



**ASME B16.1-2020**  
(Revision of ASME B16.1-2015)

# **Gray Iron Pipe Flanges and Flanged Fittings**

**Classes 25, 125, and 250**

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

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In the 2015 Edition, provisions were made to provide bolt hole tolerances that are appropriate to this Standard. Following the approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on July 29, 2015.

In ASME B16.1-2020, the U.S. Customary tables in former Mandatory Appendix I have been merged with the SI tables in the main text. The tables and figures have been redesignated, former Mandatory Appendix I has been deleted, and the subsequent Mandatory Appendix has been redesignated. Cross-references have been updated accordingly. Also in this edition, entries for NPS 66, 78, and 90 have been added to Table 7.6.1-2 (formerly Tables 9 and I-9), and the references in Mandatory Appendix I (formerly Mandatory Appendix II) have been updated. Following the approval by the ASME B16 Standards Committee, this revision to the 2015 edition was approved as an American National Standard by ANSI on July 24, 2020, with the new designation ASME B16.1-2020.



# ASME B16 COMMITTEE

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(The following is the roster of the Committee at the time of approval of this Standard.)

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<b>W. Bliss</b> , Tyler Pipe Co.	<b>G. L. Simmons</b> , Charlotte Pipe and Foundry
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# ASME B16.1-2020

## SUMMARY OF CHANGES

Following approval by the ASME B16 Standards Committee and ASME, and after public review, ASME B16.1-2020 was approved by the American National Standards Institute on July 24, 2020.

In ASME B16.1-2020, the U.S. Customary tables in former Mandatory Appendix I have been merged with the SI tables in the main text. The tables and figures have been redesignated, former Mandatory Appendix I has been deleted, and the subsequent Mandatory Appendix has been redesignated. Cross-references have been updated accordingly. In addition, this edition includes the following changes identified by a margin note, **(20)**. The Record Numbers listed below are explained in more detail in the “List of Changes in Record Number Order” following this Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
30	Table 7.6.1-2	NPS 66, 78, and 90 added (17-547)
36	Mandatory Appendix I	Former Mandatory Appendix II updated (20-863)

# LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
17-547	Former Tables 9 and I-9 were merged and redesignated as <a href="#">Table 7.6.1-2</a> and revised to include NPS 66, 78, and 90 for Class 125 flange and bolt dimensions.
20-863	Former Mandatory Appendix II references were updated.

# GRAY IRON PIPE FLANGES AND FLANGED FITTINGS CLASSES 25, 125, AND 250

## 1 SCOPE

This Standard covers Classes 25, 125, and 250 Gray Iron Pipe Flanges and Flanged Fittings. It includes

- (a) pressure-temperature ratings
- (b) sizes and method of designating openings of reducing fittings
- (c) marking
- (d) materials
- (e) dimensions and tolerances
- (f) bolting and gaskets
- (g) pressure testing

## 2 GENERAL

### 2.1 References

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

### 2.5 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:

Class	25	125	250
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**2.6.2 Size.** NPS, followed by a dimensionless number, is the designation for nominal flange or flange fitting size. NPS is related to the reference nominal diameter, DN, used in international standards. The relationship is, typically, as follows:

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## 6 MATERIALS

### 6.1 Castings

Castings shall meet the requirements of ASTM A126 for both flanges and flanged fittings, as follows:

Class	NPS	Class of Iron ASTM A126
25	All	A
125	≥1 but ≤12	A or B
	≥14	B
250	≥1 but ≤12	A or B
	≥14	B

### 6.2 Bolting

ASTM A307 Grade B bolting material is recommended for gray iron flange assembly. Where gray iron flanges are bolted to steel flanges, see ASME B16.5 for bolting limitations.

## 7 FITTING DIMENSIONS AND TOLERANCES

### 7.1 Wall Thickness

It is recognized that some variations are absolutely unavoidable in the making of patterns and castings. Equipment shall be designed to produce wall thicknesses given in the tables. Wall thickness at no point shall be less than

(b) Reducing 90-deg elbows, reducing 90-deg long-radius elbows, reducing side-outlet 90-deg elbows, and reducing double-branch elbows shall have the same center-to-face dimensions as straight-size fittings shown in [Tables 7.3.2-1](#) through [7.3.2-3](#) corresponding to the size of the largest opening.

(c) For 90-deg long-radius elbows with side outlet, the center-to-face dimensions of the side outlet shall be the same as dimension A in [Tables 7.3.2-1](#) through [7.3.2-3](#) for a straight-size 90-deg elbow corresponding to the size of the largest opening.

(d) Special-degree elbows ranging from 1 deg to 45 deg, inclusive, shall have the same center-to-face dimensions as those for 45-deg elbows; those over 45 deg and up to 90 deg, inclusive, shall have the same center-to-face dimensions as those for 90-deg elbows. The angle designation of an elbow is the angle between the flange faces.

### 7.3.3 Tees, Crosses, and Laterals

(a) The center-to-face dimensions for straight-size tees and crosses, with or without side outlet, and laterals are shown in [Tables 7.3.2-1](#) through [7.3.2-3](#).

(b) Reducing tees and reducing crosses, with or without side outlet, and reducing laterals, NPS 16 and smaller, shall have the same center-to-face dimensions as straight-size fittings shown in [Tables 7.3.2-1](#) through [7.3.2-3](#) corresponding to the size of the largest opening. For NPS 18 and larger, if the outlet of a reducing tee; the branch of a reducing lateral; or the largest outlet of



## 7.4 Center-to-Face Tolerances

The following tolerances shall be permitted on all center-to-contact surface dimensions of fittings. Tolerances for contact surface-to-contact surface dimensions shall be twice those given below. The largest opening in the fitting governs the tolerance to be applied to all openings.

NPS	Tolerance, mm (in.)
≤10	±1.0 (±0.03)
≥12	±1.5 (±0.06)

## 7.5 Threaded Flanges

**7.5.1 General.** Flanges shall have a standard taper pipe thread in accordance with ASME B1.20.1. The thread shall be concentric with the axis of the flange, and variations in alignment shall not exceed 5.00 mm/m (0.06 in./ft).

**7.5.2 Class 125.** Threads shall be countersunk a distance not less than one-half of the pitch of the thread at an angle approximately 45 deg with the axis of the thread for the purpose of easy entrance in making the joint and protection of the threads. Countersinking shall be concentric with the threads. The length of the threads shall be measured to include the countersink.

**7.5.3 Class 250.** Hub may be recessed. When not recessed, threads shall be countersunk a distance not less than one-half of the pitch of the thread at an angle approximately 45 deg with the axis of the thread at the back of the flange. If hub is recessed, threads shall be 45 deg countersunk to diameter of recess. The purpose is for easier entrance in making a joint and for the protection of the threads. Countersinking shall be concentric with the threads. The length of threads shall be measured to include the countersink.

## 7.6 Flange Bolt Holes

**7.6.1 Flange Bolt Holes.** Flange bolt holes shall be in accordance with the dimensions shown in [Tables 7.6.1-1 through 7.6.1-3](#). Pairs of bolt holes shall straddle the centerline.

**7.6.2 Flange Bolt Hole Tolerance.** Tolerances for bolt

**7.6.5 Bolt Circle Concentricity.** The required tolerance for concentricity between the flange bolt circle diameter and machined facing diameters are as follows:

NPS	Tolerance, mm (in.)
≤2½	0.8 (0.03)
≤48	1.5 (0.06)

**7.6.6 Tolerance.** Tolerances for sizes larger than NPS 48 shall be as agreed between the manufacturer and purchaser.

## 7.7 Spot Facing

All flanges and flanged fittings covered by this Standard shall have bearing surfaces for bolting that are parallel to the flange face within 3 deg. Any back facing or spot facing required to accomplish parallelism shall not reduce the flange thickness,  $Q$ , below the dimensions given in [Tables 7.3.2-1 through 7.3.2-3](#) and [7.6.1-1 through 7.6.1-3](#). Flange thickness at any point within the spot face area, as defined in MSS SP-9, shall not exceed the required minimum thickness by more than the following amounts:

NPS	Excess Thickness, mm (in.)
≥2 but ≤12	3.0 (0.12)
≥14 but ≤24	4.5 (0.18)
≥30 but ≤96	6.5 (0.25)

When required, all spot facing shall be done in accordance with MSS SP-9. Sharp corners shall be avoided in back facing.

## 7.8 Crosses and Lateral Reinforcement

Crosses and laterals (Y-branches) both straight and reducing shall be reinforced where necessary to compensate for the inherent weakness in the shape of these fittings.

## 7.9 Drain Connections

**7.9.1 Threaded Connections.** Holes may be drilled and tapped in the wall of fittings if the metal thickness is sufficient to provide the effective length of thread as shown in [Figure 7.9.1-1](#) and as specified in [Table 7.9.1-1](#). Where thread length is insufficient due to metal thickness on

of further illustrations or description. For further tapping details, see MSS SP-45.

## 8 BOLT, NUT, AND GASKET DIMENSIONS

### 8.1 Bolting

(a) All bolting materials shall have square, heavy hex, or hex heads and square, heavy hex, or hex nuts with full flat bearing faces as specified in ASME B18.2.1 for bolts and ASME B18.2.2 for nuts. Threads shall be UNC or UN8 and have a thread fit class of 2A for bolts and 2B for nuts. Washer faced bolts or washer faced nuts are prohibited.

(b) Carbon steel bolts 1 in. and smaller shall have square heads (ASME B18.2.1) or heavy hex heads (ASME B18.2.1) and shall have square or heavy hex nuts (ASME B18.2.2).

(c) Carbon steel bolts  $1\frac{1}{8}$  in. and larger shall have square heads (ASME B18.2.1), hex heads (ASME B18.2.1), or heavy hex heads (ASME B18.2.1) and shall have hex nuts (ASME B18.2.2) or heavy hex nuts (ASME B18.2.2) or square nuts (ASME B18.2.2). For bolt sizes  $1\frac{1}{2}$  in. and larger, stud bolts with a nut on each end are recommended.

### 8.2 Gaskets

It is recommended that flat ring gaskets be in accordance with dimensions given in ASME B16.21 for nonmetallic gaskets for pipe flanges. Flanges of Class A iron should not be used with gaskets having a gasket factor ("M" as defined in ASME BPVC, Section VIII, Division 1, Mandatory Appendix 2) greater than 2.75.

## 9 HYDROSTATIC TESTS

(a) *Pressure Testing.* Pressure testing is not required unless specified by the user.

(b) *Fittings.* Fittings shall be capable of withstanding, without showing leaks, the hydrostatic test pressures listed in [Table 3.1-1](#) for the material and maximum allowable working pressure of the item tested. These test pressures are 1.5 times the cold working pressure rate rounded to the next higher 0.5 bar (12 psi) in [Table 3.1-1](#).

(c) *Flanges.* Flanges integral with or attached to equipment may be hydrostatically tested by the purchaser at his responsibility at pressures higher than specified herein.

## 10 CERTIFICATIONS

The manufacturer shall be able to certify that products are in conformance with the requirements of this Standard when required by the purchase order.



Table 3.1-1 Pressure-Temperature Ratings

Temperature, °C (°F)	Class 125 ASTM A126						Class 250 [Note (2)] ASTM A126			
	Class 25 [Note (1)] ASTM A126 Class A		Class A NPS 1-12	Class B NPS 1-12 14-24 30-48			Class A NPS 1-12	Class B NPS 1-12 14-24 30-48		
	NPS 4-36	NPS 42-96		NPS 1-12	NPS 14-24	NPS 30-48		NPS 1-12	NPS 14-24	NPS 30-48
-29 to 65 (-20 to 150)	3.1 (45)	1.7 (25)	12.1 (175)	13.8 (200)	10.3 (150)	10.3 (150)	27.6 (400)	34.5 (500)	20.7 (300)	20.7 (300)
80 (200)	2.9 (40)	1.7 (25)	11.6 (165)	13.3 (190)	9.8 (135)	9.1 (115)	26.5 (370)	33.0 (460)	20.0 (280)	18.9 (250)
100 (225)	2.6 (35)	1.7 (25)	11.0 (155)	12.7 (180)	9.2 (130)	7.5 (100)	25.0 (355)	30.9 (440)	19.0 (270)	16.4 (225)
120 (250)	2.1 (30)	1.7 (25)	10.4 (150)	12.1 (175)	8.6 (125)	5.8 (85)	23.5 (340)	28.8 (415)	18.0 (260)	13.9 (200)
135 (275)	1.7 (25)	1.7 (25)	... (145)	... (170)	... (120)	... (65)	... (325)	... (395)	... (250)	... (175)
140 (300)	...	...	9.8 (140)	11.5 (165)	8.0 (110)	4.2 (50)	22.1 (310)	26.7 (375)	17.0 (240)	11.5 (150)
149 (325)	...	...	... (130)	... (155)	... (105)	3.4 (...)	... (295)	... (355)	... (230)	... (125)
160 (353) [Note (2)]	...	...	9.2 (125)	10.8 (150)	7.4 (100)	...	20.6 (280)	24.6 (335)	16.1 (220)	9.0 (100)
178 (375) [Note (3)]	...	...	8.6 (...)	... (145)	6.9 (...)	...	... (265)	... (315)	... (210)	6.9 (...)
180 (406) [Note (3)]	...	...	...	10.2 (140)	...	...	19.2 (250)	22.5 (290)	15.1 (200)	...
200 (425)	...	...	...	9.6 (130)	...	...	17.8 (...)	20.5 (270)	14.2 (...)	...
208 (450) [Note (4)]	...	...	...	... (125)	...	...	17.2 (...)	... (250)	13.8 (...)	...
220 (...)	...	...	...	9.0 (...)	...	...	...	18.5 (...)	...	...
232 (...)	...	...	...	8.6 (...)	...	...	...	17.2 (...)	...	...
Hydrostatic Shell Test Pressures [Note (5)]										
38 (100)	4.8 (70)	2.7 (40)	18.3 (270)	20.7 (300)	15.5 (230)	15.5 (230)	41.4 (600)	51.8 (750)	31.0 (450)	31.0 (450)

GENERAL NOTE: Pressure is in bar (psi).

NOTES:

(1) When Class 25 flange or flange fittings are used for gaseous service, the maximum pressure shall be limited to 1.7 bar (25 psi).

(2) When Class 250 is used for liquid service, the tabulated pressure shall be used. Class 250: When used for liquid service the tabulated pressure-temperature ratings in sizes NPS 14 and larger are applicable to Class 250 flanges only and not to Class 250 fittings.

(3) 178°C (353°F) to reflect the temperature of saturated steam at 8.6 bar (125 psi).

(4) 208°C (406°F) to reflect the temperature of saturated steam at 17.2 bar (250 psi).

(5) See section 9.

Table 3.1-1 Pressure-Temperature Ratings

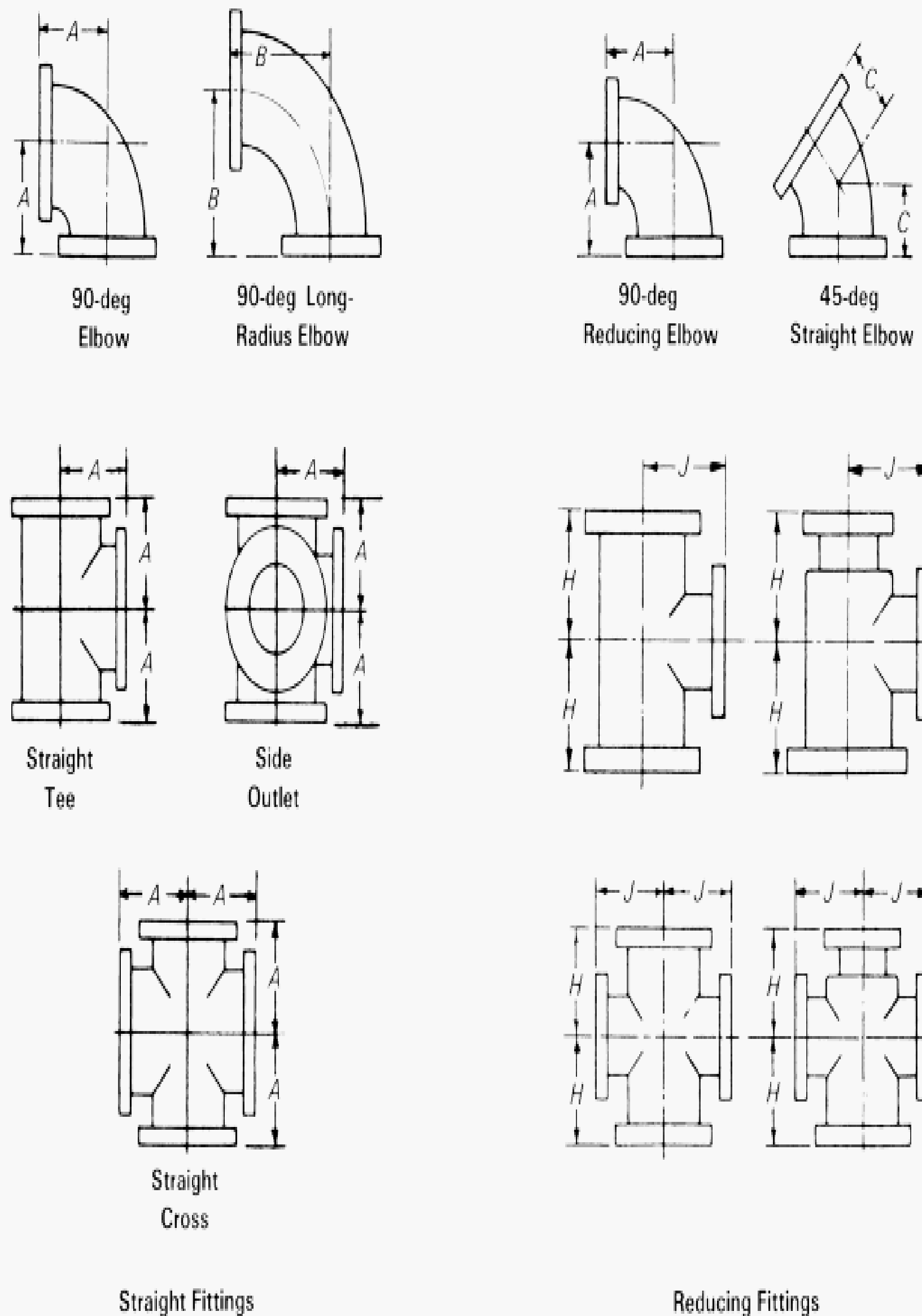
Temperature, °C (°F)	Class 125 ASTM A126						Class 250 [Note (2)] ASTM A126			
	Class 25 [Note (1)] ASTM A126 Class A		Class A NPS 1-12	Class B NPS 1-12 14-24 30-48			Class A NPS 1-12	Class B NPS 1-12 14-24 30-48		
	NPS 4-36	NPS 42-96		NPS 1-12	NPS 14-24	NPS 30-48		NPS 1-12	NPS 14-24	NPS 30-48
-29 to 65 (-20 to 150)	3.1 (45)	1.7 (25)	12.1 (175)	13.8 (200)	10.3 (150)	10.3 (150)	27.6 (400)	34.5 (500)	20.7 (300)	20.7 (300)
80 (200)	2.9 (40)	1.7 (25)	11.6 (165)	13.3 (190)	9.8 (135)	9.1 (115)	26.5 (370)	33.0 (460)	20.0 (280)	18.9 (250)
100 (225)	2.6 (35)	1.7 (25)	11.0 (155)	12.7 (180)	9.2 (130)	7.5 (100)	25.0 (355)	30.9 (440)	19.0 (270)	16.4 (225)
120 (250)	2.1 (30)	1.7 (25)	10.4 (150)	12.1 (175)	8.6 (125)	5.8 (85)	23.5 (340)	28.8 (415)	18.0 (260)	13.9 (200)
135 (275)	1.7 (25)	1.7 (25)	... (145)	... (170)	... (120)	... (65)	... (325)	... (395)	... (250)	... (175)
140 (300)	...	...	9.8 (140)	11.5 (165)	8.0 (110)	4.2 (50)	22.1 (310)	26.7 (375)	17.0 (240)	11.5 (150)
149 (325)	...	...	... (130)	... (155)	... (105)	3.4 (...)	... (295)	... (355)	... (230)	... (125)
160 (353) [Note (2)]	...	...	9.2 (125)	10.8 (150)	7.4 (100)	...	20.6 (280)	24.6 (335)	16.1 (220)	9.0 (100)
178 (375) [Note (3)]	...	...	8.6 (...)	... (145)	6.9 (...)	...	... (265)	... (315)	... (210)	6.9 (...)
180 (406) [Note (3)]	...	...	...	10.2 (140)	...	...	19.2 (250)	22.5 (290)	15.1 (200)	...
200 (425)	...	...	...	9.6 (130)	...	...	17.8 (...)	20.5 (270)	14.2 (...)	...
208 (450) [Note (4)]	...	...	...	... (125)	...	...	17.2 (...)	... (250)	13.8 (...)	...
220 (...)	...	...	...	9.0 (...)	...	...	...	18.5 (...)	...	...
232 (...)	...	...	...	8.6 (...)	...	...	...	17.2 (...)	...	...
Hydrostatic Shell Test Pressures [Note (5)]										
38 (100)	4.8 (70)	2.7 (40)	18.3 (270)	20.7 (300)	15.5 (230)	15.5 (230)	41.4 (600)	51.8 (750)	31.0 (450)	31.0 (450)

GENERAL NOTE: Pressure is in bar (psi).

## NOTES:

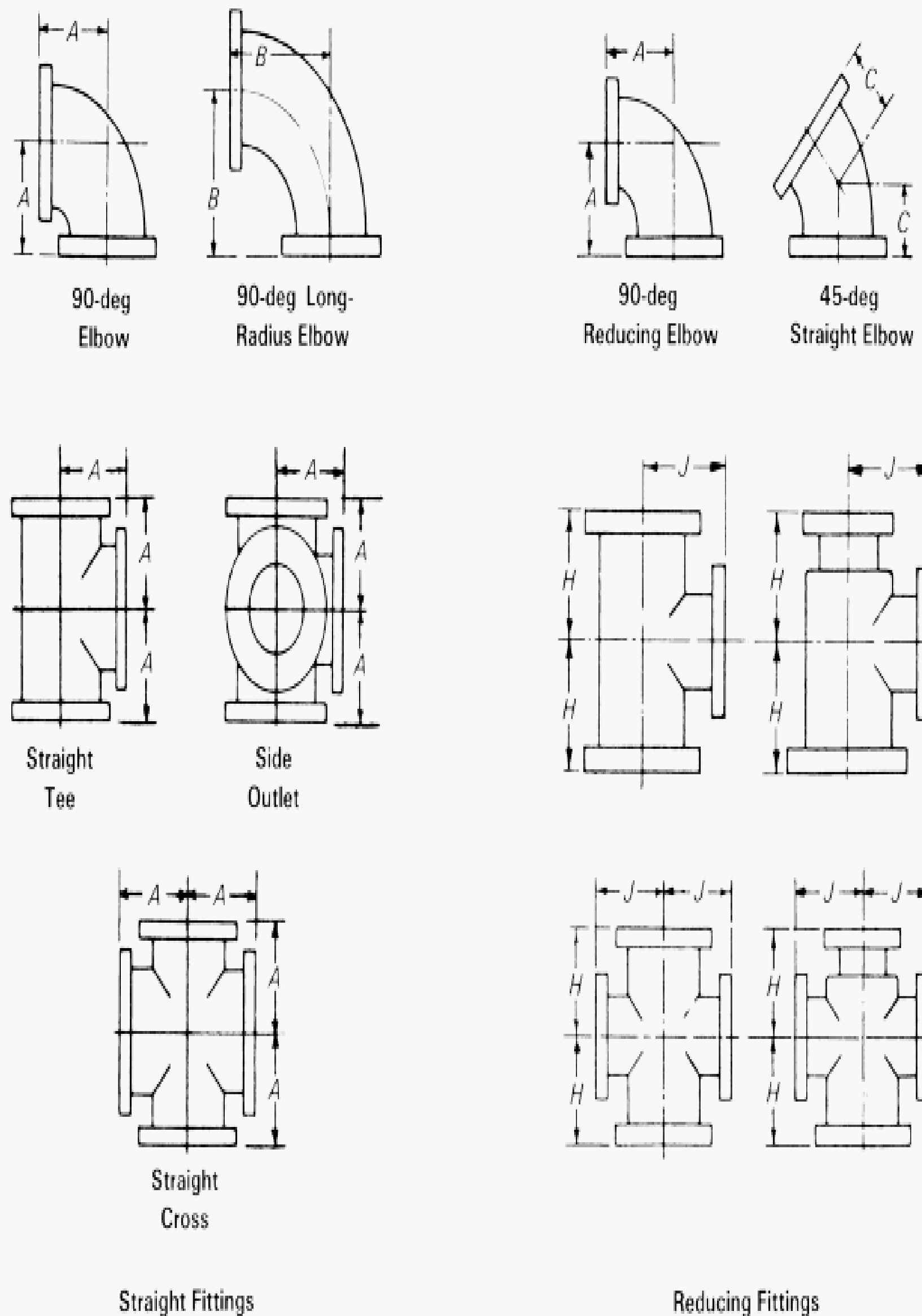
- (1) When Class 25 flange or flange fittings are used for gaseous service, the maximum pressure shall be limited to 1.7 bar (25 psi).
- (2) When Class 250 is used for liquid service, the tabulated pressure shall be used. Class 250: When used for liquid service the tabulated pressure-temperature ratings in sizes NPS 14 and larger are applicable to Class 250 flanges only and not to Class 250 fittings.
- (3) 178°C (353°F) to reflect the temperature of saturated steam at 8.6 bar (125 psi).
- (4) 208°C (406°F) to reflect the temperature of saturated steam at 17.2 bar (250 psi).
- (5) See [section 9](#).

Table 7.3.2-1 Dimensions of Class 25 Gray Iron Flanged Fittings



General					Straight Size [Note (5)]			Reducing Tees and Crosses (Short-Body Pattern) [Notes (9)–(11)]		
NPS	Diameter of Flange	Minimum Thickness of Flange	Wall Thickness of Body [Note (1)]	Inside Diameter of Fitting	Center- to-Face Elbow, Tee, and Cross, A [Notes (2)–(4)]	Center- to-Face Long Radius Elbow, B	Center- to-Face 45-deg Elbow, C [Note (6)]	NPS Size of Outlet and Smaller [Notes (7) and (8)]	Center- to-Face Run, H [Note (5)]	Center- to-Face Outlet, J [Note (5)]
4	229 (9.00)	19.0 (0.75)	11 (0.42)	102 (4)	165 (6.5)	229 (9.00)	102 (4.0)	[Note (12)]	[Note (12)]	[Note (12)]
5	254 (10.00)	19.0 (0.75)	11 (0.44)	127 (5)	191 (7.5)	260 (10.25)	114 (4.5)	[Note (12)]	[Note (12)]	[Note (12)]
6	279 (11.00)	19.0 (0.75)	11 (0.44)	152 (6)	203 (8.0)	292 (11.50)	127 (5.0)	[Note (12)]	[Note (12)]	[Note (12)]

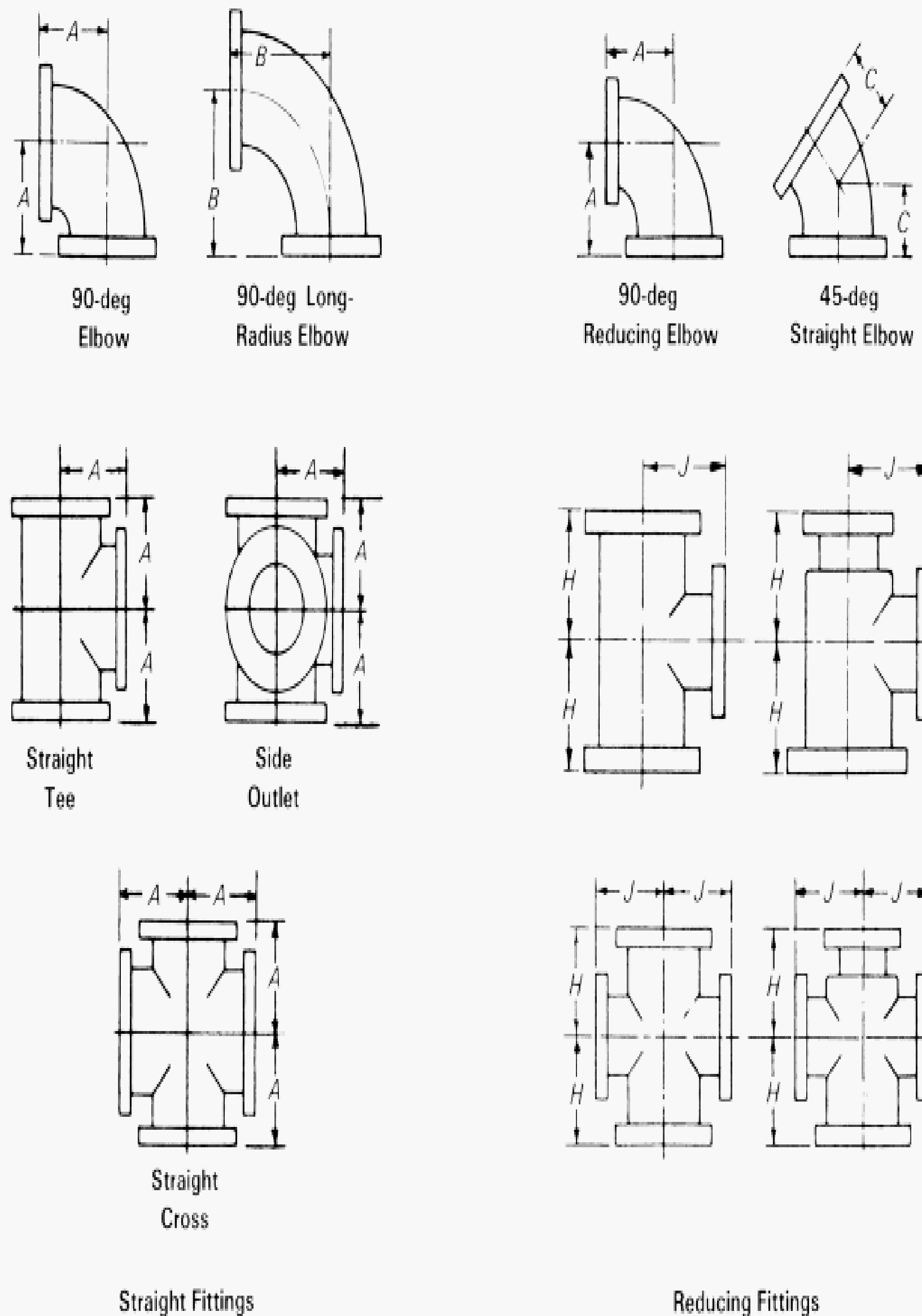
Table 7.3.2-1 Dimensions of Class 25 Gray Iron Flanged Fittings



General					Straight Size [Note (5)]			Reducing Tees and Crosses (Short-Body Pattern) [Notes (9)–(11)]		
NPS	Diameter of Flange	Minimum Thickness of Flange	Wall Thickness of Body [Note (1)]	Inside Diameter of Fitting	Center-to-Face Elbow, Tee, and Cross, A [Notes (2)–(4)]	Center-to-Face Long Radius Elbow, B	Center-to-Face 45-deg Elbow, C [Note (6)]	NPS Size of Outlet and Smaller [Notes (7) and (8)]	Center-to-Face Run, H [Note (5)]	Center-to-Face Outlet, J [Note (5)]
4	229 (9.00)	19.0 (0.75)	11 (0.42)	102 (4)	165 (6.5)	229 (9.00)	102 (4.0)	[Note (12)]	[Note (12)]	[Note (12)]
5	254 (10.00)	19.0 (0.75)	11 (0.44)	127 (5)	191 (7.5)	260 (10.25)	114 (4.5)	[Note (12)]	[Note (12)]	[Note (12)]
6	279 (11.00)	19.0 (0.75)	11 (0.44)	152 (6)	203 (8.0)	292 (11.50)	127 (5.0)	[Note (12)]	[Note (12)]	[Note (12)]



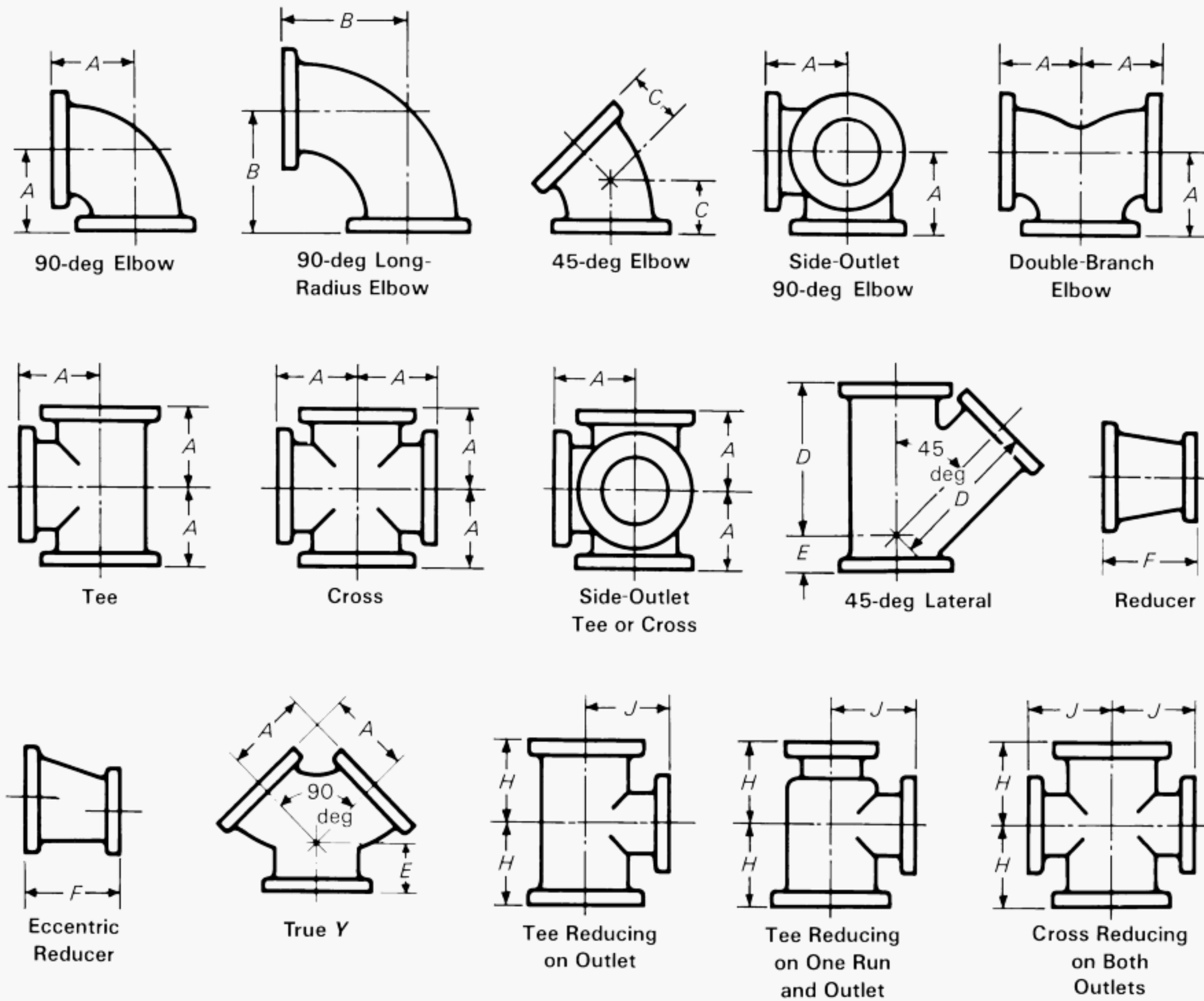
Table 7.3.2-1 Dimensions of Class 25 Gray Iron Flanged Fittings



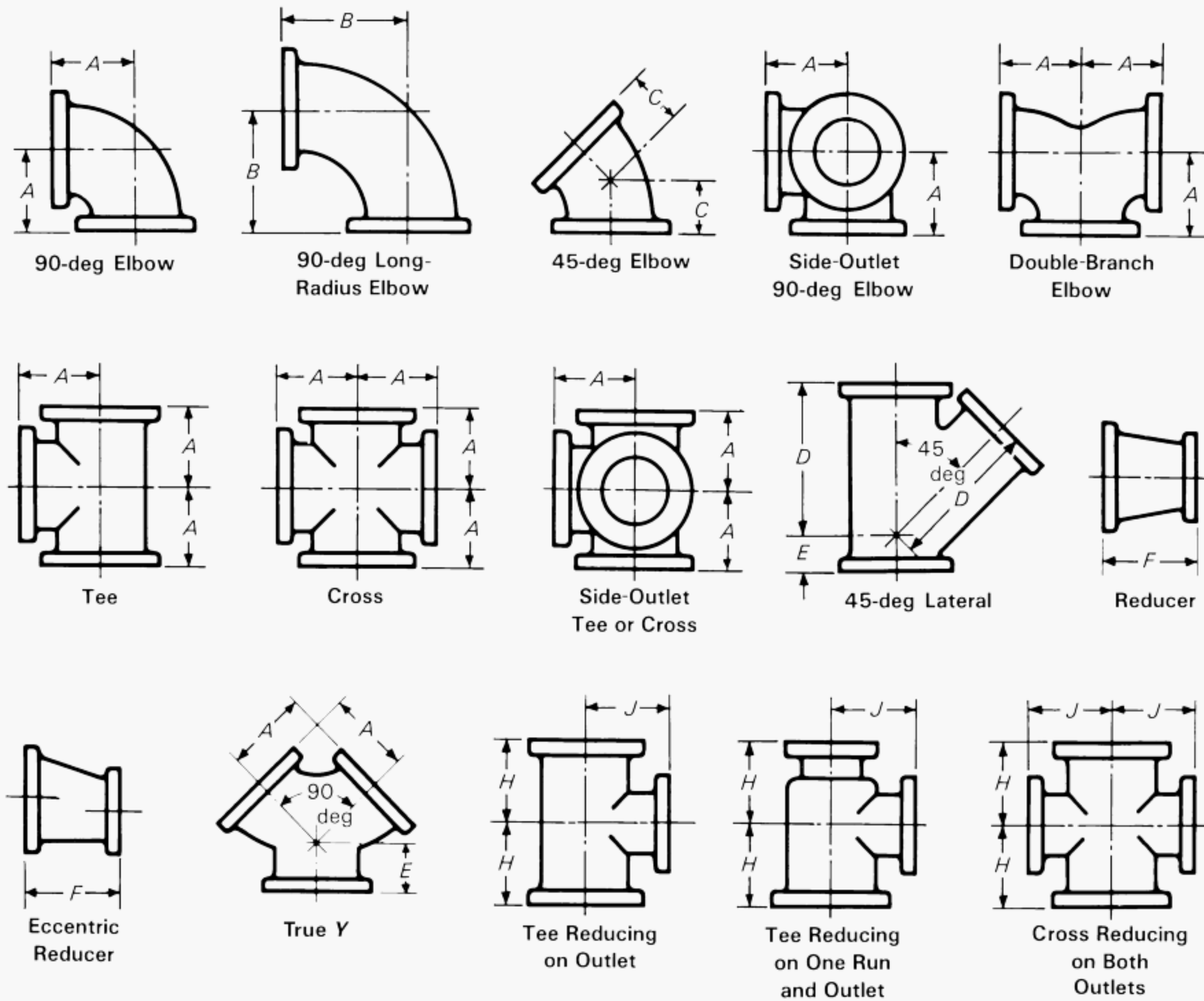
General					Straight Size [Note (5)]			Reducing Tees and Crosses (Short-Body Pattern) [Notes (9)–(11)]		
NPS	Diameter of Flange	Minimum Thickness of Flange	Wall Thickness of Body [Note (1)]	Inside Diameter of Fitting	Center-to-Face Elbow, Tee, and Cross, A [Notes (2)–(4)]	Center-to-Face Long Radius Elbow, B	Center-to-Face 45-deg Elbow, C [Note (6)]	NPS Size of Outlet and Smaller [Notes (7) and (8)]	Center-to-Face Run, H [Note (5)]	Center-to-Face Outlet, J [Note (5)]
4	229 (9.00)	19.0 (0.75)	11 (0.42)	102 (4)	165 (6.5)	229 (9.00)	102 (4.0)	[Note (12)]	[Note (12)]	[Note (12)]
5	254 (10.00)	19.0 (0.75)	11 (0.44)	127 (5)	191 (7.5)	260 (10.25)	114 (4.5)	[Note (12)]	[Note (12)]	[Note (12)]
6	279 (11.00)	19.0 (0.75)	11 (0.44)	152 (6)	203 (8.0)	292 (11.50)	127 (5.0)	[Note (12)]	[Note (12)]	[Note (12)]

TABLE STARTS ON NEXT PAGE

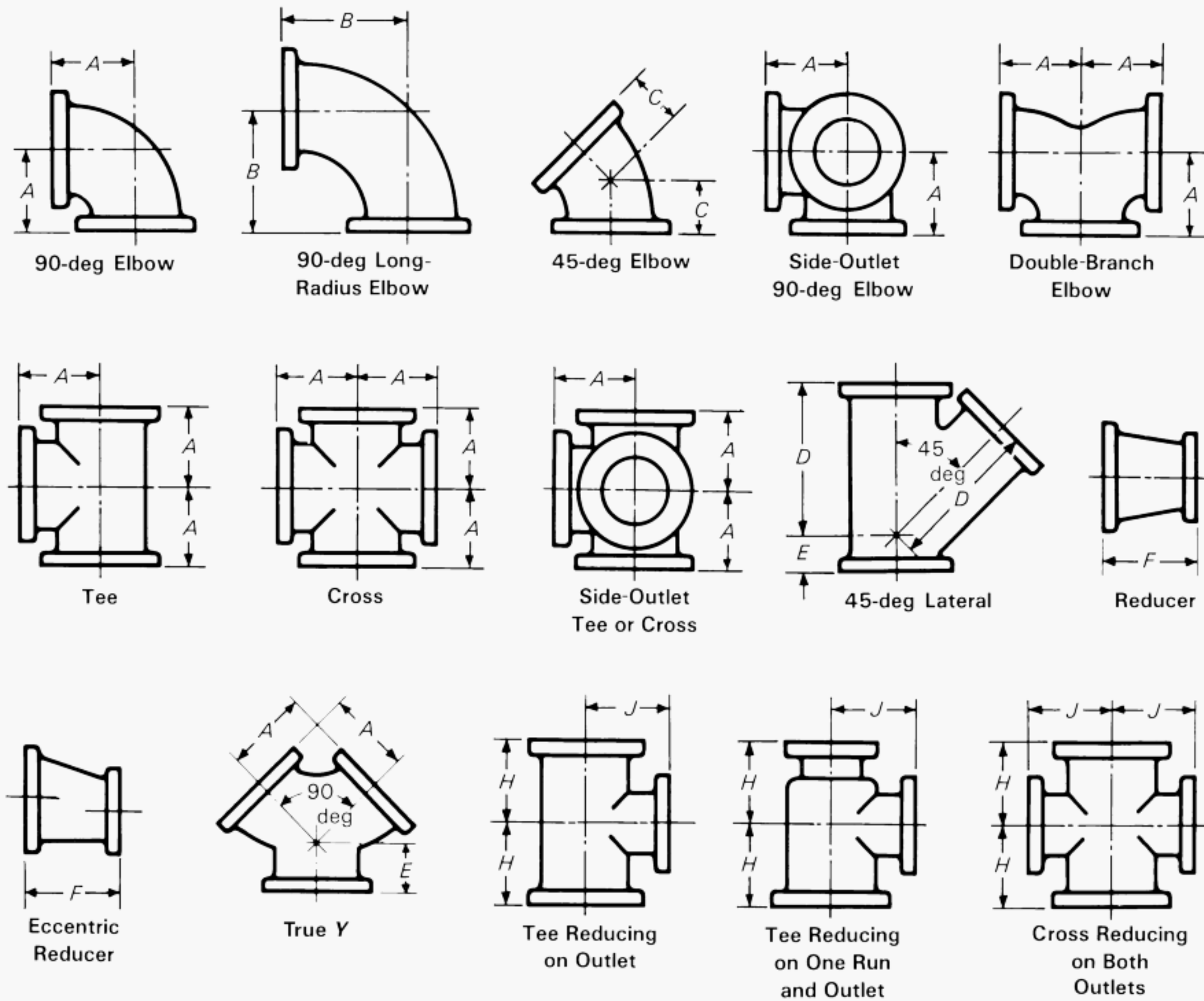
**Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings**



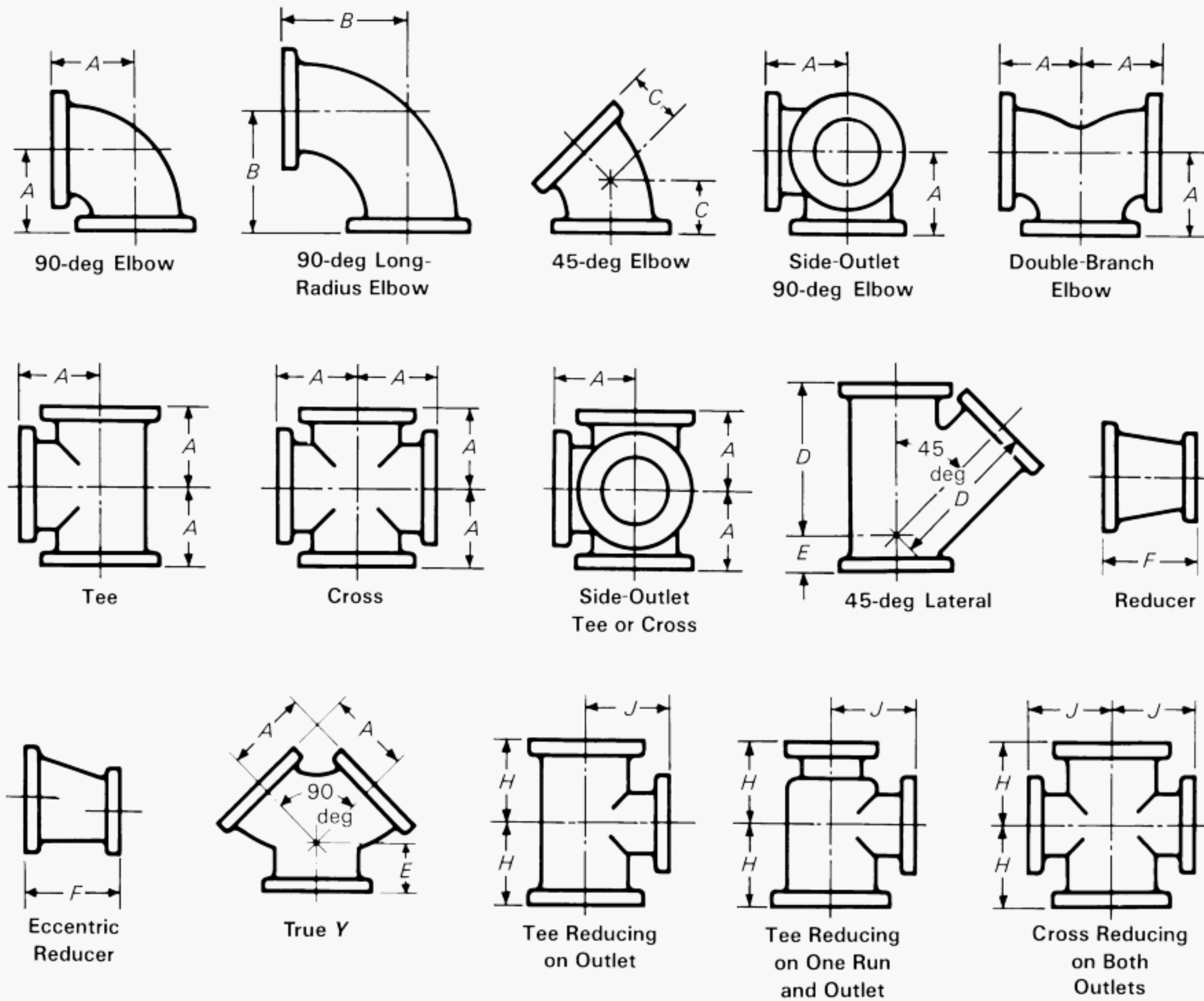
**Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings**



**Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings**



**Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings**





**Table 7.3.2-2 Dimensions of Class 125 Gray Iron Flanged Fittings (Cont'd)**

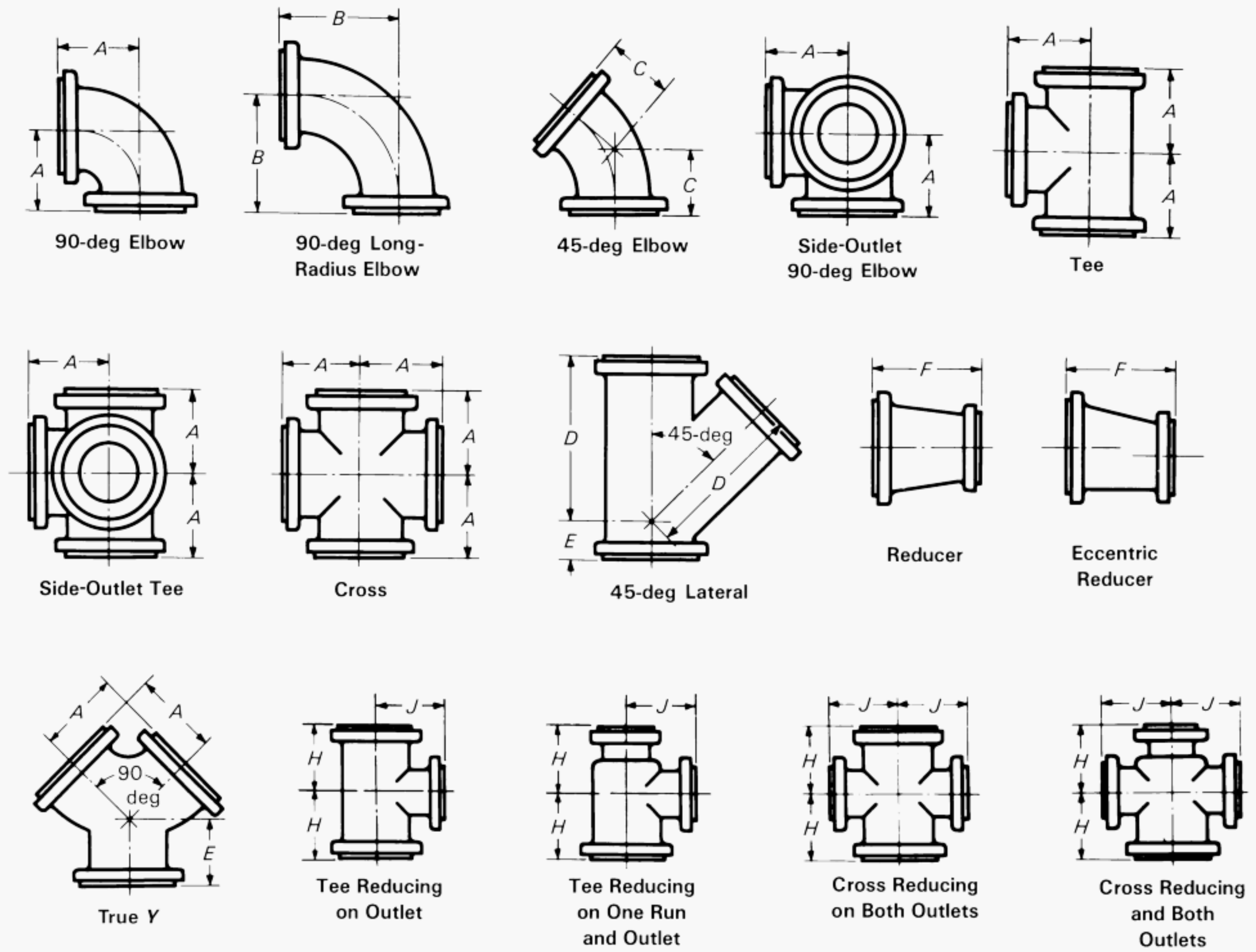
GENERAL NOTE: Dimensions are in millimeters (inches).

NOTES:

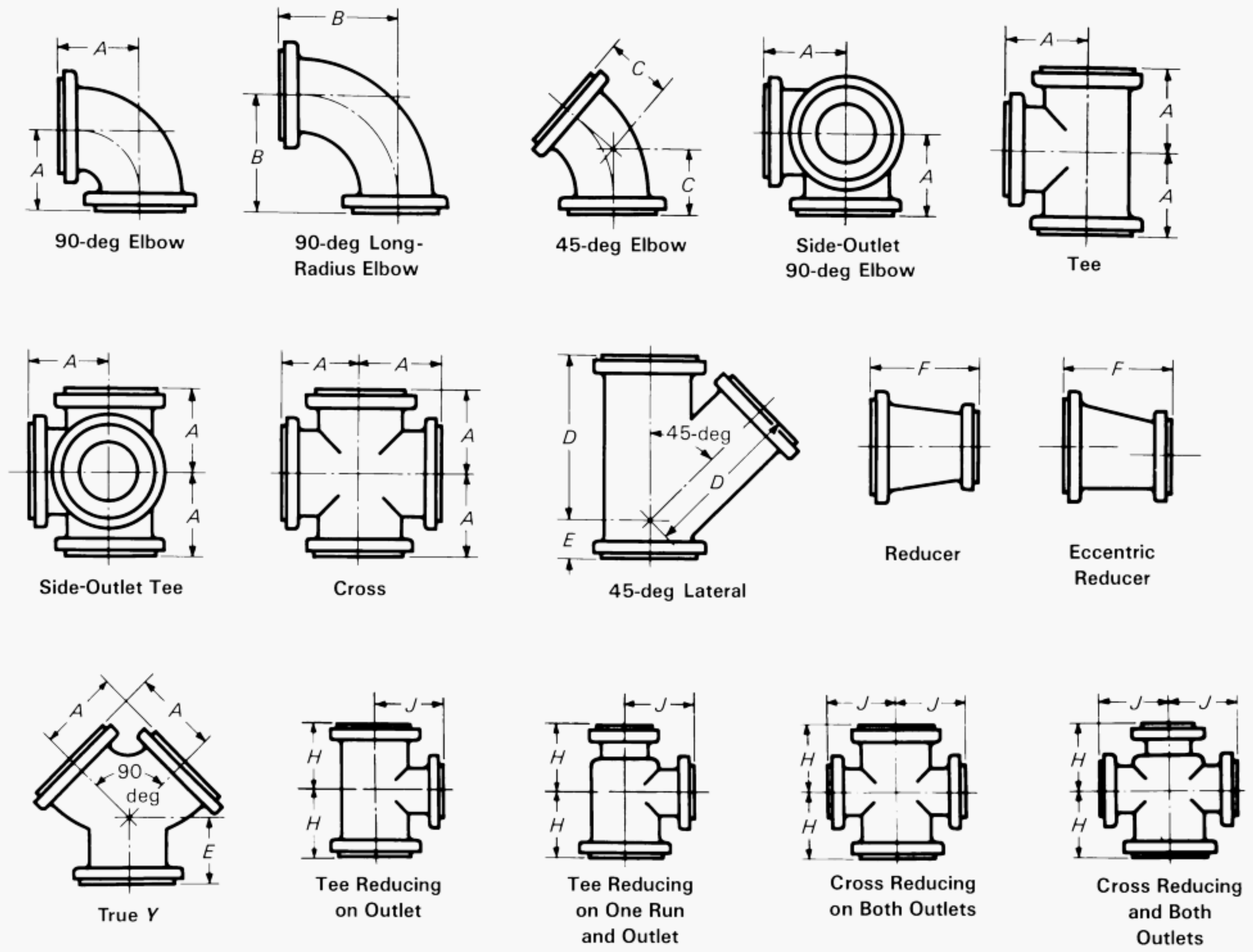
- (1) For facing, see [para. 7.2\(a\)](#).
- (2) For flange bolt holes, refer to [Table 7.6.1-2](#) and [para. 7.6](#).
- (3) For spot facing, see [para. 7.7](#).
- (4) For wall thickness tolerances, see [para. 7.1](#).
- (5) For center-to-face tolerances, see [para. 7.4](#).
- (6) For intersecting centerlines of side-outlet fittings, see [para. 7.3.1](#).
- (7) For center-to-face dimensions of reducing elbows and side-outlet elbows, see [paras. 7.3.2\(b\)](#) and [7.3.2\(c\)](#).
- (8) For center-to-face dimensions of special degree elbows, see [para. 7.3.2\(d\)](#).
- (9) For reinforcement of crosses and laterals, see [para. 7.8](#).
- (10) For face-to-face dimensions of reducers and eccentric reducers, see [para. 7.3.5](#).
- (11) For center-to-face dimensions of tees, and crosses having outlets and laterals having branches larger than given above, see [para. 7.3.3\(b\)](#).
- (12) For center-to-face dimensions of tees, crosses, and laterals reducing on run only, see [para. 7.3.3\(b\)](#).
- (13) For center-to-face dimensions of tees reducing on both runs, known as bull-head tees, see [para. 7.3.3\(c\)](#).
- (14) For center-to-face dimensions of reducing side-outlet tees and crosses having two different size reductions on the outlets, see [para. 7.3.3\(b\)](#).
- (15) Bases are furnished only when specified by the purchaser.
- (16) For tees larger than NPS 24, anchorage fittings are recommended. See [Table 7.3.2-4](#).
- (17) The base dimension applies to all straight and reducing sizes.
- (18) For reducing fittings, the size and center-to-face dimensions of base are determined by the size of the largest opening of the fitting. In the case of reducing base elbows, orders shall specify whether the base shall be opposite the larger or smaller opening.
- (19) Bolt hole template shown for round base is the same as for the flange of the supporting pipe size, except using only four holes in all cases so placed as to straddle centerlines. The bases of these fittings are intended for support in compression and are not to be used for anchors or supports in tension or shear.
- (20) All reducing tees and crosses NPS 16 and smaller shall have the same center-to-face dimensions as straight-size fittings, corresponding to the size of the largest opening.
- (21) All reducing laterals NPS 16 and smaller shall have the same center-to-face dimensions as straight-size fittings, corresponding to the size of the largest opening.

TABLE STARTS ON NEXT PAGE

**Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings**



**Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings**



**Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)**

Flanges [(1)-(3)]			General Fittings [(5), (6)]			Straight Fittings [(5), (6)]					
NPS	Diameter of Flange	Minimum Thickness of Flange, <i>Q</i>	Diameter of Raised Face (4)	Inside Diameter of Fittings	Body Wall Thickness (7)	Center-to-Face 90-deg Elbow, Tees, Crosses, and True, <i>Y, A</i> [(8)-(10)]	Center-to-Face 90-deg Long-Radius Elbow, <i>B</i> [(6), (8), (9)]	Center-to-Face 45-deg Elbow, <i>C</i> , (9)	Center-to-Face Lateral, <i>D</i> , [(10), (11)]	Short Center-to-Face True, <i>Y</i> and Lateral, <i>E</i> [(10), (11)]	Face-to-Face Reducer, <i>F</i> (12)
1	124 (4.88)	17.5 (0.69)	68 (2.69)	25 (1.00)	11.1 (0.44)	102 (4.00)	127 (5.00)	51 (2.00)	165 (6.50)	57 (2.00)	...
1¼	133 (5.25)	19.0 (0.75)	78 (3.06)	32 (1.25)	11.1 (0.44)	108 (4.25)	140 (5.50)	64 (2.50)	184 (7.25)	57 (2.25)	...
1½	156 (6.12)	20.6 (0.81)	91 (3.56)	38 (1.50)	11.1 (0.44)	114 (4.50)	152 (6.00)	70 (2.75)	216 (8.50)	64 (2.50)	...
2	165 (6.50)	22.2 (0.88)	106 (4.19)	51 (2.00)	11.1 (0.44)	127 (5.00)	165 (6.50)	76 (3.00)	229 (9.00)	64 (2.50)	127 (5.0)
2½	191 (7.50)	25.4 (1.00)	125 (4.94)	64 (2.50)	12.7 (0.50)	140 (5.50)	178 (7.00)	89 (3.50)	267 (10.50)	64 (2.50)	140 (5.5)
3	210 (8.25)	28.6 (1.12)	144 (5.69)	76 (3.00)	14.3 (0.56)	152 (6.00)	197 (7.75)	89 (3.50)	279 (11.00)	76 (3.00)	152 (6.00)
3½	229 (9.00)	30.2 (1.19)	160 (6.31)	89 (3.50)	14.3 (0.56)	165 (6.50)	216 (8.50)	102 (4.00)	318 (12.50)	76 (3.00)	165 (6.50)
4	254 (10.00)	31.8 (1.25)	176 (6.94)	102 (4.00)	15.9 (0.62)	178 (7.00)	229 (9.00)	114 (4.50)	343 (13.50)	76 (3.00)	178 (7.00)
5	279 (11.00)	34.9 (1.38)	211 (8.31)	127 (5.00)	17.5 (0.69)	203 (8.00)	260 (10.25)	127 (5.00)	381 (15.00)	89 (3.50)	203 (8.00)
6	318 (12.50)	36.5 (1.44)	246 (9.69)	152 (6.00)	19 (0.75)	216 (8.50)	292 (11.50)	140 (5.50)	445 (17.50)	102 (4.00)	229 (9.00)
8	381 (15.00)	41.3 (1.62)	303 (11.94)	203 (8.00)	20.6 (0.81)	254 (10.00)	356 (14.00)	152 (6.00)	521 (20.50)	127 (5.00)	279 (11.00)
10	445 (17.50)	47.6 (1.88)	357 (14.06)	254 (10.00)	23.8 (0.94)	292 (11.50)	419 (16.50)	178 (7.00)	610 (24.00)	140 (5.50)	305 (12.00)
12	521 (20.50)	50.8 (2.00)	418 (16.44)	305 (12.00)	25.4 (1.00)	330 (13.00)	483 (19.00)	203 (8.00)	699 (27.50)	152 (6.00)	356 (14.00)
14	584 (23.00)	54 (2.12)	481 (18.94)	337 (13.25)	28.6 (1.12)	381 (15.00)	546 (21.50)	216 (8.50)	787 (31.00)	165 (6.50)	406 (16.00)
16	648 (25.50)	57.2 (2.25)	535 (21.06)	387 (15.25)	31.8 (1.25)	419 (16.50)	609 (24.00)	241 (9.50)	876 (34.50)	191 (7.50)	457 (18.00)
18	711 (28.00)	60.3 (2.38)	592 (23.31)	432 (17.00)	34.9 (1.38)	457 (18.00)	673 (26.50)	254 (10.00)	953 (37.50)	203 (8.00)	483 (19.00)
20	775 (30.50)	63.5 (2.50)	649 (25.56)	483 (19.00)	38.1 (1.50)	495 (19.50)	737 (29.00)	267 (10.50)	1029 (40.50)	216 (8.50)	508 (20.00)
24	916 (36.00)	69.8 (2.75)	770 (30.31)	584 (23.00)	41.3 (1.62)	572 (22.50)	864 (34.00)	305 (12.00)	1207 (47.50)	254 (10.00)	610 (24.00)
30	1092 (43.00)	76.2 (3.00)	945 (37.19)	737 (29.00)	50.8 (2.00)	699 (27.50)	1054 (41.50)	381 (15.00)	...	...	762 (30.00)



**Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)**

Reducing Fittings (Short-Body Patterns) [(11), (15)]							Base Elbows and Tees [(15)-(18)]							
Tees and Crosses [(10), (13), (14)]			Laterals (10)				Base Drilling (20)							
NPS Size of Outlet and Smaller [(6), (12)]	Center-to-Face Run, <i>H</i> [(8), (9)]	Center-to-Face or Side Outlet, <i>J</i>	NPS Size of Branch and Smaller	Center-to-Face Run, <i>M</i>	Center-to-Face Run, <i>N</i>	Center-to-Face Run, <i>P</i>	Center-to-Base <i>R</i>	Diameter of Road Base or Width of Square Base <i>S</i> (19)	Thick-ness of Base, <i>T</i>	Thick-ness of Ribs, <i>U</i>	NPS Size of Support-ing Pipe for Base	Bolt Circle or Bolt Spacing, <i>W</i>	Dia-mer of Holes	NPS
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1¼
(21)	(21)	(22)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	114 (4.50)	133 (5.25)	19 (0.75)	13 (0.50)	1¼	98 (3.88)	¾	2
(21)	(21)	(21)	(22)	(22)	(22)	(22)	121 (4.75)	133 (5.25)	19 (0.75)	13 (0.50)	1¼	98 (3.88)	¾	2½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	133 (5.25)	156 (6.12)	21 (0.81)	16 (0.62)	1½	114 (4.50)	⅞	3
(21)	(21)	(21)	(22)	(22)	(22)	(22)	143 (5.62)	156 (6.12)	21 (0.81)	16 (0.62)	1½	114 (4.50)	⅞	3½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	152 (6.00)	165 (6.50)	22 (0.88)	16 (0.62)	2	127 (5.00)	¾	4
(21)	(21)	(21)	(22)	(22)	(22)	(22)	171 (6.75)	191 (7.50)	25 (1.00)	19 (0.75)	2½	149 (5.88)	⅞	5
(21)	(21)	(21)	(22)	(22)	(22)	(22)	191 (7.50)	191 (7.50)	25 (1.00)	19 (0.75)	2½	149 (5.88)	⅞	6
(21)	(21)	(21)	(22)	(22)	(22)	(22)	229 (9.00)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	⅞	8
(21)	(21)	(21)	(22)	(22)	(22)	(22)	267 (10.50)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	⅞	10
(21)	(21)	(21)	(22)	(22)	(22)	(22)	305 (12.00)	318 (10.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	⅞	12
(21)	(21)	(21)	(22)	(22)	(22)	(22)	343 (13.50)	318 (12.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	⅞	14
(21)	(21)	(21)	(22)	(22)	(22)	(22)	375 (14.75)	318 (12.50)	37 (1.44)	29 (1.12)	6	270 (10.62)	⅞	16
12	356 (14.00)	432 (17.00)	8	787 (31.00)	76 (3.00)	826 (32.50)	413 (16.25)	381 (15.00)	41 (1.62)	29 (1.12)	8	330 (13.00)	1	18
14	394 (15.50)	470 (18.50)	10	864 (34.00)	76 (3.00)	914 (36.00)	454 (17.88)	381 (15.00)	41 (1.62)	32 (1.25)	8	330 (13.00)	1	20
16	432 (17.00)	546 (21.50)	12	1041 (41.00)	76 (3.00)	1092 (43.00)	527 (20.75)	445 (17.50)	48 (1.88)	32 (1.25)	10	387 (15.25)	1⅛	24
20	521 (20.50)	648 (25.50)	...	...	...	...	...	...	...	...	...	...	...	30



**Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)**

Reducing Fittings (Short-Body Patterns) [(11), (15)]							Base Elbows and Tees [(15)-(18)]							
Tees and Crosses [(10), (13), (14)]			Laterals (10)				Base Drilling (20)							
NPS Size of Outlet and Smaller [(6), (12)]	Center-to-Face Run, <i>H</i> [(8), (9)]	Center-to-Face or Side Outlet, <i>J</i>	NPS Size of Branch and Smaller	Center-to-Face Run, <i>M</i>	Center-to-Face Run, <i>N</i>	Center-to-Face Run, <i>P</i>	Center-to-Base <i>R</i>	Diameter of Road Base or Width of Square Base <i>S</i> (19)	Thick-ness of Base, <i>T</i>	Thick-ness of Ribs, <i>U</i>	NPS Size of Support-ing Pipe for Base	Bolt Circle or Bolt Spacing, <i>W</i>	Dia-mer of Holes	NPS
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1¼
(21)	(21)	(22)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	114 (4.50)	133 (5.25)	19 (0.75)	13 (0.50)	1¼	98 (3.88)	¾	2
(21)	(21)	(21)	(22)	(22)	(22)	(22)	121 (4.75)	133 (5.25)	19 (0.75)	13 (0.50)	1¼	98 (3.88)	¾	2½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	133 (5.25)	156 (6.12)	21 (0.81)	16 (0.62)	1½	114 (4.50)	⅞	3
(21)	(21)	(21)	(22)	(22)	(22)	(22)	143 (5.62)	156 (6.12)	21 (0.81)	16 (0.62)	1½	114 (4.50)	⅞	3½
(21)	(21)	(21)	(22)	(22)	(22)	(22)	152 (6.00)	165 (6.50)	22 (0.88)	16 (0.62)	2	127 (5.00)	¾	4
(21)	(21)	(21)	(22)	(22)	(22)	(22)	171 (6.75)	191 (7.50)	25 (1.00)	19 (0.75)	2½	149 (5.88)	⅞	5
(21)	(21)	(21)	(22)	(22)	(22)	(22)	191 (7.50)	191 (7.50)	25 (1.00)	19 (0.75)	2½	149 (5.88)	⅞	6
(21)	(21)	(21)	(22)	(22)	(22)	(22)	229 (9.00)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	⅞	8
(21)	(21)	(21)	(22)	(22)	(22)	(22)	267 (10.50)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	⅞	10
(21)	(21)	(21)	(22)	(22)	(22)	(22)	305 (12.00)	318 (10.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	⅞	12
(21)	(21)	(21)	(22)	(22)	(22)	(22)	343 (13.50)	318 (12.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	⅞	14
(21)	(21)	(21)	(22)	(22)	(22)	(22)	375 (14.75)	318 (12.50)	37 (1.44)	29 (1.12)	6	270 (10.62)	⅞	16
12	356 (14.00)	432 (17.00)	8	787 (31.00)	76 (3.00)	826 (32.50)	413 (16.25)	381 (15.00)	41 (1.62)	29 (1.12)	8	330 (13.00)	1	18
14	394 (15.50)	470 (18.50)	10	864 (34.00)	76 (3.00)	914 (36.00)	454 (17.88)	381 (15.00)	41 (1.62)	32 (1.25)	8	330 (13.00)	1	20
16	432 (17.00)	546 (21.50)	12	1041 (41.00)	76 (3.00)	1092 (43.00)	527 (20.75)	445 (17.50)	48 (1.88)	32 (1.25)	10	387 (15.25)	1⅛	24
20	521 (20.50)	648 (25.50)	...	...	...	...	...	...	...	...	...	...	...	30

**Table 7.3.2-3 Dimensions of Class 250 Gray Iron Flanged Fittings (Cont'd)**

Reducing Fittings (Short-Body Patterns) [(11), (15)]							Base Elbows and Tees [(15)-(18)]							
Tees and Crosses [(10), (13), (14)]			Laterals (10)				Base Drilling (20)							
NPS Size of Outlet and Smaller [(6), (12)]	Center-to-Face Run, <i>H</i> [(8), (9)]	Center-to-Face or Side Outlet, <i>J</i>	NPS Size of Branch and Smaller	Center-to-Face Run, <i>M</i>	Center-to-Face Run, <i>N</i>	Center-to-Face Run, <i>P</i>	Center-to-Base <i>R</i>	Diameter of Road Base or Width of Square Base <i>S</i> (19)	Thick-ness of Base, <i>T</i>	Thick-ness of Ribs, <i>U</i>	NPS Size of Support-ing Pipe for Base	Bolt Circle or Bolt Spacing, <i>W</i>	Dia-mer of Holes	NPS
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1
(21)	(21)	(21)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1 <sup>1</sup> / <sub>4</sub>
(21)	(21)	(22)	(22)	(22)	(22)	(22)	...	...	...	...	...	...	...	1 <sup>1</sup> / <sub>2</sub>
(21)	(21)	(21)	(22)	(22)	(22)	(22)	114 (4.50)	133 (5.25)	19 (0.75)	13 (0.50)	1 <sup>1</sup> / <sub>4</sub>	98 (3.88)	<sup>3</sup> / <sub>4</sub>	2
(21)	(21)	(21)	(22)	(22)	(22)	(22)	121 (4.75)	133 (5.25)	19 (0.75)	13 (0.50)	1 <sup>1</sup> / <sub>4</sub>	98 (3.88)	<sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>
(21)	(21)	(21)	(22)	(22)	(22)	(22)	133 (5.25)	156 (6.12)	21 (0.81)	16 (0.62)	1 <sup>1</sup> / <sub>2</sub>	114 (4.50)	<sup>7</sup> / <sub>8</sub>	3
(21)	(21)	(21)	(22)	(22)	(22)	(22)	143 (5.62)	156 (6.12)	21 (0.81)	16 (0.62)	1 <sup>1</sup> / <sub>2</sub>	114 (4.50)	<sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>
(21)	(21)	(21)	(22)	(22)	(22)	(22)	152 (6.00)	165 (6.50)	22 (0.88)	16 (0.62)	2	127 (5.00)	<sup>3</sup> / <sub>4</sub>	4
(21)	(21)	(21)	(22)	(22)	(22)	(22)	171 (6.75)	191 (7.50)	25 (1.00)	19 (0.75)	2 <sup>1</sup> / <sub>2</sub>	149 (5.88)	<sup>7</sup> / <sub>8</sub>	5
(21)	(21)	(21)	(22)	(22)	(22)	(22)	191 (7.50)	191 (7.50)	25 (1.00)	19 (0.75)	2 <sup>1</sup> / <sub>2</sub>	149 (5.88)	<sup>7</sup> / <sub>8</sub>	6
(21)	(21)	(21)	(22)	(22)	(22)	(22)	229 (9.00)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	<sup>7</sup> / <sub>8</sub>	8
(21)	(21)	(21)	(22)	(22)	(22)	(22)	267 (10.50)	254 (10.00)	32 (1.25)	22 (0.88)	4	200 (7.88)	<sup>7</sup> / <sub>8</sub>	10
(21)	(21)	(21)	(22)	(22)	(22)	(22)	305 (12.00)	318 (10.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	<sup>7</sup> / <sub>8</sub>	12
(21)	(21)	(21)	(22)	(22)	(22)	(22)	343 (13.50)	318 (12.50)	37 (1.44)	25 (1.00)	6	270 (10.62)	<sup>7</sup> / <sub>8</sub>	14
(21)	(21)	(21)	(22)	(22)	(22)	(22)	375 (14.75)	318 (12.50)	37 (1.44)	29 (1.12)	6	270 (10.62)	<sup>7</sup> / <sub>8</sub>	16
12	356 (14.00)	432 (17.00)	8	787 (31.00)	76 (3.00)	826 (32.50)	413 (16.25)	381 (15.00)	41 (1.62)	29 (1.12)	8	330 (13.00)	1	18
14	394 (15.50)	470 (18.50)	10	864 (34.00)	76 (3.00)	914 (36.00)	454 (17.88)	381 (15.00)	41 (1.62)	32 (1.25)	8	330 (13.00)	1	20
16	432 (17.00)	546 (21.50)	12	1041 (41.00)	76 (3.00)	1092 (43.00)	527 (20.75)	445 (17.50)	48 (1.88)	32 (1.25)	10	387 (15.25)	1 <sup>1</sup> / <sub>8</sub>	24
20	521 (20.50)	648 (25.50)	...	...	...	...	...	...	...	...	...	...	...	30

**Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees (Cont'd)**

NPS	Common to Both Straight Sizes and Reducing Sizes				Straight Sizes					
	Center to Base, <i>A</i>	Thickness of Base, <i>C</i> (1)	Diameter of Bolts, <i>G</i>	Thickness of Ribs, <i>F</i>	Width and Length of Square Base, <i>B</i>	Transverse Bolt Centers, <i>K</i>	Number of Bolt Holes on Each Side of Base, <i>L</i>	Number of Ribs, <i>D</i>	Centers of Ribs and Inside Bolt Holes, <i>E</i>	Longitudinal Centers From End Bolt to Second End, <i>H</i>
2½	114 (4.50)	18 (0.69)	5/8	11 (0.44)	178 (7.00)	114 (4.50)	2	1	...	114 (4.50)
3	124 (4.88)	19 (0.75)	5/8	11 (0.44)	191 (7.50)	127 (5.00)	2	1	...	127 (5.00)
3½	133 (5.25)	21 (0.81)	5/8	11 (0.44)	216 (8.50)	152 (6.00)	2	1	...	152 (6.00)
4	140 (5.50)	24 (0.94)	5/8	13 (0.50)	229 (9.00)	165 (6.50)	3	2	108 (4.25)	83 (3.25)
5	159 (6.25)	24 (0.94)	7/8	13 (0.50)	254 (10.00)	191 (7.50)	3	2	127 (5.00)	95 (3.25)
6	178 (7.00)	25 (1.00)	7/8	14 (0.56)	279 (11.00)	222 (8.75)	3	2	152 (6.00)	111 (4.38)
8	273 (8.38)	29 (1.12)	1	16 (0.62)	343 (13.50)	279 (11.00)	3	2	203 (8.00)	140 (5.50)
10	248 (9.25)	30 (1.19)	1½	19 (0.75)	406 (16.00)	340 (13.38)	4	3	124 (4.88)	108 (4.25)
12	286 (11.25)	32 (1.25)	1¼	21 (0.81)	483 (19.00)	394 (15.50)	4	3	146 (5.75)	124 (4.88)
14	318 (12.50)	35 (1.38)	1¼	22 (0.88)	533 (21.00)	451 (17.75)	4	3	172 (6.75)	140 (5.50)
16	349 (13.75)	37 (1.44)	1¾	25 (1.00)	597 (23.50)	502 (19.75)	4	3	197 (7.75)	152 (6.00)
18	381 (15.00)	40 (1.56)	1¾	27 (1.06)	635 (25.00)	552 (21.75)	4	3	216 (8.50)	168 (6.62)
20	406 (16.00)	43 (1.69)	1½	29 (1.12)	699 (27.50)	610 (24.00)	4	3	241 (9.50)	184 (7.25)
24	470 (18.50)	48 (1.88)	1⅝	32 (1.25)	813 (32.00)	721 (28.38)	4	3	289 (11.38)	216 (8.50)
30	559 (22.00)	54 (2.12)	1¾	37 (1.44)	984 (38.75)	876 (34.50)	5	4	238 (9.38)	200 (7.88)
36	648 (25.50)	60 (2.38)	1⅞	41 (1.62)	1168 (46.00)	1035 (40.75)	5	4	286 (11.25)	232 (9.12)
42	743 (29.25)	67 (2.62)	2	46 (1.81)	1346 (53.00)	1187 (46.75)	5	4	330 (13.00)	264 (10.38)
48	832 (32.75)	70 (2.75)	2¼	51 (2.00)	1511 (59.50)	1353 (53.25)	5	4	378 (14.88)	298 (11.75)



**Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees (Cont'd)**

Reducing Sizes (Short-Body Pattern) [(1), (2)]									
NPS Outlet Sizes and Smaller	Length of Base, $B_1$ (1)	Number of Ribs, $D_1$	Centers of Ribs, $E_1$	Diameter of Bolts, $G_1$	Longitudi- nal Center From End Bolt to Second Bolt, $H_1$	Transverse Bolt Centers, $K_1$	Number of Bolt Holes on Each Side of Base, $L_1$	Width of Base, $B_2$	NPS
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	2½
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	3
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	3½
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	4
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	5
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	6
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	8
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	10
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	12
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	14
(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	16
12	483 (19.00)	3	133 (5.25)	1¼	130 (5.12)	546 (21.50)	4	629 (24.75)	18
14	533 (21.00)	3	152 (6.00)	1¼	137 (5.38)	591 (23.75)	4	679 (26.75)	20
16	597 (23.50)	3	178 (7.00)	1⅜	159 (6.25)	711 (28.00)	4	803 (31.62)	24
20	699 (27.50)	3	229 (9.00)	1½	184 (7.25)	883 (34.25)	4	991 (39.00)	30
24	813 (32.00)	3	273 (10.75)	1½	213 (8.38)	1054 (41.50)	4	1187 (46.25)	36
24	927 (36.50)	4	216 (8.50)	1⅝	191 (7.50)	1232 (48.50)	5	1391 (54.75)	42
30	1060 (41.75)	4	248 (9.75)	1⅝	210 (8.25)	1365 (53.75)	5	1524 (60.00)	48

**Table 7.3.2-4 Dimensions of Anchorage Bases for Straight and Reducing Class 125 Tees (Cont'd)**

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## GENERAL NOTES:

- (a) Dimensions are in millimeters (inches).
- (b) Bases are furnished only when specified by the purchaser.
- (c) For tee dimensions, refer to [Table 7.3.2-2](#).

## NOTES:

- (1) For NPS 18 and larger, if the outlet is the same size or smaller than given for reducing tees, the base dimensions shown in this table shall be used. If the outlet is larger than shown for reducing tees, the base dimensions shall be the same as for the straight-size tee, corresponding to the size of the largest opening.
- (2) Tees reducing on run only shall have the same base dimensions as straight-size tees, corresponding to the size of the largest opening.
- (3) Reducing tee sizes NPS 16 and smaller shall have the same base (*B*) dimensions as a straight-size tee, corresponding to the size of the largest opening.

Table 7.3.2-5 Dimensions of Anchorage Bases for Straight and Reducing Class 250 Tees

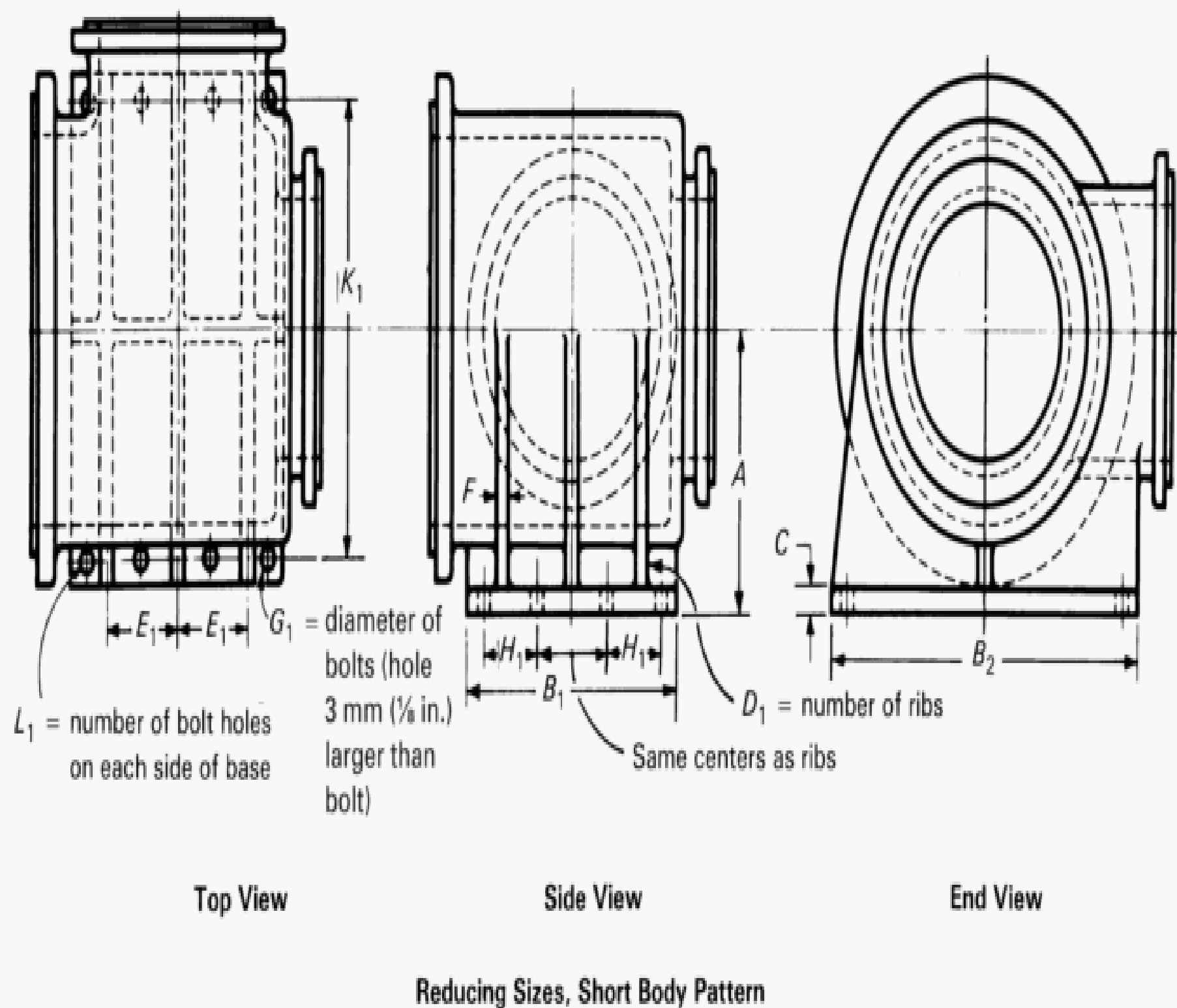
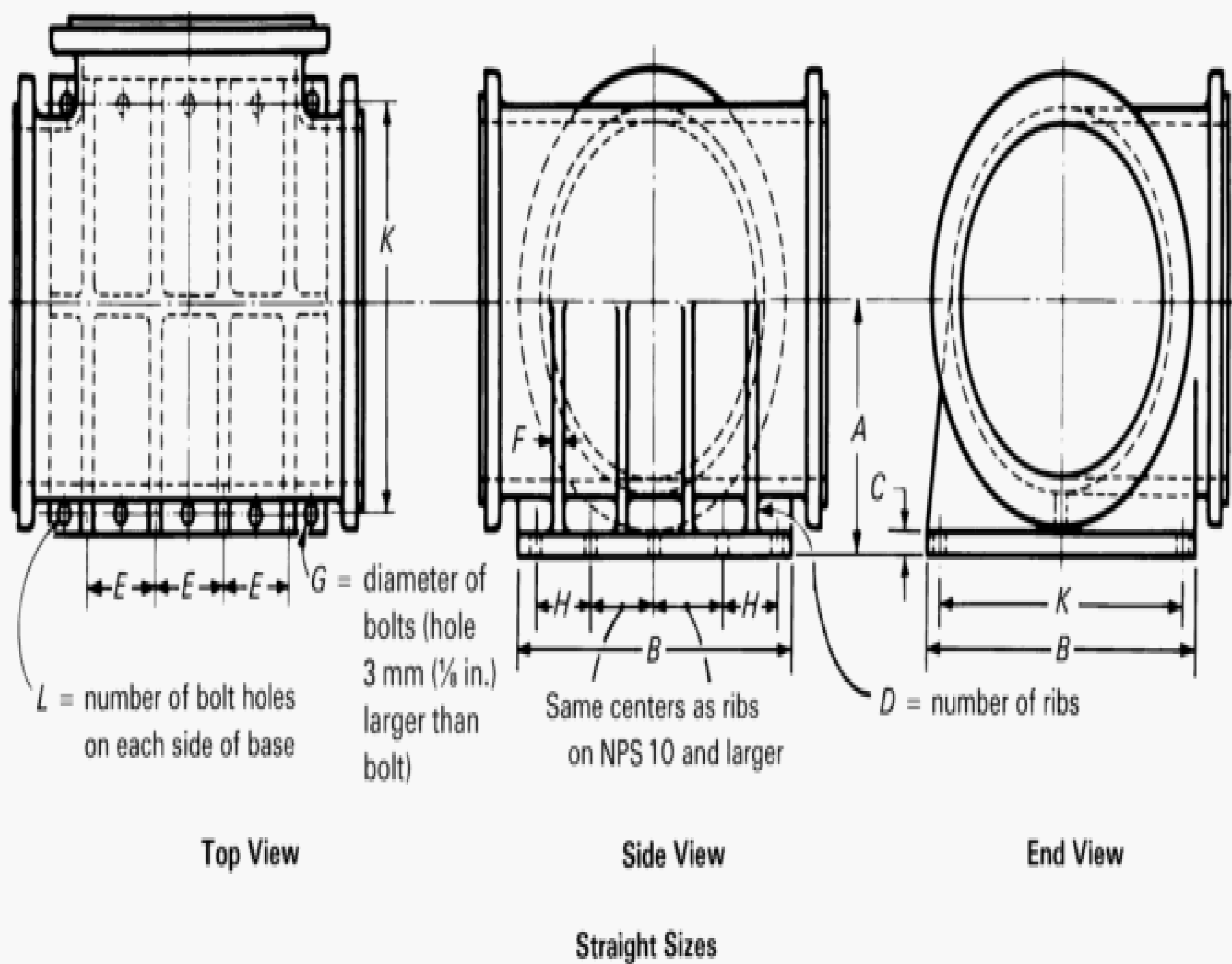




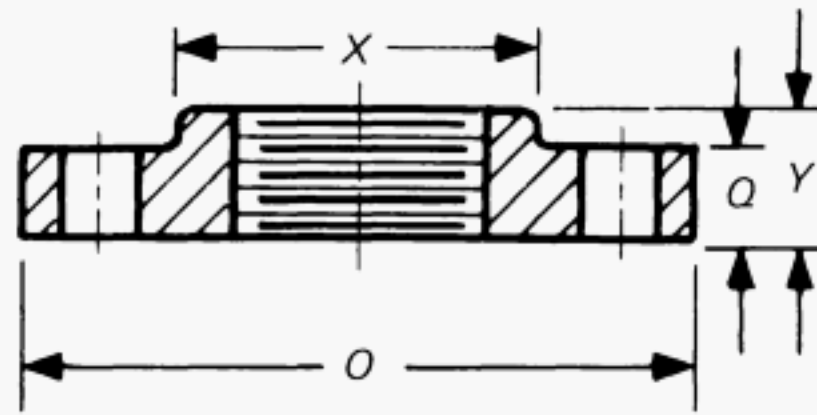
Table 7.3.2-5 Dimensions of Anchorage Bases for Straight and Reducing Class 250 Tees (Cont'd)

Common on Both Straight Sizes and Reducing Sizes				Straight Sizes						Reducing Sizes (Short-Body Pattern) [(2), (3)]						
NPS	Center to Base, A	Thickness of Base, C [(1), (2)]	Diameter of Bolts, G	Thickness of Ribs, F	Width and Length of Square Base, B	Transverse Bolt Centers, K	Number of Bolt Holes on Each Side of Base, L	Number of Ribs, D	Centers of Ribs, and Inside Bolt Holes E	Longitudinal Centers From End Bolt to Second End, H	NPS Outlet Sizes and Smaller (2)	Length of Base, B <sub>1</sub>	Centers of Ribs, E <sub>1</sub>	Longitudinal Centers From End Bolt to Second End, H <sub>1</sub>	Transverse Bolt Centers, K <sub>1</sub>	Width of Base, B <sub>2</sub>
2½	121 (4.75)	19 (0.75)	⅝	14 (0.56)	190 (7.50)	146 (5.75)	2	1	...	146 (5.75)	(4)	(4)	(4)	(4)	(4)	(4)
3	133 (5.25)	21 (0.81)	⅝	14 (0.56)	210 (8.25)	165 (6.50)	2	1	...	165 (6.50)	(4)	(4)	(4)	(4)	(4)	(4)
3½	143 (5.62)	24 (0.94)	⅝	14 (0.56)	229 (9.00)	184 (7.25)	2	1	...	184 (7.25)	(4)	(4)	(4)	(4)	(4)	(4)
4	152 (6.00)	24 (0.94)	⅝	16 (0.62)	254 (10.00)	197 (7.75)	3	2	102 (4)	98 (3.78)	(4)	(4)	(4)	(4)	(4)	(4)
5	171 (6.75)	25 (1.00)	⅞	18 (0.69)	279 (11.00)	222 (8.75)	3	2	127 (5)	111 (4.38)	(4)	(4)	(4)	(4)	(4)	(4)
6	190 (7.50)	27 (1.06)	⅞	19 (0.75)	318 (12.50)	260 (10.25)	3	2	152 (6)	130 (5.12)	(4)	(4)	(4)	(4)	(4)	(4)
8	229 (9.00)	29 (1.12)	1	21 (0.81)	381 (15.00)	318 (12.50)	3	2	203 (8)	159 (6.25)	(4)	(4)	(4)	(4)	(4)	(4)
10	267 (10.50)	32 (1.25)	1⅛	24 (0.94)	444 (17.50)	375 (14.75)	4	3	127 (5)	124 (4.88)	(4)	(4)	(4)	(4)	(4)	(4)
12	305 (12.00)	32 (1.25)	1¼	25 (1.00)	521 (20.50)	444 (17.50)	4	3	152 (6)	146 (5.75)	(4)	(4)	(4)	(4)	(4)	(4)
14	343 (13.50)	35 (1.38)	1¼	29 (1.12)	584 (23.00)	508 (20.00)	4	3	178 (7)	165 (6.50)	(4)	(4)	(4)	(4)	(4)	(4)
16	375 (14.75)	40 (1.56)	1⅜	32 (1.25)	648 (25.50)	559 (22.00)	4	3	203 (8)	178 (7.00)	(4)	(4)	(4)	(4)	(4)	(4)
18	413 (16.25)	43 (1.69)	1⅜	35 (1.38)	711 (28.00)	616 (24.25)	4	3	229 (9)	194 (7.38)	12	521 (20.50)	165 (6.50)	133 (5.25)	622 (24.50)	718 (28.25)
20	454 (17.88)	48 (1.88)	1½	38 (1.50)	775 (30.50)	679 (26.75)	4	3	254 (10)	213 (8.38)	14	584 (23.00)	178 (7.00)	152 (6.00)	673 (26.50)	768 (30.25)
24	527 (20.75)	52 (2.06)	1⅝	41 (1.62)	914 (36.00)	806 (31.75)	4	3	305 (12)	251 (9.88)	16	648 (25.50)	206 (8.12)	170 (6.69)	813 (32.00)	921 (36.25)
30	629 (24.75)	59 (2.31)	1¾	51 (2.00)	1092 (43.00)	965 (38.00)	5	4	254 (10)	229 (9.00)	20	775 (30.50)	168 (6.62)	156 (6.12)	965 (38.00)	1092 (43.00)

GENERAL NOTES:  
(a) Dimensions are in millimeters (inches).  
(b) For tee dimensions, refer to Table 7.3.2-3.

NOTES:  
(1) Bases are furnished only when specified by the purchaser.  
(2) For NPS 18 and larger, if the outlet is the same size or smaller than given for reducing tees, the base dimensions shown in this table for reducing tees shall be used. If the outlet is larger than shown for reducing tees, the base dimensions shall be the same as for the straight-size tees, corresponding to the size of the largest opening.  
(3) Tees reducing on run only shall have the same base dimensions as straight-size tees, corresponding to the size of the largest opening.  
(4) Reducing tee sizes NPS 16 and smaller shall have the same base (B) dimensions as a straight-size tee, corresponding to the size of the largest opening.

Table 7.6.1-1 Class 25 Flange and Bolting Dimensions



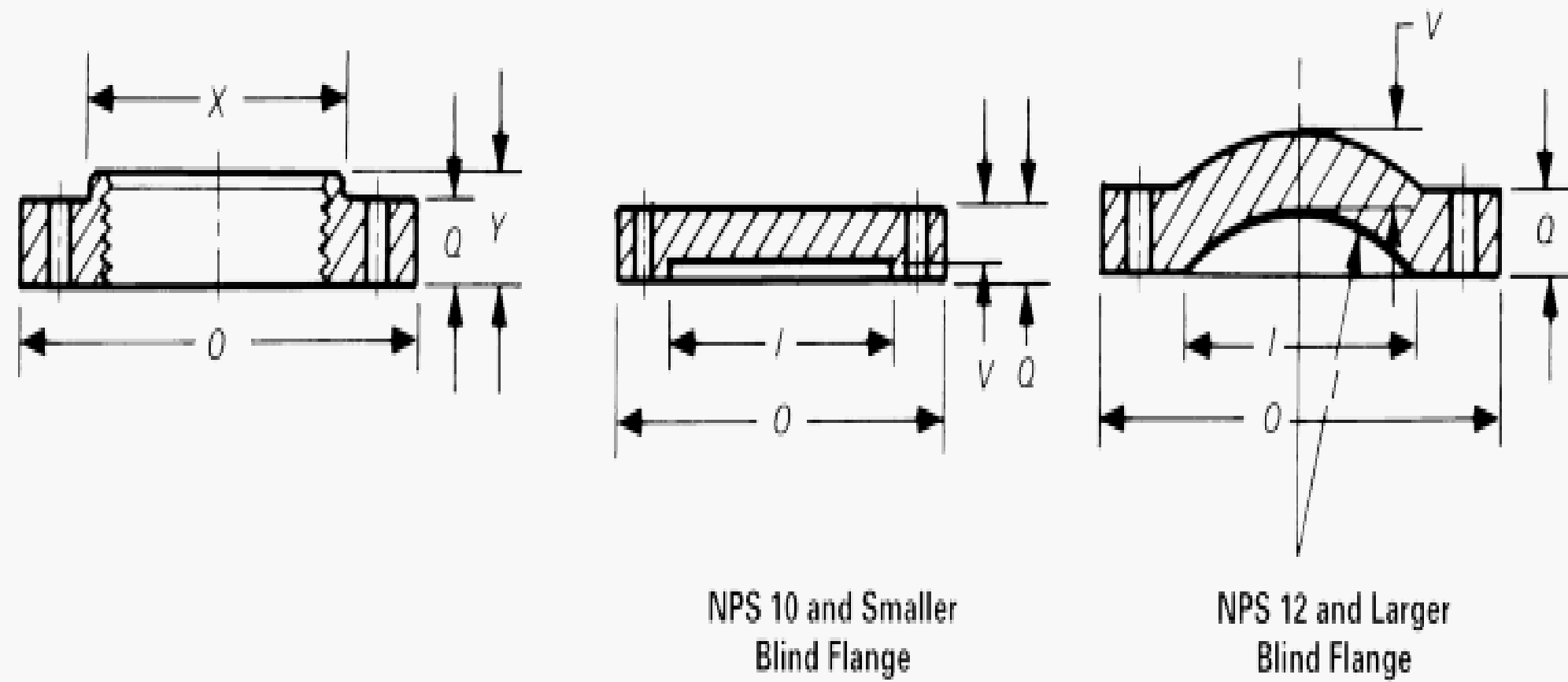
Flanges		Hub		Bolt Holes		Bolting [Note (6)]			
NPS	Diameter, <i>O</i>	Minimum Thickness, <i>Q</i> [Notes (1) and (2)]	Minimum Diameter, <i>X</i>	Minimum Length, <i>Y</i>	Diameter of Bolt Circle [Note (3)]	Diameter of Bolt Holes [Notes (3)–(5)]	Number of Bolts	Diameter of Bolts [Note (3)]	Length of Bolts
4	230 (9.00)	19.0 (0.75)	135 (5.31)	33 (1.31)	191 (7.50)	$\frac{3}{4}$	8	$\frac{5}{8}$	64 (2.50)
5	255 (10.00)	19.0 (0.75)	164 (6.44)	37 (1.44)	216 (8.50)	$\frac{3}{4}$	8	$\frac{5}{8}$	64 (2.50)
6	280 (11.00)	19.0 (0.75)	192 (7.56)	40 (1.56)	241 (9.50)	$\frac{3}{4}$	8	$\frac{5}{8}$	64 (2.50)
8	345 (13.50)	19.0 (0.75)	246 (9.69)	45 (1.75)	299 (11.75)	$\frac{3}{4}$	8	$\frac{5}{8}$	64 (2.50)
10	405 (16.00)	22.2 (0.88)	303 (11.94)	49 (1.94)	368 (14.25)	$\frac{3}{4}$	12	$\frac{5}{8}$	70 (3.00)
12	485 (19.00)	25.4 (1.00)	357 (14.06)	56 (2.19)	432 (17.00)	$\frac{3}{4}$	12	$\frac{5}{8}$	76 (3.00)
14	535 (21.00)	28.6 (1.12)	391 (15.37)	57 (2.25)	476 (18.75)	$\frac{7}{8}$	12	$\frac{3}{4}$	89 (3.50)
16	595 (23.50)	28.6 (1.12)	445 (17.50)	64 (2.50)	540 (21.25)	$\frac{7}{8}$	16	$\frac{3}{4}$	89 (3.50)
18	635 (25.00)	31.8 (1.25)	498 (19.62)	68 (2.69)	578 (22.75)	$\frac{7}{8}$	16	$\frac{3}{4}$	95 (4.00)
20	700 (27.50)	31.8 (1.25)	552 (21.75)	78 (2.88)	635 (25.00)	$\frac{7}{8}$	20	$\frac{3}{4}$	95 (4.00)
24	815 (32.00)	34.9 (1.38)	560 (26.00)	83 (3.25)	749 (29.50)	$\frac{7}{8}$	20	$\frac{3}{4}$	102 (4.00)
30	985 (38.75)	38.1 (1.50)	...	...	914 (36.00)	1	28	$\frac{7}{8}$	114 (4.50)
36	1170 (46.00)	41.3 (1.62)	...	...	1085 (42.75)	1	32	$\frac{7}{8}$	121 (5.00)
42	1345 (53.00)	44.5 (1.75)	...	...	1257 (49.50)	$1\frac{1}{8}$	36	1	133 (5.50)
48	1510 (59.50)	50.8 (2.00)	...	...	1422 (56.00)	$1\frac{1}{8}$	44	1	146 (6.00)
54	1685 (66.25)	57.2 (2.25)	...	...	1594 (62.75)	$1\frac{1}{8}$	44	1	159 (6.50)
60	1855 (73.00)	57.2 (2.25)	...	...	1759 (69.25)	$1\frac{1}{4}$	52	$1\frac{1}{8}$	159 (6.50)
72	2195 (86.50)	63.5 (2.50)	...	...	2095 (82.50)	$1\frac{1}{4}$	60	$1\frac{1}{8}$	172 (7.00)
84	2535 (99.75)	69.9 (2.75)	...	...	2425 (95.50)	$1\frac{3}{8}$	64	$1\frac{1}{4}$	191 (7.50)
96	2875 (113.25)	76.2 (3.00)	...	...	2756 (108.50)	$1\frac{3}{8}$	68	$1\frac{1}{4}$	203 (8.00)

GENERAL NOTE: Dimensions are in millimeters (inches).

## NOTES:

- (1) For facing, see [para. 7.2\(a\)](#).
- (2) Threaded companion flanges should not be thinner than the Class 125 thickness on NPS 24 and smaller. Other types of flanges may have thicknesses as given above.
- (3) The flange diameter, bolt circle, and number of bolts are the same in Class 25 as in Class 125. Bolt hole diameters of Class 25 shall not be modified when mated with Class 125 flanges or with steel flanges.
- (4) For spot facing, see [para. 7.7](#).
- (5) For flange bolt holes, see [para. 7.6](#).
- (6) For bolts and nuts, see [para. 8.1](#).

Table 7.6.1-2 Class 125 Flange and Bolting Dimensions

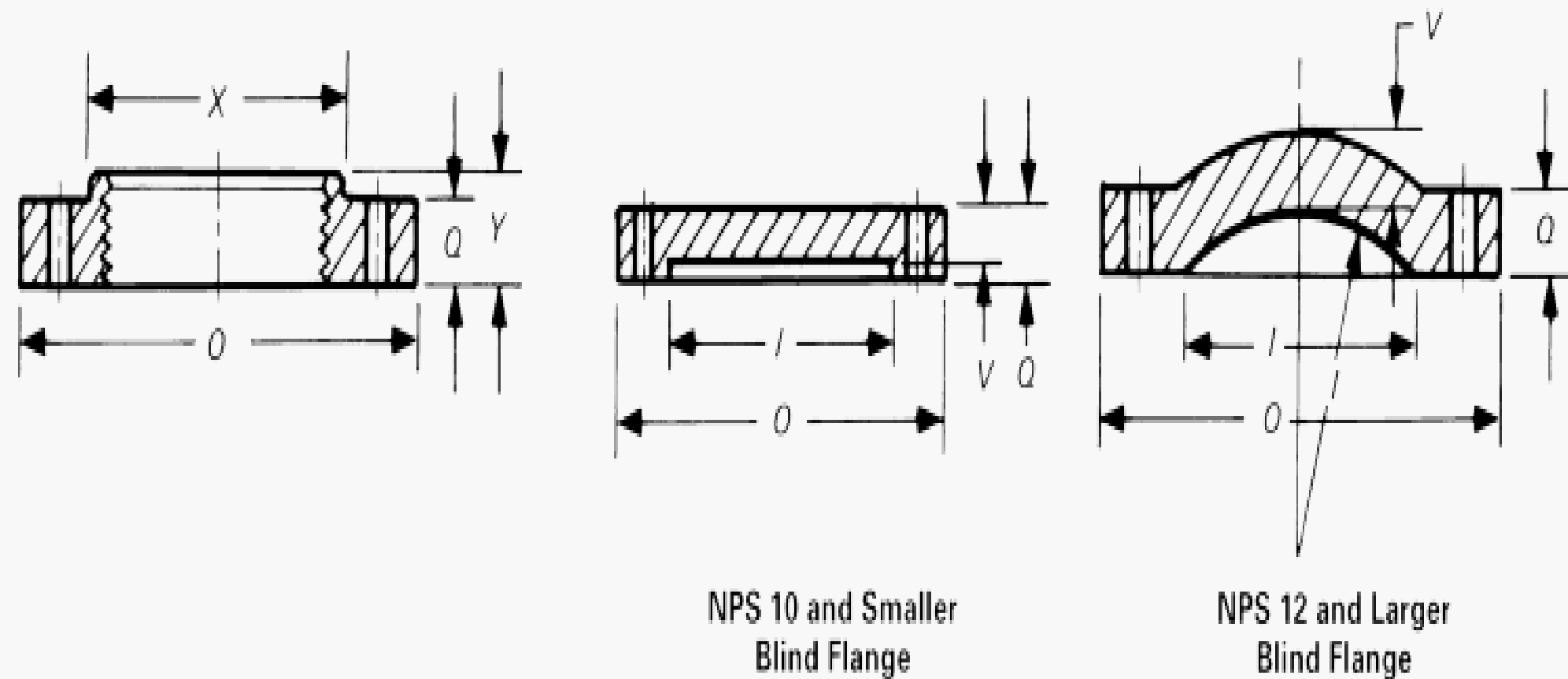


NPS 10 and Smaller  
Blind Flange

NPS 12 and Larger  
Blind Flange

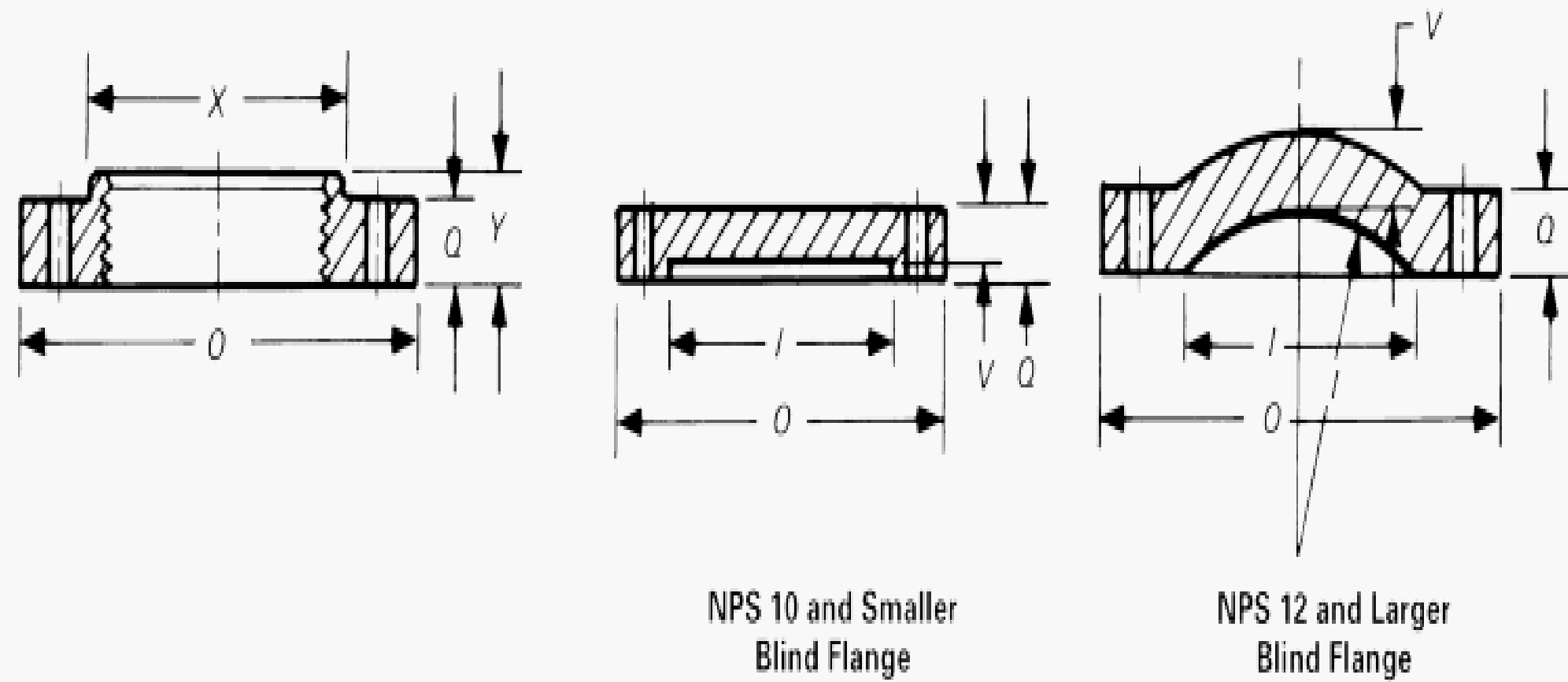
Flanges		Hub		Blind Flanges		Bolt Holes		Bolting				
NPS	Diameter of Flange, O	Minimum Thickness of Flange, Q	Minimum Diameter, X	Minimum Length of Hub and Threads, Y	Diameter of Port, I	Wall Thickness, V	Diameter of Bolt Circle	Diameter of Bolt Holes [Notes (5) and (6)]	Number of Bolts	Diameter of Bolts [Notes (7) and (8)]	Length of Bolts [Notes (7) and (8)]	Length of Bolt Stud With Two Nuts [Note (7)]
		[Note (1)]		[Note (2)]								
1	110 (4.25)	11.1 (0.44)	49 (1.94)	18 (0.69)	25 (1.00)	9.6 (0.38)	79 (3.12)	5/8	4	1/2	45 (2.00)	...
1 1/4	115 (4.62)	12.7 (0.50)	59 (2.31)	21 (0.81)	32 (1.25)	11.1 (0.44)	89 (3.50)	5/8	4	1/2	51 (2.00)	...
1 1/2	125 (5.00)	14.3 (0.56)	65 (2.56)	22 (0.88)	38 (1.50)	12.7 (0.50)	98 (3.88)	5/8	4	1/2	51 (2.00)	...
2	150 (6.00)	15.9 (0.62)	78 (3.06)	25 (1.00)	51 (2.00)	14.3 (0.56)	121 (4.75)	3/4	4	5/8	57 (2.50)	...
2 1/2	180 (7.00)	17.5 (0.69)	91 (3.56)	29 (1.12)	64 (2.50)	15.9 (0.63)	140 (5.50)	3/4	4	5/8	64 (2.50)	...
3	190 (7.50)	19.0 (0.75)	108 (4.25)	30 (1.19)	76 (3.00)	17.5 (0.69)	152 (6.00)	3/4	4	5/8	64 (2.50)	...
3 1/2	215 (8.50)	20.6 (0.81)	122 (4.81)	32 (1.25)	89 (3.50)	19.0 (0.75)	178 (7.00)	3/4	8	5/8	70 (3.00)	...
4	230 (9.00)	23.8 (0.94)	135 (5.31)	33 (1.31)	102 (4.00)	22.2 (0.88)	191 (7.50)	3/4	8	5/8	76 (3.00)	...
5	255 (10.00)	23.8 (0.94)	164 (6.44)	37 (1.44)	127 (5.00)	22.2 (0.88)	216 (8.50)	7/8	8	3/4	76 (3.00)	...
6	280 (11.00)	25.4 (1.00)	192 (7.56)	40 (1.56)	152 (6.00)	23.8 (0.94)	241 (9.50)	7/8	8	3/4	83 (3.50)	...
8	345 (13.50)	28.6 (1.12)	246 (9.69)	45 (1.75)	203 (8.00)	27.0 (1.06)	299 (11.75)	7/8	8	3/4	89 (3.50)	...
10	405 (16.00)	30.2 (1.19)	303 (11.94)	49 (1.94)	254 (10.00)	28.6 (1.12)	362 (14.25)	1	12	7/8	95 (4.00)	...
12	485 (19.00)	31.8 (1.25)	357 (14.06)	56 (2.19)	305 (12.00)	20.6 (0.81)	432 (17.00)	1	12	7/8	95 (4.00)	...
14	535 (21.00)	35.1 (1.38)	391 (15.38)	57 (2.25)	356 (14.00)	22.2 (0.88)	476 (18.75)	1 1/8	12	1	108 (4.50)	...
16	595 (23.50)	36.5 (1.44)	445 (17.50)	64 (2.50)	406 (16.00)	25.4 (1.00)	540 (21.25)	1 1/8	16	1	114 (4.50)	...
18	635 (25.00)	39.7 (1.56)	499 (19.62)	68 (2.69)	457 (18.00)	27.0 (1.06)	578 (22.75)	1 1/4	16	1 1/8	121 (5.00)	...
20	700 (27.50)	42.9 (1.69)	553 (21.75)	73 (2.88)	508 (20.00)	28.6 (1.12)	635 (25.00)	1 1/4	20	1 1/8	127 (5.00)	...

Table 7.6.1-2 Class 125 Flange and Bolting Dimensions



Flanges		Hub		Blind Flanges		Bolt Holes		Bolting				
NPS	Diameter of Flange, O	Minimum Thickness of Flange, Q	Minimum Diameter, X	Minimum Length of Hub and Threads, Y	Diameter of Port, I	Wall Thickness, V	Diameter of Bolt Circle	Diameter of Bolt Holes [Notes (5) and (6)]	Number of Bolts	Diameter of Bolts [Notes (7) and (8)]	Length of Bolts [Notes (7) and (8)]	Length of Bolt Stud With Two Nuts [Note (7)]
		[Note (1)]		[Note (2)]								
1	110 (4.25)	11.1 (0.44)	49 (1.94)	18 (0.69)	25 (1.00)	9.6 (0.38)	79 (3.12)	5/8	4	1/2	45 (2.00)	...
1 1/4	115 (4.62)	12.7 (0.50)	59 (2.31)	21 (0.81)	32 (1.25)	11.1 (0.44)	89 (3.50)	5/8	4	1/2	51 (2.00)	...
1 1/2	125 (5.00)	14.3 (0.56)	65 (2.56)	22 (0.88)	38 (1.50)	12.7 (0.50)	98 (3.88)	5/8	4	1/2	51 (2.00)	...
2	150 (6.00)	15.9 (0.62)	78 (3.06)	25 (1.00)	51 (2.00)	14.3 (0.56)	121 (4.75)	3/4	4	5/8	57 (2.50)	...
2 1/2	180 (7.00)	17.5 (0.69)	91 (3.56)	29 (1.12)	64 (2.50)	15.9 (0.63)	140 (5.50)	3/4	4	5/8	64 (2.50)	...
3	190 (7.50)	19.0 (0.75)	108 (4.25)	30 (1.19)	76 (3.00)	17.5 (0.69)	152 (6.00)	3/4	4	5/8	64 (2.50)	...
3 1/2	215 (8.50)	20.6 (0.81)	122 (4.81)	32 (1.25)	89 (3.50)	19.0 (0.75)	178 (7.00)	3/4	8	5/8	70 (3.00)	...
4	230 (9.00)	23.8 (0.94)	135 (5.31)	33 (1.31)	102 (4.00)	22.2 (0.88)	191 (7.50)	3/4	8	5/8	76 (3.00)	...
5	255 (10.00)	23.8 (0.94)	164 (6.44)	37 (1.44)	127 (5.00)	22.2 (0.88)	216 (8.50)	7/8	8	3/4	76 (3.00)	...
6	280 (11.00)	25.4 (1.00)	192 (7.56)	40 (1.56)	152 (6.00)	23.8 (0.94)	241 (9.50)	7/8	8	3/4	83 (3.50)	...
8	345 (13.50)	28.6 (1.12)	246 (9.69)	45 (1.75)	203 (8.00)	27.0 (1.06)	299 (11.75)	7/8	8	3/4	89 (3.50)	...
10	405 (16.00)	30.2 (1.19)	303 (11.94)	49 (1.94)	254 (10.00)	28.6 (1.12)	362 (14.25)	1	12	7/8	95 (4.00)	...
12	485 (19.00)	31.8 (1.25)	357 (14.06)	56 (2.19)	305 (12.00)	20.6 (0.81)	432 (17.00)	1	12	7/8	95 (4.00)	...
14	535 (21.00)	35.1 (1.38)	391 (15.38)	57 (2.25)	356 (14.00)	22.2 (0.88)	476 (18.75)	1 1/8	12	1	108 (4.50)	...
16	595 (23.50)	36.5 (1.44)	445 (17.50)	64 (2.50)	406 (16.00)	25.4 (1.00)	540 (21.25)	1 1/8	16	1	114 (4.50)	...
18	635 (25.00)	39.7 (1.56)	499 (19.62)	68 (2.69)	457 (18.00)	27.0 (1.06)	578 (22.75)	1 1/4	16	1 1/8	121 (5.00)	...
20	700 (27.50)	42.9 (1.69)	553 (21.75)	73 (2.88)	508 (20.00)	28.6 (1.12)	635 (25.00)	1 1/4	20	1 1/8	127 (5.00)	...

Table 7.6.1-2 Class 125 Flange and Bolting Dimensions



NPS 10 and Smaller  
Blind Flange

NPS 12 and Larger  
Blind Flange

Flanges		Hub		Blind Flanges		Bolt Holes		Bolting				
NPS	Diameter of Flange, O	Minimum Thickness of Flange, Q	Minimum Diameter, X	Minimum Length of Hub and Threads, Y	Diameter of Port, I	Wall Thickness, V	Diameter of Bolt Circle	Diameter of Bolt Holes [Notes (5) and (6)]	Number of Bolts	Diameter of Bolts [Notes (7) and (8)]	Length of Bolts [Notes (7) and (8)]	Length of Bolt Stud With Two Nuts [Note (7)]
		[Note (1)]		[Note (2)]								
1	110 (4.25)	11.1 (0.44)	49 (1.94)	18 (0.69)	25 (1.00)	9.6 (0.38)	79 (3.12)	5/8	4	1/2	45 (2.00)	...
1 1/4	115 (4.62)	12.7 (0.50)	59 (2.31)	21 (0.81)	32 (1.25)	11.1 (0.44)	89 (3.50)	5/8	4	1/2	51 (2.00)	...
1 1/2	125 (5.00)	14.3 (0.56)	65 (2.56)	22 (0.88)	38 (1.50)	12.7 (0.50)	98 (3.88)	5/8	4	1/2	51 (2.00)	...
2	150 (6.00)	15.9 (0.62)	78 (3.06)	25 (1.00)	51 (2.00)	14.3 (0.56)	121 (4.75)	3/4	4	5/8	57 (2.50)	...
2 1/2	180 (7.00)	17.5 (0.69)	91 (3.56)	29 (1.12)	64 (2.50)	15.9 (0.63)	140 (5.50)	3/4	4	5/8	64 (2.50)	...
3	190 (7.50)	19.0 (0.75)	108 (4.25)	30 (1.19)	76 (3.00)	17.5 (0.69)	152 (6.00)	3/4	4	5/8	64 (2.50)	...
3 1/2	215 (8.50)	20.6 (0.81)	122 (4.81)	32 (1.25)	89 (3.50)	19.0 (0.75)	178 (7.00)	3/4	8	5/8	70 (3.00)	...
4	230 (9.00)	23.8 (0.94)	135 (5.31)	33 (1.31)	102 (4.00)	22.2 (0.88)	191 (7.50)	3/4	8	5/8	76 (3.00)	...
5	255 (10.00)	23.8 (0.94)	164 (6.44)	37 (1.44)	127 (5.00)	22.2 (0.88)	216 (8.50)	7/8	8	3/4	76 (3.00)	...
6	280 (11.00)	25.4 (1.00)	192 (7.56)	40 (1.56)	152 (6.00)	23.8 (0.94)	241 (9.50)	7/8	8	3/4	83 (3.50)	...
8	345 (13.50)	28.6 (1.12)	246 (9.69)	45 (1.75)	203 (8.00)	27.0 (1.06)	299 (11.75)	7/8	8	3/4	89 (3.50)	...
10	405 (16.00)	30.2 (1.19)	303 (11.94)	49 (1.94)	254 (10.00)	28.6 (1.12)	362 (14.25)	1	12	7/8	95 (4.00)	...
12	485 (19.00)	31.8 (1.25)	357 (14.06)	56 (2.19)	305 (12.00)	20.6 (0.81)	432 (17.00)	1	12	7/8	95 (4.00)	...
14	535 (21.00)	35.1 (1.38)	391 (15.38)	57 (2.25)	356 (14.00)	22.2 (0.88)	476 (18.75)	1 1/8	12	1	108 (4.50)	...
16	595 (23.50)	36.5 (1.44)	445 (17.50)	64 (2.50)	406 (16.00)	25.4 (1.00)	540 (21.25)	1 1/8	16	1	114 (4.50)	...
18	635 (25.00)	39.7 (1.56)	499 (19.62)	68 (2.69)	457 (18.00)	27.0 (1.06)	578 (22.75)	1 1/4	16	1 1/8	121 (5.00)	...
20	700 (27.50)	42.9 (1.69)	553 (21.75)	73 (2.88)	508 (20.00)	28.6 (1.12)	635 (25.00)	1 1/4	20	1 1/8	127 (5.00)	...



**Table 7.6.1-3 Class 250 Flange and Bolting Dimensions**

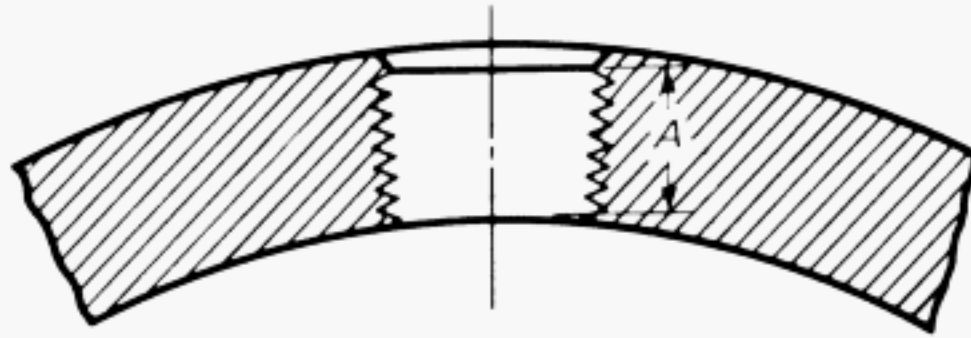
Bolt Holes		Bolting (6)				
Diameter of Bolt Circle	Diameter of Bolts (5)	Number of Bolts	Diameter of Bolts (7)	Length of Bolts (8), (9)	Length of Stud Bolts (8), (9)	NPS
89 (3.50)	$\frac{3}{4}$	4	$\frac{5}{8}$ (0.62)	64 (2.50)	...	1
98 (3.88)	$\frac{3}{4}$	4	$\frac{5}{8}$ (0.62)	64 (2.50)	...	1 $\frac{1}{4}$
114 (4.50)	$\frac{7}{8}$	4	$\frac{3}{4}$ (0.75)	70 (3.00)	...	1 $\frac{1}{2}$
127 (5.00)	$\frac{3}{4}$	8	$\frac{5}{8}$ (0.62)	70 (3.00)	...	2
149 (5.88)	$\frac{7}{8}$	8	$\frac{3}{4}$ (0.75)	83 (3.50)	...	2 $\frac{1}{2}$
168 (6.62)	$\frac{7}{8}$	8	$\frac{3}{4}$ (0.75)	89 (3.50)	...	3
184 (7.25)	$\frac{7}{8}$	8	$\frac{3}{4}$ (0.75)	89 (3.50)	...	3 $\frac{1}{2}$
200 (7.88)	$\frac{7}{8}$	8	$\frac{3}{4}$ (0.75)	95 (4.00)	...	4
235 (9.25)	$\frac{7}{8}$	8	$\frac{3}{4}$ (0.75)	102 (4.00)	...	5
270 (10.62)	$\frac{7}{8}$	12	$\frac{3}{4}$ (0.75)	102 (4.00)	...	6
330 (13.00)	1 $\frac{1}{8}$	12	$\frac{7}{8}$ (0.88)	114 (4.50)	...	8
387 (15.25)	1 $\frac{1}{4}$	16	1 (1.00)	131 (5.50)	...	10
451 (17.75)	1 $\frac{1}{4}$	16	1 $\frac{1}{8}$ (1.12)	140 (5.50)	...	12
514 (20.25)	1 $\frac{3}{8}$	20	1 $\frac{1}{8}$ (1.12)	152 (6.00)	...	14
572 (22.50)	1 $\frac{3}{8}$	20	1 $\frac{1}{4}$ (1.25)	159 (6.50)	...	16
629 (24.75)	1 $\frac{3}{8}$	24	1 $\frac{1}{4}$ (1.25)	165 (6.50)	...	18
686 (27.00)	1 $\frac{3}{8}$	24	1 $\frac{1}{4}$ (1.25)	172 (7.00)	...	20
813 (32.00)	1 $\frac{5}{8}$	24	1 $\frac{1}{2}$ (1.50)	191 (7.50)	241 (9.50)	24
997 (39.25)	2	28	1 $\frac{3}{4}$ (1.75)	216 (8.50)	268 (10.50)	30
1168 (46.00)	2 $\frac{1}{4}$	32	2 (2.00)	241 (9.50)	298 (12.00)	36 (10)
1340 (52.75)	2 $\frac{1}{4}$	36	2 (2.00)	254 (10.00)	318 (12.50)	42 (10)
1543 (60.75)	2 $\frac{1}{4}$	40	2 (2.00)	273 (11.00)	330 (13.00)	48 (10)

**Table 7.6.1-3 Class 250 Flange and Bolting Dimensions (Cont'd)**

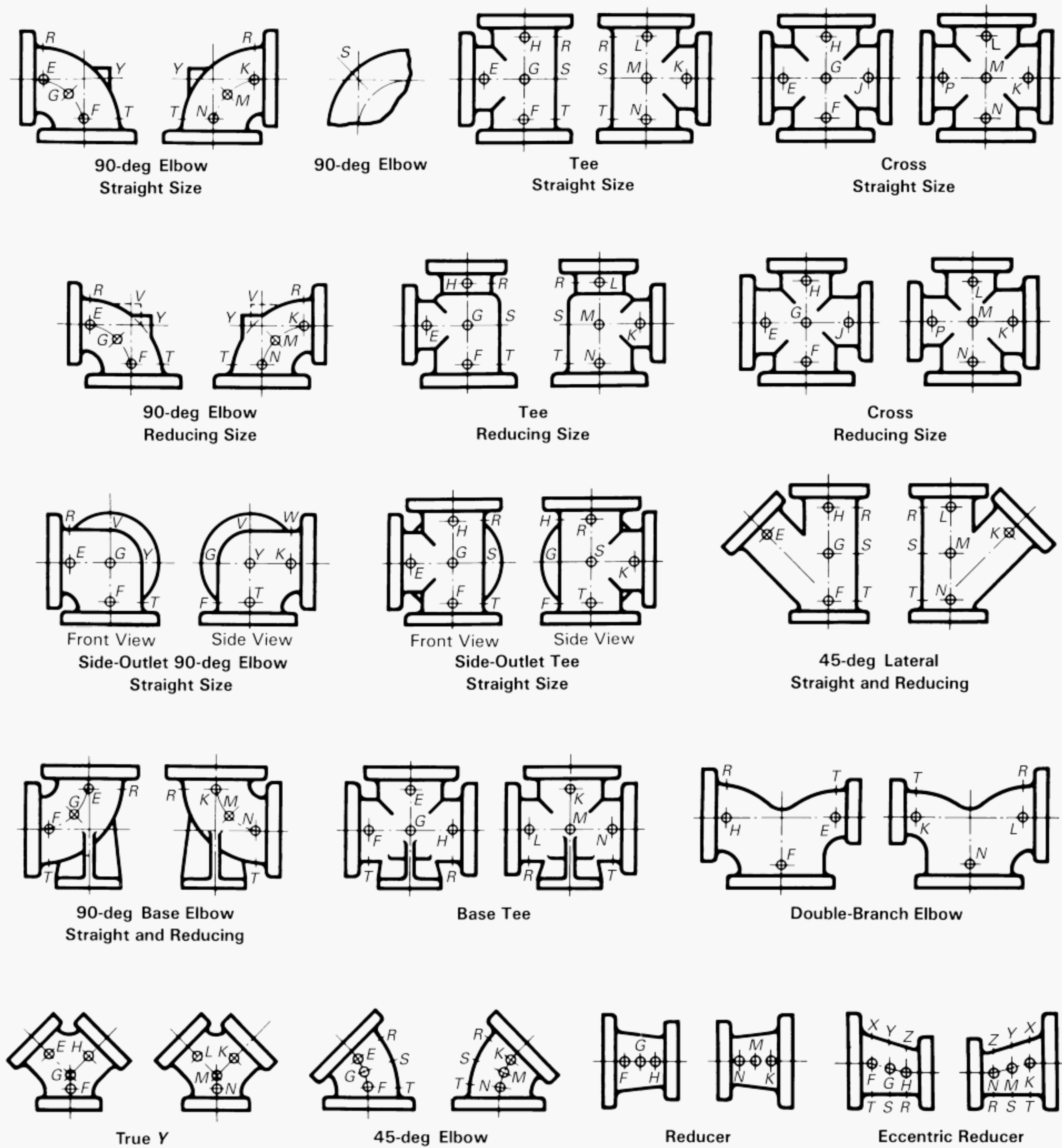
GENERAL NOTE: Dimensions are in millimeters (inches).

NOTES:

- (1) Diameter of raised face has tolerance of  $\pm 0.8$  mm.
- (2) For facing, see [para. 7.2\(b\)](#).
- (3) All blind flanges for NPS 10 and larger must be dished with inside radius equal to the port diameter.
- (4) For wall thickness tolerances, see [para. 7.1](#).
- (5) For thread of threaded flanges, see [paras. 7.5.1](#) and [7.5.3](#).
- (6) For flange bolt holes, see [para. 7.6](#).
- (7) For bolts and nuts, see [para. 8.1](#).
- (8) For spot facing, see [para. 7.7](#).
- (9) When bolting to steel flanges, longer bolts or studs may be used.
- (10) NPS 36-48 are not produced and used in sufficient quantities to warrant standardization; however, the flange dimensions are included for convenience where special fittings larger than NPS 30 are required. When these fittings are made, the body structure should be designed to be the equivalent of the flanges in service pressure fittings.

**Figure 7.9.1-1 Drain Connections****Table 7.9.1-1 Minimum Thread Length**

Tap Size, NPS	Thread Length, A, mm (in.)
$\frac{3}{8}$	10.4 (0.41)
$\frac{1}{2}$	13.5 (0.53)
$\frac{3}{4}$	14.0 (0.55)
1	17.3 (0.68)
$1\frac{1}{4}$	18.0 (0.71)
$1\frac{1}{2}$	18.3 (0.72)
2	19.3 (0.76)

**Figure 7.9.2-1 Method of Designating Location of Tapped Holes for Drains When Specified**


GENERAL NOTE: The above illustrations show two views of the same fitting and represent fittings with symmetrical shapes, with the exception of the side-outlet elbow and the side-outlet tee (straight sizes).



## MANDATORY APPENDIX I

### REFERENCES

(20)

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

ASME B1.1, Unified Inch Screw Threads (UN and UNR Thread Form)

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

ASME B16.5, Pipe Flanges and Flanged Fittings: NPS  $\frac{1}{2}$  Through NPS 24 Metric/Inch Standard

ASME B16.21, Nonmetallic Flat Gaskets for Pipe Flanges

ASME B18.2.1, Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2, Square and Hex Nuts (Inch Series)

ASME Boiler and Pressure Vessel Code (BPVC); Section VIII, Rules for Construction of Pressure Vessels; Division 1

ASME PCC-1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly

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

ASTM A126-04 (2019), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A307-14e1, Specification for Carbon Steel Bolts, Studs and Threaded Rod 60,000 psi Tensile Strength

ASTM E29-13(2019), 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](http://www.astm.org))

ISO 9001:2015, Quality management systems — Requirements <sup>1</sup>

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

MSS SP-6-2017, Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings

MSS SP-9-2018, Spot Facing for Bronze, Iron, and Steel Flanges

MSS SP-45-2020, Bypass and Drain Connections

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

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

## NONMANDATORY APPENDIX A

### QUALITY SYSTEM PROGRAM

The products manufactured in accordance with this Standard shall be produced under ISO 9001.<sup>1</sup> 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.

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<sup>1</sup> 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 the prefix "Q," replacing the prefix "ISO." ISO 9001 is listed under References in [Mandatory Appendix I](#).



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