

Wrought and Fabricated Butt-Welding Fittings for Low Pressure, Corrosion Resistant Applications

Standard Practice
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This MSS Standard Practice was developed under the consensus of the MSS Technical Committee 113, *Wrought Welding Fittings*, and the MSS Coordinating Committee. The content of this Standard Practice is the resulting efforts of knowledgeable and experienced industry volunteers to provide an effective, clear, and non-exclusive standard that will benefit the industry as a whole. This MSS Standard Practice describes minimal requirements and is intended as a basis for common practice by the manufacturer, the user, and the industry at large. It is the responsibility of the user of this Standard Practice to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use. The existence of an MSS Standard Practice does not in itself preclude the manufacture, sale, or use of products not conforming to the Standard Practice. Mandatory conformance to this Standard Practice is established only by reference in other documents such as a code, specification, sales contract, or public law, as applicable. MSS has no power, nor does it undertake, to enforce or certify compliance with this document. Any certification or other statement of compliance with the requirements of this Standard Practice shall not be attributable to MSS and is solely the responsibility of the certifier or maker of the statement.

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Substantive changes in this 2019 edition are “flagged” by parallel bars as shown on the margins of this paragraph. The specific detail of the change may be determined by comparing the material flagged with that in the previous 2010 edition.

Non-toleranced dimensions in this Standard Practice are nominal unless otherwise specified.

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| **FOREWORD** |

ASME B16.9 is the American Standard for steel butt-welding fittings and although not so stated, it is implied that its scope deals primarily with the schedules of wall thicknesses which are common to carbon steel and the grades of alloy steel piping that are selected for pressure and temperature considerations.

The rapid expansion of the process industries in the field of chemicals, plastics, textiles, etc., has created a demand for a class of pipe referred to as stainless piping, using this word in its generic sense. This field employs the use of the austenitic stainless steels and also nickel and its related alloys. This stainless piping is used for resistance to corrosion, elimination of product contamination, or combination of the two as the principle reason for material selection. Pressure is seldom, if ever, a critical consideration.

When pressure is a consideration, reference is made to ASME B16.9.

Mechanical strength, resistance to vacuum, and economy, are the most usual criteria in the selection of pipe thickness in this field, and for this reason the wall thicknesses employed in the field of corrosion resistant pipe are lighter than those in common usage with carbon steel piping.

In 1949, the American Standards Association, now known as the American National Standards Institute or ANSI, approved B36.19, Stainless Steel Pipe, as an American Standard. The B36.19 standard was developed by the ASA B36 Standards Committee, which included MSS as a participant. In this American Standard, a schedule of wall thickness was established and designated as Schedule 10S. Numerous companies were also using a wall thickness lighter than Schedule 10S for services where contamination rather than corrosion was the prime consideration. These lighter wall thicknesses were designated Schedule 5S and the original 1950 edition of MSS SP-43 established a series of Schedule 5S fittings. The 5S thicknesses were published in MSS SP-43 and were developed in cooperation with representatives of the various principal chemical companies and processing industries. In 1952, the B36.19 Stainless Steel Pipe Standard was revised to recognize the Schedule 5S wall thickness pipe as an American Standard. MSS and the ASA endorsed this inclusion.

The purpose of this Standard Practice is to provide industry with a set of dimensional standards for butt-welding fittings that can be used with these light wall pipes of corrosion resisting materials. The center-to-end dimensions of all fittings are identical with those in ASME B16.9, which give to industry the advantage of uniform design room practice and a maximum utilization of existing die equipment. The only departure from this is in the lap-joint stub end, where for purposes of economy, the face-to-end of the product has been reduced for use with thin wall piping.

The advantage of longer center-to-end dimensions of size 3/4 elbows resulted in a change to the tables that would permit a gradual changeover, thus providing manufacturers ample time to deplete existing stock, re-tool, and replenish their stock.

The 1991 revision of MSS SP-43 involved the deletion of metric equivalents.

The 2001 Reaffirmation had no technical changes. There were minor editorial changes. The precedence of the longer dimensions for 3/4 elbows was made in accordance with ASME B16.9. Referenced standards were brought up to date. The title of 180-degree returns was clarified.

In the 2008 edition, a minimal pressure rating was established to correspond with the ASTM CR designation.

The 2013 edition was revised to include a new section on welding, a revision of Table 1 to include angularity tolerances, a revision of Section 6.1 to update AISI/SAE fitting grade types, data corrections were made to Tables 4, 5, and 6, referenced standards in Annex A were updated, and numerous formatting and editorial corrections were made. In addition, the drawings for Section 10 and 11, and Tables 2, 3, and 5 have been redone in this current revision although not "flagged" given there were no substantive changes. Note that various Table corrections contained within an Errata Sheet issued in 2010 were also incorporated.

This 2019 edition was revised to include: (1) incorporation of changes to Section 3 and Annex A as contained in the 2015 Amendment; (2) updates to the Scope; (3) update to Section 3 involving pressure ratings; (4) clarification of figures and nomenclature; (6) update of Table 1 Tolerances, (7) clarification of table drawings; (8) update of Table 4 headings; (9) other editorial and conforming revisions; (10) update to Annex A References.

TABLE OF CONTENTS

SECTION

1	SCOPE	1	
2	REFERENCES	1	
3	PRESSURE RATINGS	1	
4	SIZE	1	
5	MARKING	1	
6	MATERIALS	2	
7	METAL THICKNESS	2	
8	FITTING DIMENSIONS	2	
9	TEST	2	
10	TOLERANCES	2	
11	WELDING BEVEL	4	
12	FINISH AND HEAT TREATMENT	4	
13	WELDING	4	

TABLE

1	Tolerances	3	
2	Dimensions of Long Radius Elbows	5	
3	Dimensions of Straight and Reducing-on-the-Outlet Tees	6	
4	Dimensions of Lap-Joint Stub Ends and Caps	9	
5	Dimensions of Long Radius 180 Degree Returns	10	
6	Dimensions of Concentric and Eccentric Reducers	11	

FIGURE

1	Locations of OA and OP	2	
2	Welding Bevel	4	

ANNEX

A	Referenced Standards and Applicable Dates	12	
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Manufacturers Standardization Society of the Valve and Fittings Industry

WROUGHT AND FABRICATED BUTT-WELDING FITTINGS FOR LOW PRESSURE, CORROSION RESISTANT APPLICATIONS

1. SCOPE

1.1 This Standard Practice provides requirements for wrought and fabricated butt-welding fittings intended for low pressure, corrosion resistant applications. Requirements covered include pressure ratings, size, marking, materials, metal thickness, dimensions, testing, and tolerances.

1.2 This Standard Practice covers only fittings made for use with Schedule 5S or 10S pipe, for all Nominal Pipe Sizes (NPS) listed in ASME B36.19M; except that short pattern stub ends suitable for use with Schedule 40S are also shown.

2. REFERENCES

2.1 External standards incorporated by reference in this Standard Practice are shown in Annex A for convenience of identifying edition number, date, and source of supply.

3. PRESSURE RATINGS

3.1 Fittings covered by this Standard Practice are primarily intended for corrosion resistant applications; however, they shall have a pressure rating equal to 30% of the allowable pressure rating for comparable straight seamless pipe of the same wall and grade of material as marked on the fittings, whose ratings are determined by the applicable ASME B31 Code for Pressure Piping.

3.2 For fittings that are of the same pressure rating as the matching pipe, refer to ASME B16.9.

4. SIZE

4.1 The size of the fittings in Tables 1 through 6 are identified by the corresponding NPS.

5. MARKING

5.1 Each fitting shall be marked as per MSS SP-25 to show the following:

- a) Manufacturer's name or trademark
- b) "CR" followed by the material identification symbol established for the respective grade in the appropriate ASTM specifications or AISI/SAE designations
- c) Manufacturer's heat number/identification number
- d) Schedule number or nominal wall thickness designation
- e) Size

5.2 Where the size of the fittings does not permit complete marking, Sections 5.1 (a) and (c) are mandatory. The other marking and identification marks may be omitted in the sequence, as specified in MSS SP-25.

5.3 The required markings shall be made by any suitable method that is not injurious to the fitting.

6. MATERIALS

6.1 Fittings made from AISI/SAE Grade Types 304, 304L, 310, 316, 316L, 317, 317L, 321, and 347 are considered standard designations under this Standard Practice. Fittings made from other corrosion resistant material, including nonferrous materials, are acceptable by agreement between the purchaser and the manufacturer provided they meet the requirements of a recognized and applicable AISI/SAE grade designation or ASTM specification.

7. METAL THICKNESS

7.1 As these fittings are to match pipe, the dimensions of the welding ends must conform to established pipe standards, with regard to outside diameters and tolerances. The nominal wall thickness of the fittings shall be the same as the pipe to which it is welded; except that fittings with heavier walls may be butt-welded to lighter wall pipe, provided the heavier wall is tapered on the inside or outside to match the dimensions of the lighter pipe.

8. FITTING DIMENSIONS

8.1 U.S. customary (inch) dimensions for the fittings covered by this Standard Practice are given in Tables 1 through 6.

8.2 One of the principals of this Standard Practice is the maintenance of a fixed position for welding ends, with reference to the center-line of the fittings or the overall dimensions, as the case may be.

9. TEST

9.1 Hydrostatic testing of fittings is not required in this Standard Practice; however, fittings shall be capable of withstanding a hydrostatic test pressure that is 1.5 times greater than the pressure rating required in Section 3.1.

10. TOLERANCES

10.1 Table 1 lists tolerances for the fittings covered by this Standard Practice. The location of dimensions OA and OP are illustrated in Figure 1 below and actual maximum angularity tolerances are indicated in Table 1.

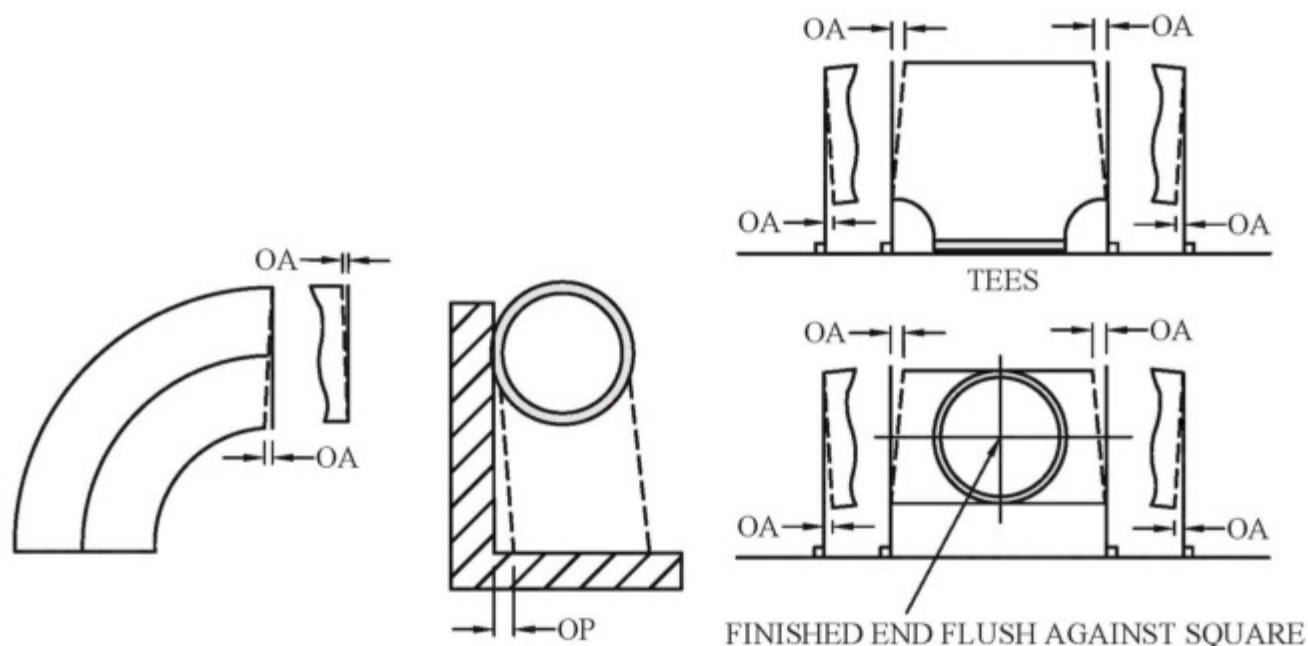


FIGURE 1
Locations of OA and OP

TABLE 1 |
Tolerances

Dimensions are in inches

NPS	All Fittings		90° Elbows 45° Elbows Tees	Reducers Lap-Joint Stub Ends	180° Returns			Caps	Lap-Joint Stub Ends		Angularity Tolerances (Max.)	
	Outside Diameter at Welding End ^(a)	Wall Thickness	Center-to- End Dimension A-B-C-M	Overall Length F-H	Center-to- Center Dimension O	Back-to- Face Dimension K	Alignment of Ends U	Overall Length E	Fillet Radius of Lap ^(b) A	Outside Diameter of Lap G	Off Angle OA	Off Plane OP
1/2 – 1 1/2	±0.03	Not less than 87 1/2% of nominal thickness	±0.06	±0.06	±0.25	±0.25	±0.03	±0.12	+0.00 -0.03	+0.00 -0.03	0.03	0.06
2 – 3 1/2	±0.03		±0.06	±0.06	±0.25	±0.25	±0.03	±0.12	+0.00 -0.03	+0.00 -0.03	0.03	0.06
4	±0.03		±0.06	±0.06	±0.25	±0.25	±0.03	±0.12	+0.00 -0.03	+0.00 -0.03	0.03	0.06
5 – 8	+0.06 -0.03		±0.06	±0.06	±0.25	±0.25	±0.03	±0.25	+0.00 -0.06	+0.00 -0.06	0.06	0.12
10 – 18	+0.09 -0.03		±0.09	±0.09	±0.38	±0.25	±0.06	±0.25	+0.00 -0.06	+0.00 -0.06	0.09	0.25
20 – 24	+0.12 -0.03		±0.09	±0.09	±0.38	±0.25	±0.06	±0.25	+0.00 -0.06	+0.00 -0.06	0.12	0.38

GENERAL NOTE: Diameter and wall thicknesses are as specified in either ASME B36.19M or ASME B36.10M.

NOTES:

(a) Out of roundness is the vector sum of plus and minus tolerance.

(b) Fillet B radius is maximum (see Table 4).

11. WELDING BEVEL

11.1 Fittings conforming to this Standard Practice may be finished with ends cut square for wall thickness 0.12 in. or less. For wall thicknesses in excess of 0.12 in., the ends shall be beveled at $37\frac{1}{2}^{\circ} \pm 2\frac{1}{2}^{\circ}$, with root face (land) 0.06 in. $\pm$ 0.03 in. as indicated in Figure 2 below.

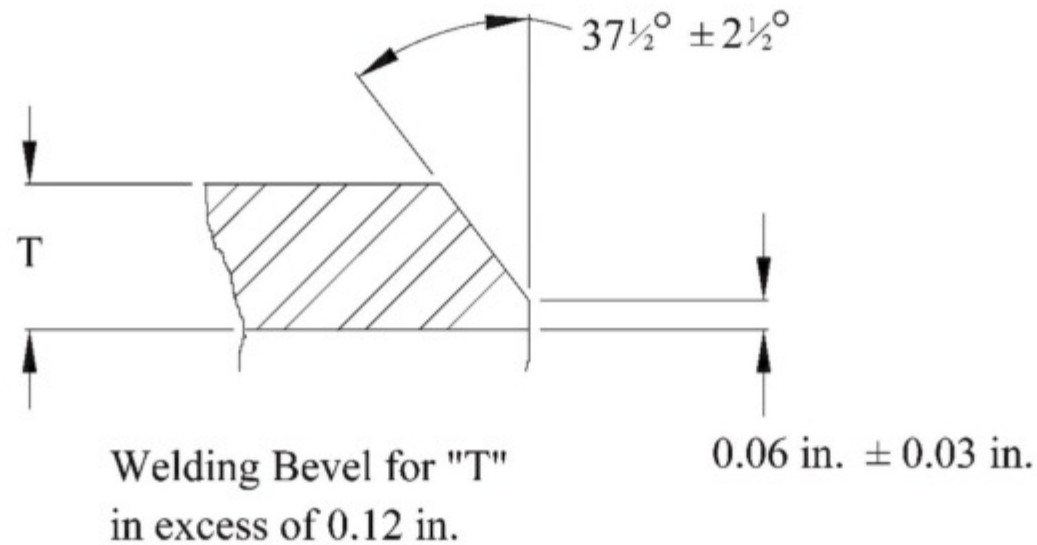


FIGURE 2
Welding Bevel

12. FINISH AND HEAT TREATMENT

12.1 The fittings shall be satisfactorily heat treated by an accepted practice, and adequately cleaned to insure maximum corrosion resistance.

13. WELDING

13.1 All fittings shall have the welders, welding operators, and welding procedures qualified under the provisions of Section IX of the ASME Boiler and Pressure Vessel Code (BPVC).

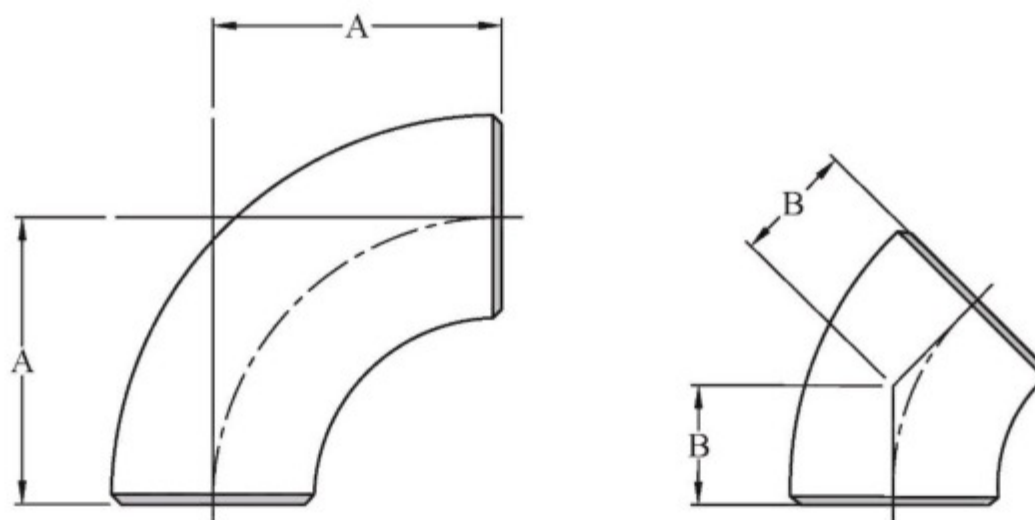


TABLE 2
Dimensions of Long Radius Elbows

Dimensions are in inches

NPS	Outside Diameter at Bevel	Center-to-End	
		90° Elbows A	45° Elbows B
1/2	0.84	1.50	0.62
3/4	1.05	1.50	0.75
1	1.32	1.50	0.88
1 1/4	1.66	1.88	1.00
1 1/2	1.90	2.25	1.12
2	2.38	3.00	1.38
2 1/2	2.88	3.75	1.75
3	3.50	4.50	2.00
3 1/2	4.00	5.25	2.25
4	4.50	6.00	2.50
5	5.56	7.50	3.12
6	6.62	9.00	3.75
8	8.62	12.00	5.00
10	10.75	15.00	6.25
12	12.75	18.00	7.50
14	14.00	21.00	8.75
16	16.00	24.00	10.00
18	18.00	27.00	11.25
20	20.00	30.00	12.50
22	22.00	33.00	13.50
24	24.00	36.00	15.00

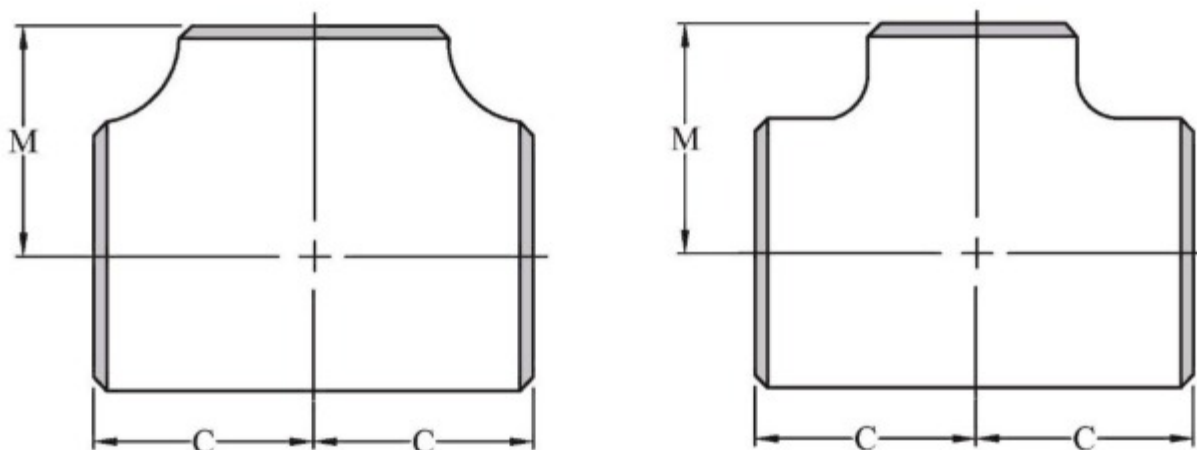


TABLE 3
Dimensions of Straight and Reducing-on-the-Outlet Tees

Dimensions are in inches

NPS	Nominal Outside Diameter at Bevel		Center-to-End	
	Run	Outlet	Run C	Outlet M
1/2 (Straight)	0.84	0.84	1.00	1.00
3/4 (Straight)	1.05	1.05	1.12	1.12
3/4 x 3/4 x 1/2	1.05	0.84	1.12	1.12
1 (Straight)	1.32	1.32	1.50	1.50
1 x 1 x 1/2	1.32	0.84	1.50	1.50
1 x 1 x 3/4	1.32	1.05	1.50	1.50
1 1/4 (Straight)	1.66	1.66	1.88	1.88
1 1/4 x 1 1/4 x 1/2	1.66	0.84	1.88	1.88
1 1/4 x 1 1/4 x 3/4	1.66	1.05	1.88	1.88
1 1/4 x 1 1/4 x 1	1.66	1.32	1.88	1.88
1 1/2 (Straight)	1.90	1.90	2.25	2.25
1 1/2 x 1 1/2 x 3/4	1.90	1.05	2.25	2.25
1 1/2 x 1 1/2 x 1	1.90	1.32	2.25	2.25
1 1/2 x 1 1/2 x 1 1/4	1.90	1.66	2.25	2.25
2 (Straight)	2.38	2.38	2.50	2.50
2 x 2 x 3/4	2.38	1.05	2.50	1.75
2 x 2 x 1	2.38	1.32	2.50	2.00
2 x 2 x 1 1/4	2.38	1.66	2.50	2.25
2 x 2 x 1 1/2	2.38	1.90	2.50	2.38
2 1/2 (Straight)	2.88	2.88	3.00	3.00
2 1/2 x 2 1/2 x 1	2.88	1.32	3.00	2.25
2 1/2 x 2 1/2 x 1 1/4	2.88	1.66	3.00	2.50
2 1/2 x 2 1/2 x 1 1/2	2.88	1.90	3.00	2.62
2 1/2 x 2 1/2 x 2	2.88	2.38	3.00	2.75
3 (Straight)	3.50	3.50	3.38	3.38
3 x 3 x 1 1/2	3.50	1.90	3.38	2.88
3 x 3 x 2	3.50	2.38	3.38	3.00
3 x 3 x 2 1/2	3.50	2.88	3.38	3.25

(continued on next page)

TABLE 3*(continued)***Dimensions of Straight and Reducing-on-the-Outlet Tees**

Dimensions are in inches

NPS	Nominal Outside Diameter at Bevel		Center-to-End	
	Run	Outlet	Run C	Outlet M
3½ (Straight)	4.00	4.00	3.75	3.75
3½ x 3½ x 1½	4.00	1.90	3.75	3.12
3½ x 3½ x 2	4.00	2.38	3.75	3.25
3½ x 3½ x 2½	4.00	2.88	3.75	3.50
3½ x 3½ x 3	4.00	3.50	3.75	3.62
4 (Straight)	4.50	4.50	4.12	4.12
4 x 4 x 1½	4.50	1.90	4.12	3.38
4 x 4 x 2	4.50	2.38	4.12	3.50
4 x 4 x 2½	4.50	2.88	4.12	3.75
4 x 4 x 3	4.50	3.50	4.12	3.88
4 x 4 x 3½	4.50	4.00	4.12	4.00
5 (Straight)	5.56	5.56	4.88	4.88
5 x 5 x 2	5.56	2.38	4.88	4.12
5 x 5 x 2½	5.56	2.88	4.88	4.25
5 x 5 x 3	5.56	3.50	4.88	4.38
5 x 5 x 3½	5.56	4.00	4.88	4.50
5 x 5 x 4	5.56	4.50	4.88	4.62
6 (Straight)	6.62	6.62	5.62	5.62
6 x 6 x 2½	6.62	2.88	5.62	4.75
6 x 6 x 3	6.62	3.50	5.62	4.88
6 x 6 x 3½	6.62	4.00	5.62	5.00
6 x 6 x 4	6.62	4.50	5.62	5.12
6 x 6 x 5	6.62	5.56	5.62	5.38
8 (Straight)	8.62	8.62	7.00	7.00
8 x 8 x 3½	8.62	4.00	7.00	6.00
8 x 8 x 4	8.62	4.50	7.00	6.12
8 x 8 x 5	8.62	5.56	7.00	6.38
8 x 8 x 6	8.62	6.62	7.00	6.62
10 (Straight)	10.75	10.75	8.50	8.50
10 x 10 x 4	10.75	4.50	8.50	7.25
10 x 10 x 5	10.75	5.56	8.50	7.50
10 x 10 x 6	10.75	6.62	8.50	7.62
10 x 10 x 8	10.75	8.62	8.50	8.00
12 (Straight)	12.75	12.75	10.00	10.00
12 x 12 x 5	12.75	5.56	10.00	8.50
12 x 12 x 6	12.75	6.62	10.00	8.62
12 x 12 x 8	12.75	8.62	10.00	9.00
12 x 12 x 10	12.75	10.75	10.00	9.50

(continued on next page)

TABLE 3*(continued)***Dimensions of Straight and Reducing-on-the-Outlet Tees**

Dimensions are in inches

NPS	Nominal Outside Diameter at Bevel		Center-to-End	
	Run	Outlet	Run C	Outlet M
14 (Straight)	14.00	14.00	11.00	11.00
14 x 14 x 6	14.00	6.62	11.00	9.38
14 x 14 x 8	14.00	8.62	11.00	9.75
14 x 14 x 10	14.00	10.75	11.00	10.12
14 x 14 x 12	14.00	12.75	11.00	10.62
16 (Straight)	16.00	16.00	12.00	12.00
16 x 16 x 6	16.00	6.62	12.00	10.38
16 x 16 x 8	16.00	8.62	12.00	10.75
16 x 16 x 10	16.00	10.75	12.00	11.12
16 x 16 x 12	16.00	12.75	12.00	11.62
16 x 16 x 14	16.00	14.00	12.00	12.00
18 (Straight)	18.00	18.00	13.50	13.50
18 x 18 x 8	18.00	8.62	13.50	11.75
18 x 18 x 10	18.00	10.75	13.50	12.12
18 x 18 x 12	18.00	12.75	13.50	12.62
18 x 18 x 14	18.00	14.00	13.50	13.00
18 x 18 x 16	18.00	16.00	13.50	13.00
20 (Straight)	20.00	20.00	15.00	15.00
20 x 20 x 8	20.00	8.62	15.00	12.75
20 x 20 x 10	20.00	10.75	15.00	13.12
20 x 20 x 12	20.00	12.75	15.00	13.62
20 x 20 x 14	20.00	14.00	15.00	14.00
20 x 20 x 16	20.00	16.00	15.00	14.00
20 x 20 x 18	20.00	18.00	15.00	14.50
24 (Straight)	24.00	24.00	17.00	17.00
24 x 24 x 10	24.00	10.75	17.00	15.12
24 x 24 x 12	24.00	12.75	17.00	15.62
24 x 24 x 14	24.00	14.00	17.00	16.00
24 x 24 x 16	24.00	16.00	17.00	16.00
24 x 24 x 18	24.00	18.00	17.00	16.50
24 x 24 x 20	24.00	20.00	17.00	17.00

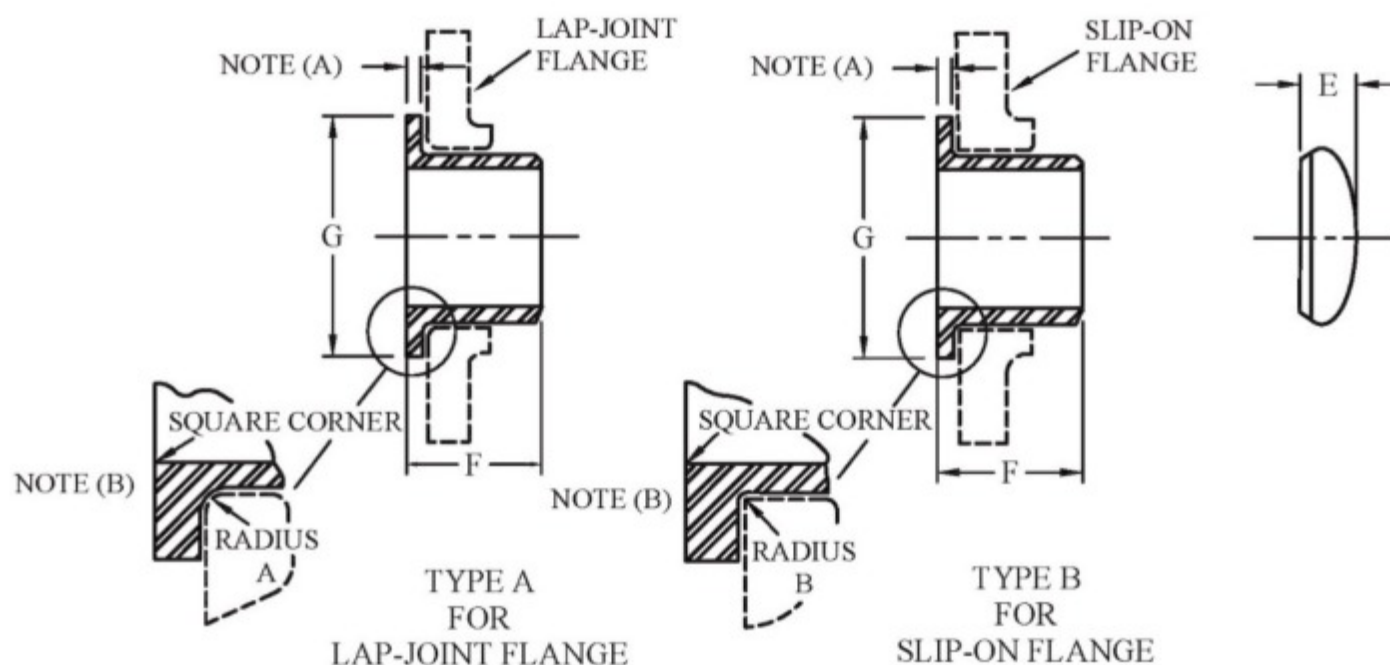


TABLE 4
Dimensions of Lap-Joint Stub Ends and Caps

Dimensions are in inches

NPS	Nominal O.D. at Bevel	Caps Length E	Lap-Joint-Stub-Ends ^(c)			
			Length F	Diameter of Lap G (max.)	Radius of Fillet	
					A	B (max.)
1/2	0.84	1.00	2.00	1.38	0.12	0.03
3/4	1.05	1.00	2.00	1.69	0.12	0.03
1	1.32	1.50	2.00	2.00	0.12	0.03
1 1/4	1.66	1.50	2.00	2.50	0.19	0.03
1 1/2	1.90	1.50	2.00	2.88	0.25	0.03
2	2.38	1.50	2.50	3.62	0.31	0.03
2 1/2	2.88	1.50	2.50	4.12	0.31	0.03
3	3.50	2.00	2.50	5.00	0.38	0.03
3 1/2	4.00	2.50	3.00	5.50	0.38	0.03
4	4.50	2.50	3.00	6.19	0.44	0.03
5	5.56	3.00	3.00	7.31	0.44	0.06
6	6.62	3.50	3.50	8.50	0.50	0.06
8	8.62	4.00	4.00	10.62	0.50	0.06
10	10.75	5.00	5.00	12.75	0.50	0.06
12	12.75	6.00	6.00	15.00	0.50	0.06
14	14.00	6.50	6.00	16.25	0.50	0.06
16	16.00	7.00	6.00	18.50	0.50	0.06
18	18.00	8.00	6.00	21.00	0.50	0.06
20	20.00	9.00	6.00	23.00	0.50	0.06
24	24.00	10.50	6.00	27.25	0.50	0.06

NOTES:

- (a) Minimum lap thickness shall not be less than nominal wall thickness.
 (b) Contact faces of stub ends shall have a modified spiral or concentric serration.
 (c) These lengths and radii for use with Schedule 40S or thinner pipe.

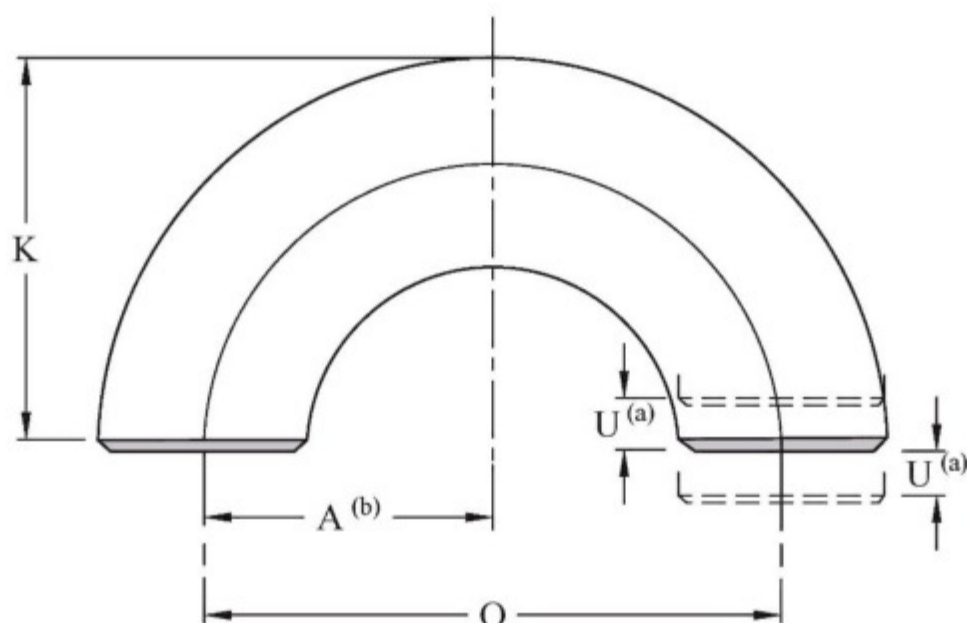


TABLE 5
Dimensions of Long Radius 180 Degree Returns

Dimensions are in inches

NPS	Outside Diameter at Bevel	Center-to-Center O	Back-to-Face K
1/2	0.84	3.00	1.88
3/4	1.05	3.00	2.00
1	1.32	3.00	2.19
1 1/4	1.66	3.75	2.75
1 1/2	1.90	4.50	3.25
2	2.38	6.00	4.19
2 1/2	2.88	7.50	5.19
3	3.50	9.00	6.25
3 1/2	4.00	10.50	7.25
4	4.50	12.00	8.25
5	5.56	15.00	10.31
6	6.62	18.00	12.31
8	8.62	24.00	16.31
10	10.75	30.00	20.38
12	12.75	36.00	24.38
14	14.00	42.00	28.00
16	16.00	48.00	32.00
18	18.00	54.00	36.00
20	20.00	60.00	40.00
24	24.00	72.00	48.00

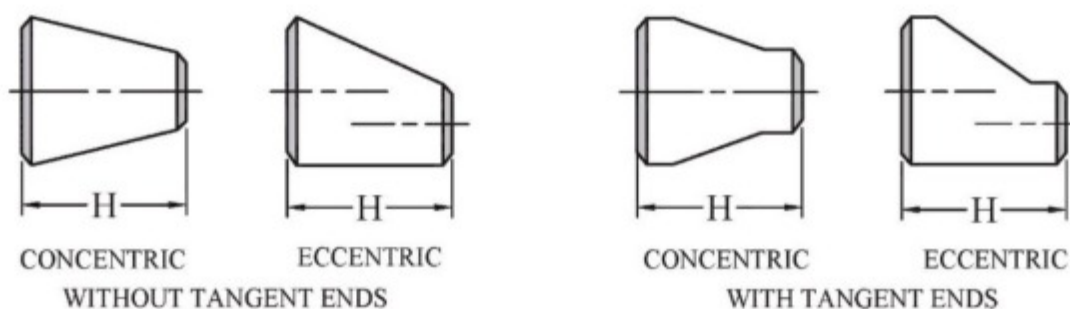
NOTES:

(a) Alignment of "U" ends:

NPS 8 and smaller: ± 0.03 in.

NPS 10 and larger: ± 0.06 in.

(b) "A" Dimension is equal to one-half (1/2) the "O" Dimension.

**TABLE 6****Dimensions of Concentric and Eccentric Reducers**

Dimensions are in inches

Dimensions are in inches

NPS	Outside Diameter at Bevel		Length H
	Large End	Small End	
3/4 x 1/2	1.05	0.84	1.50
1 x 3/8	1.32	0.68	2.00
1 x 1/2	1.32	0.84	2.00
1 x 3/4	1.32	1.05	2.00
1 1/4 x 1/2	1.66	0.84	2.00
1 1/4 x 3/4	1.66	1.05	2.00
1 1/4 x 1	1.66	1.32	2.00
1 1/2 x 1/2	1.90	0.84	2.50
1 1/2 x 3/4	1.90	1.05	2.50
1 1/2 x 1	1.90	1.32	2.50
1 1/2 x 1 1/4	1.90	1.66	2.50
2 x 3/4	2.38	1.05	3.00
2 x 1	2.38	1.32	3.00
2 x 1 1/4	2.38	1.66	3.00
2 x 1 1/2	2.38	1.90	3.00
2 1/2 x 1	2.88	1.32	3.50
2 1/2 x 1 1/4	2.88	1.66	3.50
2 1/2 x 1 1/2	2.88	1.90	3.50
2 1/2 x 2	2.88	2.38	3.50
3 x 1 1/4	3.50	1.66	3.50
3 x 1 1/2	3.50	1.90	3.50
3 x 2	3.50	2.38	3.50
3 x 2 1/2	3.50	2.88	3.50
3 1/2 x 1 1/4	4.00	1.66	4.00
3 1/2 x 1 1/2	4.00	1.90	4.00
3 1/2 x 2	4.00	2.38	4.00
3 1/2 x 2 1/2	4.00	2.88	4.00
3 1/2 x 3	4.00	3.50	4.00
4 x 1 1/2	4.50	1.90	4.00
4 x 2	4.50	2.38	4.00
4 x 2 1/2	4.50	2.88	4.00
4 x 3	4.50	3.50	4.00
4 x 3 1/2	4.50	4.00	4.00
5 x 2	5.56	2.38	5.00
5 x 2 1/2	5.56	2.88	5.00
5 x 3	5.56	3.50	5.00
5 x 3 1/2	5.56	4.00	5.00
5 x 4	5.56	4.50	5.00

NPS	Outside Diameter at Bevel		Length H
	Large End	Small End	
6 x 2 1/2	6.62	2.88	5.50
6 x 3	6.62	3.50	5.50
6 x 3 1/2	6.62	4.00	5.50
6 x 4	6.62	4.50	5.50
6 x 5	6.62	5.56	5.50
8 x 3 1/2	8.62	4.00	6.00
8 x 4	8.62	4.50	6.00
8 x 5	8.62	5.56	6.00
8 x 6	8.62	6.62	6.00
10 x 4	10.75	4.50	7.00
10 x 5	10.75	5.56	7.00
10 x 6	10.75	6.62	7.00
10 x 8	10.75	8.62	7.00
12 x 5	12.75	5.56	8.00
12 x 6	12.75	6.62	8.00
12 x 8	12.75	8.62	8.00
12 x 10	12.75	10.75	8.00
14 x 6	14.00	6.62	13.00
14 x 8	14.00	8.62	13.00
14 x 10	14.00	10.75	13.00
14 x 12	14.00	12.75	13.00
16 x 8	16.00	8.62	14.00
16 x 10	16.00	10.75	14.00
16 x 12	16.00	12.75	14.00
16 x 14	16.00	14.00	14.00
18 x 10	18.00	10.75	15.00
18 x 12	18.00	12.75	15.00
18 x 14	18.00	14.00	15.00
18 x 16	18.00	16.00	15.00
20 x 12	20.00	12.75	20.00
20 x 14	20.00	14.00	20.00
20 x 16	20.00	16.00	20.00
20 x 18	20.00	18.00	20.00
24 x 16	20.00	16.00	20.00
24 x 18	20.00	18.00	20.00
24 x 20	20.00	20.00	20.00

| ANNEX A |

Referenced Standards and Applicable Dates

This Annex is an integral part of this Standard Practice and is placed after the main text for convenience.

Standard Name	Description
<u>ASME; ANSI/ASME</u>	
B16.9-2018	Factory-Made Wrought Buttwelding Fittings
B31.x	[applicable] Code for Pressure Piping
B36.10M-2018	Welded and Seamless Wrought Steel Pipe
B36.19M-2018	Stainless Steel Pipe
BPVC-IX-2017	Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications
<u>MSS; ANSI/MSS</u>	
SP-25-2018	Standard Marking System for Valves, Fittings, Flanges, and Unions

The following organizations appear in the above list or are referenced within this Standard Practice:

AISI	American Iron and Steel Institute 1101 17th Street, NW Washington, D.C. 20036-4700
ANSI	American National Standards Institute 25 West 43rd Street, Fourth Floor New York, NY 10036-7406
ASME	American Society of Mechanical Engineers (ASME International) Two Park Avenue New York, NY 10016-5990
ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428-2959
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, VA 22180-4602
SAE	SAE International 400 Commonwealth Drive Warrendale, PA 15096-0001

Purchase or View a Full Listing of MSS Standards at:

<http://msshq.org/Store/PriceList.cfm>

MSS Standard Practices (SPs) related to or referenced in this publication:

ANSI/MSS SP-25	<i>Standard Marking System for Valves, Fittings, Flanges, and Unions</i>
ANSI/MSS SP-96	<i>Terminology for Valves, Fittings, and Their Related Components</i>

American National Standards Published by MSS, an ANSI-accredited Standards Developer:

ANSI/MSS SP-25	<i>Standard Marking System for Valves, Fittings, Flanges, and Unions</i>
ANSI/MSS SP-44	<i>Steel Pipeline Flanges</i>
ANSI/MSS SP-55	<i>Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components</i> <i>– Visual Method for Evaluation of Surface Irregularities</i>
ANSI/MSS SP-58	<i>Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation</i>
ANSI/MSS SP-96	<i>Terminology for Valves, Fittings, and Their Related Components</i>
ANSI/MSS SP-114	<i>Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000</i>
ANSI/MSS SP-122	<i>Plastic Industrial Ball Valves</i>
ANSI/MSS SP-134	<i>Valves for Cryogenic Service, including Requirements for Body/Bonnet Extensions</i>
ANSI/MSS SP-135	<i>High Pressure Knife Gate Valves</i>
ANSI/MSS SP-138	<i>Quality Standard Practice for Oxygen Cleaning of Valves and Fittings</i>
ANSI/MSS SP-144	<i>Pressure Seal Bonnet Valves</i>

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