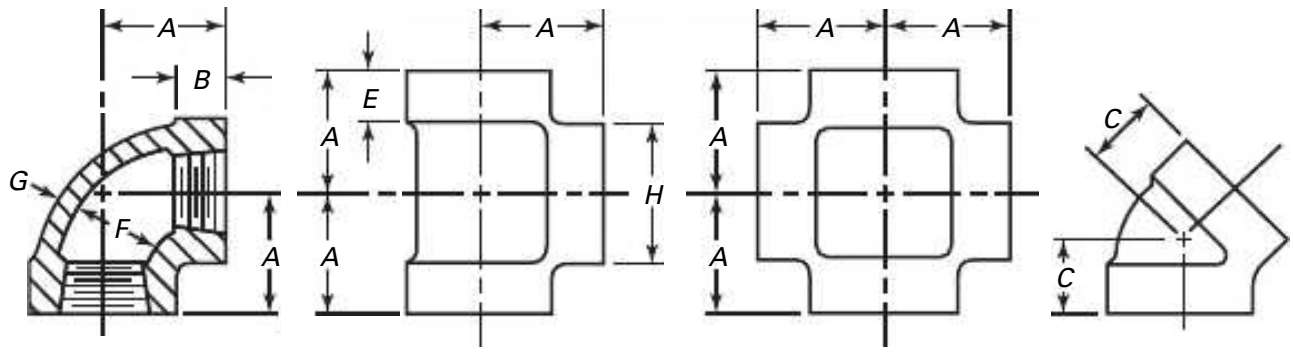
This Appendix provides tables of the standard inch dimensions for fittings (Tables I-1 through I-7).

Table I-1 Pressure–Temperature Ratings

	Working Pressure, psi	
Temperature, °F	Class 125	Class 250
−20 to 150	175	400
200	165	370
250	150	340
300	140	310
350	125 [Note (1)]	300
400	. .	250 [Note (2)]

NOTES:
(1) Permissible for service temperature up to 353°F, reflecting the temperature of saturated steam at 125 psi.
(2) Permissible for service temperature up to 406°F, reflecting the temperature of saturated steam at 250 psi.

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



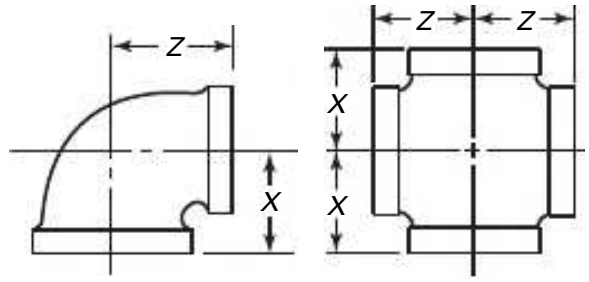
	90-deg Elbow		Tee		Cross		45-deg Elbow	
NPS	Center-to-End Elbows, Tees, and Crosses, *A* [Note (1)]	Center-to-End, 45-deg Elbows, *C*	Minimum Length of Thread, *B*	Minimum Width of Band, *E*	Inside Diameter of Fitting, *F* Min.	Max.	Metal Thickness, *G*	Minimum Outside Diameter of Band, *H*
1/4	0.81	0.73	0.32	0.38	0.54	0.58	0.11	0.93
3/8	0.95	0.80	0.36	0.41	0.67	0.72	0.12	1.12
1/2	1.12	0.88	0.43	0.50	0.84	0.90	0.13	1.34
3/4	1.31	0.98	0.50	0.56	1.05	1.11	0.15	1.63
1	1.50	1.12	0.58	0.62	1.31	1.38	0.17	1.95
1 1/4	1.75	1.29	0.67	0.69	1.66	1.73	0.18	2.39
1 1/2	1.94	1.43	0.70	0.75	1.90	1.97	0.20	2.68
2	2.25	1.68	0.75	0.84	2.37	2.44	0.22	3.28
2 1/2	2.70	1.95	0.92	0.94	2.87	2.97	0.24	3.86
3	3.08	2.17	0.98	1.00	3.50	3.60	0.26	4.62
3 1/2	3.42	2.39	1.03	1.06	4.00	4.10	0.28	5.20
4	3.79	2.61	1.08	1.12	4.50	4.60	0.31	5.79
5	4.50	3.05	1.18	1.18	5.56	5.66	0.38	7.05
6	5.13	3.46	1.28	1.28	6.62	6.72	0.43	8.28
8	6.56	4.28	1.47	1.47	8.62	8.72	0.55	10.63
10	8.08	5.16	1.68	1.68	10.75	10.85	0.69	13.12
12	9.50	5.97	1.88	1.88	12.75	12.85	0.80	15.47

GENERAL NOTE: Dimensions are in inches.

NOTE:

(1) Dimensions for reducing elbows and reducing crosses are given in Table I-3 and reducing tees in Table I-4.

Table I-3 Dimensions of Class 125, 90-deg Elbows and Crosses (Reducing Sizes)

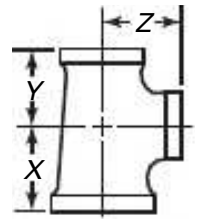


Elbow Cross

Elbows			Crosses		
	Center-to-End			Center-to-End	
NPS	*X*	*Z*	NPS	*X*	*Z*
½ × ⅜	1.04	1.03	¾ × ¾ × ½ × ½	1.20	1.22
¾ × ½	1.20	1.22	1 × 1 × ¾ × ¾	1.37	1.45
1 × ¾	1.37	1.45	1¼ × 1¼ × 1 × 1	1.58	1.67
1 × ½	1.26	1.36	1¼ × 1¼ × ¾ × ¾	1.45	1.62
1¼ × 1	1.58	1.67	1½ × 1½ × 1¼ × 1¼	1.82	1.88
1¼ × ¾	1.45	1.62	1½ × 1½ × × 1	1.65	1.80
1¼ × ½	1.34	1.53	1½ × 1½ × ¾ × ¾	1.52	1.75
1½ × 1¼	1.82	1.88	2 × 2 × 1½ × 1½	2.02	2.16
1½ × 1	1.65	1.80	2 × 2 × 1¼ × 1¼	1.90	2.10
1½ × ¾	1.52	1.75	2 × 2 × 1 × 1	1.73	2.02
1½ × ½	1.41	1.66	2 × 2 × ¾ × ¾	1.60	1.97
2 × 1½	2.02	2.16	2½ × 2½ × 2 × 2	2.39	2.60
2 × 1¼	1.90	2.10	2½ × 2½ × 1½ × 1½	2.16	2.51
2 × 1	1.73	2.02	2½ × 2½ × 1¼ × 1¼	2.04	2.45
2 × ¾	1.60	1.97	2½ × 2½ × 1 × 1	1.87	2.37
2 × ½	1.49	1.88	3 × 3 × 2 × 2	2.57	2.89
2½ × 2	2.39	2.60	3 × 3 × 1½ × 1½	2.29	2.80
2½ × 1½	2.16	2.51	3 × 3 × 1¼ × 1¼	2.17	2.74
2½ × 1¼	2.04	2.45	3 × 3 × 1 × 1	2.00	2.66
2½ × 1	1.87	2.37	3½ × 3½ × 2½ × 2½	2.93	3.24
3 × 2½	2.83	2.99	3½ × 3½ × 2 × 2	2.62	3.14
3 × 2	2.52	2.89	3½ × 3½ × 1½ × 1½	2.39	3.05
3 × 1½	2.29	2.80	4 × 4 × 3 × 3	3.30	3.60
3 × 1¼	2.17	2.74	4 × 4 × 2½ × 2½	3.05	3.51
3½ × 3	3.18	3.33	4 × 4 × 2 × 2	2.74	3.41
4 × 3½	3.54	3.69	4 × 4 × 1½ × 1½	2.51	3.32
4 × 3	3.30	3.60	5 × 5 × 4 × 4	4.00	4.41
4 × 2½	3.05	3.51	5 × 5 × 3 × 3	3.51	4.22
4 × 2	2.74	3.41	5 × 5 × 2 × 2	2.95	4.03
5 × 4	4.00	4.41	6 × 6 × 4 × 4	4.13	4.94
5 × 3	3.51	4.22	6 × 6 × 3 × 3	3.64	4.75
5 × 2½	3.26	4.13	6 × 6 × 2½ × 2½	3.39	4.66
6 × 5	4.63	5.03	6 × 6 × 2 × 2	3.08	4.56
6 × 4	4.13	4.94	8 × 8 × 6 × 6	5.56	6.37
6 × 3	3.64	4.75	8 × 8 × 4 × 4	4.50	6.17
8 × 6	5.56	6.37			

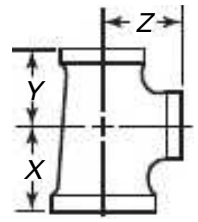
GENERAL NOTES:
(a) Dimensions are in inches.
(b) For dimensions not given, see Table I-2.

Table I-4 Dimensions of Class 125 Tees (Reducing Sizes)



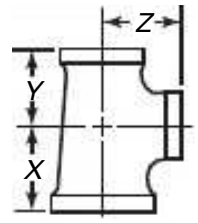
NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
1/2 × 1/2 × 3/8	1.04	1.04	1.03	1 1/2 × 1 1/4 × 1/2	1.41	1.34	1.66
1/2 × 1/2 × 1/4	0.97	0.97	0.98	1 1/2 × 1 × 1 1/2	1.94	1.80	1.94
3/4 × 3/4 × 1/2	1.20	1.20	1.22	1 1/2 × 1 × 1 1/4	1.82	1.67	1.88
3/4 × 3/4 × 3/8	1.12	1.12	1.13	1 1/2 × 1 × 1	1.65	1.50	1.80
3/4 × 3/4 × 1/4	1.05	1.05	1.08	1 1/2 × 3/4 × 1 1/2	1.94	1.75	1.94
3/4 × 1/2 × 3/4	1.31	1.22	1.31	1 1/2 × 3/4 × 1 1/4	1.82	1.62	1.88
3/4 × 1/2 × 1/2	1.20	1.12	1.22	1 1/2 × 1/2 × 1 1/2	1.94	1.66	1.94
1/2 × 1/2 × 3/4	1.22	1.22	1.20	1 1/4 × 1 1/4 × 1 1/2	1.88	1.88	1.82
1 × 1 × 3/4	1.37	1.37	1.45	1 1/4 × 1 × 1 1/2	1.88	1.80	1.82
1 × 1 × 1/2	1.26	1.26	1.36	1 × 1 × 1 1/2	1.80	1.80	1.65
1 × 1 × 3/8	1.18	1.18	1.27	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
1 × 3/4 × 1/2	1.26	1.20	1.36	2 × 2 × 3/4	1.60	1.60	1.97
1 × 1/2 × 1	1.50	1.36	1.50	2 × 2 × 1/2	1.49	1.49	1.88
1 × 1/2 × 3/4	1.37	1.22	1.45	2 × 1 1/2 × 2	2.25	2.16	2.25
1 × 1/2 × 1/2	1.26	1.12	1.36	2 × 1 1/2 × 1 1/2	2.02	1.94	2.16
1 × 3/8 × 1	1.50	1.27	1.50	2 × 1 1/2 × 1 1/4	1.90	1.82	2.10
3/4 × 3/4 × 1	1.45	1.45	1.57	2 × 1 1/2 × 1	1.73	1.65	2.02
1 1/4 × 1 1/4 × 1	1.58	1.58	1.67	2 × 1 1/2 × 3/4	1.60	1.52	1.97
1 1/4 × 1 1/4 × 3/4	1.45	1.45	1.62	2 × 1 1/2 × 1/2	1.49	1.41	1.88
1 1/4 × 1 1/4 × 1/2	1.34	1.34	1.53	2 × 1 1/4 × 2	2.25	2.10	2.25
1 1/4 × 1 × 1 1/4	1.75	1.67	1.75	2 × 1 1/4 × 1 1/2	1.02	1.88	2.16
1 1/4 × 1 × 1	1.58	1.50	1.67	2 × 1 1/4 × 1 1/4	1.90	1.75	2.10
1 1/4 × 1 × 3/4	1.45	1.37	1.62	2 × 1 1/4 × 1	1.73	1.58	2.02
1 1/4 × 1 × 1/2	1.34	1.26	1.53	2 × 1 × 2	2.25	2.02	2.25
1 1/4 × 3/4 × 1 1/4	1.75	1.62	1.75	2 × 1 × 1 1/2	2.02	1.80	2.16
1 1/4 × 3/4 × 1	1.58	1.45	1.67	2 × 1 × 1 1/4	1.90	1.67	2.10
1 1/4 × 3/4 × 3/4	1.45	1.31	1.62	2 × 3/4 × 2	2.25	1.97	2.25
1 1/4 × 1/2 × 1 1/4	1.75	1.53	1.75	2 × 1/2 × 2	2.25	1.88	2.25
1 1/4 × 1/2 × 1	1.58	1.36	1.67	1 1/2 × 1 × 2	2.16	2.02	2.02
1 × 1 × 1 1/4	1.67	1.67	1.58	1 1/4 × 1 1/4 × 2	2.10	2.10	1.90
1 1/2 × 1 1/2 × 1 1/4	1.82	1.82	1.88	1 1/2 × 1 1/2 × 2	2.16	2.16	2.02
1 1/2 × 1 1/2 × 1	1.65	1.65	1.80	1 1/2 × 1 1/4 × 2	2.16	2.10	2.02
1 1/2 × 1 1/2 × 3/4	1.52	1.52	1.75	2 1/2 × 2 1/2 × 2	2.39	2.39	2.60
1 1/2 × 1 1/2 × 1/2	1.41	1.41	1.66	2 1/2 × 2 1/2 × 1 1/2	2.16	2.16	2.51
1 1/2 × 1 1/4 × 1 1/2	1.94	1.88	1.94	2 1/2 × 2 1/2 × 1 1/4	2.04	2.04	2.45
1 1/2 × 1 1/4 × 1 1/4	1.82	1.75	1.88	2 1/2 × 2 1/2 × 1	1.87	1.87	2.37
1 1/2 × 1 1/4 × 1	1.65	1.58	1.80	2 1/2 × 2 1/2 × 3/4	1.74	1.74	2.32
1 1/2 × 1 1/4 × 3/4	1.52	1.45	1.75	2 1/2 × 2 1/2 × 1/2	1.63	1.63	2.23

Table I-4 Dimensions of Class 125 Tees (Reducing Sizes) (Cont'd)



NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
2½ × 2 × 2½	2.70	2.60	2.70	3 × ¾ × 3	3.08	2.61	3.08
2½ × 2 × 2	2.39	2.25	2.60	2½ × 2½ × 3	2.99	2.99	2.83
2½ × 2 × 1½	2.16	2.02	2.51	2½ × 2 × 3	2.99	2.89	2.83
2½ × 2 × 1¼	2.04	1.90	2.45	2 × 2 × 3	2.89	2.89	2.52
2½ × 2 × 1	1.87	1.73	2.37	3½ × 3½ × 3	3.18	3.18	3.33
2½ × 2 × ¾	1.74	1.60	2.32	3½ × 3½ × 2½	2.93	2.93	3.24
2½ × 2 × ½	1.63	1.49	2.23	3½ × 3½ × 2	2.62	2.62	3.14
2½ × 1½ × 2½	2.70	2.51	2.70	3½ × 3½ × 1½	2.39	2.39	3.05
2½ × 1½ × 2	2.39	2.16	2.60	3½ × 3½ × 1¼	2.27	2.27	2.99
2½ × 1½ × 1½	2.16	1.94	2.51	3½ × 3½ × 1	2.10	2.10	2.91
2½ × 1¼ × 2½	2.70	2.45	2.70	3½ × 3 × 3	3.18	3.08	3.33
2½ × 1¼ × 2	2.39	2.10	2.60	3½ × 3 × 2½	2.93	2.83	3.24
2½ × 1 × 2½	2.70	2.37	2.70	3½ × 3 × 2	2.62	2.52	3.14
2½ × 1 × 2	2.39	2.02	2.60	3½ × 3 × 1½	2.39	2.29	3.05
2½ × ¾ × 2½	2.70	2.32	2.70	3½ × 2½ × 3½	3.42	3.24	3.42
2½ × ½ × 2½	2.70	2.23	2.70	3½ × 2½ × 3	3.18	2.99	3.33
2 × 2 × 2½	2.60	2.60	2.39	3½ × 2½ × 2½	2.93	2.70	3.24
2 × 1½ × 2½	2.60	2.51	2.39	3½ × 2 × 3½	3.42	3.14	3.42
2 × 1¼ × 2½	2.60	2.45	2.39	3½ × 1½ × 3½	3.42	3.05	3.42
1½ × 1½ × 2½	2.51	2.51	2.16	3½ × 1¼ × 3½	3.42	2.99	3.42
3 × 3 × 2½	2.83	2.83	2.99	3½ × 1 × 3½	3.42	2.91	3.42
3 × 3 × 2	2.52	2.52	2.89	3 × 3 × 3½	3.33	3.33	3.18
3 × 3 × 1½	2.29	2.29	2.80	4 × 4 × 3½	3.54	3.54	3.69
3 × 3 × 1¼	2.17	2.17	2.74	4 × 4 × 3	3.30	3.30	3.60
3 × 3 × 1	2.00	2.00	2.66	4 × 4 × 2½	3.05	3.05	3.51
3 × 3 × ¾	1.87	1.87	2.61	4 × 4 × 2	2.74	2.74	3.41
3 × 3 × ½	1.76	1.76	2.52	4 × 4 × 1½	2.51	2.51	3.32
3 × 2½ × 3	3.08	2.99	3.08	4 × 4 × 1¼	2.39	2.39	3.26
3 × 2½ × 2½	2.83	2.70	2.99	4 × 4 × 1	2.22	2.22	3.18
3 × 2½ × 2	2.52	2.39	2.89	4 × 4 × ¾	2.09	2.09	3.13
3 × 2½ × 1½	2.29	2.16	2.80	4 × 3½ × 4	3.79	3.69	3.79
3 × 2½ × 1¼	2.17	2.04	2.74	4 × 3½ × 3½	3.54	3.42	3.69
3 × 2½ × 1	2.00	1.87	2.66	4 × 3½ × 3	3.30	3.18	3.60
3 × 2 × 3	3.08	2.89	3.08	4 × 3½ × 2½	3.05	2.93	3.51
3 × 2 × 2½	2.83	2.60	2.99	4 × 3½ × 2	2.74	2.62	3.41
3 × 2 × 2	2.52	2.25	2.89	4 × 3½ × 1½	2.51	2.39	3.32
3 × 2 × 1½	2.29	2.02	2.80	4 × 3½ × 1¼	2.39	2.27	3.26
3 × 1½ × 3	3.08	2.80	3.08	4 × 3 × 4	3.79	3.60	3.79
3 × 1¼ × 3	3.08	2.74	3.08	4 × 3 × 3	3.30	3.08	3.60
3 × 1 × 3	3.08	2.66	3.08	4 × 3 × 2½	3.05	2.83	3.51

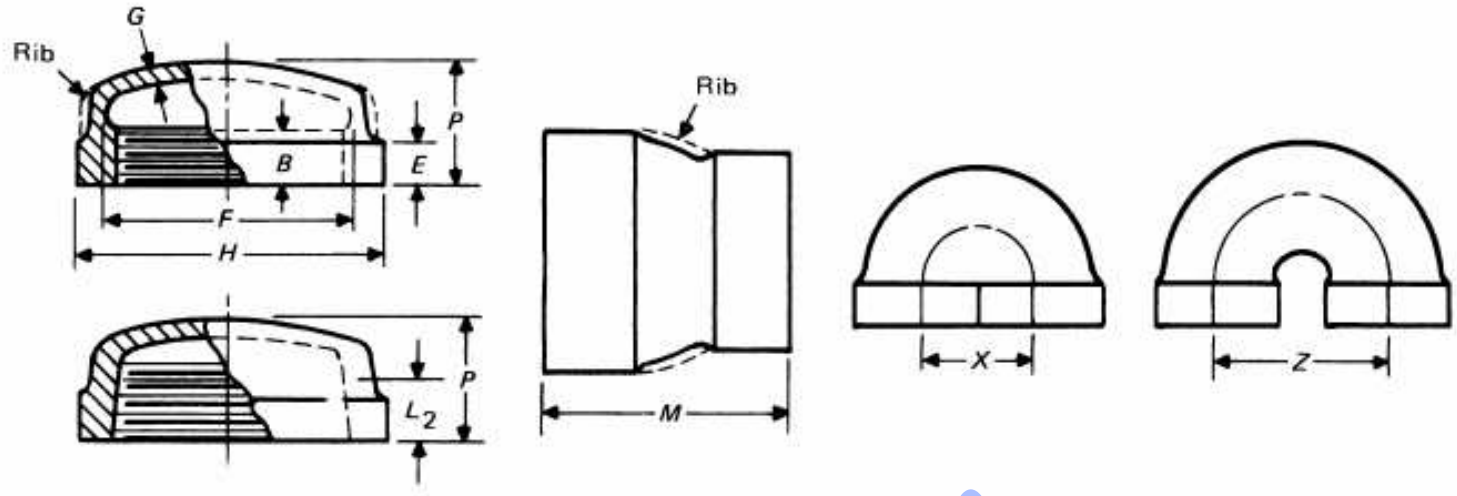
Table I-4 Dimensions of Class 125 Tees (Reducing Sizes) (Cont'd)



NPS	Center-to-End			NPS	Center-to-End		
	X	*Y*	*Z*		*X*	*Y*	*Z*
4 × 3 × 2	2.74	2.52	3.41	6 × 6 × 5	4.63	4.63	5.03
4 × 2½ × 4	3.79	3.51	3.79	6 × 6 × 4	4.13	4.13	4.94
4 × 2½ × 3	3.30	2.99	3.60	6 × 6 × 3	3.64	3.64	4.75
4 × 2½ × 2½	3.05	2.70	3.51	6 × 6 × 2½	3.39	3.39	4.66
4 × 2 × 4	3.79	3.41	3.79	6 × 6 × 2	3.08	3.08	4.56
4 × 2 × 3	3.30	2.89	3.60	6 × 6 × 1½	2.85	2.85	4.47
4 × 2 × 2	2.74	2.25	3.41	6 × 6 × 1¼	2.73	2.73	4.41
4 × 1½ × 4	3.79	3.32	3.79	6 × 6 × 1	2.56	2.56	4.33
4 × 1¼ × 4	3.79	3.26	3.79	6 × 5 × 6	5.13	5.03	5.13
4 × 1 × 4	3.79	3.18	3.79	6 × 5 × 5	4.63	4.50	5.03
3½ × 3½ × 4	3.69	3.69	3.54	6 × 5 × 4	4.13	4.00	4.94
3 × 3 × 4	3.60	3.60	3.30	6 × 5 × 3	3.64	3.51	4.75
2½ × 2½ × 4	3.51	3.51	3.05	6 × 5 × 2½	3.39	3.26	4.66
2 × 2 × 4	3.41	3.41	2.74	6 × 5 × 2	3.08	2.95	4.56
5 × 5 × 4	4.00	4.00	4.41	6 × 4 × 6	5.13	4.94	5.13
5 × 5 × 3½	3.75	3.75	4.31	6 × 4 × 5	4.63	4.41	5.03
5 × 5 × 3	3.51	3.51	4.22	6 × 4 × 4	4.13	3.79	4.94
5 × 5 × 2½	3.26	3.26	4.13	6 × 3 × 6	5.13	4.75	5.13
5 × 5 × 2	2.95	2.95	4.03	6 × 3 × 3	3.64	3.08	4.75
5 × 5 × 1½	2.72	2.72	3.94	6 × 2½ × 6	5.13	4.66	5.13
5 × 5 × 1¼	2.60	2.60	3.88	6 × 2 × 6	5.13	4.56	5.13
5 × 5 × 1	2.43	2.43	3.80	5 × 5 × 6	5.03	5.03	4.63
5 × 4 × 5	4.50	4.41	4.50	5 × 3 × 6	5.03	4.75	4.63
5 × 4 × 4	4.00	3.79	4.41	4 × 4 × 6	4.94	4.94	4.13
5 × 4 × 3½	3.75	3.54	4.31	8 × 8 × 6	5.56	5.56	6.37
5 × 4 × 3	3.51	3.30	4.22	8 × 8 × 5	5.03	5.03	6.27
5 × 4 × 2½	3.26	3.05	4.13	8 × 8 × 4	4.50	4.50	6.17
5 × 4 × 2	2.95	2.74	4.03	8 × 8 × 3	4.00	4.00	6.07
5 × 4 × 1½	2.72	2.51	3.94	8 × 8 × 2½	3.69	3.69	6.01
5 × 3 × 5	4.50	4.22	4.50	8 × 8 × 2	3.44	3.44	5.84
5 × 3 × 4	4.00	3.60	4.41	8 × 6 × 8	6.56	6.37	6.56
5 × 3 × 3	3.51	3.08	4.22	8 × 6 × 6	5.56	5.13	6.37
5 × 2½ × 5	4.50	4.13	4.50	8 × 4 × 8	6.56	6.17	6.56
5 × 2 × 5	4.50	4.03	4.50	6 × 6 × 8	6.37	6.37	5.56
4 × 4 × 5	4.41	4.41	4.00				

GENERAL NOTES:
(a) Dimensions are in inches.
(b) For dimensions not given, see Table I-2.

Table I-5 Dimensions of Class 125 Caps, Reducing Couplings, and Closed- and Open-Pattern Return Bends



NPS	Minimum Length of Thread [Note (1)] B	Minimum Length of Thread [Note (1)] L_2	Minimum Width of Band, E	Inside Diameter of Fitting, F [Note (1)] Min.	Inside Diameter of Fitting, F [Note (1)] Max.	Metal Thickness, G	Minimum Outside Diameter of Band, H	Length of Reducing Concentric Couplings, M [Note (2)]	Minimum Height, P [Note (1)]	Center-to-Center Closed, X	Center-to-Center Open, Z
1/2	0.43	...	0.50	0.84	0.90	0.13	1.34	1.38	...	1.25	1.75
3/4	0.50	...	0.56	1.05	1.11	0.15	1.63	1.50	...	1.50	1.88
1	0.58	...	0.62	1.31	1.38	0.17	1.95	1.70	...	1.75	2.50
1 1/4	0.67	...	0.69	1.66	1.75	0.18	2.39	2.13	...	2.25	3.00
1 1/2	0.70	...	0.75	1.90	1.97	0.20	2.68	2.25	...	2.50	3.50
2	0.75	...	0.84	2.37	2.44	0.22	3.28	2.32	...	3.25	4.50
2 1/2	0.92	1.14	0.94	2.87	2.97	0.24	3.86	2.63	1.81	3.75	5.50
3	0.98	1.20	1.00	3.50	3.60	0.26	4.62	2.88	1.91	4.50	6.50
3 1/2	1.03	1.25	1.06	4.00	4.10	0.28	5.20	3.13	2.03	...	...
4	1.08	1.30	1.12	4.50	4.60	0.31	5.79	3.38	2.22	6.00	7.50
5	1.18	1.41	1.18	5.56	5.66	0.38	7.05	3.57	2.38	...	...
6	1.28	1.51	1.28	6.62	6.72	0.43	8.28	3.81	2.63	...	...
8	1.47	1.71	1.47	8.62	8.72	0.55	10.63	5.25	2.88	...	...
10	1.68	1.92	1.68	10.75	10.85	0.69	13.12	...	3.50	...	...
12	1.88	2.12	1.88	12.75	12.85	0.80	15.47	...	3.88	...	...

GENERAL NOTES:

(a) Dimensions are in inches.

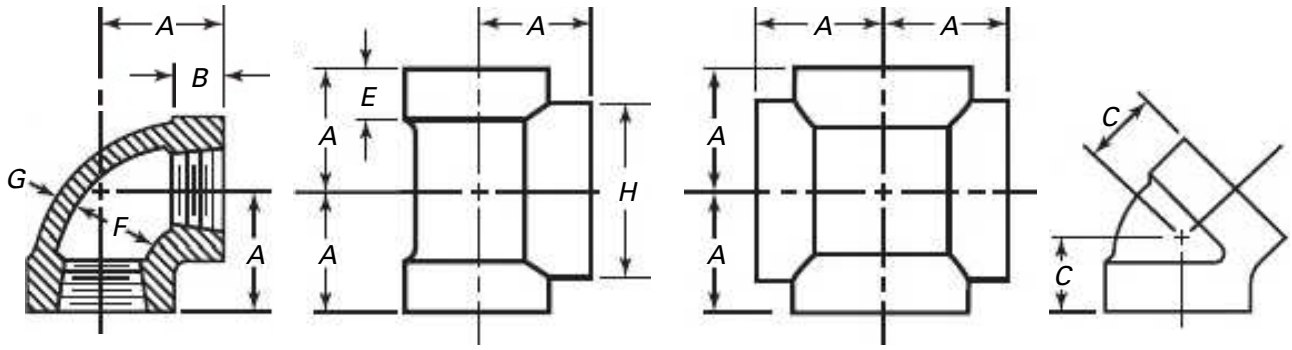
(b) Caps may be made flat or with a radius as shown in the illustrations.

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 not less than B, and the length of useful thread (B plus threads with fully formed roots and flat crests) shall be not less than L (effective length of external thread) required by ASME B1.20.1.

(2) Dimension M for all reduction of reducing couplings (concentric only) shall be the same as shown for the largest opening. Dimension M for eccentric couplings is not standard and such information should be obtained from the manufacturer.

Table I-6 Dimensions of Class 250, 90-deg and 45-deg Elbows, Tees, and Crosses (Straight Sizes)



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

NPS	Center-to-End Elbows, Tees, and Crosses, *A*	Center-to-End, 45 deg Elbows, *C*	Minimum Length of Thread, *B*	Minimum Width of Band, *E*	Inside Diameter of Fitting, *F*		Metal Thickness, *G*	Minimum Outside Diameter of Band, *H*
					Min.	Max.		
1/4	0.94	0.81	0.43	0.49	0.54	0.58	0.18	1.17
3/8	1.06	0.88	0.47	0.55	0.67	0.72	0.18	1.36
1/2	1.25	1.00	0.57	0.60	0.84	0.90	0.20	1.59
3/4	1.44	1.13	0.64	0.68	1.05	1.11	0.23	1.88
1	1.63	1.31	0.75	0.76	1.3[illegible]	1.38	0.28	2.24
1 1/4	1.94	1.50	0.84	0.88	1.6[illegible]	1.73	0.33	2.73
1 1/2	2.13	1.69	0.87	0.97	1.90	1.97	0.35	3.07
2	2.50	2.00	1.00	1.12	2.37	2.44	0.39	3.74
2 1/2	2.94	2.25	1.17	1.30	2.87	2.97	0.43	4.60
3	3.38	2.50	1.23	1.4[illegible]	3.50	3.60	0.48	5.36
3 1/2	3.75	2.63	1.28	1.4[illegible]	4.00	4.10	0.52	5.98
4	4.13	2.81	1.33	1.57	4.50	4.60	0.56	6.61
5	4.88	3.19	1.43	1.74	5.56	5.66	0.66	7.92
6	5.63	3.50	1.53	1.91	6.62	6.72	0.74	9.24
8	7.00	4.31	1.72	2.24	8.62	8.72	0.90	11.73
10	8.63	5.19	1.[illegible]	2.58	10.75	10.85	1.08	14.37
12	10.00	6.00	2.13	2.91	12.75	12.85	1.24	16.84

GENERAL NOTES:
(a) Dimensions are in inches.
(b) The Class 250 standard for threaded fittings covers only the straight sizes of 90-deg and 45-deg elbows, tees, and crosses.

Table I-7 Inspection Tolerances

NPS	Tolerance, in.
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, 3 1/2	±0.10
4, 5	±0.12
6	±0.14
8	±0.16
10	±0.19
12	±0.21

MANDATORY APPENDIX II
REFERENCES

The following is a list of publications referenced in this Standard. Unless otherwise stated, the latest edition shall apply.

ASME B1.20.1, Pipe Threads, General Purpose (Inch)

ASME B16.14, Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

ASTM A126-04(2014), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A153/A153M-16, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM B633-15, Specification for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM E29-13, 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, 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, Chemin de Blandonnet 8, Case postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

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[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 a quality system program following the principles of 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. 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.

[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.

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