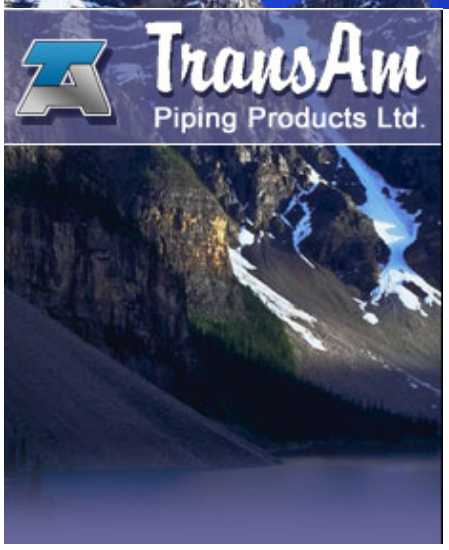

Photo by Jim Yikes

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The dimensions provided in this catalogue are expressed in metric units. It is also available in imperial units. If you have any comments or suggestions regarding this catalogue, please contact us at:

feedback@transampiping.com

Note: While we have taken great care to ensure that the information provided in this catalogue is correct, we assume no responsibility for any errors or omissions.

Table of Contents

ASME B16.5 Flanges

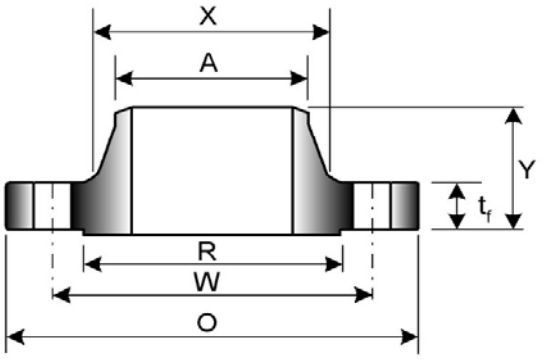
ASME B16.5 covers flanges in Classes 150 through 1500 in sizes NPS 1/2 through NPS 24, and Class 2500 in sizes NPS 1/2 through NPS 12. In the 2013 edition of ASME B16.5, the primary tables report pressure-temperature ratings and dimensions in metric units with the U.S. Customary units reported in Mandatory Appendix II. The dimensions in this catalogue are reported in metric units with the exception of bolt diameters and bolt holes, which are reported in inch units. The pressure-temperature ratings for A105 and A350-LF2 flanges (Group 1.1 materials), can be found on Page 69.

Tolerances	
Outside Diameter of Raised Face (R) (For Ring Joint tolerances please see page19):	+/- 1.0 mm (2.0 mm RF) +/- 0.5 mm (7.0 mm RF)
Flange Thickness (t_f) (the plus tolerance is applicable to bolting bearing surfaces):	+ 3.0, - 0.0 mm (NPS 18 and smaller) + 5.0, - 0.0 mm (NPS 20 and larger)
Outside Diameter at Bevel (Dimension A) of Welding Neck:	+ 2.0, - 1.0 mm (NPS 5 and smaller) + 4.0, - 1.0 mm (NPS 6 and larger)
Inside Diameter (Welding Neck and small bore of Socket Weld):	+/- 1.0 mm (NPS 10 and smaller) +/- 1.5 mm (NPS 12 through 18) + 3.0, -1.5 mm (NPS 20 and larger)
Wall Thickness at Bevel:	not less than 87.5% of the nominal pipe thickness.
Length Through Hub (W/N Flange):	+/- 1.4 mm (NPS 4 and smaller) + 1.5, - 3.0 mm (NPS 5 through 10) + 3.0, - 5.0 mm (NPS 12 and larger)
Flange Bore Socket Weld (Dimension B):	+/- 0.25 mm
Flange Bore Slip On and Lap Joint (Dimension B) and counterbore of Threaded (Dimension Q):	+ 1.0, - 0.0 mm (NPS 10 and smaller) + 1.5, - 0.0 mm (NPS 12 through 18)
Bolt Circle Diameter (Dimension W):	+/- 1.5 mm (all sizes)
Spacing of adjacent bolt holes (centre-to-centre):	+/- 0.8 mm
Concentricity between Bolt Circle Diameter and machined facing diameter:	0.8 mm (NPS 21/2 and smaller) 1.5 mm (NPS 3 and larger)

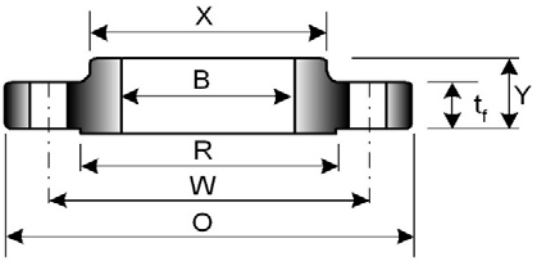
Dimensions of Flanges to ASME B16.5

Class 150

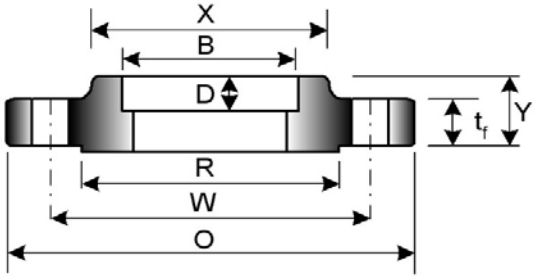
Welding Neck



Slip On



Socket Weld



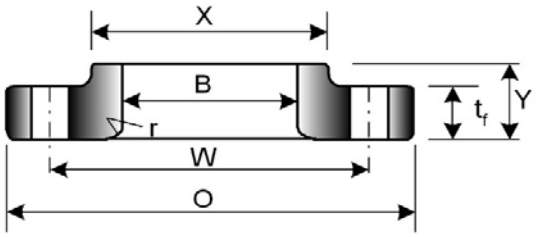
Nominal Pipe Size NPS	O.D. of Flange O	Thickness		Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]		Thread Length [3]	Depth of Socket
		Flange [1] t_f (min)	Lap Joint t_f (min)			W/N Y [1]	S/O, Thrd. S/W Y [1]	Lap Joint Y [1]	S/O, S/W B (min)	Lap Joint B (min)	T (min)	D
1/2	90	9.6	11.2	30	21.3	46	14	16	22.2	22.9	16	10
3/4	100	11.2	12.7	38	26.7	51	14	16	27.7	28.2	16	11
1	110	12.7	14.3	49	33.4	54	16	17	34.5	34.9	17	13
1 1/4	115	14.3	15.9	59	42.2	56	19	21	43.2	43.7	21	14
1 1/2	125	15.9	17.5	65	48.3	60	21	22	49.5	50.0	22	16
2	150	17.5	19.1	78	60.3	62	24	25	61.9	62.5	25	17
2 1/2	180	20.7	22.3	90	73.0	68	27	29	74.6	75.4	29	19
3	190	22.3	23.9	108	88.9	68	29	30	90.7	91.4	30	21
3 1/2	215	22.3	23.9	122	101.6	70	30	32	103.4	104.1	32	…
4	230	22.3	23.9	135	114.3	75	32	33	116.1	116.8	33	…
5	255	22.3	23.9	164	141.3	87	35	36	143.8	144.4	36	…
6	280	23.9	25.4	192	168.3	87	38	40	170.7	171.4	40	…
8	345	27.0	28.6	246	219.1	100	43	44	221.5	222.2	44	…
10	405	28.6	30.2	305	273.0	100	48	49	276.2	277.4	49	…
12	485	30.2	31.8	365	323.8	113	54	56	327.0	328.2	56	…
14	535	33.4	35.0	400	355.6	125	56	79	359.2	360.2	57	…
16	595	35.0	36.6	457	406.4	125	62	87	410.5	411.2	64	…
18	635	38.1	39.7	505	457.0	138	67	97	461.8	462.3	68	…
20	700	41.3	42.9	559	508.0	143	71	103	513.1	514.4	73	…
24	815	46.1	47.7	663	610.0	151	81	111	616.0	616.0	83	…

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

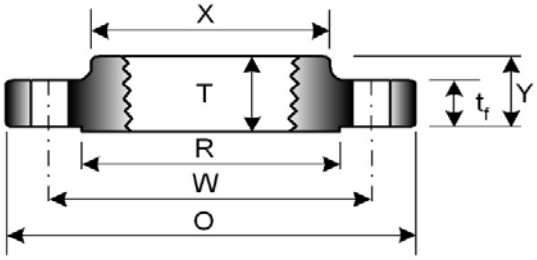
Class 150

Dimensions of Flanges to ASME B16.5

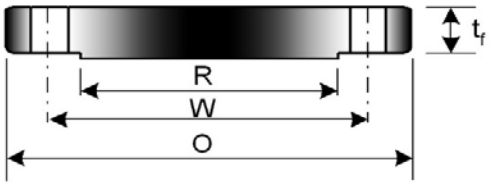
Lap Joint



Threaded



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						2 mm RF	Ring Joint	Welding Neck	S/O, S/W, Threaded	Lap Joint	Blind	
3	34.9	60.3	4	5/8	1/2	55	…	0.5	0.4	0.5	0.4	1/2
3	42.9	69.9	4	5/8	1/2	65	…	0.7	0.6	0.7	0.6	3/4
3	50.8	79.4	4	5/8	1/2	65	75	1.1	0.8	0.9	0.9	1
5	63.5	88.9	4	5/8	1/2	70	85	1.3	1.0	1.1	1.1	1 1/4
6	73.0	98.4	4	5/8	1/2	70	85	1.7	1.4	1.4	1.5	1 1/2
8	92.1	120.7	4	3/4	5/8	85	95	2.5	2.1	2.1	2.4	2
8	104.8	139.7	4	3/4	5/8	90	100	4.2	3.5	3.6	4.1	2 1/2
10	127.0	152.4	4	3/4	5/8	90	100	5.0	4.1	4.0	5.0	3
10	139.7	177.8	8	3/4	5/8	90	100	6.1	5.0	5.0	6.2	3 1/2
11	157.2	190.5	8	3/4	5/8	90	100	7.2	5.8	5.6	7.2	4
11	185.7	215.9	8	7/8	3/4	95	110	8.9	6.7	6.4	8.8	5
13	215.9	241.3	8	7/8	3/4	100	115	10.9	8.1	7.7	11.5	6
13	269.9	298.5	8	7/8	3/4	110	120	17.9	13.5	12.6	20.1	8
13	323.8	362.0	12	1	7/8	115	125	23.9	18.2	16.5	28.9	10
13	381.0	431.8	12	1	7/8	120	135	37.2	28.5	27.1	44.1	12
13	412.8	476.3	12	1 1/8	1	135	145	49.0	38.1	39.2	59.0	14
13	469.9	539.8	16	1 1/8	1	135	145	59.7	47.5	50.1	76.3	16
13	533.4	577.9	16	1 1/4	1 1/8	145	160	68.6	54.3	55.6	94.4	18
13	584.2	635.0	20	1 1/4	1 1/8	160	170	84.6	67.5	70.3	124.0	20
13	692.2	749.3	20	1 3/8	1 1/4	170	185	116.0	96.0	97.8	188.0	24

Notes:

(1) 2 mm RF is not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Bore diameter of Welding Neck Flange and small bore of Socket Weld Flange to be specified by purchaser.

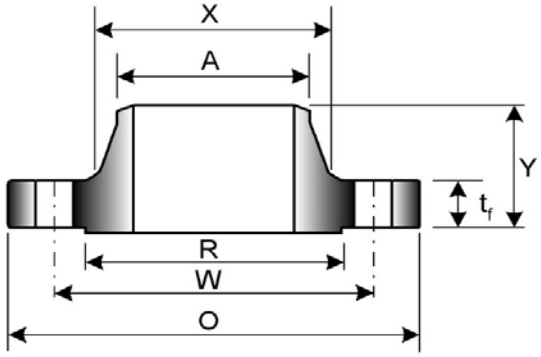
(3) Class 150 Threaded Flanges are made without a counterbore. Threads are per ASME B1.20.1.

(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

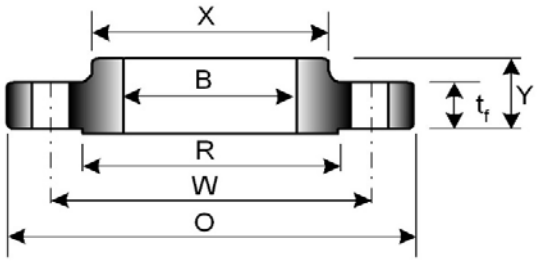
Dimensions of Flanges to ASME B16.5

Class 300

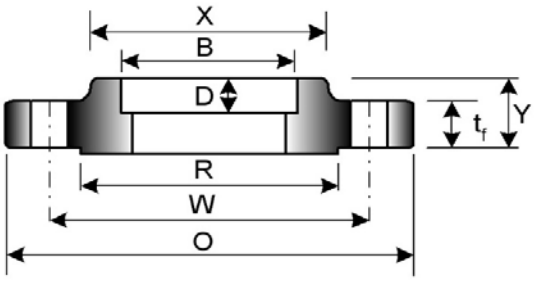
Welding Neck



Slip On



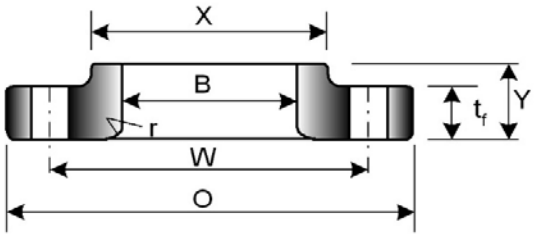
Socket Weld



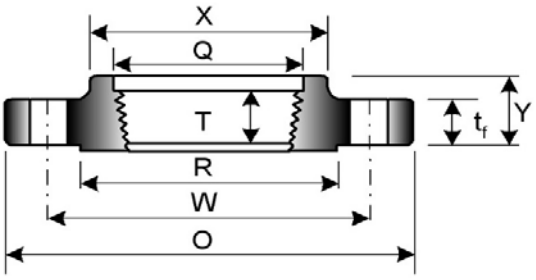
Nominal Pipe Size NPS	O.D. of Flange O	Thickness		Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]			Thread Length [3] T (min)	Depth of Socket D
		Flange [1] t_f (min)	Lap Joint t_f (min)			W/N Y [1]	S/O,Thrd. S/W Y [1]	Lap Joint Y [1]	S/O, S/W B (min)	Lap Joint B (min)	Counter-bore Q (min)		
1/2	95	12.7	14.3	38	21.3	51	21	22	22.2	22.9	23.6	16	10
3/4	115	14.3	15.9	48	26.7	56	24	25	27.7	28.2	29.0	16	11
1	125	15.9	17.5	54	33.4	60	25	27	34.5	34.9	35.8	18	13
1 1/4	135	17.5	19.1	64	42.2	64	25	27	43.2	43.7	44.4	21	14
1 1/2	155	19.1	20.7	70	48.3	67	29	30	49.5	50.0	50.3	23	16
2	165	20.7	22.3	84	60.3	68	32	33	61.9	62.5	63.5	29	17
2 1/2	190	23.9	25.4	100	73.0	75	37	38	74.6	75.4	76.2	32	19
3	210	27.0	28.6	117	88.9	78	41	43	90.7	91.4	92.2	32	21
3 1/2	230	28.6	30.2	133	101.6	79	43	44	103.4	104.1	104.9	37	…
4	255	30.2	31.8	146	114.3	84	46	48	116.1	116.8	117.6	37	…
5	280	33.4	35.0	178	141.3	97	49	51	143.8	144.4	144.4	43	…
6	320	35.0	36.6	206	168.3	97	51	52	170.7	171.4	171.4	47	…
8	380	39.7	41.3	260	219.1	110	60	62	221.5	222.2	222.2	51	…
10	445	46.1	47.7	321	273.0	116	65	95	276.2	277.4	276.2	56	…
12	520	49.3	50.8	375	323.8	129	71	102	327.0	328.2	328.6	61	…
14	585	52.4	54.0	425	355.6	141	75	111	359.2	360.2	360.4	64	…
16	650	55.6	57.2	483	406.4	144	81	121	410.5	411.2	411.2	69	…
18	710	58.8	60.4	533	457.0	157	87	130	461.8	462.3	462.0	70	…
20	775	62.0	63.5	587	508.0	160	94	140	513.1	514.4	512.8	74	…
24	915	68.3	69.9	702	610.0	167	105	152	616.0	616.0	614.4	83	…

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

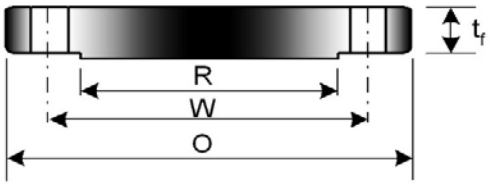
Lap Joint



Threaded



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						2 mm RF	Ring Joint	Welding Neck	S/O, S/W, Threaded	Lap Joint	Blind	
3	34.9	66.7	4	5/8	1/2	65	75	0.7	0.6	0.7	0.6	1/2
3	42.9	82.6	4	3/4	5/8	75	90	1.2	1.1	1.2	1.1	3/4
3	50.8	88.9	4	3/4	5/8	75	90	1.6	1.4	1.5	1.4	1
5	63.5	98.4	4	3/4	5/8	85	95	2.1	1.7	1.9	1.9	1 1/4
6	73.0	114.3	4	7/8	3/4	90	100	2.9	2.5	2.6	2.7	1 1/2
8	92.1	127.0	8	3/4	5/8	90	100	3.5	2.9	3.0	3.2	2
8	104.8	149.2	8	7/8	3/4	100	115	5.2	4.3	4.5	4.9	2 1/2
10	127.0	168.3	8	7/8	3/4	110	120	7.0	5.9	6.1	6.9	3
10	139.7	184.2	8	7/8	3/4	110	125	8.9	7.5	7.7	8.9	3 1/2
11	157.2	200.0	8	7/8	3/4	115	125	11.5	9.7	10.0	11.7	4
11	185.7	235.0	8	7/8	3/4	120	135	15.3	12.3	12.6	15.8	5
13	215.9	269.9	12	7/8	3/4	120	140	19.8	16.0	16.3	21.4	6
13	269.9	330.2	12	1	7/8	140	150	29.9	24.0	24.5	34.3	8
13	323.8	387.4	16	1 1/8	1	160	170	43.3	34.3	38.8	53.9	10
13	381.0	450.8	16	1 1/4	1 1/8	170	185	62.3	49.6	55.4	106.0	12
13	412.8	514.4	20	1 1/4	1 1/8	180	190	86.5	69.9	80.7	109.0	14
13	469.9	571.5	20	1 3/8	1 1/4	190	205	108.0	89.2	104.0	139.0	16
13	533.4	628.6	24	1 3/8	1 1/4	195	210	132.0	108.0	125.0	176.0	18
13	584.2	685.8	24	1 3/8	1 1/4	205	220	160.0	134.0	155.0	223.0	20
13	692.2	812.8	24	1 5/8	1 1/2	230	255	233.0	202.0	233.0	341.0	24

Notes:

(1) 2 mm RF is not included in Flange Thickness (t_f) and Length Through Hub (Y).

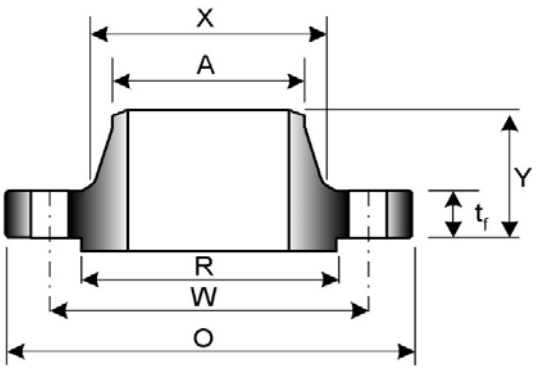
(2) Bore diameter of Welding Neck Flange and small bore of Socket Weld Flange to be specified by purchaser.

(3) Class 300 Threaded Flanges are made with a counterbore. Threads are per ASME B1.20.1.

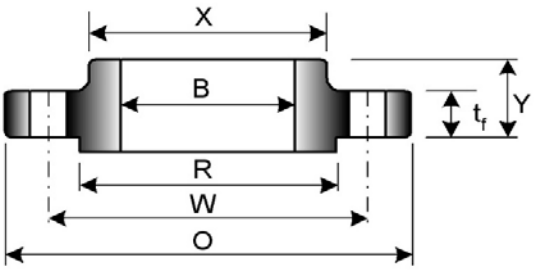
(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

Class 400

Welding Neck



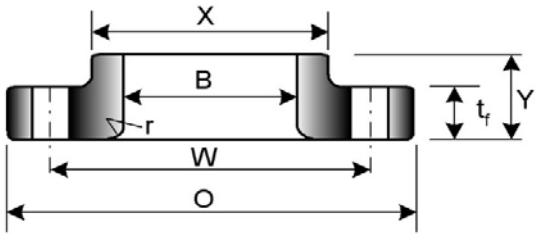
Slip On



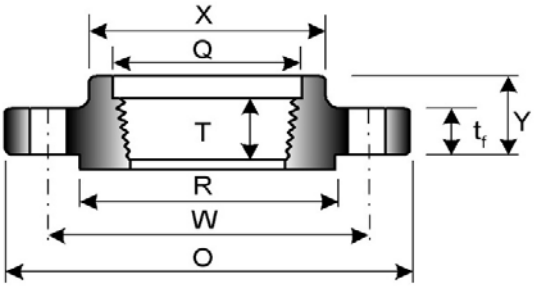
Nominal Pipe Size NPS	O.D. of Flange O	Thickness of Flange [1] t_f (min)	Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]			Thread Length [3] T (min)
					W/N Y [1]	S/O, Threaded Y [1]	Lap Joint Y [1]	S/O B (min)	Lap Joint B (min)	Counter-bore Q (min)	
1/2 3/4 1 1 1/4 1 1/2 2 2 1/2 3 3 1/2	Use Class 600 dimensions in these sizes										
4	255	35.0	146	114.3	89	51	51	116.1	116.8	117.6	37
5	280	38.1	178	141.3	102	54	54	143.8	144.5	144.4	43
6	320	41.3	206	168.3	103	57	57	170.7	171.4	171.4	46
8	380	47.7	260	219.1	117	68	68	221.5	222.2	222.2	51
10	445	54.0	321	273.0	124	73	102	276.2	277.4	276.2	56
12	520	57.2	375	323.8	137	79	108	327.0	328.2	328.6	61
14	585	60.4	425	355.6	149	84	117	359.2	360.2	360.4	64
16	650	63.5	483	406.4	152	94	127	410.5	411.2	411.2	69
18	710	66.7	533	457.0	165	98	137	461.8	462.3	462.0	70
20	775	69.9	587	508.0	168	102	146	513.1	514.4	512.8	74
24	915	76.2	702	610.0	175	114	159	616.0	616.0	614.4	83

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

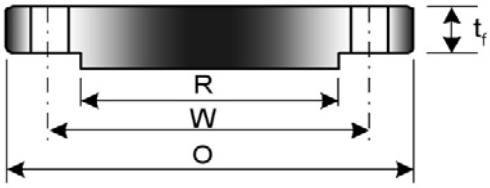
Lap Joint



Threaded



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						7 mm RF	Ring Joint	Welding Neck	S/O, Threaded	Lap Joint	Blind	
Use Class 600 dimensions in these sizes												1/2 3/4 1 1 1/4 1 1/2 2 2 1/2 3 3 1/2
11	157.2	200.0	8	1	7/8	140	140	13.2	11.2	10.7	14.0	4
11	185.7	235.0	8	1	7/8	145	145	17.3	14.0	13.3	18.7	5
13	215.9	269.9	12	1	7/8	150	150	22.9	18.7	17.8	26.1	6
13	269.9	330.0	12	1 1/8	1	170	170	34.8	28.4	27.3	42.7	8
13	323.8	387.4	16	1 1/4	1 1/8	190	190	49.4	39.4	42.0	65.1	10
13	381.0	450.8	16	1 3/8	1 1/4	205	205	70.5	56.8	60.0	94.7	12
13	412.8	514.4	20	1 3/8	1 1/4	210	210	97.0	79.4	86.6	126.0	14
13	469.9	571.5	20	1 1/2	1 3/8	220	220	121.0	102.0	111.0	164.0	16
13	533.4	628.6	24	1 1/2	1 3/8	230	230	146.0	122.0	133.0	205.0	18
13	584.2	685.8	24	1 5/8	1 1/2	240	250	174.0	147.0	162.0	256.0	20
13	692.2	812.8	24	1 7/8	1 3/4	265	280	252.0	219.0	243.0	388.0	24

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Bore diameter of Welding Neck Flange to be specified by purchaser.

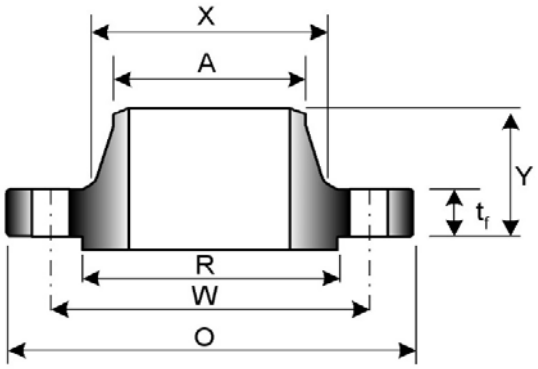
(3) Class 400 Threaded Flanges are made with a counterbore. Threads are per ASME B1.20.1.

(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

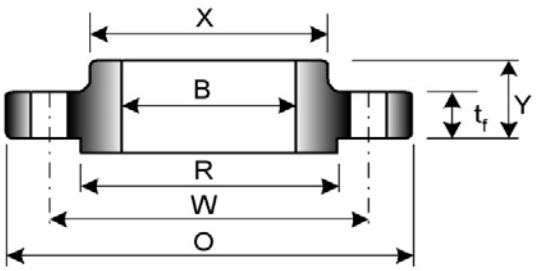
Dimensions of Flanges to ASME B16.5

Class 600

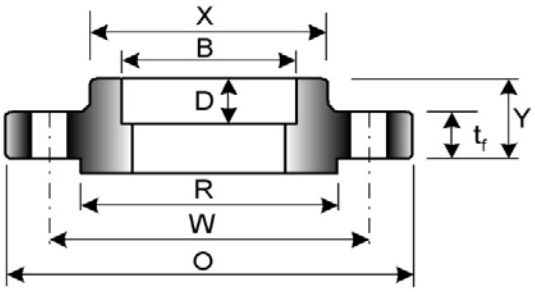
Welding Neck



Slip On



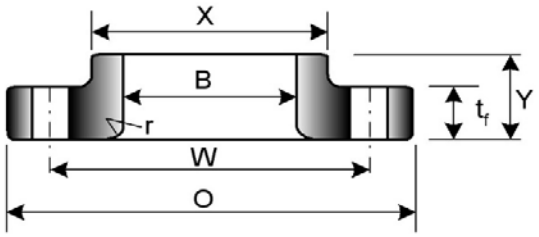
Socket Weld



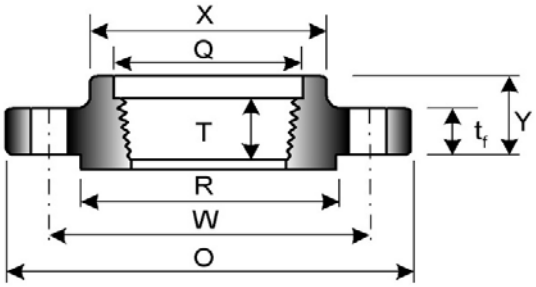
Nominal Pipe Size NPS	O.D. of Flange O	Thickness of Flange [1] t_f (min)	Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]			Thread Length [3] T (min)	Depth of Socket D
					W/N Y [1]	S/O, Thrd. S/W Y [1]	Lap Joint Y [1]	S/O, S/W B (min)	Lap Joint B (min)	Counter-bore Q (min)		
1/2	95	14.3	38	21.3	52	22	22	22.2	22.9	23.6	16	10
3/4	115	15.9	48	26.7	57	25	25	27.7	28.2	29.0	16	11
1	125	17.5	54	33.4	62	27	27	34.5	34.9	35.8	18	13
1 1/4	135	20.7	64	42.2	67	29	29	43.2	43.7	44.4	21	14
1 1/2	155	22.3	70	48.3	70	32	32	49.5	50.0	50.6	23	16
2	165	25.4	84	60.3	73	37	37	61.9	62.5	63.5	29	17
2 1/2	190	28.6	100	73.0	79	41	41	74.6	75.4	76.2	32	19
3	210	31.8	117	88.9	83	46	46	90.7	91.4	92.2	35	21
3 1/2	230	35.0	133	101.6	86	49	49	103.4	104.1	104.9	40	…
4	275	38.1	152	114.3	102	54	54	116.1	116.8	117.6	42	…
5	330	44.5	189	141.3	114	60	60	143.8	144.4	144.4	48	…
6	355	47.7	222	168.3	117	67	67	170.7	171.4	171.4	51	…
8	420	55.6	273	219.1	133	76	76	221.5	222.2	222.2	58	…
10	510	63.5	343	273.0	152	86	111	176.2	277.4	276.2	66	…
12	560	66.7	400	323.8	156	92	117	327.0	328.2	328.6	70	…
14	605	69.9	432	355.6	165	94	127	359.2	360.2	360.4	74	…
16	685	76.2	495	406.4	178	106	140	410.5	411.2	411.2	78	…
18	745	82.6	546	457.0	184	117	152	461.8	462.3	462.0	80	…
20	815	88.9	610	508.0	190	127	165	513.1	514.4	512.8	83	…
24	940	101.6	718	610.0	203	140	184	616.0	616.0	614.4	93	…

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

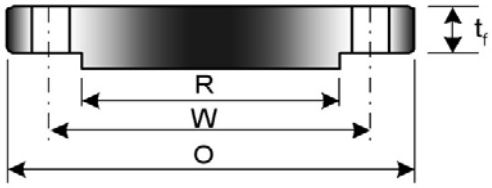
Lap Joint



Threaded



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						7 mm RF	Ring Joint	Welding Neck	S/O, S/W, Threaded	Lap Joint	Blind	
3	34.9	66.7	4	5/8	1/2	75	75	0.9	0.7	0.7	0.8	1/2
3	42.9	82.6	4	3/4	5/8	90	90	1.4	1.2	1.2	1.2	3/4
3	50.8	88.9	4	3/4	5/8	90	90	1.9	1.6	1.5	1.6	1
5	63.5	98.4	4	3/4	5/8	95	95	2.6	2.1	2.0	2.3	1 1/4
6	73.0	114.3	4	7/8	3/4	110	110	3.5	3.0	2.8	3.3	1 1/2
8	92.1	127.0	8	3/4	5/8	110	110	4.4	3.6	3.4	4.2	2
8	104.8	149.2	8	7/8	3/4	120	120	6.5	5.3	5.0	6.1	2 1/2
10	127.0	168.3	8	7/8	3/4	125	125	8.7	7.1	6.7	8.6	3
10	139.7	184.2	8	1	7/8	140	140	11.1	9.0	8.5	11.1	3 1/2
11	157.2	215.9	8	1	7/8	145	145	17.9	14.8	14.2	17.6	4
11	185.7	266.7	8	1 1/8	1	165	165	29.6	24.4	23.7	29.6	5
13	215.9	292.1	12	1 1/8	1	170	170	35.4	28.7	27.9	36.2	6
13	269.9	349.2	12	1 1/4	1 1/8	190	195	54.7	43.6	42.5	59.5	8
13	323.8	431.8	16	1 3/8	1 1/4	215	215	88.3	71.1	75.3	98.7	10
13	381.0	489.0	20	1 3/8	1 1/4	220	220	105.0	84.7	89.9	125.0	12
13	412.8	527.0	20	1 1/2	1 3/8	235	235	128.0	99.8	108.0	153.0	14
13	469.9	603.2	20	1 5/8	1 1/2	255	255	172.0	141.0	153.0	214.0	16
13	533.4	654.0	20	1 3/4	1 5/8	275	275	208.0	174.0	188.0	275.0	18
13	584.2	723.9	24	1 3/4	1 5/8	285	290	258.0	222.0	240.0	353.0	20
13	692.2	838.2	24	2	1 7/8	330	335	361.0	313.0	342.0	535.0	24

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

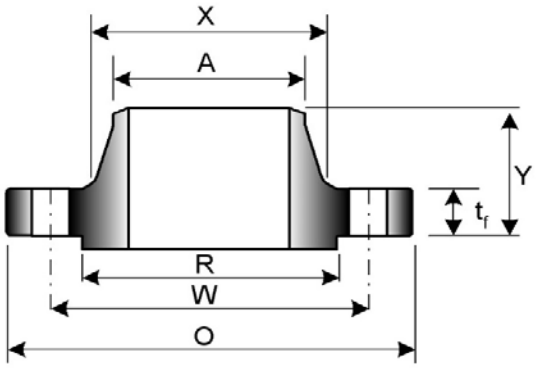
(2) Bore diameter of Welding Neck Flange and small bore of Socket Weld Flange to be specified by purchaser.

(3) Class 600 Threaded Flanges are made with a counterbore. Threads are per ASME B1.20.1.

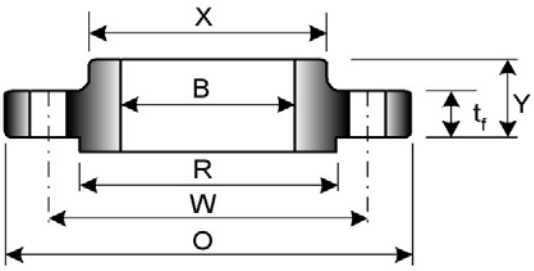
(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

Class 900

Welding Neck



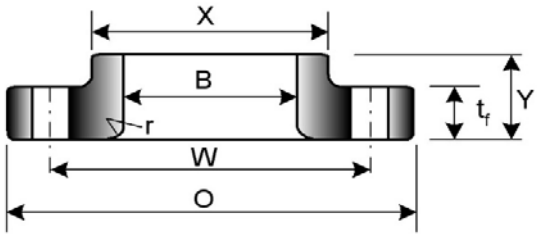
Slip On



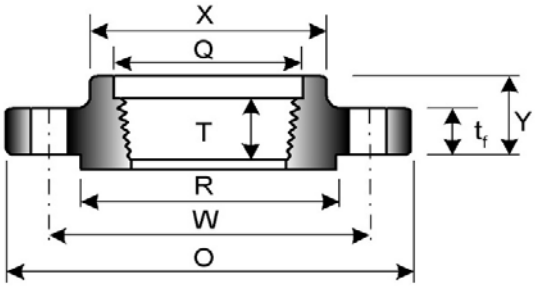
Nominal Pipe Size NPS	O.D. of Flange O	Thickness of Flange [1] t_f (min)	Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]			Thread Length [3] T (min)
					W/N Y [1]	S/O, Threaded Y [1]	Lap Joint Y [1]	S/O B (min)	Lap Joint B (min)	Counter-bore Q (min)	
1/2 3/4 1 1 1/4 1 1/2 2 2 1/2	Use Class 1500 dimensions in these sizes										
3	240	38.1	127	88.9	102	54	54	90.7	91.4	92.2	42
4	290	44.5	159	114.3	114	70	70	116.1	116.8	117.6	48
5	350	50.8	190	141.3	127	79	79	143.8	144.4	144.4	54
6	380	55.6	235	168.3	140	86	86	170.7	171.4	171.4	58
8	470	63.5	298	219.1	162	102	114	221.5	222.2	222.2	64
10	545	69.9	368	273.0	184	108	127	276.2	277.4	276.2	72
12	610	79.4	419	323.8	200	117	143	327.0	328.2	328.6	77
14	640	85.8	451	355.6	213	130	156	359.2	360.2	360.4	83
16	705	88.9	508	406.4	216	133	165	410.5	411.2	411.2	86
18	785	101.6	565	457.0	229	152	190	461.8	462.3	462.0	89
20	855	108.0	622	508.0	248	159	210	513.1	514.4	512.8	93
24	1040	139.7	749	610.0	292	203	267	616.0	616.0	614.4	102

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

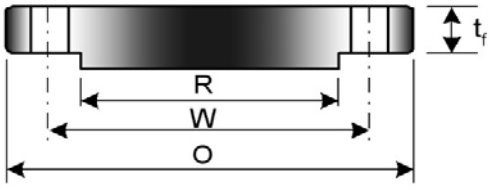
Lap Joint



Threaded



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						7 mm RF	Ring Joint	Welding Neck	S/O, Threaded	Lap Joint	Blind	
Use Class 1500 dimensions in these sizes												1/2 3/4 1 1 1/4 1 1/2 2 2 1/2
10	127.0	190.5	8	1	7/8	145	145	13.3	11.5	11.1	13.0	3
11	157.2	235.0	8	1 1/4	1 1/8	170	170	21.8	19.4	18.9	21.9	4
11	185.7	279.4	8	1 3/8	1 1/4	190	190	35.6	32.0	31.3	36.8	5
13	215.9	317.5	12	1 1/4	1 1/8	190	195	46.3	40.8	39.9	47.4	6
13	269.9	393.7	12	1 1/2	1 3/8	220	220	78.8	70.5	72.0	82.8	8
13	323.8	469.9	16	1 1/2	1 3/8	235	235	116.0	99.8	104.0	123.0	10
13	381.0	533.4	20	1 1/2	1 3/8	255	255	156.0	133.0	162.0	174.0	12
13	412.8	558.8	20	1 5/8	1 1/2	275	280	179.0	152.0	170.0	206.0	14
13	469.9	616.0	20	1 3/4	1 5/8	285	290	220.0	184.0	210.0	260.0	16
13	533.4	685.8	20	2	1 7/8	325	335	298.0	255.0	280.0	366.0	18
13	584.2	749.3	20	2 1/8	2	350	360	373.0	314.0	343.0	463.0	20
13	692.2	901.7	20	2 5/8	2 1/2	440	455	691.0	601.0	660.0	861.0	24

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

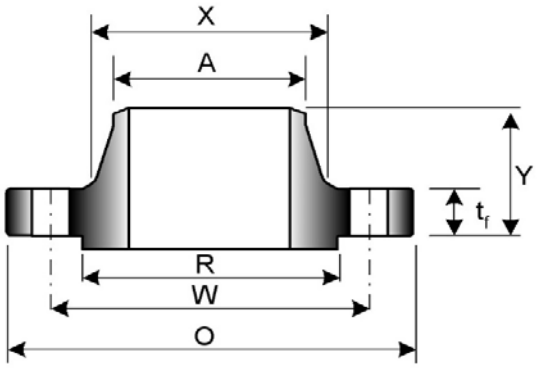
(2) Bore diameter of Welding Neck Flange to be specified by purchaser.

(3) Class 900 Threaded Flanges are made with a counterbore. Threads are per ASME B1.20.1.

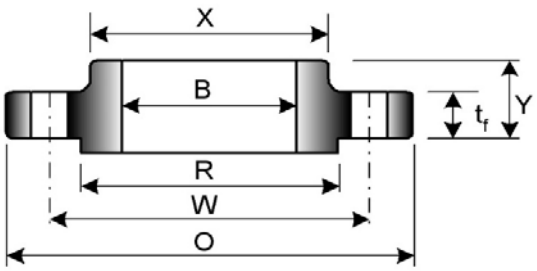
(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

Class 1500

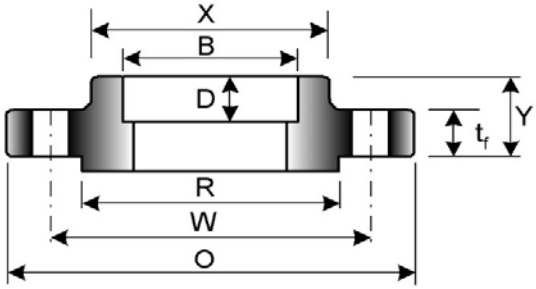
Welding Neck



Slip On



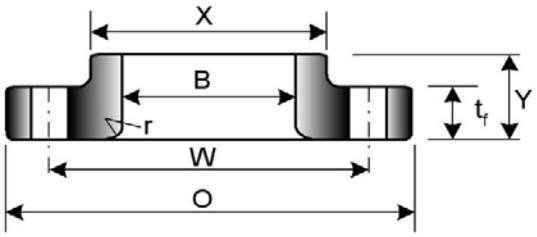
Socket Weld



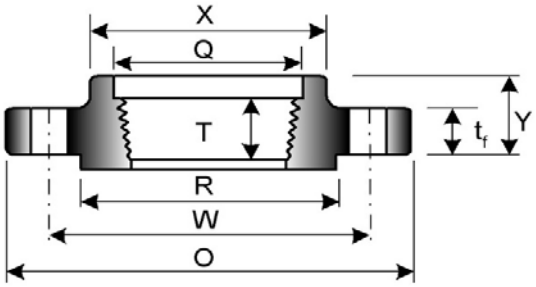
Nominal Pipe Size NPS	O.D. of Flange O	Thickness of Flange [1] t_f (min)	Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]			Thread Length [3] T (min)	Depth of Socket D
					W/N Y [1]	S/O, Thrd. S/W Y [1]	Lap Joint Y [1]	S/O, S/W B (min)	Lap Joint B (min)	Counter-bore Q (min)		
1/2	120	22.3	38	21.3	60	32	32	22.2	22.9	23.6	23	10
3/4	130	25.4	44	26.7	70	35	35	27.7	28.2	29.0	26	11
1	150	28.6	52	33.4	73	41	41	34.5	34.9	35.8	29	13
1 1/4	160	28.6	64	42.2	73	41	41	43.2	43.7	44.4	31	14
1 1/2	180	31.8	70	48.3	83	44	44	49.5	50.0	50.6	32	16
2	215	38.1	105	60.3	102	57	57	61.9	62.5	63.5	39	17
2 1/2	245	41.3	124	73.0	105	64	64	74.6	75.4	76.2	48	19
3	265	47.7	133	88.9	117	…	73	…	91.4	…	…	…
4	310	54.0	162	114.3	124	…	90	…	116.8	…	…	…
5	375	73.1	197	141.3	156	…	105	…	144.4	…	…	…
6	395	82.6	229	168.3	171	…	119	…	171.4	…	…	…
8	485	92.1	292	219.1	213	…	143	…	222.2	…	…	…
10	585	108.0	368	273.0	254	…	178	…	277.4	…	…	…
12	675	123.9	451	323.8	283	…	219	…	328.2	…	…	…
14	750	133.4	495	355.6	298	…	241	…	360.2	…	…	…
16	825	146.1	552	406.4	311	…	260	…	411.2	…	…	…
18	915	162.0	597	457.0	327	…	276	…	462.3	…	…	…
20	985	177.8	641	508.0	356	…	292	…	514.4	…	…	…
24	1170	203.2	762	610.0	406	…	330	…	616.0	…	…	…

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

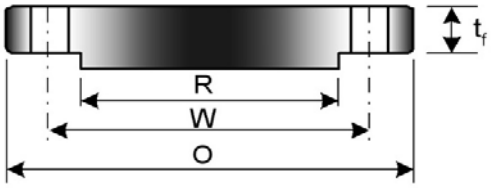
Lap Joint



Threaded



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						7 mm RF	Ring Joint	Welding Neck	S/O, S/W, Threaded	Lap Joint	Blind	
3	34.9	82.6	4	7/8	3/4	110	110	1.9	1.8	1.7	1.8	1/2
3	42.9	88.9	4	7/8	3/4	115	115	2.6	2.5	2.3	2.4	3/4
3	50.8	101.6	4	1	7/8	125	125	3.8	3.6	3.4	3.6	1
5	63.5	111.1	4	1	7/8	125	125	4.4	4.1	3.9	4.2	1 1/4
6	73.0	123.8	4	1 1/8	1	140	140	6.2	5.5	5.4	5.9	1 1/2
8	92.1	165.1	8	1	7/8	145	145	10.9	9.8	9.5	10.0	2
8	104.8	190.5	8	1 1/8	1	160	160	15.2	15.4	13.5	14.1	2 1/2
10	127.0	203.2	8	1 1/4	1 1/8	180	180	19.8	…	17.2	19.0	3
11	157.2	241.3	8	1 3/8	1 1/4	195	195	30.0	…	26.8	29.8	4
11	185.7	292.1	8	1 5/8	1 1/2	250	250	57.8	…	51.2	58.7	5
13	215.9	317.5	12	1 1/2	1 3/8	260	265	69.9	…	60.5	72.6	6
13	269.9	393.7	12	1 3/4	1 5/8	290	300	119.0	…	103.0	123.0	8
13	323.8	482.6	12	2	1 7/8	335	345	207.0	…	180.0	212.0	10
13	381.0	571.5	16	2 1/8	2	375	385	313.0	…	283.0	319.0	12
13	412.8	635.0	16	2 3/8	2 1/4	405	425	411.0	…	378.0	422.0	14
13	469.9	704.8	16	2 5/8	2 1/2	445	470	527.0	…	485.0	559.0	16
13	533.4	774.7	16	2 7/8	2 3/4	495	525	693.0	…	631.0	763.0	18
13	584.2	831.8	16	3 1/8	3	540	565	858.0	…	759.0	968.0	20
13	392.2	990.6	16	3 5/8	3 1/2	615	650	1380.0	…	1216.0	1551.0	24

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Bore diameter of Welding Neck Flange and small bore of Socket Weld Flange to be specified by purchaser.

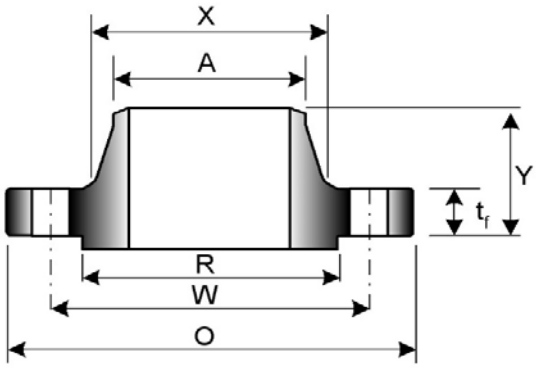
(3) Class 1500 Threaded Flanges are made with a counterbore. Threads are per ASME B1.20.1.

(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

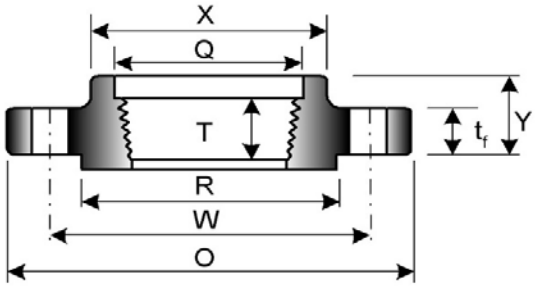
Dimensions of Flanges to ASME B16.5

Class 2500

Welding Neck



Threaded



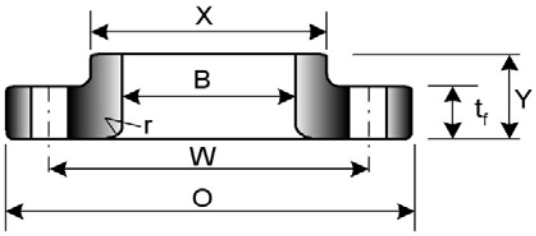
Nominal Pipe Size NPS	O.D. of Flange O	Thickness of Flange [1] t_f (min)	Diameter of Hub X	Diameter at Bevel A	Length Through Hub			Diameter of Bore [2]		Thread Length [3] T (min)
					W/N Y [1]	Threaded Y [1]	Lap Joint Y [1]	Lap Joint B (min)	Counter-bore Q (min)	
1/2	135	30.2	43	21.3	73	40	40	22.9	23.6	29
3/4	140	31.8	51	26.7	79	43	43	28.2	29.0	32
1	160	35.0	57	33.4	89	48	48	34.9	35.8	35
1 1/4	185	38.1	73	42.2	95	52	52	43.7	44.4	39
1 1/2	205	44.5	79	48.3	111	60	60	50.0	50.6	45
2	235	50.9	95	60.3	127	70	70	62.5	63.5	51
2 1/2	265	57.2	114	73.0	143	79	79	75.4	76.2	58
3	305	66.7	133	88.9	168	…	92	91.4	…	…
4	355	76.2	165	114.3	190	…	108	116.8	…	…
5	420	92.1	203	141.3	229	…	130	144.4	…	…
6	485	108.0	235	168.3	273	…	152	171.4	…	…
8	550	127.0	305	219.1	318	…	178	222.2	…	…
10	675	165.1	375	273.0	419	…	229	277.4	…	…
12	760	184.2	441	323.8	464	…	254	328.2	…	…

All dimensions are given in millimeters except for diameters of bolts and bolt holes, which are noted in inch units.

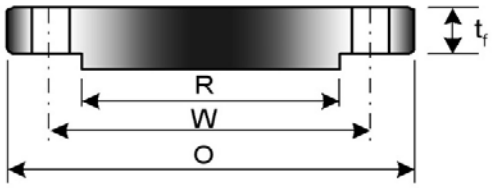
Class 2500

Dimensions of Flanges to ASME B16.5

Lap Joint



Blind



Corner Radius of Bore r	Diameter of RF R	Diameter of Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes	Diameter of Bolts	Length of Studs (4)		Approximate Weight Each in Kg				Nominal Pipe Size NPS
						7 mm RF	Ring Joint	Welding Neck	Threaded	Lap Joint	Blind	
3	34.9	88.9	4	7/8	3/4	120	120	3.3	3.2	3.0	3.1	1/2
3	42.9	95.2	4	7/8	3/4	125	125	3.9	3.7	3.4	3.5	3/4
3	50.8	108.0	4	1	7/8	140	140	5.6	5.3	4.9	5.1	1
5	63.5	130.2	4	1 1/8	1	150	150	8.2	7.8	7.1	7.5	1 1/4
6	73.0	146.0	4	1 1/4	1 1/8	170	170	11.7	11.1	10.1	10.7	1 1/2
8	92.1	171.4	8	1 1/8	1	180	180	17.2	16.1	14.6	15.6	2
8	104.8	196.8	8	1 1/4	1 1/8	195	205	25.0	23.0	20.9	22.4	2 1/2
10	127.0	228.6	8	1 3/8	1 1/4	220	230	38.7	…	32.2	34.9	3
11	157.2	273.0	8	1 5/8	1 1/2	255	260	59.4	…	48.9	53.9	4
11	185.7	323.8	8	1 7/8	1 3/4	300	310	100.0	…	82.5	91.4	5
13	215.9	368.3	8	2 1/8	2	345	355	157.0	…	128.0	143.0	6
13	269.9	438.2	12	2 1/8	2	380	395	231.0	…	184.0	213.0	8
13	323.8	539.8	12	2 5/8	2 1/2	490	510	447.0	…	355.0	414.0	10
13	381.0	619.1	12	2 7/8	2 3/4	540	560	623.0	…	496.0	590.0	12

Notes:

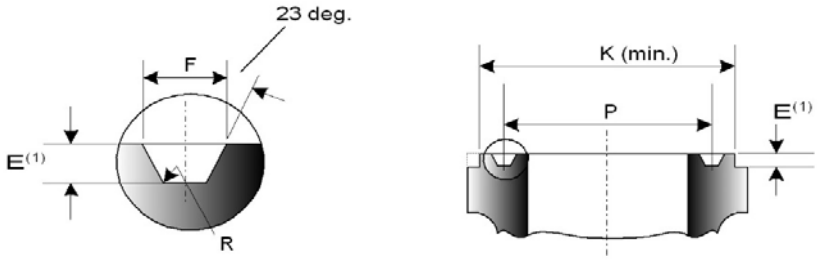
(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Bore diameter of Welding Neck Flange to be specified by purchaser.

(3) Class 2500 Threaded Flanges are made with a counterbore. Threads are per ASME B1.20.1.

(4) Stud lengths noted are thread to thread, and assume a 4 mm gasket thickness.

Dimensions of Ring Joint Facings to ASME B16.5



Groove Number	Nominal Pipe Size NPS / Diameter of Raised Portion, K										Groove Dimensions			
	Class 150		Classes 300/400/600		Class 900 (2)		Class 1500		Class 2500		Pitch Diameter P	Groove Depth E (1)	Groove Width F	Radius at Bottom R
R11	...	...	1/2	51.0	...	...	...	...	...	...	34.14	5.54	7.14	0.8
R12	...	...	...	...	...	...	1/2	60.5	...	...	39.67	6.35	8.74	0.8
R13	...	...	3/4	63.5	...	...	...	...	1/2	65.0	42.88	6.35	8.74	0.8
R14	...	...	...	...	...	...	3/4	66.5	...	...	44.45	6.35	8.74	0.8
R15	1	63.5	...	...	...	...	...	...	...	...	47.63	6.35	8.74	0.8
R16	...	...	1	70.0	...	...	1	71.5	3/4	73.0	50.80	6.35	8.74	0.8
R17	1 1/4	73.0	...	...	...	...	...	...	...	...	57.15	6.35	8.74	0.8
R18	...	...	1 1/4	79.5	...	...	1 1/4	81.0	1	82.5	60.33	6.35	8.74	0.8
R19	1 1/2	82.5	...	...	...	...	...	...	...	...	65.07	6.35	8.74	0.8
R20	...	...	1 1/2	90.5	...	...	1 1/2	92.0	...	...	68.27	6.35	8.74	0.8
R21	...	...	...	...	...	...	...	...	1 1/4	102	72.23	7.92	11.91	0.8
R22	2	102	...	...	...	...	...	...	...	...	82.55	6.35	8.74	0.8
R23	...	...	2	108	...	...	...	...	1 1/2	114	82.55	7.92	11.91	0.8
R24	...	...	...	...	...	...	2	124	...	...	95.25	7.92	11.91	0.8
R25	2 1/2	121	...	...	...	...	...	...	...	...	101.60	6.35	8.74	0.8
R26	...	...	2 1/2	127	...	...	...	...	2	133	101.60	7.92	11.91	0.8
R27	...	...	...	...	...	...	2 1/2	137	...	...	107.95	7.92	11.91	0.8
R28	...	...	...	...	...	...	...	...	2 1/2	149	111.13	9.53	13.49	1.5
R29	3	133	...	...	...	...	...	...	...	...	114.30	6.35	8.74	0.8
R30	...	...	(3)	...	...	...	...	...	...	...	117.48	7.92	11.91	0.8
R31	...	...	3 (3)	146	3	156	...	...	...	...	123.83	7.92	11.91	0.8
R32	...	...	...	...	...	...	...	...	3	168	127.00	9.53	13.49	1.5
R33	3 1/2	154	...	...	...	...	...	...	...	...	131.78	6.35	8.74	0.8
R34	...	...	3 1/2	159	...	...	...	...	...	...	131.78	7.92	11.91	0.8
R35	...	...	...	...	...	...	3	168	...	...	136.53	7.92	11.91	0.8
R36	4	171	...	...	...	...	...	...	...	...	149.23	6.35	8.74	0.8
R37	...	...	4	175	4	181	...	...	...	...	149.23	7.92	11.91	0.8
R38	...	...	...	...	...	...	...	...	4	203	157.18	11.13	16.66	1.5
R39	...	...	...	...	...	...	4	194	...	...	161.93	7.92	11.91	0.8
R40	5	194	...	...	...	...	...	...	...	...	171.45	6.35	8.74	0.8
R41	...	...	5	210	5	216	...	...	...	...	180.98	7.92	11.91	0.8
R42	...	...	...	...	...	...	...	...	5	241	190.50	12.70	19.84	1.5
R43	6	219	...	...	...	...	...	...	...	...	193.68	6.35	8.74	0.8
R44	...	...	...	...	...	...	5	229	...	...	193.68	7.92	11.91	0.8
R45	...	...	6	241	6	241	...	...	...	...	211.12	7.92	11.91	0.8

All dimensions are given in millimeters.

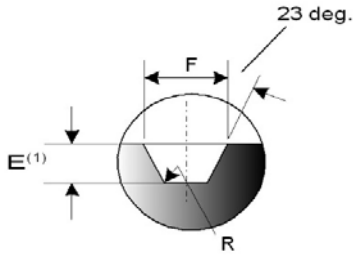
Notes:

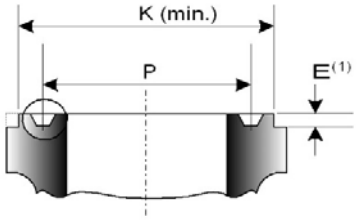
(1) Height of raised portion is equal to the Groove Depth, Dimension E, but is not subject to the tolerances for E.

(2) Use Class 1500 dimensions for sizes NPS 1/2 through NPS 21/2 Class 900

(3) Groove Number R30 used for NPS 3 Classes 300 and 600 Lap Joints instead of R31

Dimensions of Ring Joint Facings to ASME B16.5





Groove Number	Nominal Pipe Size NPS/ Diameter of Raised Portion, K										Groove Dimensions			
	Class 150		Classes 300/400/600		Class 900 (2)		Class 1500		Class 2500		Pitch Diameter P	Groove Depth E (1)	Groove Width F	Radius at Bottom R
R46	...	...	...	...	...	...	6	248	...	...	211.14	9.53	13.49	1.5
R47	...	...	...	...	...	...	...	...	6	279	228.60	12.70	19.84	1.5
R48	8	273	...	...	...	...	...	...	...	...	247.65	6.35	8.74	0.8
R49	...	...	8	302	8	308	...	...	...	...	269.88	7.92	11.91	0.8
R50	...	...	...	...	...	...	8	318	...	...	269.88	11.13	16.66	1.5
R51	...	...	...	...	...	...	...	...	8	340	279.40	14.27	23.01	1.5
R52	10	330	...	...	...	...	...	...	...	...	304.80	6.35	8.74	0.8
R53	...	...	10	356	10	362	...	...	...	...	323.85	7.92	11.91	0.8
R54	...	...	...	...	...	...	10	371	...	...	323.85	11.13	16.66	1.5
R55	...	...	...	...	...	...	...	...	10	425	342.90	17.48	30.18	2.4
R56	12	406	...	...	...	...	...	...	...	...	381.00	6.35	8.74	0.8
R57	...	...	12	413	12	419	...	...	...	...	381.00	7.92	11.91	0.8
R58	...	...	...	...	...	...	12	438	...	...	381.00	14.27	23.01	1.5
R59	14	425	...	...	...	...	...	...	...	...	396.88	6.35	8.74	0.8
R60	...	...	...	...	...	...	...	...	12	495	406.40	17.48	33.32	2.4
R61	...	...	14	457	...	...	...	...	...	...	419.10	7.92	11.91	0.8
R62	...	...	...	...	14	467	...	...	...	...	419.10	11.13	16.66	1.5
R63	...	...	...	...	...	...	14	489	...	...	419.10	15.88	26.97	2.4
R64	16	483	...	...	...	...	...	...	...	...	454.03	6.35	8.74	0.8
R65	...	...	16	508	...	...	...	...	...	...	469.90	7.92	11.91	0.8
R66	...	...	...	...	16	524	...	...	...	...	469.90	11.13	16.66	1.5
R67	...	...	...	...	...	...	16	546	...	...	469.90	17.48	30.18	2.4
R68	18	546	...	...	...	...	...	...	...	...	517.53	6.35	8.74	0.8
R69	...	...	18	575	...	...	...	...	...	...	533.40	7.92	11.91	0.8
R70	...	...	...	...	18	594	...	...	...	...	533.40	12.70	19.84	1.5
R71	...	...	...	...	...	...	18	613	...	...	533.40	17.48	30.18	2.4
R72	20	597	...	...	...	...	...	...	...	...	558.80	6.35	8.74	0.8
R73	...	...	20	635	...	...	...	...	...	...	584.20	9.53	13.49	1.5
R74	...	...	...	...	20	648	...	...	...	...	584.20	12.70	19.84	1.5
R75	...	...	...	...	...	...	20	673	...	...	584.20	17.48	33.32	2.4
R76	24	711	...	...	...	...	...	...	...	...	673.10	6.35	8.74	0.8
R77	...	...	24	749	...	...	...	...	...	...	692.15	11.13	16.66	1.5
R78	...	...	...	...	24	772	...	...	...	...	692.15	15.88	26.97	2.4
R79	...	...	...	...	...	...	24	794	...	...	692.15	20.62	36.53	2.4

Tolerances:

E (Groove Depth): +0.40, -0.0

F (Groove Width): +/- 0.20

P (Pitch Diameter): +/- 0.13

R (Radius at Bottom): R</= 2: + 0.8, -0.00; R>/=2: +/- 0.8

23 deg. angle: +/- 1/2 deg.

ASME B16.47 Large Diameter Flanges

ASME B16.47 covers welding neck and blind flanges NPS 26 through NPS 60, Classes 150, 300, 400, 600 and 900 in Series A, and Classes 75 through 900 in Series B. Series A dimensions- flanges for general use- are based on MSS SP-44, while Series B flanges are more compact and conform to the dimensions of API Standard 605.

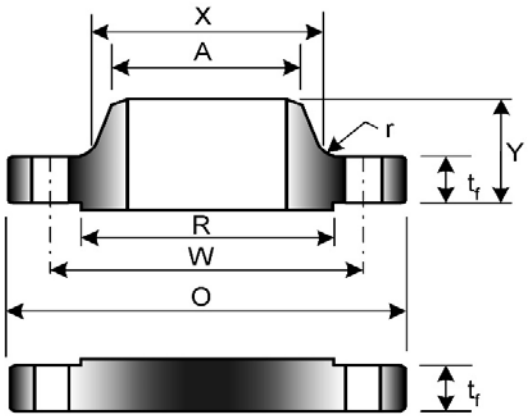
Classes 75, 150 and 300 flanges are normally furnished with a 2 mm raised face. Classes 400, 600 and 900 are normally furnished with a 7 mm raised face. The required serrated face-finish is 3.2 µm to 6.3 µm. Additionally, ring joint faces are available in Series A flanges in Classes 300 and higher.

Ring joint dimensions and tolerances for Series A flanges can be found on page 32. For pressure-temperature ratings for ASME B16.47 flanges, please refer to page 69.

Tolerances	
Outside Diameter of Raised Face (R):	+/- 2 mm
Height of Raised Face:	+/- 0.5 mm (2 mm Raised Face) +/- 2 mm (7 mm Raised Face)
Flange Thickness (t_f):	+ 3.0 mm, - 0.0 mm (to 25 mm t_f) + 5.0 mm, - 0.0 mm (>25 mm - 50 mm t_f) + 8.0 mm, - 0.0 mm (>50 mm - 75 mm t_f) + 10.0 mm, - 0.0 mm (>75 mm t_f)
Outside Diameter at Welding End (A):	+ 5.0 mm, - 2.0 mm
Inside Diameter of Welding End:	+ 3.0 mm, - 2.0 mm
Hub Thickness at Welding End:	not less than 87.5% of the nominal pipe thickness.
Length Through Hub (W/N Flange) (Y):	+ 3.0 mm, - 5.0 mm
Bolt Circle Diameter (W):	+/- 1.5 mm
Spacing of adjacent bolt holes (centre-to-centre):	+/- 0.8 mm
Concentricity between Bolt Circle Diameter and machined facing diameter:	1.5 mm

Class 150

Dimensions of Flanges to ASME B16.47 Series A



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	870	66.7	66.7	119	676	660.4	749	806.4	24	1 3/8	1 1/4	10	149	306
28	925	69.9	69.9	124	727	711.2	800	863.6	28	1 3/8	1 1/4	11	169	362
30	985	73.1	73.1	135	781	762.0	857	914.4	28	1 3/8	1 1/4	11	200	431
32	1060	79.4	79.4	143	832	812.8	914	977.9	28	1 5/8	1 1/2	11	248	537
34	1110	81.0	81.0	148	883	863.6	965	1028.7	32	1 5/8	1 1/2	13	265	600
36	1170	88.9	88.9	156	933	914.4	1022	1085.8	32	1 5/8	1 1/2	13	316	733
38	1240	85.8	85.8	156	991	965.2	1073	1149.4	32	1 5/8	1 1/2	13	352	799
40	1290	88.9	88.9	162	1041	1016.0	1124	1200.2	36	1 5/8	1 1/2	13	379	894
42	1345	95.3	95.3	170	1092	1068.8	1194	1257.3	36	1 5/8	1 1/2	13	431	1044
44	1405	100.1	100.1	176	1143	1117.6	1245	1314.4	40	1 5/8	1 1/2	13	484	1195
46	1455	101.6	101.6	184	1197	1168.4	1295	1365.2	40	1 5/8	1 1/2	13	518	1304
48	1510	106.4	106.4	191	1248	1219.2	1359	1422.4	44	1 5/8	1 1/2	13	552	1453
50	1570	109.6	109.6	202	1302	1270.0	1410	1479.6	44	1 7/8	1 3/4	13	617	1623
52	1625	114.3	114.3	208	1353	1320.8	1461	1536.7	44	1 7/8	1 3/4	13	676	1817
54	1685	119.4	119.1	214	1403	1371.6	1511	1593.8	44	1 7/8	1 3/4	13	752	2040
56	1745	122.3	122.3	227	1457	1422.4	1575	1651.0	48	1 7/8	1 3/4	13	829	2245
58	1805	127.0	127.0	233	1508	1473.2	1626	1708.2	48	1 7/8	1 3/4	13	914	2498
60	1855	130.2	130.2	238	1559	1524.0	1676	1759.0	52	1 7/8	1 3/4	13	959	2702

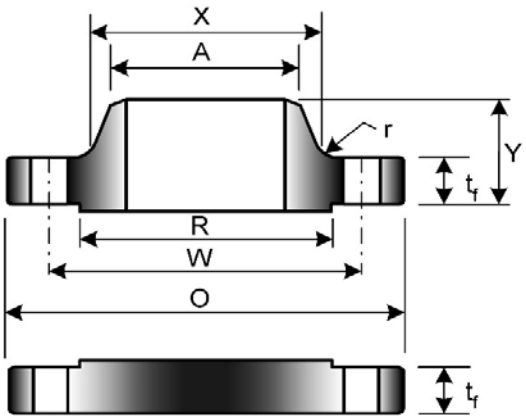
All dimensions are given in millimeters.

Notes:

(1) 2 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Dimensions of Flanges to ASME B16.47 Series A

Class 300



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1)		Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face (2) R	Drilling			Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg	
		W/N t_f (min)	Blind t_f (min)					Diameter Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes			W/N	Blind
26	970	77.8	82.6	183	721	660.4	749	876.3	28	1 3/4	1 5/8	10	281	458
28	1035	84.2	88.9	195	775	711.2	800	939.8	28	1 3/4	1 5/8	11	341	565
30	1090	90.5	93.7	208	827	762.0	857	997.0	28	1 7/8	1 3/4	11	392	659
32	1150	96.9	98.5	221	881	812.8	914	1054.1	28	2	1 7/8	11	454	770
34	1205	100.1	103.2	230	937	863.6	965	1104.9	28	2	1 7/8	13	508	889
36	1270	103.2	109.6	240	991	914.4	1022	1168.4	32	2 1/8	2	13	567	1040
38	1170	106.4	106.4	179	994	965.2	1029	1092.2	32	1 5/8	1 1/2	13	319	875
40	1240	112.8	112.8	192	1048	1016.0	1086	1155.7	32	1 3/4	1 5/8	13	386	1040
42	1290	117.5	117.5	198	1099	1066.8	1137	1206.5	32	1 3/4	1 5/8	13	420	1176
44	1355	122.3	122.3	205	1149	1117.6	1194	1263.6	32	1 7/8	1 3/4	13	480	1347
46	1415	127.0	127.0	214	1203	1168.4	1245	1320.8	28	2	1 7/8	13	546	1530
48	1465	131.8	131.8	222	1254	1219.2	1302	1371.6	32	2	1 7/8	13	581	1698
50	1530	138.2	138.2	230	1305	1270.0	1359	1428.8	32	2 1/8	2	13	660	1938
52	1580	142.9	142.9	237	1356	1320.8	1410	1479.6	32	2 1/8	2	13	708	2142
54	1660	150.9	150.9	251	1410	1371.6	1467	1549.4	28	2 3/8	2 1/4	13	863	2496
56	1710	152.4	152.4	259	1464	1422.4	1518	1600.2	28	2 3/8	2 1/4	13	911	2680
58	1760	157.2	157.2	265	1514	1473.2	1575	1651.0	32	2 3/8	2 1/4	13	952	2920
60	1810	162.0	162.0	271	1565	1524.0	1626	1701.8	32	2 3/8	2 1/4	13	1012	3188

All dimensions are given in millimeters.

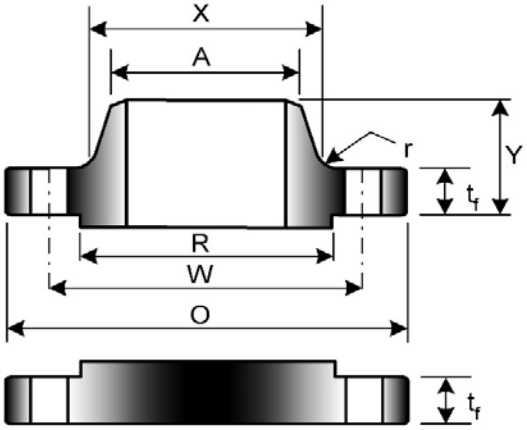
Notes:

(1) 2 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Class 300 Series A Flanges are also available in Ring Joint. Please see Page 32.

Class 400

Dimensions of Flanges to ASME B16.47 Series A



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face (2) R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	970	88.9	98.5	194	727	660.4	749	876.3	28	1 7/8	1 3/4	11	318	557
28	1035	95.3	104.8	206	783	711.2	800	939.8	28	2	1 7/8	13	378	673
30	1090	101.6	111.2	219	837	762.0	857	997.0	28	2 1/8	2	13	432	790
32	1150	108.0	115.9	232	889	812.8	914	1054.1	28	2 1/8	2	13	503	923
34	1205	111.2	122.3	241	945	863.6	965	1104.9	28	2 1/8	2	14	560	1073
36	1270	114.3	128.6	251	1000	914.4	1022	1168.4	32	2 1/8	2	14	632	1250
38	1205	123.9	123.9	206	1003	965.2	1035	1117.6	32	1 7/8	1 3/4	14	430	1100
40	1270	130.2	130.2	316	1054	1016.0	1092	1174.8	32	2	1 7/8	14	497	1280
42	1320	133.4	133.4	224	1108	1066.8	1143	1225.6	32	2	1 7/8	14	538	1422
44	1385	139.7	139.7	233	1159	1117.6	1200	1282.7	32	2 1/8	2	14	614	1634
46	1440	146.1	146.1	244	1213	1168.4	1257	1339.8	36	2 1/8	2	14	677	1841
48	1510	152.4	152.4	257	1267	1219.2	1308	1403.4	28	2 3/8	2 1/4	14	798	2121
50	1570	157.2	158.8	268	1321	1270.0	1362	1460.5	32	2 3/8	2 1/4	14	877	2379
52	1620	162.0	163.6	276	1372	1320.8	1413	1511.3	32	2 3/8	2 1/4	14	937	2616
54	1700	169.9	171.5	289	1426	1371.6	1470	1581.2	28	2 5/8	2 1/2	14	1120	3017
56	1755	174.7	176.3	298	1480	1422.4	1527	1632.0	32	2 5/8	2 1/2	14	1198	3293
58	1805	177.8	181.0	306	1530	1473.2	1578	1682.8	32	2 5/8	2 1/2	14	1260	3584
60	1885	185.8	189.0	319	1584	1524.0	1635	1752.6	32	2 7/8	2 3/4	14	1460	4057

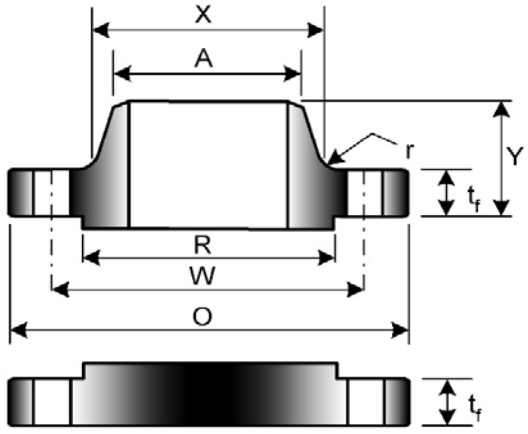
All dimensions are given in millimeters.

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Class 400 Series A Flanges are also available in Ring Joint. Please see Page 32.

Class 600



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face (2) R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	1015	108.0	125.5	222	748	660.4	749	914.4	28	2	1 7/8	13	442	765
28	1075	111.2	131.8	235	803	711.2	800	965.2	28	2 1/8	2	13	500	900
30	1130	114.3	139.7	248	862	762.0	857	1022.4	28	2 1/8	2	13	565	1061
32	1195	117.5	147.7	260	918	812.8	914	1079.5	28	2 3/8	2 1/4	13	650	1262
34	1245	120.7	154.0	270	973	863.6	965	1130.3	28	2 3/8	2 1/4	14	695	1415
36	1315	123.9	162.0	283	1032	914.4	1022	1193.8	28	2 5/8	2 1/2	14	788	1648
38	1270	152.4	155.0	254	1022	965.2	1054	1162.0	28	2 3/8	2 1/4	14	665	1492
40	1320	158.8	162.0	264	1073	1016.0	1111	1212.8	32	2 3/8	2 1/4	14	714	1677
42	1405	168.3	171.5	279	1127	1066.8	1168	1282.7	28	2 5/8	2 1/2	14	887	2014
44	1455	173.1	177.8	289	1181	1117.6	1226	1333.5	32	2 5/8	2 1/2	14	939	2230
46	1510	179.4	185.8	300	1235	1168.4	1276	1390.6	32	2 5/8	2 1/2	14	1038	2519
48	1595	189.0	195.3	316	1289	1219.2	1334	1460.5	32	2 7/8	2 3/4	14	1237	2935
50	1670	196.9	203.2	329	1343	1270.0	1384	1524.0	28	3 1/8	3	14	1321	3237
52	1720	203.2	209.6	337	1394	1320.8	1435	1574.8	32	3 1/8	3	14	1367	3512
54	1780	209.6	217.5	349	1448	1371.6	1492	1632.0	32	3 1/8	3	14	1521	3929
56	1855	217.5	225.5	362	1502	1422.4	1543	1695.4	32	3 3/8	3 1/4	16	1870	4560
58	1905	222.3	231.8	370	1553	1473.2	1600	1746.2	32	3 3/8	3 1/4	16	1975	4961
60	1995	233.4	242.9	389	1610	1524.0	1657	1822.4	28	3 5/8	3 1/2	17	2377	5723

All dimensions are given in millimeters.

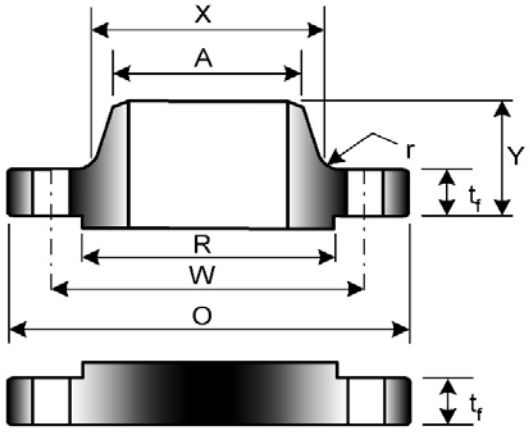
Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Class 600 Series A Flanges are also available in Ring Joint. Please see Page 32.

Class 900

Dimensions of Flanges to ASME B16.47 Series A



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face (2) R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	1085	139.7	160.4	286	775	660.4	749	952.5	20	2 7/8	2 3/4	11	684	1083
28	1170	142.9	171.5	298	832	711.2	800	1022.4	20	3 1/8	3	13	809	1342
30	1230	149.3	182.6	311	889	762.0	857	1085.8	20	3 1/8	3	13	925	1593
32	1315	158.8	193.7	330	946	812.8	914	1155.7	20	3 3/8	3 1/4	13	1135	1951
34	1395	165.1	204.8	349	1006	863.6	965	1225.6	20	3 5/8	3 1/2	14	1299	2283
36	1460	171.5	214.4	362	1064	914.4	1022	1289.0	20	3 5/8	3 1/2	14	1473	2631
38	1460	190.5	215.9	352	1073	965.2	1099	1289.0	20	3 5/8	3 1/2	19	1437	2664
40	1510	196.9	223.9	364	1127	1016.0	1162	1339.8	24	3 5/8	3 1/2	21	1518	2925
42	1560	206.4	231.8	371	1176	1066.8	1213	1390.6	24	3 5/8	3 1/2	21	1659	3251
44	1650	214.4	242.9	391	1235	1117.6	1270	1463.7	24	3 7/8	3 3/4	22	1942	3799
46	1735	225.5	255.6	411	1292	1168.4	1334	1536.7	24	4 1/8	4	22	2263	4405
48	1785	233.4	263.6	419	1343	1219.2	1384	1587.5	24	4 1/8	4	24	2426	4833
50	…	…	…	…	…	…	…	…	…	…	…	…	…	…
52	…	…	…	…	…	…	…	…	…	…	…	…	…	…
54	…	…	…	…	…	…	…	…	…	…	…	…	…	…
56	…	…	…	…	…	…	…	…	…	…	…	…	…	…
58	…	…	…	…	…	…	…	…	…	…	…	…	…	…
60	…	…	…	…	…	…	…	…	…	…	…	…	…	…

All dimensions are given in millimeters.

Notes:

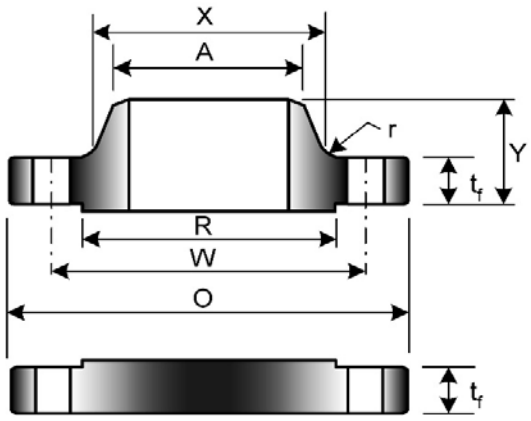
(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

(2) Class 900 Series A Flanges are also available in Ring Joint. Please see Page 32.

Trans Am
Piping Products Ltd.

Dimensions of Flanges to ASME B16.47 Series B

Class 75



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1)		Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling			Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg	
		W/N t_f (min)	Blind t_f (min)					Diameter Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes			W/N	Blind
26	760	31.9	31.9	57	676	661.9	705	723.9	36	3/4	5/8	8	43	132
28	815	31.9	31.9	60	727	712.7	756	774.7	40	3/4	5/8	8	48	152
30	865	31.9	31.9	64	778	763.5	806	825.5	44	3/4	5/8	8	52	172
32	915	33.5	35.0	68	829	814.3	857	876.3	48	3/4	5/8	8	58	209
34	965	33.5	36.6	72	879	865.1	908	927.1	52	3/4	5/8	8	62	241
36	1035	35.0	40.9	84	935	915.9	965	992.2	40	7/8	3/4	10	83	306
38	1085	36.6	43.0	87	986	966.7	1016	1043.0	40	7/8	3/4	10	91	352
40	1135	36.6	43.0	91	1037	1017.5	1067	1093.8	44	7/8	3/4	10	97	386
42	1185	38.2	46.3	94	1087	1068.3	1118	1144.6	48	7/8	3/4	10	104	449
44	1250	41.4	47.7	103	1140	1119.1	1175	1203.3	36	1	7/8	10	128	512
46	1300	43.0	49.3	106	1191	1169.9	1226	1254.1	40	1	7/8	10	138	571
48	1355	44.6	52.5	110	1241	1220.7	1276	1304.9	44	1	7/8	10	151	655
50	1405	46.2	54.1	114	1294	1271.5	1327	1355.7	44	1	7/8	10	160	725
52	1455	46.2	55.7	119	1345	1322.3	1378	1409.7	48	1	7/8	10	171	798
54	1510	47.8	58.9	124	1397	1373.1	1429	1460.5	48	1	7/8	10	185	905
56	1575	49.3	60.4	133	1451	1423.9	1486	1520.8	40	1 1/8	1	11	222	1007
58	1625	50.9	62.0	137	1502	1474.7	1537	1571.6	44	1 1/8	1	11	230	1098
60	1675	54.1	65.2	143	1553	1525.5	1588	1622.4	44	1 1/8	1	11	254	1222

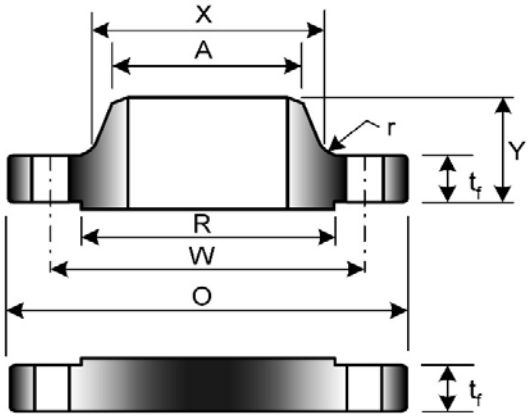
All dimensions are given in millimeters.

Notes:

(1) 2 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Class 150

Dimensions of Flanges to ASME B16.47 Series B



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1)		Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling			Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg	
		W/N t_f (min)	Blind t_f (min)					Diameter Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes			W/N	Blind
26	785	39.8	43.0	87	684	661.9	711	744.5	36	7/8	3/4	10	67	180
28	835	43.0	46.2	94	735	712.7	762	795.3	40	7/8	3/4	10	77	218
30	885	43.0	49.3	98	787	763.5	813	846.1	44	7/8	3/4	10	83	256
32	940	44.6	52.5	106	840	814.3	864	900.1	48	7/8	3/4	10	96	311
34	1005	47.7	55.7	109	892	865.1	921	957.3	40	1	7/8	10	113	372
36	1055	50.9	57.3	116	945	915.9	972	1009.6	44	1	7/8	10	129	424
38	1125	52.5	62.0	122	997	968.2	1022	1070.0	40	1 1/8	1	10	155	516
40	1175	54.1	65.2	127	1049	1019.0	1080	1120.8	44	1 1/8	1	10	169	591
42	1225	57.3	66.8	132	1102	1069.8	1130	1171.6	48	1 1/8	1	11	185	657
44	1275	58.9	70.0	135	1153	1120.6	1181	1222.4	52	1 1/8	1	11	197	743
46	1340	60.4	73.1	143	1205	1171.4	1235	1284.3	40	1 1/4	1 1/8	11	231	857
48	1390	63.6	76.3	148	1257	1222.2	1289	1335.1	44	1 1/4	1 1/8	11	250	960
50	1445	66.8	79.5	152	1308	1273.0	1340	1385.9	48	1 1/4	1 1/8	11	266	1077
52	1495	68.4	82.7	156	1360	1323.8	1391	1436.7	52	1 1/4	1 1/8	11	290	1196
54	1550	70.0	85.8	160	1413	1374.6	1441	1492.2	56	1 1/4	1 1/8	11	306	1331
56	1600	71.6	89.0	165	1465	1425.4	1492	1543.0	60	1 1/4	1 1/8	14	334	1468
58	1675	73.1	91.9	173	1516	1476.2	1543	1611.3	48	1 3/8	1 1/4	14	384	1659
60	1725	74.7	95.4	178	1570	1527.0	1600	1662.1	52	1 3/8	1 1/4	14	446	1860

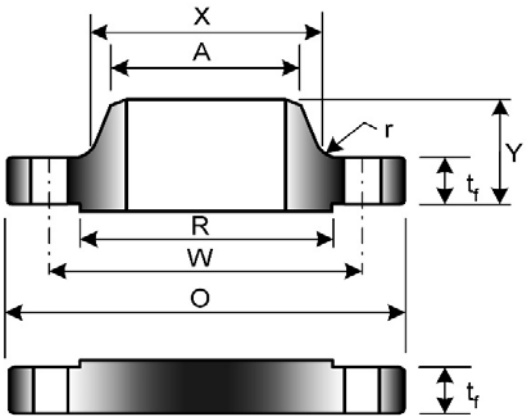
All dimensions are given in millimeters.

Notes:

(1) 2 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Dimensions of Flanges to ASME B16.47 Series B

Class 300



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1)		Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling			Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg	
		W/N t_f (min)	Blind t_f (min)					Diameter Bolt Circle W	Number of Bolt Holes	Diameter of Bolt Holes			W/N	Blind
26	865	87.4	87.4	143	702	665.2	737	803.3	32	1 3/8	1 1/4	14	203	406
28	920	87.4	87.4	148	756	716.0	787	857.2	36	1 3/8	1 1/4	14	212	459
30	990	92.1	92.1	156	813	768.4	845	920.8	36	1 1/2	1 3/8	14	259	558
32	1055	101.6	101.6	167	864	819.2	902	977.9	32	1 5/8	1 1/2	16	319	698
34	1110	101.6	101.6	171	918	870.0	953	1031.9	36	1 5/8	1 1/2	16	344	773
36	1170	101.6	101.6	179	965	920.8	1010	1089.0	32	1 3/4	1 5/8	16	380	862
38	1220	109.6	109.6	191	1016	971.6	1060	1139.8	36	1 3/4	1 5/8	16	407	1006
40	1275	114.3	114.3	197	1067	1022.4	1114	1190.6	40	1 3/4	1 5/8	16	466	1143
42	1335	117.5	117.5	203	1118	1074.7	1168	1244.6	36	1 7/8	1 3/4	16	520	1291
44	1385	125.5	125.5	213	1173	1125.5	1219	1295.4	40	1 7/8	1 3/4	16	573	1478
46	1460	127.0	128.6	221	1229	1176.3	1270	1365.2	36	2	1 7/8	16	669	1686
48	1510	127.0	133.4	222	1278	1227.1	1327	1416.0	40	2	1 7/8	16	688	1866
50	1560	136.6	138.2	233	1330	1277.9	1378	1466.8	44	2	1 7/8	16	725	2059
52	1615	141.3	142.6	241	1383	1328.7	1429	1517.6	48	2	1 7/8	16	816	2272
54	1675	135.0	147.7	238	1435	1379.5	1480	1578.0	48	2	1 7/8	16	815	2537
56	1765	152.4	155.4	267	1494	1430.3	1537	1651.0	36	2 3/8	2 1/4	17	1122	2961
58	1825	152.4	160.4	273	1548	1481.1	1594	1712.9	40	2 3/8	2 1/4	17	1150	3260
60	1880	149.3	165.1	270	1599	1531.9	1651	1763.7	40	2 3/8	2 1/4	17	1255	3567

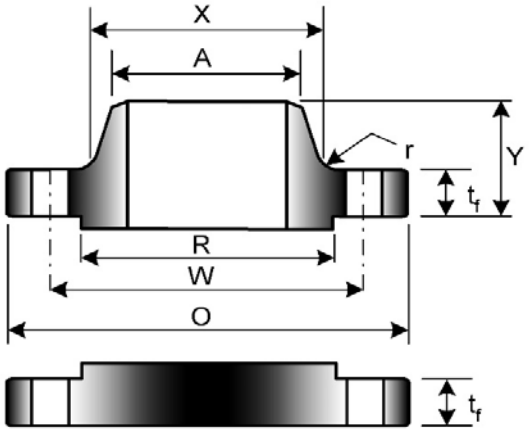
All dimensions are given in millimeters.

Notes:

(1) 2 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Class 400

Dimensions of Flanges to ASME B16.47 Series B



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	850	88.9	88.9	149	689	660.4	711	781.0	28	1 1/2	1 3/8	11	176	396
28	915	95.3	95.3	159	740	711.2	762	838.2	24	1 5/8	1 1/2	13	218	493
30	970	101.6	101.6	170	794	762.0	819	895.4	28	1 5/8	1 1/2	13	252	588
32	1035	108.0	108.0	179	845	812.8	873	952.5	28	1 3/4	1 5/8	13	304	714
34	1085	111.2	111.2	187	899	863.6	927	1003.3	32	1 3/4	1 5/8	14	353	830
36	1155	119.1	119.1	200	952	914.4	981	1066.8	28	1 7/8	1 3/4	14	400	975
38	…	…	…	…	…	…	…	…	…	…	…	…	…	…
40	…	…	…	…	…	…	…	…	…	…	…	…	…	…
42	…	…	…	…	…	…	…	…	…	…	…	…	…	…
44	…	…	Sizes NPS 38 through 60 are identical to Series A flanges in Class 400									…	…	…
46	…	…	…	…	…	…	…	…	…	…	…	…	…	…
48	…	…	…	…	…	…	…	…	…	…	…	…	…	…
50	…	…	…	…	…	…	…	…	…	…	…	…	…	…
52	…	…	…	…	…	…	…	…	…	…	…	…	…	…
54	…	…	…	…	…	…	…	…	…	…	…	…	…	…
56	…	…	…	…	…	…	…	…	…	…	…	…	…	…
58	…	…	…	…	…	…	…	…	…	…	…	…	…	…
60	…	…	…	…	…	…	…	…	…	…	…	…	…	…

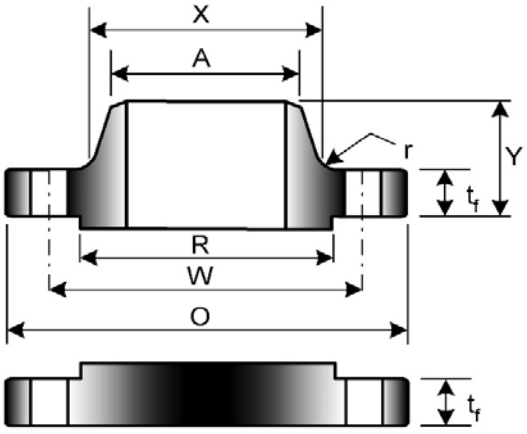
All dimensions are given in millimeters.

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Dimensions of Flanges to ASME B16.47 Series B

Class 600



Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	890	111.2	111.3	181	698	660.4	727	806.4	28	1 3/4	1 5/8	13	259	528
28	950	115.9	115.9	190	752	711.2	784	863.6	28	1 7/8	1 3/4	13	299	626
30	1020	125.5	127.0	205	806	762.0	841	927.1	28	2	1 7/8	13	331	748
32	1085	130.2	134.9	216	860	812.8	895	984.2	28	2 1/8	2	13	378	890
34	1160	141.3	144.2	233	914	863.6	953	1054.1	24	2 3/8	2 1/4	14	565	1180
36	1215	146.1	150.9	243	968	914.4	1010	1104.9	28	2 3/8	2 1/4	14	593	1323
38	…	…	…	…	…	…	…	…	…	…	…	…	…	…
40	…	…	…	…	…	…	…	…	…	…	…	…	…	…
42	…	…	…	…	…	…	…	…	…	…	…	…	…	…
44	…	…	Sizes NPS 38 through 60 are identical to Series A flanges in Class 600									…	…	…
46	…	…	…	…	…	…	…	…	…	…	…	…	…	…
48	…	…	…	…	…	…	…	…	…	…	…	…	…	…
50	…	…	…	…	…	…	…	…	…	…	…	…	…	…
52	…	…	…	…	…	…	…	…	…	…	…	…	…	…
54	…	…	…	…	…	…	…	…	…	…	…	…	…	…
56	…	…	…	…	…	…	…	…	…	…	…	…	…	…
58	…	…	…	…	…	…	…	…	…	…	…	…	…	…
60	…	…	…	…	…	…	…	…	…	…	…	…	…	…

All dimensions are given in millimeters.

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Trans Am

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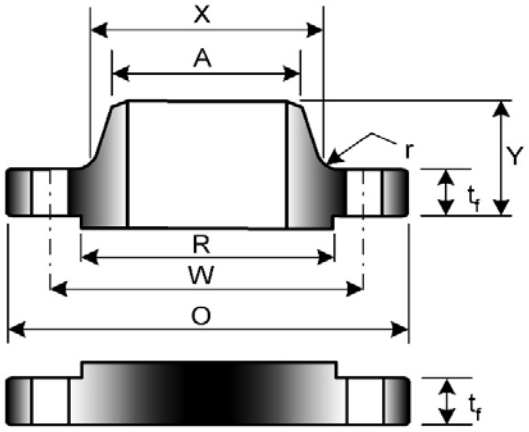
Class 900

Dimensions of Flanges to ASME B16.47 Series B



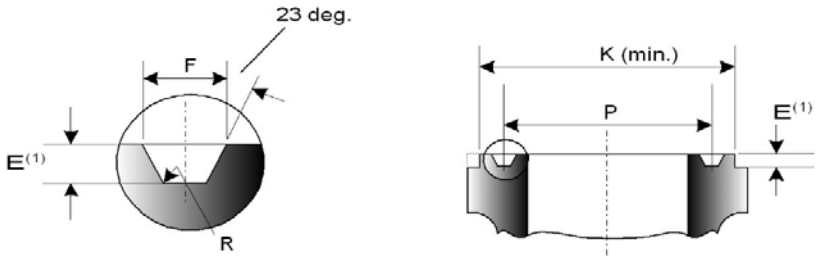
Nominal Pipe Size NPS	O.D. of Flange O	Thickness (1) W/N t_f (min)	Thickness (1) Blind t_f (min)	Length Through Hub (1) Y	Hub Dia. at Base X	Hub Dia. Welding End A	Diameter of Raised Face R	Drilling Diameter Bolt Circle W	Drilling Number of Bolt Holes	Drilling Diameter of Bolt Holes	Diameter of Bolts	Radius of Fillet r	Approximate Weight each/Kg W/N	Approximate Weight each/Kg Blind
26	1020	135.0	154.0	259	743	660.4	762	901.7	20	2 5/8	2 1/2	11	533	928
28	1105	147.7	166.7	276	797	711.2	819	971.6	20	2 7/8	2 3/4	13	673	1174
30	1180	155.6	176.1	289	851	762.0	876	1035.0	20	3 1/8	3	13	793	1408
32	1240	160.4	186.0	303	908	812.8	927	1092.2	20	3 1/8	3	13	833	1578
34	1315	171.5	195.0	319	962	863.6	991	1155.7	20	3 3/8	3 1/4	14	1094	1982
36	1345	173.1	201.7	325	1016	914.4	1029	1200.2	24	3 1/8	3	14	1070	2107
38	…	…	…	…	…	…	…	…	…	…	…	…	…	…
40	…	…	…	…	…	…	…	…	…	…	…	…	…	…
42	…	…	…	…	…	…	…	…	…	…	…	…	…	…
44	…	…	Sizes NPS 38 through 48 are identical to Series A flanges in Class 900									…	…	…
46	…	…	…	…	…	…	…	…	…	…	…	…	…	…
48	…	…	…	…	…	…	…	…	…	…	…	…	…	…
50	…	…	…	…	…	…	…	…	…	…	…	…	…	…
52	…	…	…	…	…	…	…	…	…	…	…	…	…	…
54	…	…	…	…	…	…	…	…	…	…	…	…	…	…
56	…	…	…	…	…	…	…	…	…	…	…	…	…	…
58	…	…	…	…	…	…	…	…	…	…	…	…	…	…
60	…	…	…	…	…	…	…	…	…	…	…	…	…	…

All dimensions are given in millimeters.

Notes:

(1) 7 mm RF not included in Flange Thickness (t_f) and Length Through Hub (Y).

Dimensions of Ring Joint Facings to ASME B16.47 Series A



Groove Number	Nominal Pipe Size NPS		Diameter of Raised Portion K	Groove Dimensions			
	Classes 3/4/600	Class 900		Pitch Diameter P	Groove Depth E (1)	Groove Width F	Radius at Bottom R
R93	26	…	810	749.30	12.70	19.84	1.5
R94	28	…	861	800.10	12.70	19.84	1.5
R95	30	…	917	857.25	12.70	19.84	1.5
R96	32	…	984	914.40	14.27	23.01	1.5
R97	34	…	1035	965.20	14.27	23.01	1.5
R98	36	…	1092	1022.35	14.27	23.01	1.5
R100	…	26	832	749.30	17.48	30.18	2.3
R101	…	28	889	800.10	17.48	33.32	2.3
R102	…	30	946	857.25	17.48	33.32	2.3
R103	…	32	1003	914.40	17.48	33.32	2.3
R104	…	34	1067	965.20	20.62	36.53	2.3
R105	…	36	1124	1022.35	20.62	36.53	2.3

All dimensions are given in millimeters.

Notes:

(1) Height of raised portion is equal to the Groove Depth, Dimension E, but is not subject to the tolerances for E.

Tolerances:

E (Groove Depth): + 0.4, -0.0

F (Groove Width): +/- 0.2

P (Pitch Diameter): +/- 0.13

R (Radius at Bottom): R </= 2: +0.8, -0.0; R > 2: +/- 0.8

23 deg. angle: +/- 1/2 deg.

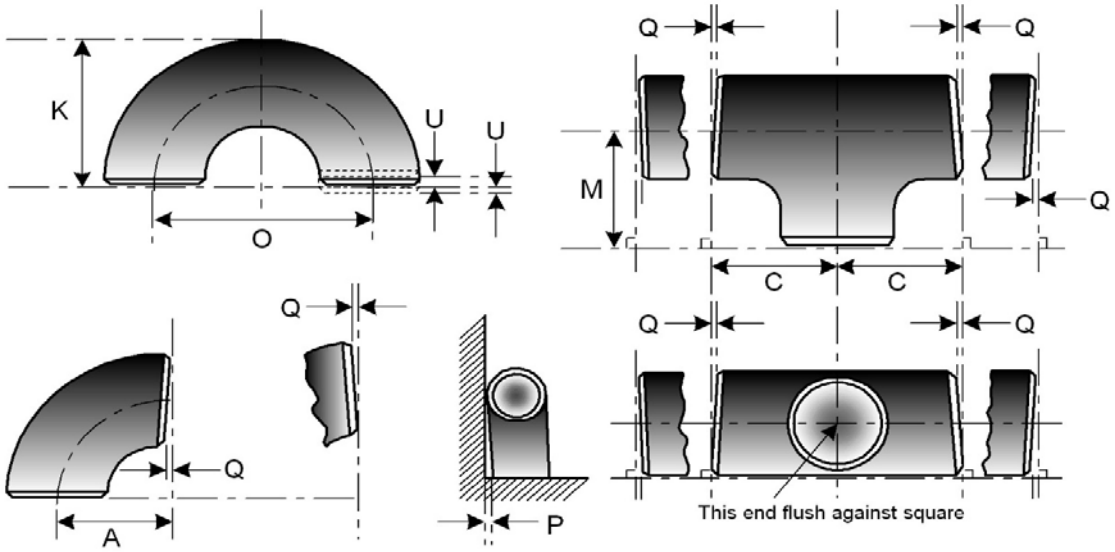
ASME B16.9 Buttwelding Fittings

ASME B16.9 covers overall dimensions and characteristics of factory-made wrought buttwelding fittings in sizes NPS 1/2 through NPS 48. The primary dimensional tables report values in metric units, while inch unit tables appear in Madatory Appendix 1.

The 2001 edition added the dimensions and tolerances for short radius elbows and return bends from ASME B16.28-1994. The 2003 edition dropped the alternate dimensions for NPS 3/4 long radius elbows, however, they remained for NPS 3/4 return bends until the 2007 edition. The 2007 edition also added requirements for segmental elbows and dimensions for 3D elbows.

The tolerances for buttwelding fittings are shown in the tables on page 34.

Tolerances of BW Fittings to ASME B16.9



These drawings are for illustration purposes. Please also refer to the drawings with each dimensional chart.

Nominal Pipe Size NPS	All Fittings			LR and SR Elbows and Tees	3D Elbows	180 Deg Return Bends			Reducers	Caps
	O.D. at Bevel (1), (2)	I.D. at End (1), (3), (4)	Wall Thickness (3)	Centre-to-End A,B,C,M	Centre-to-End A,B	Centre-to-Centre O	Back-to-Face K	Alignment of Ends U	Overall Length H	Overall Length E
1/2 to 21/2	+1.6 -0.8	0.8	Not less than 87.5% of nominal thickness	2	3	6	6	1	2	3
3 to 31/2	1.6	1.6		2	3	6	6	1	2	3
4	1.6	1.6		2	3	6	6	1	2	3
5 to 8	+2.4 -1.6	1.6		2	3	6	6	1	2	6
10 to 18	+4.0 -3.2	3.2		2	3	10	6	2	2	6
20 to 24	+6.4 -4.8	4.8		2	3	10	6	2	2	6
26 to 30	+6.4 -4.8	4.8		3	6	…	…	…	5	10
32 to 48	+6.4 -4.8	4.8		5	6	…	…	…	5	10

All dimensions are given in millimeters. Tolerances are equal plus and minus except as noted.

Notes:

(1) Out-of-round is the sum of absolute values of plus and minus tolerance.

(2) This tolerance may not apply in localized areas of formed fittings where increased wall thickness is required to meet design requirements of ASME B16.9.

(3) The inside diameter and the nominal wall thicknesses at ends are to be specified by the purchaser.

(4) Unless otherwise specified by the purchaser, these tolerances apply to the nominal inside diameter, which equals the difference between the nominal outside diameter and twice the nominal wall thickness.

Nominal Pipe Size NPS	Angularity Tolerances	
	Off Angle Q	Off Plane P
1/2 to 4	1	2
5 to 8	2	4
10 to 12	3	5
14 to 16	3	6
18 to 24	4	10
26 to 30	5	10
32 to 42	5	13
44 to 48	5	19

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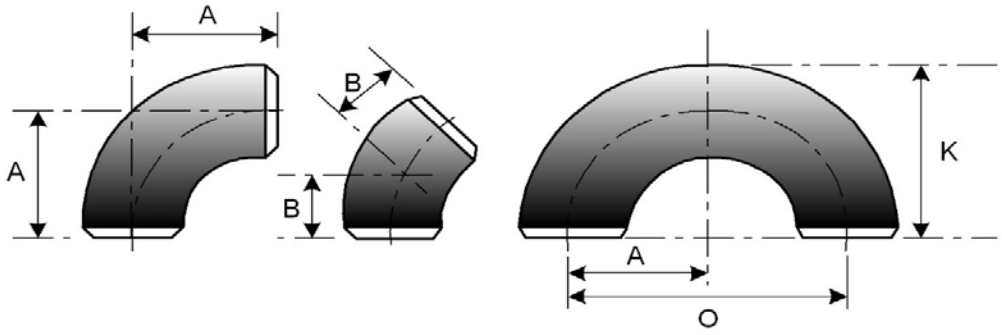
Dimensions of Elbows and Return Bends to ASME B16.9



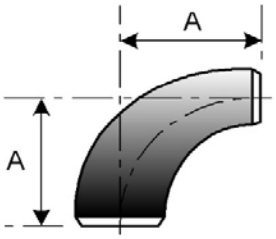
Nominal Pipe Size NPS	O.D. at Bevel	Centre-to-End					Centre-to-Centre		Back-to-Face	
		90 Deg Elbows			45 Deg Elbows		180 Deg Return Bends		180 Deg Return Bends	
		LR A	SR A	3D A	LR B	3D B	LR O (1)	SR O (1)	LR K	SR K
1/2	21.3	38	…	…	16	…	76	…	48	…
3/4	26.7	38	…	57	19	24	76	…	51	…
1	33.4	38	25	76	22	31	76	51	56	41
1 1/4	42.2	48	32	95	25	39	95	64	70	52
1 1/2	48.3	57	38	114	29	47	114	76	83	62
2	60.3	76	51	152	35	63	152	102	106	81
2 1/2	73.0	95	64	190	44	79	190	127	132	100
3	88.9	114	76	229	51	95	229	152	159	121
3 1/2	101.6	133	89	267	57	111	267	178	184	140
4	114.3	152	102	305	64	127	305	203	210	159
5	141.3	190	127	381	79	157	381	254	262	197
6	168.3	229	152	457	95	189	457	305	313	237
8	219.1	305	203	610	127	252	610	406	414	313
10	273.0	381	254	762	159	316	762	508	518	391
12	323.8	457	305	914	190	378	914	610	619	467
14	355.6	533	356	1067	222	441	1067	711	711	533
16	406.4	610	406	1219	254	505	1219	813	813	610
18	457.0	686	457	1372	286	568	1372	914	914	686
20	508.0	762	508	1524	318	632	1524	1016	1016	762
22	559.0	838	559	1676	343	694	1676	1118	1118	838
24	610.0	914	610	1829	381	757	1829	1219	1219	914
26	660.0	991	…	1981	406	821	…	…	…	…
28	711.0	1067	…	2134	438	883	…	…	…	…
30	762.0	1143	…	2286	470	964	…	…	…	…
32	813.0	1219	…	2438	502	1010	…	…	…	…
34	864.0	1295	…	2591	533	1073	…	…	…	…
36	914.0	1372	…	2743	565	1135	…	…	…	…
38	965.0	1448	…	2896	600	1200	…	…	…	…
40	1016.0	1524	…	3048	632	1264	…	…	…	…
42	1067.0	1600	…	3200	660	1326	…	…	…	…
44	1118.0	1676	…	3353	695	1389	…	…	…	…
46	1168.0	1753	…	3505	727	1453	…	…	…	…
48	1219.0	1829	…	3658	759	1516	…	…	…	…

All dimensions are given in millimeters.

Notes:

(1) Dimension "A" is equal to one half dimension "O".

Dimensions of Reducing Elbows to ASME B16.9

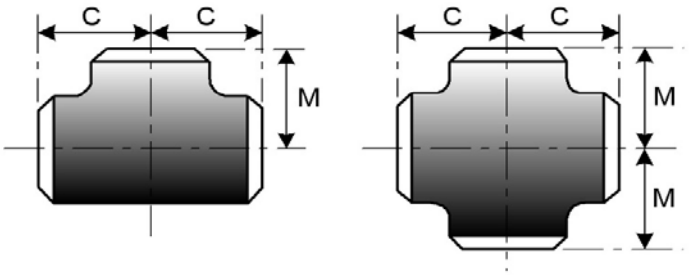


Nominal Pipe Size NPS	O.D. at Bevel		Centre to End A
	Large End	Small End	
2 x 11/2	60.3	48.3	76
2 x 11/4	60.3	42.2	76
2 x 1	60.3	33.4	76
21/2 x 2	73.0	60.3	95
21/2 x 11/2	73.0	48.3	95
21/2 x 11/4	73.0	42.2	95
3 x 21/2	88.9	73.0	114
3 x 2	88.9	60.3	114
3 x 11/2	88.9	48.3	114
31/2 x 3	101.6	88.9	133
31/2 x 21/2	101.6	73.0	133
31/2 x 2	101.6	60.3	133
4 x 31/2	114.3	101.6	152
4 x 3	114.3	88.9	152
4 x 21/2	114.3	73.0	152
4 x 2	114.3	60.3	152
5 x 4	141.3	114.3	190
5 x 31/2	141.3	101.6	190
5 x 3	141.3	88.9	190
5 x 21/2	141.3	73.0	190
6 x 5	168.3	141.3	229
6 x 4	168.3	114.3	229
6 x 31/2	168.3	101.6	229
6 x 3	168.3	88.9	229
8 x 6	219.1	168.3	305
8 x 5	219.1	141.3	305
8 x 4	219.1	114.3	305

Nominal Pipe Size NPS	O.D. at Bevel		Centre to End A
	Large End	Small End	
10 x 8	273.0	219.1	381
10 x 6	273.0	168.3	381
10 x 5	273.0	141.3	381
12 x 10	323.8	273.0	457
12 x 8	323.8	219.1	457
12 x 6	323.8	168.3	457
14 x 12	355.6	323.8	533
14 x 10	355.6	273.0	533
14 x 8	355.6	219.1	533
16 x 14	406.4	355.6	610
16 x 12	406.4	323.8	610
16 x 10	406.4	273.0	610
18 x 16	457.0	406.4	686
18 x 14	457.0	355.6	686
18 x 12	457.0	323.8	686
18 x 10	457.0	273.0	686
20 x 18	508.0	457.0	762
20 x 16	508.0	406.4	762
20 x 14	508.0	355.6	762
20 x 12	508.0	323.8	762
20 x 10	508.0	273.0	762
24 x 22	610.0	559.0	914
24 x 20	610.0	508.0	914
24 x 18	610.0	457.0	914
24 x 16	610.0	406.4	914
24 x 14	610.0	355.6	914
24 x 12	610.0	323.8	914

All dimensions are given in millimeters.

Dimensions of Straight Tees and Crosses to ASME B16.9



Nominal Pipe Size NPS	O.D. at Bevel	Centre-to-End	
		Run C	Outlet M (1) (2)
1/2	21.3	25	25
3/4	26.7	29	29
1	33.4	38	38
1 1/4	42.2	48	48
1 1/2	48.3	57	57
2	60.3	64	64
2 1/2	73.0	76	76
3	88.9	86	86
3 1/2	101.6	95	95
4	114.3	105	105
5	141.3	124	124
6	168.3	143	143
8	219.1	178	178
10	273.0	216	216
12	323.8	254	254
14	355.6	279	279
16	406.4	305	305
18	457.0	343	343
20	508.0	381	381
22	559.0	419	419
24	610.0	432	432
26	660.0	495	495
28	711.0	521	521
30	762.0	559	559
32	813.0	597	597
34	864.0	635	635
36	914.0	673	673
38	965.0	711	711
40	1016.0	749	749
42	1067.0	762	711
44	1118.0	813	762
46	1168.0	851	800
48	1219.0	889	838

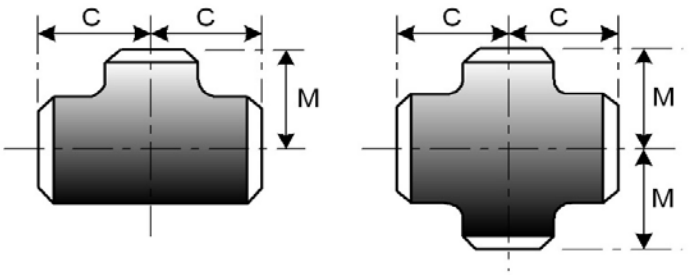
All dimensions are given in millimeters.

Notes:

(1) Outlet dimension "M" for NPS 26 and larger is recommended but not required.

(2) Dimensions are applicable to crosses NPS 24 and smaller.

Dimensions of Reducing Tees and Crosses to ASME B16.9



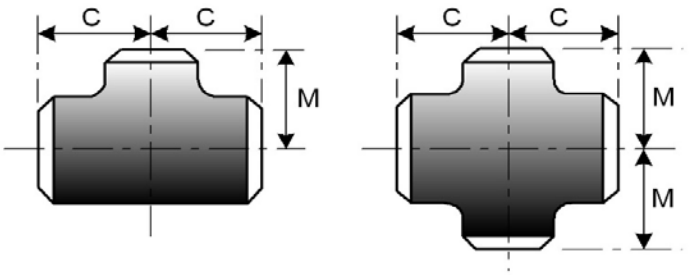
Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
1/2 x 1/2 x 3/8	21.3	17.3	25	25
1/2 x 1/2 x 1/4	21.3	13.7	25	25
3/4 x 3/4 x 1/2	26.7	21.3	29	29
3/4 x 3/4 x 3/8	26.7	17.3	29	29
1 x 1 x 3/4	33.4	26.7	38	38
1 x 1 x 1/2	33.4	21.3	38	38
11/4 x 11/4 x 1	42.2	33.4	48	48
11/4 x 11/4 x 3/4	42.2	26.7	48	48
11/4 x 11/4 x 1/2	42.2	21.3	48	48
11/2 x 11/2 x 11/4	48.3	42.2	57	57
11/2 x 11/2 x 1	48.3	33.4	57	57
11/2 x 11/2 x 3/4	48.3	26.7	57	57
11/2 x 11/2 x 1/2	48.3	21.3	57	57
2 x 2 x 11/2	60.3	48.3	64	60
2 x 2 x 11/4	60.3	42.2	64	57
2 x 2 x 1	60.3	33.4	64	51
2 x 2 x 3/4	60.3	26.7	64	44
21/2 x 21/2 x 2	73.0	60.3	76	70
21/2 x 21/2 x 11/2	73.0	48.3	76	67
21/2 x 21/2 x 11/4	73.0	42.2	76	64
21/2 x 21/2 x 1	73.0	33.4	76	57
3 x 3 x 21/2	88.9	73.0	86	83
3 x 3 x 2	88.9	60.3	86	76
3 x 3 x 11/2	88.9	48.3	86	73
3 x 3 x 11/4	88.9	42.2	86	70
31/2 x 31/2 x 3	101.6	88.9	95	92
31/2 x 31/2 x 21/2	101.6	73.0	95	89
31/2 x 31/2 x 2	101.6	60.3	95	83
31/2 x 31/2 x 11/2	101.6	48.3	95	79
4 x 4 x 31/2	114.3	101.6	105	102
4 x 4 x 3	114.3	88.9	105	98
4 x 4 x 21/2	114.3	73.0	105	95
4 x 4 x 2	114.3	60.3	105	89
4 x 4 x 11/2	114.3	48.3	105	86

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.

Dimensions of Reducing Tees and Crosses to ASME B16.9



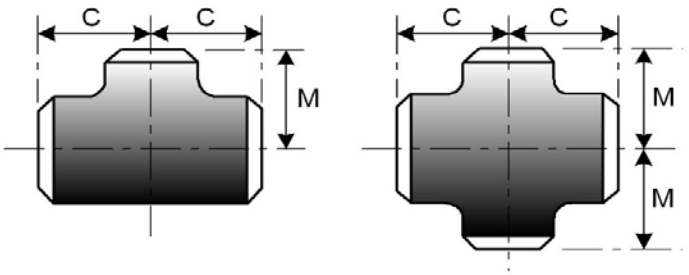
Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
5 x 5 x 4	141.3	114.3	124	117
5 x 5 x 31/2	141.3	101.6	124	114
5 x 5 x 3	141.3	88.9	124	111
5 x 5 x 21/2	141.3	73.0	124	108
5 x 5 x 2	141.3	60.3	124	105
6 x 6 x 5	168.3	141.3	143	137
6 x 6 x 4	168.3	114.3	143	130
6 x 6 x 31/2	168.3	101.6	143	127
6 x 6 x 3	168.3	88.9	143	124
6 x 6 x 21/2	168.3	73.0	143	121
8 x 8 x 6	219.1	168.3	178	168
8 x 8 x 5	219.1	141.3	178	162
8 x 8 x 4	219.1	114.3	178	156
8 x 8 x 31/2	219.1	101.6	178	152
10 x 10 x 8	273.0	219.1	216	203
10 x 10 x 6	273.0	168.3	216	194
10 x 10 x 5	273.0	141.3	216	191
10 x 10 x 4	273.0	114.3	216	184
12 x 12 x 10	323.8	273.0	254	241
12 x 12 x 8	323.8	219.1	254	229
12 x 12 x 6	323.8	168.3	254	219
12 x 12 x 5	323.8	141.3	254	216
14 x 14 x 12	355.6	323.8	279	270
14 x 14 x 10	355.6	273.0	279	257
14 x 14 x 8	355.6	219.1	279	248
14 x 14 x 6	355.6	168.3	279	238
16 x 16 x 14	406.4	355.6	305	305
16 x 16 x 12	406.4	323.8	305	295
16 x 16 x 10	406.4	273.0	305	283
16 x 16 x 8	406.4	219.1	305	273
16 x 16 x 6	406.4	168.3	305	264
18 x 18 x 16	457	406.4	343	330
18 x 18 x 14	457	355.6	343	330
18 x 18 x 12	457	323.8	343	321
18 x 18 x 10	457	273.0	343	308
18 x 18 x 8	457	219.1	343	298

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.

Dimensions of Reducing Tees and Crosses to ASME B16.9



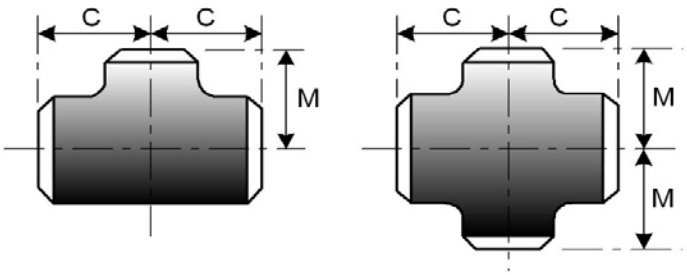
Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
20 x 20 x 18	508	457.0	381	368
20 x 20 x 16	508	406.4	381	356
20 x 20 x 14	508	355.6	381	356
20 x 20 x 12	508	323.8	381	346
20 x 20 x 10	508	273.0	381	333
20 x 20 x 8	508	219.1	381	324
22 x 22 x 20	559	508.0	419	406
22 x 22 x 18	559	457.0	419	394
22 x 22 x 16	559	406.4	419	381
22 x 22 x 14	559	355.6	419	381
22 x 22 x 12	559	323.8	419	371
22 x 22 x 10	559	273.0	419	359
24 x 24 x 22	610	559.0	432	432
24 x 24 x 20	610	508.0	432	432
24 x 24 x 18	610	457.0	432	419
24 x 24 x 16	610	406.4	432	406
24 x 24 x 14	610	355.6	432	406
24 x 24 x 12	610	323.8	432	397
24 x 24 x 10	610	273.0	432	384
26 x 26 x 24	660	610.0	495	483
26 x 26 x 22	660	559.0	495	470
26 x 26 x 20	660	508.0	495	457
26 x 26 x 18	660	457.0	495	444
26 x 26 x 16	660	406.4	495	432
26 x 26 x 14	660	355.6	495	432
26 x 26 x 12	660	323.8	495	422
28 x 28 x 26	711	660.0	521	521
28 x 28 x 24	711	610.0	521	508
28 x 28 x 22	711	559.0	521	495
28 x 28 x 20	711	508.0	521	483
28 x 28 x 18	711	457.0	521	470
28 x 28 x 16	711	406.4	521	457
28 x 28 x 14	711	355.6	521	457
28 x 28 x 12	711	323.8	521	448

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.

Dimensions of Reducing Tees and Crosses to ASME B16.9



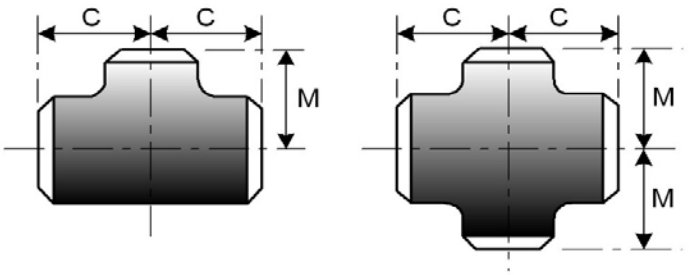
Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
30 x 30 x 28	762	711.0	559	546
30 x 30 x 26	762	660.0	559	546
30 x 30 x 24	762	610.0	559	533
30 x 30 x 22	762	559.0	559	521
30 x 30 x 20	762	508.0	559	508
30 x 30 x 18	762	457.0	559	495
30 x 30 x 16	762	406.4	559	483
30 x 30 x 14	762	355.6	559	483
30 x 30 x 12	762	323.8	559	473
30 x 30 x 10	762	273.0	559	460
32 x 32 x 30	813	762.0	597	584
32 x 32 x 28	813	711.0	597	572
32 x 32 x 26	813	660.0	597	572
32 x 32 x 24	813	610.0	597	559
32 x 32 x 22	813	559.0	597	546
32 x 32 x 20	813	508.0	597	533
32 x 32 x 18	813	457.0	597	521
32 x 32 x 16	813	406.4	597	508
32 x 32 x 14	813	355.6	597	508
34 x 34 x 32	864	813.0	635	622
34 x 34 x 30	864	762.0	635	610
34 x 34 x 28	864	711.0	635	597
34 x 34 x 26	864	660.0	635	597
34 x 34 x 24	864	610.0	635	584
34 x 34 x 22	864	559.0	635	572
34 x 34 x 20	864	508.0	635	559
34 x 34 x 18	864	457.0	635	546
34 x 34 x 16	864	406.4	635	533

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.

Dimensions of Reducing Tees and Crosses to ASME B16.9



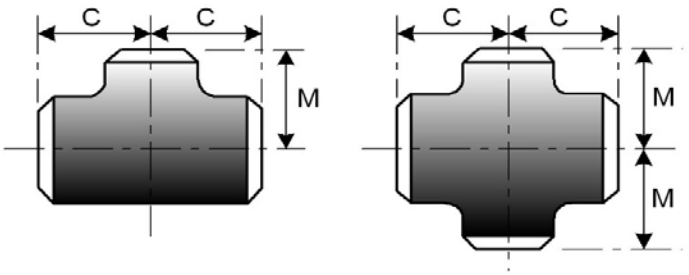
Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
36 x 36 x 34	914	864.0	673	660
36 x 36 x 32	914	813.0	673	648
36 x 36 x 30	914	762.0	673	635
36 x 36 x 28	914	711.0	673	622
36 x 36 x 26	914	660.0	673	622
36 x 36 x 24	914	610.0	673	610
36 x 36 x 22	914	559.0	673	597
36 x 36 x 20	914	508.0	673	584
36 x 36 x 18	914	457.0	673	572
36 x 36 x 16	914	406.4	673	559
38 x 38 x 36	965	914	711	711
38 x 38 x 34	965	864	711	698
38 x 38 x 32	965	813	711	686
38 x 38 x 30	965	762	711	673
38 x 38 x 28	965	711	711	648
38 x 38 x 26	965	660	711	648
38 x 38 x 24	965	610	711	635
38 x 38 x 22	965	559	711	622
38 x 38 x 20	965	508	711	610
38 x 38 x 18	965	457	711	597
40 x 40 x 38	1016	965	749	749
40 x 40 x 36	1016	914	749	737
40 x 40 x 34	1016	864	749	724
40 x 40 x 32	1016	813	749	711
40 x 40 x 30	1016	762	749	698
40 x 40 x 28	1016	711	749	673
40 x 40 x 26	1016	660	749	673
40 x 40 x 24	1016	610	749	660
40 x 40 x 22	1016	559	749	648
40 x 40 x 20	1016	508	749	635
40 x 40 x 18	1016	457	749	622

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.

Dimensions of Reducing Tees and Crosses to ASME B16.9



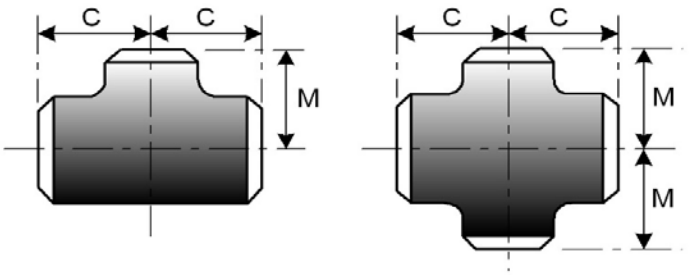
Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
42 x 42 x 40	1067	1016.0	762	711
42 x 42 x 38	1067	965.0	762	711
42 x 42 x 36	1067	914.0	762	711
42 x 42 x 34	1067	864.0	762	711
42 x 42 x 32	1067	813.0	762	711
42 x 42 x 30	1067	762.0	762	711
42 x 42 x 28	1067	711.0	762	698
42 x 42 x 26	1067	660.0	762	698
42 x 42 x 24	1067	610.0	762	660
42 x 42 x 22	1067	559.0	762	660
42 x 42 x 20	1067	508.0	762	660
42 x 42 x 18	1067	457.0	762	648
42 x 42 x 16	1067	406.4	762	635
44 x 44 x 42	1118	1067	813	762
44 x 44 x 40	1118	1016	813	749
44 x 44 x 38	1118	965	813	737
44 x 44 x 36	1118	914	813	724
44 x 44 x 34	1118	864	813	724
44 x 44 x 32	1118	813	813	711
44 x 44 x 30	1118	762	813	711
44 x 44 x 28	1118	711	813	698
44 x 44 x 26	1118	660	813	698
44 x 44 x 24	1118	610	813	698
44 x 44 x 22	1118	559	813	686
44 x 44 x 20	1118	508	813	686

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.

Dimensions of Reducing Tees and Crosses to ASME B16.9

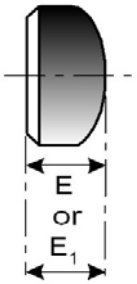


Nominal Pipe Size NPS	O.D. at Bevel		Centre-to-End	
	Run	Outlet	Run C	Outlet M (1)
46 x 46 x 44	1168	1118	851	800
46 x 46 x 42	1168	1067	851	787
46 x 46 x 40	1168	1016	851	775
46 x 46 x 38	1168	965	851	762
46 x 46 x 36	1168	914	851	762
46 x 46 x 34	1168	864	851	749
46 x 46 x 32	1168	813	851	749
46 x 46 x 30	1168	762	851	737
46 x 46 x 28	1168	711	851	737
46 x 46 x 26	1168	660	851	737
46 x 46 x 24	1168	610	851	724
46 x 46 x 22	1168	559	851	724
48 x 48 x 46	1219	1168	889	838
48 x 48 x 44	1219	1118	889	838
48 x 48 x 42	1219	1067	889	813
48 x 48 x 40	1219	1016	889	813
48 x 48 x 38	1219	965	889	813
48 x 48 x 36	1219	914	889	787
48 x 48 x 34	1219	864	889	787
48 x 48 x 32	1219	813	889	787
48 x 48 x 30	1219	762	889	762
48 x 48 x 28	1219	711	889	762
48 x 48 x 26	1219	660	889	762
48 x 48 x 24	1219	610	889	737
48 x 48 x 22	1219	559	889	737

All dimensions are given in millimeters.

Note:

(1) Outlet dimension M for run sizes NPS 14 and larger is recommended but not required.



Nominal Pipe Size NPS	O.D. at Bevel	Length E (1)	Limiting WT for Length E	Length E_1 (2)
1/2	21.3	25	4.57	25
3/4	26.7	25	3.81	25
1	33.4	38	4.57	38
1 1/4	42.2	38	4.83	38
1 1/2	48.3	38	5.08	38
2	60.3	38	5.59	44
2 1/2	73.0	38	7.11	51
3	88.9	51	7.62	64
3 1/2	101.6	64	8.13	76
4	114.3	64	8.64	76
5	141.3	76	9.65	89
6	168.3	89	10.92	102
8	219.1	102	12.70	127
10	273.0	127	12.70	152
12	323.8	152	12.70	178
14	355.6	165	12.70	191
16	406.4	178	12.70	203
18	457.0	203	12.70	229
20	508.0	229	12.70	254
22	559.0	254	12.70	254
24	610.0	267	12.70	305
26	660.0	267	…	…
28	711.0	267	…	…
30	762.0	267	…	…
32	813.0	267	…	…
34	864.0	267	…	…
36	914.0	267	…	…
38	965.0	305	…	…
40	1016.0	305	…	…
42	1067.0	305	…	…
44	1118.0	343	…	…
46	1168.0	343	…	…
48	1219.0	343	…	…

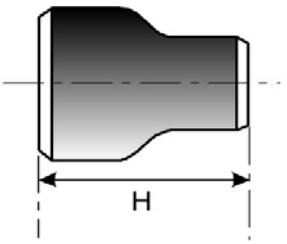
All dimensions are given in millimeters.

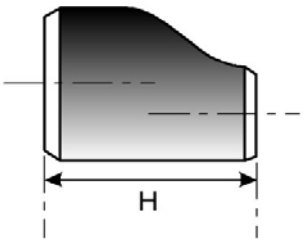
Notes:

(1) Length "E" applies for thickness not exceeding that given in column "Limiting WT for Length E".

(2) Length "E_1" applies for thickness greater than that given in column "Limiting WT" for NPS 24 and smaller. For NPS 26 and larger, length "E_1" shall be by agreement between the manufacturer and purchaser.

Dimensions of Reducers to ASME B16.9





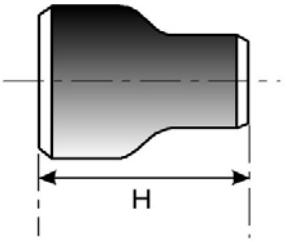
Nominal Pipe Size NPS	O.D. at Bevel		End to End H
	Large End	Small End	
3/4 x 1/2	26.7	21.3	38
3/4 x 3/8	26.7	17.3	38
1 x 3/4	33.4	26.7	51
1 x 1/2	33.4	21.3	51
11/4 x 1	42.2	33.4	51
11/4 x 3/4	42.2	26.7	51
11/4 x 1/2	42.2	21.3	51
11/2 x 11/4	48.3	42.2	64
11/2 x 1	48.3	33.4	64
11/2 x 3/4	48.3	26.7	64
11/2 x 1/2	48.3	21.3	64
2 x 11/2	60.3	48.3	76
2 x 11/4	60.3	42.2	76
2 x 1	60.3	33.4	76
2 x 3/4	60.3	26.7	76
21/2 x 2	73.0	60.3	89
21/2 x 11/2	73.0	48.3	89
21/2 x 11/4	73.0	42.2	89
21/2 x 1	73.0	33.4	89
3 x 21/2	88.9	73.0	89
3 x 2	88.9	60.3	89
3 x 11/2	88.9	48.3	89
3 x 11/4	88.9	42.2	89
31/2 x 3	101.6	88.9	102
31/2 x 21/2	101.6	73.0	102
31/2 x 2	101.6	60.3	102
31/2 x 11/2	101.6	48.3	102
31/2 x 11/4	101.6	42.2	102
4 x 31/2	114.3	101.6	102
4 x 3	114.3	88.9	102
4 x 21/2	114.3	73.0	102
4 x 2	114.3	60.3	102
4 x 11/2	114.3	48.3	102

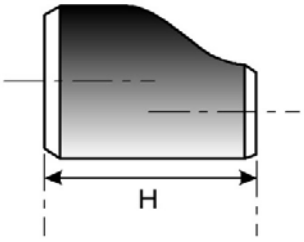
All dimensions are given in millimeters.

Nominal Pipe Size NPS	O.D. at Bevel		End to End H
	Large End	Small End	
5 x 4	141.3	114.3	127
5 x 31/2	141.3	101.6	127
5 x 3	141.3	88.9	127
5 x 21/2	141.3	73.0	127
5 x 2	141.3	60.3	127
6 x 5	168.3	141.3	140
6 x 4	168.3	114.3	140
6 x 31/2	168.3	101.6	140
6 x 3	168.3	88.9	140
6 x 21/2	168.3	73.0	140
8 x 6	219.1	168.3	152
8 x 5	219.1	141.3	152
8 x 4	219.1	114.3	152
8 x 31/2	219.1	101.6	152
10 x 8	273.0	219.1	178
10 x 6	273.0	168.3	178
10 x 5	273.0	141.3	178
10 x 4	273.0	114.3	178
12 x 10	323.8	273.0	203
12 x 8	323.8	219.1	203
12 x 6	323.8	168.3	203
12 x 5	323.8	141.3	203
14 x 12	355.6	323.8	330
14 x 10	355.6	273.0	330
14 x 8	355.6	219.1	330
14 x 6	355.6	168.3	330
16 x 14	406.4	355.6	356
16 x 12	406.4	323.8	356
16 x 10	406.4	273.0	356
16 x 8	406.4	219.1	356
18 x 16	457	406.4	381
18 x 14	457	355.6	381
18 x 12	457	323.8	381
18 x 10	457	273.0	381

While the illustration shows "bell shaped" reducers, the use of conical reducers is not prohibited.

Dimensions of Reducers to ASME B16.9





Nominal Pipe Size NPS	O.D. at Bevel Large End	O.D. at Bevel Small End	End to End H
20 x 18	508	457.0	508
20 x 16	508	406.4	508
20 x 14	508	355.6	508
20 x 12	508	323.8	508
22 x 20	559	508.0	508
22 x 18	559	457.0	508
22 x 16	559	406.4	508
22 x 14	559	355.4	508
24 x 22	610	559.0	508
24 x 20	610	508.0	508
24 x 18	610	457.0	508
24 x 16	610	406.4	508
26 x 24	660	610	610
26 x 22	660	559	610
26 x 20	660	508	610
26 x 18	660	457	610
28 x 26	711	660	610
28 x 24	711	610	610
28 x 20	711	508	610
28 x 18	711	457	610
30 x 28	762	711	610
30 x 26	762	660	610
30 x 24	762	610	610
30 x 20	762	508	610
32 x 30	813	762	610
32 x 28	813	711	610
32 x 26	813	660	610
32 x 24	813	610	610
34 x 32	864	813	610
34 x 30	864	762	610
34 x 26	864	660	610
34 x 24	864	610	610

While the illustration shows "bell shaped" reducers, the use of conical reducers is not prohibited.

Nominal Pipe Size NPS	O.D. at Bevel Large End	O.D. at Bevel Small End	End to End H
36 x 34	914	864	610
36 x 32	914	813	610
36 x 30	914	762	610
36 x 26	914	660	610
36 x 24	914	610	610
38 x 36	965	914	610
38 x 34	965	864	610
38 x 32	965	813	610
38 x 30	965	762	610
38 x 28	965	711	610
38 x 26	965	660	610
40 x 38	1016	965	610
40 x 36	1016	914	610
40 x 34	1016	864	610
40 x 32	1016	813	610
40 x 30	1016	762	610
42 x 40	1067	1016	610
42 x 38	1067	965	610
42 x 36	1067	914	610
42 x 34	1067	864	610
42 x 32	1067	813	610
42 x 30	1067	762	610
44 x 42	1118	1067	610
44 x 40	1118	1016	610
44 x 38	1118	965	610
44 x 36	1118	914	610
46 x 44	1168	1118	711
46 x 42	1168	1067	711
46 x 40	1168	1016	711
46 x 38	1168	965	711
48 x 46	1219	1168	711
48 x 44	1219	1118	711
48 x 42	1219	1067	711
48 x 40	1219	1016	711

All dimensions are given in millimeters.

ASME B16.11 Forged Fittings

ASME B16.11 covers the requirements for forged socket-welding fittings, NPS 1/8 through 4 in Class 3000, NPS 1/8 through 2 in Classes 6000 and 9000; and forged threaded fittings NPS 1/8 through 4 in Classes 2000, 3000 and 6000. Included are 90^0 and 45^0 elbows, tees, crosses, full and half couplings, caps, plugs and bushings. Street elbows are covered in Classes 3000 and 6000 only, NPS 1/8 through 2. ASME B16.11 does not include unions, which are covered by MSS SP-83 (see pages 54-56).

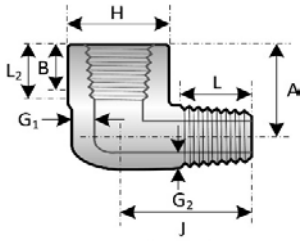
Tolerances

In addition to the tolerances shown in the tables, the following applies:

Concentricity of Bores: the socket and fitting bores shall be concentric within a tolerance of 0.8 mm for all sizes. Opposite socket bores shall be concentric within a tolerance of 1.5 mm for all sizes.

Coincidence of Axes: the maximum allowable variation in the alignment of the fitting bore and socket bore axes shall be 1 mm in 200 mm. The maximum allowable variation in alignment of threads shall be 1 mm in 200 mm.

Dimensions of Forged Threaded Fittings- ASME B16.11



Street Elbow

Nominal Pipe Size	Centre-to-End				Outside Diameter of Band		Minimum Wall Thickness		Minimum Wall Thickness		Minimum Length Internal Thread [4]		Minimum Thread Length
	Female End A[1]		Male End J		H[2]		G_1		G_2[3]				
NPS	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	B	L_2	L
1/8	19	22	25	32	19	25	3.18	5.08	2.74	4.22	6.4	6.7	10
1/4	22	25	32	38	25	32	3.30	5.66	3.22	5.28	8.1	10.2	11
3/8	25	28	38	41	32	38	3.51	6.98	3.50	5.59	9.1	10.4	13
1/2	28	35	41	48	38	44	4.09	8.15	4.16	6.53	10.9	13.6	14
3/4	35	44	48	57	44	51	4.32	8.53	4.88	6.86	12.7	13.9	16
1	44	51	57	66	51	62	4.98	9.93	5.56	7.95	14.7	17.3	19
1 1/4	51	54	66	71	62	70	5.28	10.59	5.56	8.48	17.0	18.0	21
1 1/2	54	64	71	84	70	84	5.56	11.07	6.25	8.89	17.8	18.4	21
2	64	83	84	105	84	102	7.14	12.09	7.64	9.70	19.0	19.2	22

All dimensions are given in millimeters.

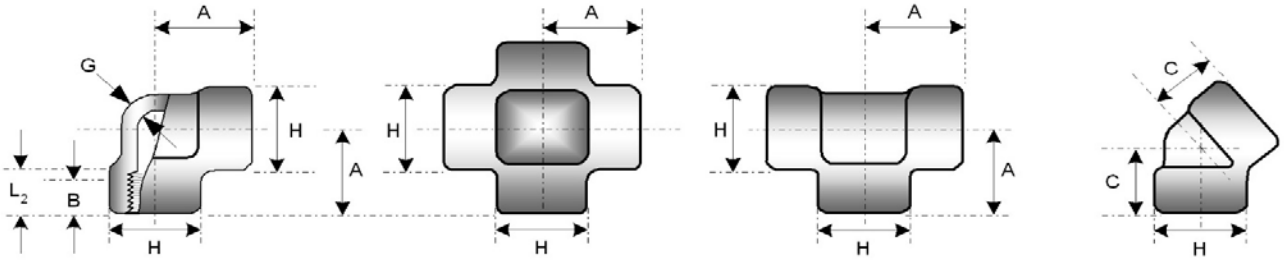
Notes:

(1) Dimension A of the table on Page 49 for the appropriate fitting size may also be used at the option of the manufacturer.

(2) Dimension H of the table on Page 49 for the appropriate fitting size may also be used at the option of the manufacturer.

(3) Wall thickness before threading.

(4) Dimension B is the minimum length of perfect thread. The length of ueful thread (B plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1)



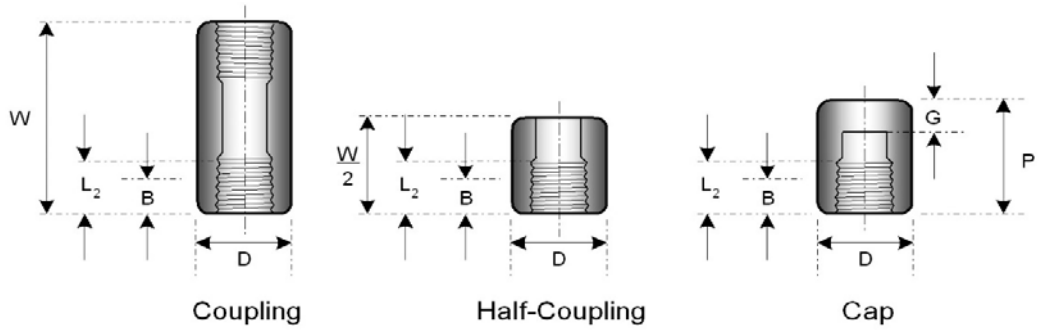
Nominal Pipe Size	Centre-to-End						Outside Diameter of Band- H			Minimum Wall Thickness- G			Minimum Thread Length (1)	
	90 Deg Elbows, Tees, and Crosses- A			45 Deg Elbows- C										
NPS	2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L_2
1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
1/4	21	25	28	17	19	22	22	25	33	3.18	3.30	6.60	8.1	10.2
3/8	25	28	33	19	22	25	25	33	38	3.18	3.51	6.98	9.1	10.4
1/2	28	33	38	22	25	28	33	38	46	3.18	4.09	8.15	10.9	13.6
3/4	33	38	44	25	28	33	38	46	56	3.18	4.32	8.53	12.7	13.9
1	38	44	51	28	33	35	46	56	62	3.68	4.98	9.93	14.7	17.3
1 1/4	44	51	60	33	35	43	56	62	75	3.89	5.28	10.59	17.0	18.0
1 1/2	51	60	64	35	43	44	62	75	84	4.01	5.56	11.07	17.8	18.4
2	60	64	83	43	44	52	75	84	102	4.27	7.14	12.09	19.0	19.2
2 1/2	76	83	95	52	52	64	92	102	121	5.61	7.65	15.29	23.6	28.9
3	86	95	106	64	64	79	109	121	146	5.99	8.84	16.64	25.9	30.5
4	106	114	114	79	79	79	146	152	152	6.55	11.18	18.67	27.7	33.0

All dimensions are given in millimeters.

Notes:

(1) Dimension B is the minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by American National Standard for Pipe threads (ASME B1.20.1).

Dimensions of Forged Threaded Fittings- ASME B16.11



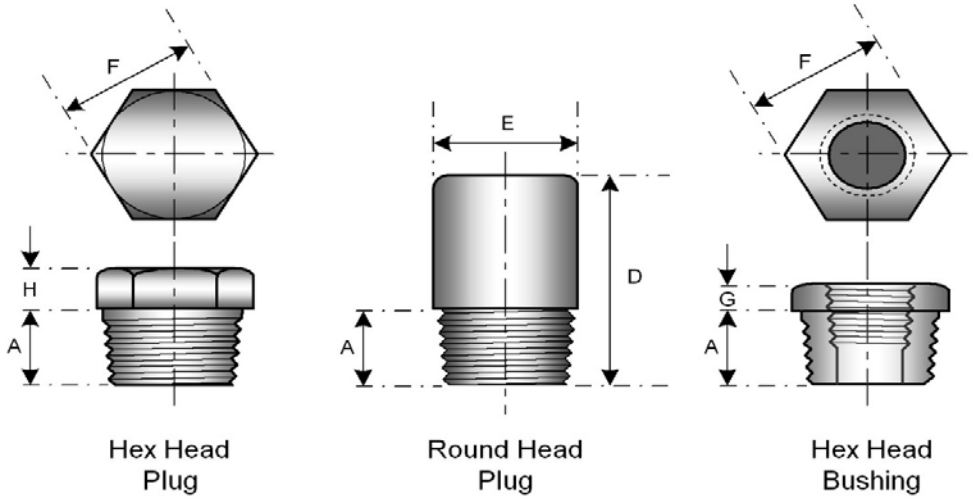
Coupling Half-Coupling Cap

Nominal Pipe Size	End-to-End			Outside Diameter		End Wall Thickness (min)		Minimum Thread Length (1)	
	Couplings W	Caps P		D		G			
NPS	3000 and 6000	3000	6000	3000	6000	3000	6000	B	L_2
1/8	32	19	…	16	22	4.8	…	6.4	6.7
1/4	35	25	27	19	25	4.8	6.4	8.1	10.2
3/8	38	25	27	22	32	4.8	6.4	9.1	10.4
1/2	48	32	33	28	38	6.4	7.9	10.9	13.6
3/4	51	37	38	35	44	6.4	7.9	12.7	13.9
1	60	41	43	44	57	9.7	11.2	14.7	17.3
1 1/4	67	44	46	57	64	9.7	11.2	17.0	18.0
1 1/2	79	44	48	64	76	11.2	12.7	17.8	18.4
2	86	48	51	76	92	12.7	15.7	19.0	19.2
2 1/2	92	60	64	92	108	15.7	19.0	23.6	28.9
3	108	65	68	108	127	19.0	22.4	25.9	30.5
4	121	68	75	140	159	22.4	28.4	27.7	33.0

All dimensions are given in millimeters.

Notes:

(1) Dimension B is the minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L_2 (effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1).



Hex Head Plug | Round Head Plug | Hex Head Bushing

Nominal Pipe Size NPS	Length (Minimum) A	Hex Plugs and Bushings [1]			Round Head Plugs	
		Width of Flats (Nominal) [2] F	Hex Head Height (Min.)		Head Diameter (Nominal) E	Overall Length (Min.) D
			Bushing G	Plug H		
1/8	10	11.11	…	6	10	35
1/4	11	15.88	3	6	14	41
3/8	13	17.46	4	8	18	41
1/2	14	22.23	5	8	21	44
3/4	16	26.99	6	10	27	44
1	19	34.93	6	10	33	51
1 1/4	21	44.45	7	14	43	51
1 1/2	21	50.80	8	16	48	51
2	22	63.50	9	18	60	64
2 1/2	27	76.20	10	19	73	70
3	28	88.90	10	21	89	70
4	32	117.48	13	25	114	76

All dimensions are given in millimeters.

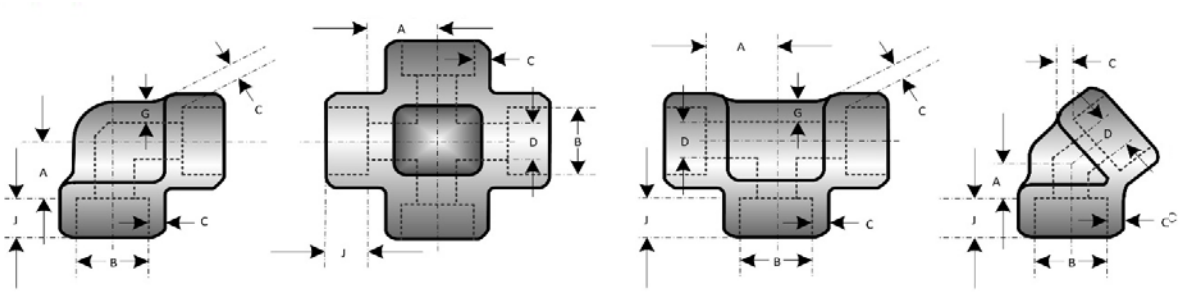
Notes:

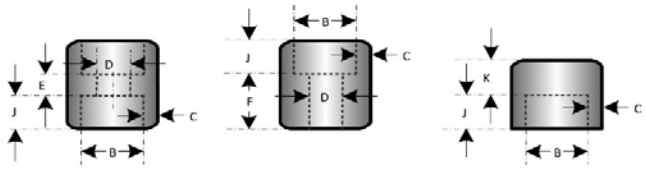
(1) ASME B16.11 provides the following cautionary note:

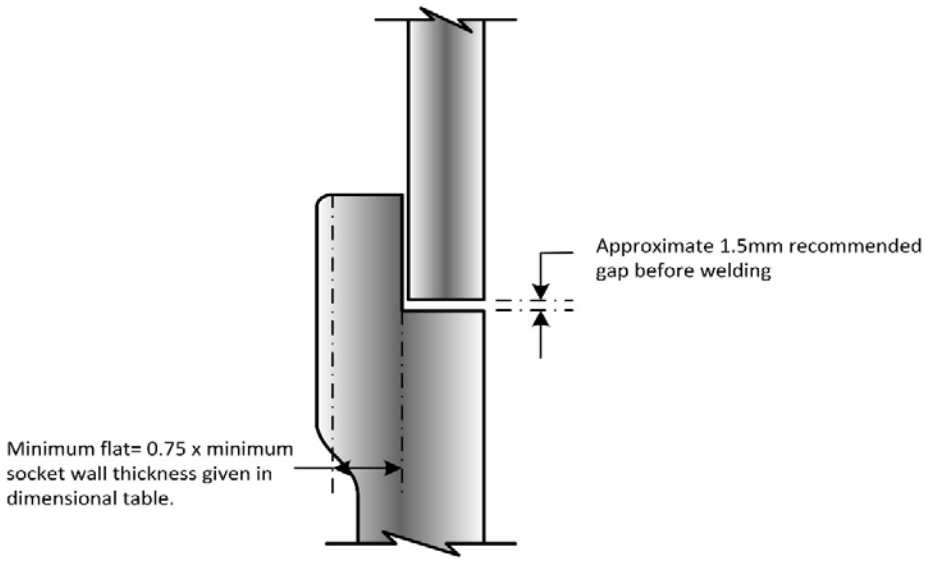
Hex Bushings of one-size reduction should not be used in services wherein they might be subject to harmful loads and forces other than internal pressures.

(2) Manufacturer's applied toleranceshall ensure dimension will fir U.S. Customary tooling.

Dimensions of Forged Socket-Welding Fittings to ASME B16.11







Welding Gap and Minimum Flat Dimensions for Socket-Welding Fittings

Dimensions of Forged Socket-Welding Fittings to ASME B16.11

Nominal Pipe Size NPS	Diameter of Socket B (1)	Depth of Socket (min) J	Socket Wall Thickness- C (2)						Body Wall Thickness- G			Diameter of Bore D(1)		
			3000		6000		9000		3000	6000	9000			
			Ave.	Min.	Ave.	Min.	Ave.	Min	Min.	Min.	Min.	3000	6000	9000
1/8	11.2 10.8	9.5	3.18	3.18	3.96	3.43	…	…	2.41	3.15	…	7.6 6.1	4.8 3.2	… …
1/4	14.6 14.2	9.5	3.78	3.30	4.60	4.01	…	…	3.02	3.68	…	10.0 8.5	7.1 5.6	… …
3/8	18.0 17.6	9.5	4.01	3.50	5.03	4.37	…	…	3.20	4.01	…	13.3 11.8	9.9 8.4	… …
1/2	22.2 21.8	9.5	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47	16.6 15.0	12.5 11.0	7.2 5.6
3/4	27.6 27.2	12.5	4.90	4.27	6.96	6.04	9.78	8.56	3.91	5.56	7.82	21.7 20.2	16.3 14.8	11.8 10.3
1	34.3 33.9	12.5	5.69	4.98	7.92	6.93	11.38	9.96	4.55	6.35	9.09	27.4 25.9	21.5 19.9	16.0 14.4
1 1/4	43.1 42.7	12.5	6.07	5.28	7.92	6.93	12.14	10.62	4.85	6.35	9.70	35.8 34.3	30.2 28.7	23.5 22.0
1 1/2	49.2 48.8	12.5	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15	41.6 40.1	34.7 33.2	28.7 27.2
2	61.7 61.2	16.0	6.96	6.04	10.92	9.50	13.84	12.12	5.54	8.74	11.07	53.3 51.7	43.6 42.1	38.9 37.4
2 1/2	74.4 73.9	16.0	8.76	7.67	…	…	…	…	7.01	…	…	64.2 61.2	… …	… …
3	90.3 89.8	16.0	9.52	8.30	…	…	…	…	7.62	…	…	79.4 76.4	… …	… …
4	115.7 115.2	19.0	10.69	9.35	…	…	…	…	8.56	…	…	103.8 100.7	… …	… …

Nominal Pipe Size NPS	Centre-to-Bottom of Socket A						Laying Lengths E, F		End Wall Thickness Caps (min) K			Tolerances +/-		
	90 Deg Elbows, Tees, and Crosses			45 Deg Elbows			Couplings	Half Couplings						
	3000	6000	9000	3000	6000	9000	E	F	3000	6000	9000	A	E	F
1/8	11.0	11.0	…	8.0	8.0	…	6.5	16.0	4.8	6.4	…	1.0	1.5	1.0
1/4	11.0	13.5	…	8.0	8.0	…	6.5	16.0	4.8	6.4	…	1.0	1.5	1.0
3/8	13.5	15.5	…	8.0	11.0	…	6.5	17.5	4.8	6.4	…	1.5	3.0	1.5
1/2	15.5	19.0	25.5	11.0	12.5	15.5	9.5	22.5	6.4	7.9	11.2	1.5	3.0	1.5
3/4	19.0	22.5	28.5	13.0	14.0	19.0	9.5	24.0	6.4	7.9	12.7	1.5	3.0	1.5
1	22.5	27.0	32.0	14.0	17.5	20.5	12.5	28.5	9.6	11.2	14.2	2.0	4.0	2.0
1 1/4	27.0	32.0	35.0	17.5	20.5	22.5	12.5	30.0	9.6	11.2	14.2	2.0	4.0	2.0
1 1/2	32.0	38.0	38.0	20.5	25.5	25.5	12.5	32.0	11.2	12.7	15.7	2.0	4.0	2.0
2	38.0	41.0	54.0	25.5	28.5	28.5	19.0	41.0	12.7	15.7	19.0	2.0	4.0	2.0
2 1/2	41.0	…	…	28.5	…	…	19.0	43.0	15.7	19.0	…	2.5	5.0	2.5
3	57.0	…	…	32.0	…	…	19.0	44.5	19.0	22.4	…	2.5	5.0	2.5
4	66.5	…	…	41.0	…	…	19.0	48.0	22.4	28.4	…	2.5	5.0	2.5

All dimensions are given in millimeters.

Notes:

(1) Upper and lower values for each size are the respective maximum and minimum dimensions.

(2) Average of Socket Wall Thickness around periphery shall be no less than the listed values. The minimum values are permitted in localized areas.

The Manufacturers Standardization Society Standard Practice 83 covers the requirements for forged pipe unions, socket-welding and threaded ends. The 2014 edition added the requirements and dimensions for Class 6000 unions, which were not previously included. Class 3000 threaded and socket-welding and Class 6000 threaded unions are covered in NPS 1/8 through 3 while Class 6000 socket-welding unions are covered in NPS 1/8 through 2-1/2.

MSS SP-83 dimensional and technical data is not published in metric units. All values in this section have been converted from U.S. customary units, and are for reference only.

MSS SP-83 advises that union parts from different manufacturers are not functionally interchangeable and does not recommend the combining of parts from different manufacturers.

Tolerances

In addition to the tolerances shown in the tables, the following applies:

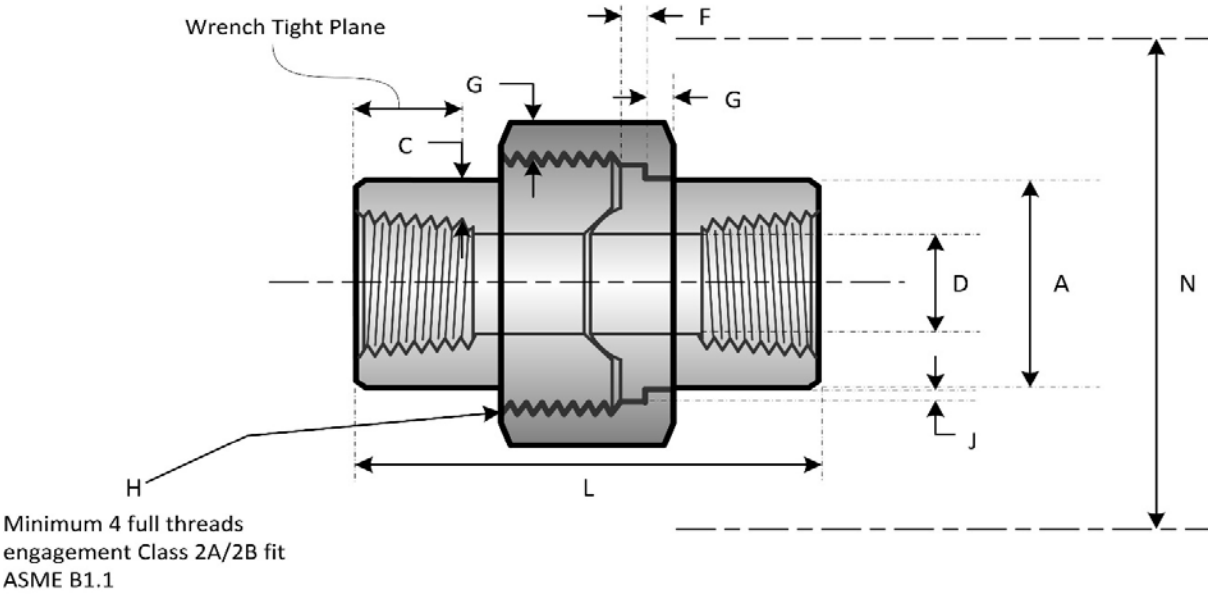
Concentricity of Bores: the socket shall be concentric with the waterway bore within a tolerance of +/- 0.8 mm for all sizes.

Coincidence of Axes: the maximum allowable variation in the alignment of one threaded pipe end of the assembled union to the axis of the opposite threaded pipe end shall not exceed 5 mm in 305 mm.

Recommended Nut Tightening Torque

NPS	N*m (min)
1/8	115
1/4	115
3/8	136
1/2	136
3/4	163
1	163
1 1/4	176
1 1/2	176
2	176
2 1/2	203
3	203

Dimensions of Class 3000 Threaded Unions- MSS SP-83



Nominal Pipe Size NPS	Pipe End Min. A	Wall Thickness Min. C	Waterway Bore Max/Min (1) D	Male Flange Min. F	Nut Thickness Min. G	Threads Per 25 mm H	Bearing Surface Min. J	Assem. Length Nominal L	Clear Assem. Nut N
1/8	14.7	2.41	8.43 6.43	3.18	3.18	16	1.24	41.4	50.8
1/4	19.1	3.02	11.13 9.45	3.18	3.18	16	1.24	41.4	50.8
3/8	22.9	3.20	14.27 13.51	3.43	3.43	14	1.37	46.0	55.9
1/2	27.7	3.73	17.86 17.07	3.68	3.68	14	1.50	49.0	58.4
3/4	33.5	3.91	23.01 21.39	4.06	4.06	11	1.68	56.9	66.0
1	41.4	4.55	28.98 27.74	4.57	4.45	11	1.85	62.0	78.7
1 1/4	50.5	4.85	37.69 35.36	5.33	5.21	10	2.13	71.1	94.0
1 1/2	57.2	5.08	43.54 41.20	5.84	5.59	10	2.31	76.5	111.8
2	70.1	5.54	55.58 52.12	6.60	6.35	10	2.69	86.1	132.1
2 1/2	85.3	7.01	66.27 64.31	7.49	7.11	8	3.07	102.4	149.9
3	102.4	7.62	82.55 77.27	8.26	8.00	8	3.53	109.0	175.3

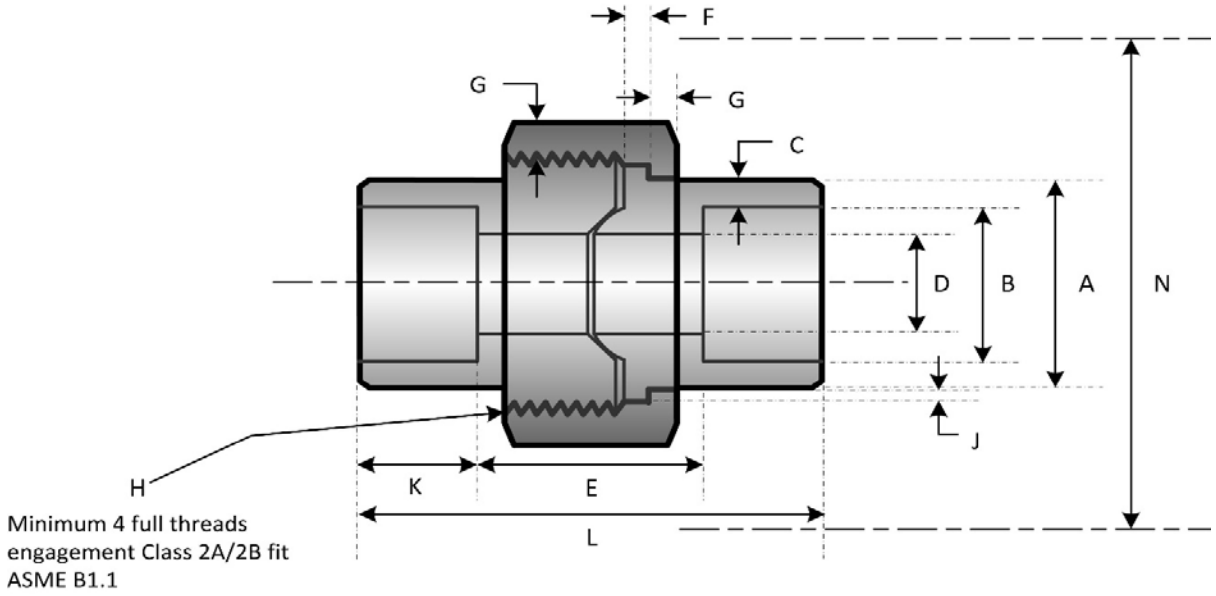
All dimensions are given in millimeters.

Threaded ends per ASME B1.20.1

Notes:

(1) The contact diameter of the male/female tailpiece is affected by the waterway bore (D).

Dimensions of Class 3000 Socket Weld Unions- MSS SP-83



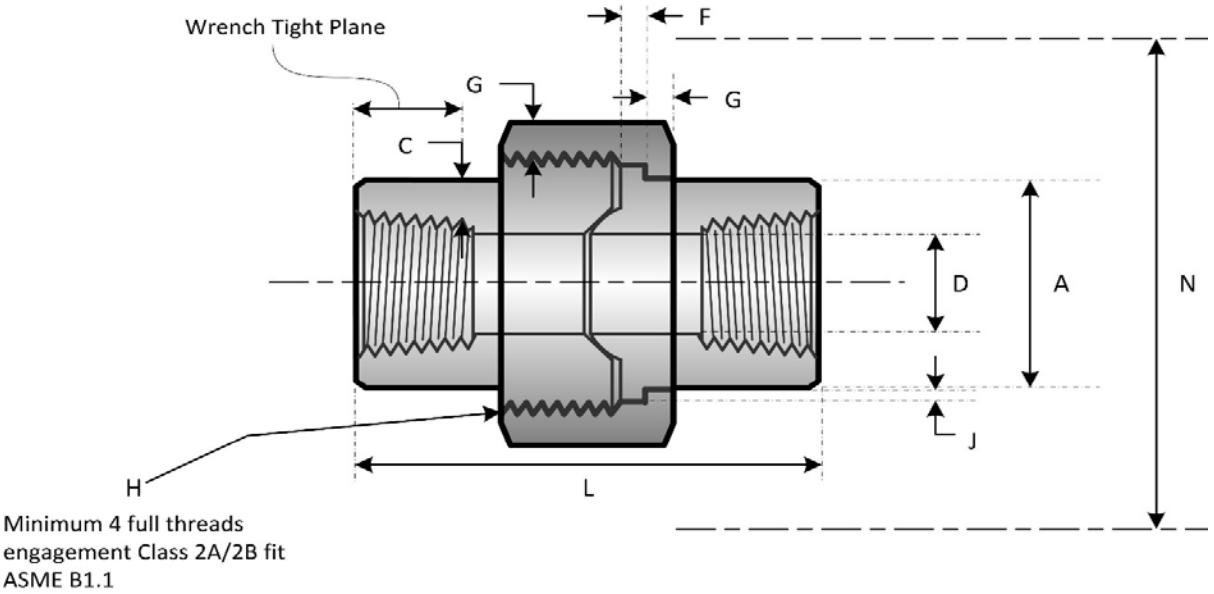
Nominal Pipe Size NPS	Pipe End Min. A	Socket Diameter Max/Min B	W.T. of Socket C	Waterway Bore Max/Min (1) D	Laying Length Max/Min E	Male Flange Min. F	Nut Thickness Min. G	Threads Per 25 mm H	Bearing Surface Min. J	Socket Depth Min. K	Assem. Length Nominal L	Clear Assem. Nut N
1/8	21.8	11.2 10.7	3.18	7.59 6.07	22.4 19.1	3.18	3.18	16	1.24	9.7	41.4	50.8
1/4	21.8	14.6 14.1	3.30	10.01 8.48	22.4 19.1	3.18	3.18	16	1.24	9.7	41.4	50.8
3/8	25.9	18.0 17.5	3.51	13.28 11.76	26.9 20.6	3.43	3.43	14	1.37	9.7	46.0	55.9
1/2	31.2	22.2 21.7	4.09	16.56 15.04	26.9 20.6	3.68	3.68	14	1.50	9.7	49.0	58.4
3/4	37.1	27.6 27.1	4.27	21.69 20.17	31.8 25.4	4.06	4.06	11	1.68	12.7	56.9	66.0
1	45.5	34.3 33.8	4.98	27.41 25.88	34.3 26.2	4.57	4.45	11	1.85	12.7	62.0	78.7
1 1/4	54.9	43.1 42.5	5.28	35.81 34.29	40.6 32.5	5.33	5.21	10	2.13	12.7	71.1	94.0
1 1/2	61.5	49.1 48.6	5.54	41.66 40.13	42.2 34.0	5.84	5.59	10	2.31	12.7	76.5	111.8
2	75.2	61.6 61.1	6.05	53.26 51.74	45.5 37.3	6.60	6.35	10	2.69	15.7	86.1	132.1
2 1/2	91.7	74.4 73.8	7.67	64.24 61.19	61.7 52.1	7.49	7.11	8	3.07	15.7	102.4	149.9
3	109.2	90.4 89.8	8.31	79.45 76.40	63.8 53.6	8.26	8.00	8	3.53	15.7	109.0	175.3

All dimensions are given in millimeters.

Notes:

(1) The contact diameter of the male/female tailpiece is affected by the waterway bore (D).

Dimensions of Class 6000 Threaded Unions- MSS SP-83



Nominal Pipe Size NPS	Pipe End Min. A	Wall Thickness Min. C	Waterway Bore Max/Min (1) D	Male Flange Min. F	Nut Thickness Min. G	Threads Per 25 mm H	Bearing Surface Min. J	Assem. Length Nominal L	Clear Assem. Nut N
1/8	16.5	3.15	8.43 3.20	3.18	3.18	16	1.24	41.4	50.8
1/4	21.1	3.68	11.13 5.59	3.43	3.43	14	1.37	46.0	55.9
3/8	25.1	4.01	14.27 8.36	3.68	3.68	14	1.50	49.0	58.4
1/2	31.0	4.78	17.86 11.02	4.06	4.06	11	1.68	56.9	66.0
3/4	37.8	5.56	23.01 14.78	4.57	4.45	11	1.85	62.0	78.7
1	46.2	6.35	28.98 19.94	5.33	5.21	10	2.13	71.1	94.0
1 1/4	54.9	6.35	37.69 28.70	5.84	5.59	10	2.31	76.5	111.8
1 1/2	62.5	7.14	43.54 33.22	6.60	6.35	10	2.69	86.1	132.1
2	77.7	8.74	55.58 42.09	7.49	7.11	8	3.07	102.4	149.9
2 1/2	92.2	9.53	66.27 53.21	8.26	8.00	8	3.53	109.0	175.3
3	111.3	11.13	82.55 65.89	10.19	10.19	8	4.06	190.5	200.7

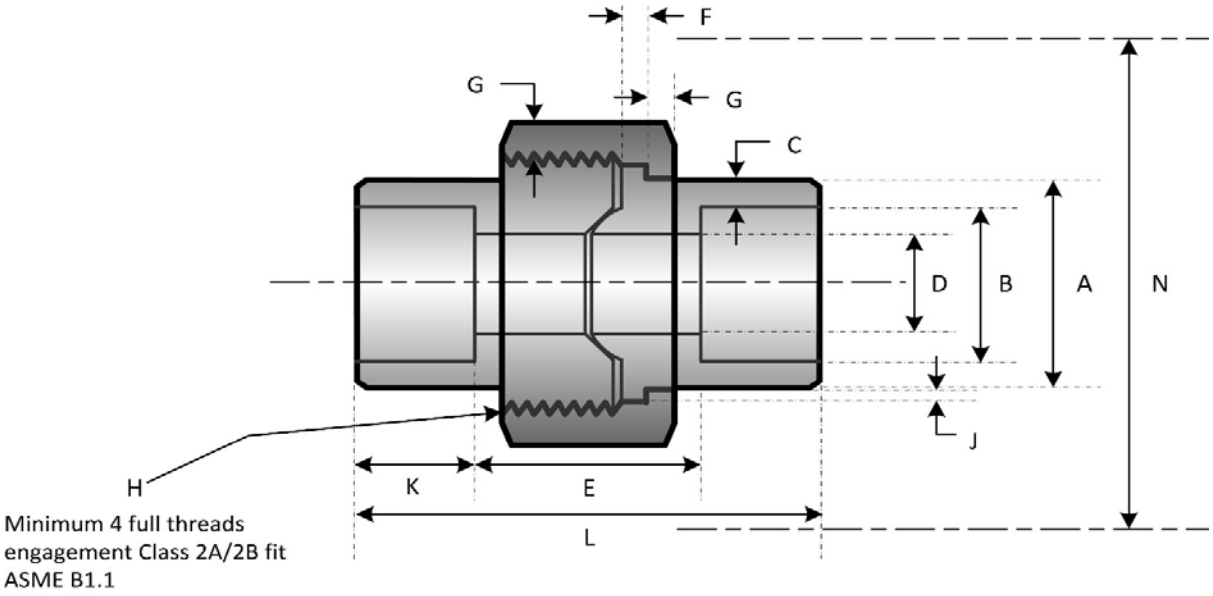
All dimensions are given in millimeters.

Threaded ends per ASME B1.20.1

Notes:

(1) The contact diameter of the male/female tailpiece is affected by the waterway bore (D).

Dimensions of Class 6000 Socket Weld Unions- MSS SP-83



Nominal Pipe Size NPS	Pipe End Min. A	Socket Diameter Max/Min B	W.T. of Socket C	Waterway Bore Max/Min (1) D	Laying Length Max/Min E	Male Flange Min. F	Nut Thickness Min. G	Threads Per 25 mm H	Bearing Surface Min. J	Socket Depth Min. K	Assem. Length Nominal L	Clear Assem. Nut N
1/8	21.8	11.2 10.7	3.43	4.80 3.20	22.4 19.1	3.18	3.18	16	1.24	9.7	41.4	50.8
1/4	25.9	14.6 14.1	4.01	7.11 5.59	26.9 20.6	3.43	3.43	14	1.37	9.7	46.0	55.9
3/8	31.2	18.0 17.5	4.37	9.88 8.36	26.9 20.6	3.68	3.68	14	1.50	9.7	49.0	58.4
1/2	37.1	22.2 21.7	5.18	12.55 11.02	31.8 25.4	4.06	4.06	11	1.68	9.7	56.9	66.0
3/4	45.5	27.6 27.1	6.05	16.31 14.78	34.3 26.2	4.57	4.45	11	1.85	12.7	62.0	78.7
1	54.9	34.3 33.8	6.93	21.46 19.94	40.6 32.5	5.33	5.21	10	2.13	12.7	71.1	94.0
1 1/4	61.5	43.1 42.5	6.93	30.23 28.70	42.2 34.0	5.84	5.59	10	2.31	12.7	76.5	111.8
1 1/2	75.2	49.1 48.6	7.80	34.75 33.22	45.5 37.3	6.60	6.35	10	2.69	12.7	86.1	132.1
2	91.7	61.6 61.1	9.50	43.61 42.09	61.7 52.1	7.49	7.11	8	3.07	15.7	102.4	149.9
2 1/2	109.2	74.4 73.8	10.39	54.74 53.21	63.8 53.6	8.26	8.00	8	3.53	15.7	109.0	175.3

All dimensions are given in millimeters.

Notes:

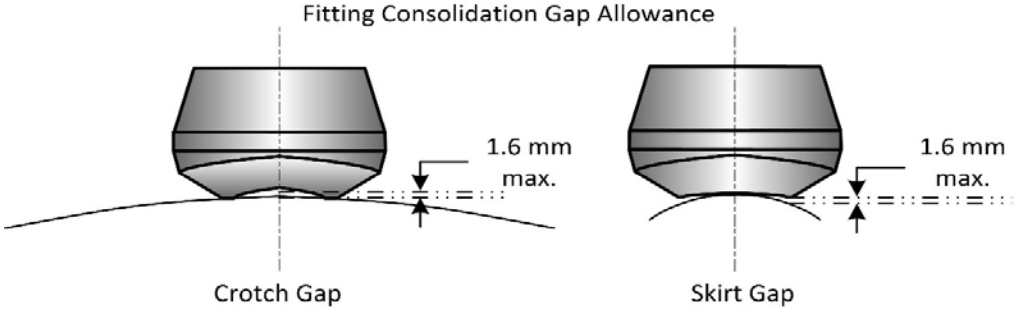
(1) The contact diameter of the male/female tailpiece is affected by the waterway bore (D).

MSS SP-97 Integrally Reinforced Branch Outlet Fittings

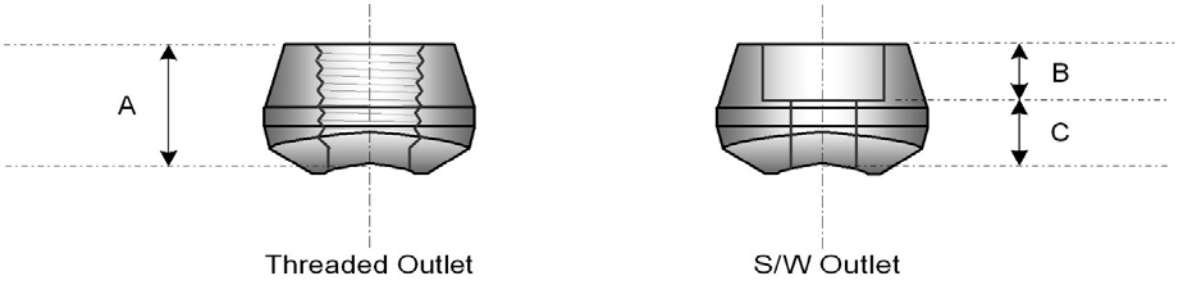
The Manufacturers Standardization Society Standard Practice 97 covers the requirements for 90^0 and 45^0 integrally forged branch outlet fittings in buttwelding, socket-welding and threaded types. The fittings are attached to a run pipe by means of a full penetration weld, and are designed to make a fully reinforced branch connection. The buttwelding types are classified as Standard, Extra Strong and Schedule 160, while the threaded and socket-welding types are rated as Class 3000 and Class 6000.

Buttwelding ends are bevelled in accordance with ASME B16.25. Threads in threaded fittings comply with the NPT requirements of ASME B1.20.1. Socket-welding dimensions for socket depth, minimum socket wall thickness and socket diameter are in accordance with ASME B16.11 of the appropriate class.

Run sizes for a given branch size may be consolidated at the manufacturer's option. The consolidation gap distance between the radius of the run pipe and the contoured radius of the fitting inlet must not exceed 1.6 mm. This is applicable to both 90^0 and 45^0 branch outlets.



Height Dimensions of Threaded & S/W Branch Outlets- MSS SP-97



Outlet Size NPS	Threaded Outlets		Socket Weld Outlets		
	Face of Fitting to Crotch- A (1)		Depth of Socket	Bottom of Socket to Crotch- C (max)	
	3000	6000	B (min) (2)	3000	6000
1/8	19.0	…	9.5	11	…
1/4	19.0	…	9.5	11	…
3/8	20.6	…	9.5	13	…
1/2	25.4	31.8	9.5	16	24
3/4	26.9	36.6	12.5	16	26
1	33.3	39.6	12.5	23	29
1 1/4	33.3	41.1	12.5	23	31
1 1/2	35.0	42.3	12.5	24	32
2	38.1	52.3	16.0	24	37
2 1/2	46.0	…	16.0	26	…
3	50.8	…	16.0	31	…
4	57.2	…	19.0	31	…

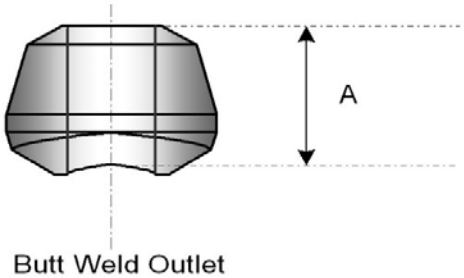
All dimensions are given in millimeters.

Notes:

(1) Tolerances: NPS 1/8 - 3/4 +/- 0.8 mm
NPS 1 - 4 +/- 1.6 mm

(2) Minimum socket depth per ASME B16.11

Height Dimensions of Butt Weld Outlets- MSS SP-97



Butt Weld Outlet

Outlet Size NPS	Face of Fitting to Crotch- A (1)					
	Standard		Extra Heavy		Schedule 160	
	Reducing	Full	Reducing	Full	Reducing	Full
1/8	15.7	…	15.7	…	…	…
1/4	15.7	…	15.7	…	…	…
3/8	19.1	…	19.1	…	…	…
1/2	19.1	19.1	19.1	19.1	28.4	28.4
3/4	22.4	22.4	22.4	22.4	31.8	31.8
1	26.9	26.9	26.9	26.9	38.1	38.1
1 1/4	31.8	31.8	31.8	31.8	44.4	44.4
1 1/2	33.3	33.3	33.3	33.3	50.8	50.8
2	38.1	38.1	38.1	38.1	55.4	55.4
2 1/2	41.1	41.1	41.1	41.1	62.0	62.0
3	44.4	44.4	44.4	44.4	73.2	73.2
3 1/2	47.8	50.8	47.8	50.8	…	…
4	50.8	50.8	50.8	50.8	84.1	84.1
5	57.2	57.2	57.2	57.2	93.7	93.7
6	60.4	60.4	77.7	77.7	104.6	104.6
8	69.8	69.8	98.6	98.6	…	…
10	77.7	77.7	93.7	88.9	…	…
12	85.9	85.9	103.1	100.1	…	…
14	88.9	88.9	100.1	104.6	…	…
16	93.7	93.7	106.2	112.8	…	…
18	96.8	103.1	111.2	119.1	…	…
20	101.6	117.3	119.1	127.0	…	…
24	115.8	136.6	139.7	139.7	…	…

All dimensions are given in millimeters.

Notes:

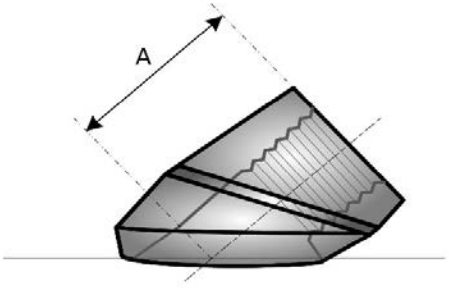
(1) Tolerances: NPS 1/8 - 3/4 +/- .08 mm

NPS 1 - 4 +/- 1.6 mm

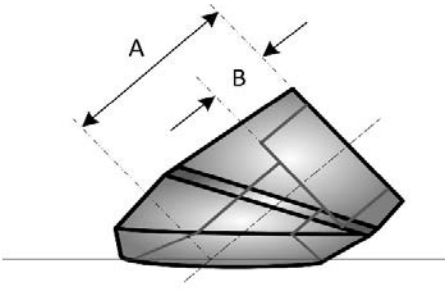
NPS 5 - 12 +/- 3.2 mm

NPS 14 - 24 +/- 4.8 mm

Height Dimensions of 45^0 Threaded & S/W Branch Outlets- MSS SP-97



Threaded 45^0 Outlet



S/W 45^0 Outlet

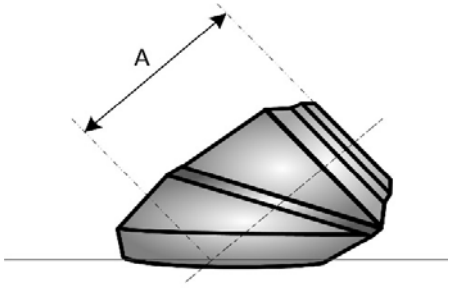
Outlet Size NPS	Depth of Socket B (min) [1]	Top of Fitting to Run Pipe- A			
		3000		6000	
		A (min)	A (max)	A (min)	A (max)
1/4	9.5	38.1	42.9	38.9	47.6
3/8	9.5	38.1	42.9	38.9	47.6
1/2	9.5	38.1	44.5	46.0	55.6
3/4	12.5	46.0	50.8	54.0	63.5
1	12.5	54.0	63.5	61.1	73.0
1 1/4	12.5	61.1	76.2	65.1	77.8
1 1/2	12.5	63.5	76.2	78.6	85.7
2	16.0	76.2	84.1	78.6	104.8

All dimensions are given in millimeters.

Notes:

(1) Minimum socket depth per ASME B16.11

Height Dimensions of 45^0 Butt Weld Branch Outlets- MSS SP-97



Butt Weld 45^0 Outlet

Outlet Size NPS	Top of Fitting to Run Pipe- A Standard and Extra Heavy	
	A (min)	A (max)
1/4	38.1	42.9
3/8	38.1	42.9
1/2	38.1	42.9
3/4	44.5	50.8
1	54.0	65.1
1 1/4	54.0	65.1
1 1/2	63.5	69.9
2	73.0	88.9

All dimensions are given in millimeters.

Pipe Dimensions and Materials Specifications

The dimensions and weights of welded and seamless wrought steel pipe used in pipeline and piping systems are covered by ASME B36.10.

Pages 66 and 67 list the nominal wall thicknesses and weights according to pipe schedule, page 65 provides the nominal inside diameters.

The nominal weights of steel pipe, in pounds per foot, can be calculated as follows:

$$W_{pe} = 10.69(D-t)t$$

where W_{pe}= nominal plain end weight rounded to the nearest 0.01 lb/ft

D= outside diameter to the nearest 0.001 in.

t= specified wall thickness rounded to the nearest 0.001"

The nominal masses of steel pipe, in kilograms per meter, can be calculated as follows:

$$W_{pe} = 0.0246615(D-t)t$$

where W_{pe}= nominal plain end weight rounded to the nearest 0.01 kg/m

D= outside diameter to the nearest 0.1 mm for outside diameters which are 16" and smaller and to the nearest 1.0 mm for outside diameters larger than 16"

t= specified wall thickness rounded to the nearest 0.01 mm

Nominal Inside Diameters of Steel Pipe

Pipe Size	Outside	Pipe Schedules												
NPS	Diameter	10	20	30	40	Std	60	80	XS	100	120	140	160	XXS
1/8	10.3	7.8	…	7.4	6.8	6.8	…	5.5	5.5	…	…	…	…	…
1/4	13.7	10.4	…	10.0	9.2	9.2	…	7.7	7.7	…	…	…	…	…
3/8	17.1	13.8	…	13.4	12.5	12.5	…	10.7	10.7	…	…	…	…	…
1/2	21.3	17.1	…	16.5	15.8	15.8	…	13.9	13.9	…	…	…	11.8	6.4
3/4	26.7	22.5	…	21.8	20.9	20.9	…	18.8	18.8	…	…	…	15.5	11.0
1	33.4	27.9	…	27.6	26.6	26.6	…	24.3	24.3	…	…	…	20.7	15.2
1 1/4	42.2	36.6	…	36.2	35.1	35.1	…	32.5	32.5	…	…	…	29.5	22.8
1 1/2	48.3	42.7	…	41.9	40.9	40.9	…	38.1	38.1	…	…	…	34.0	27.9
2	60.3	54.8	…	54.0	52.5	52.5	…	49.3	49.3	…	…	…	42.8	38.2
2 1/2	73.0	66.9	…	63.5	62.7	62.7	…	59.0	59.0	…	…	…	54.0	45.0
3	88.9	82.8	…	79.3	77.9	77.9	…	73.7	73.7	…	…	…	66.6	58.4
3 1/2	101.6	95.5	…	92.0	90.1	90.1	…	85.4	85.4	…	…	…	…	…
4	114.3	108.2	…	104.7	102.3	102.3	…	97.2	97.2	…	92.0	…	87.3	80.1
5	141.3	134.5	…	…	128.2	128.2	…	122.3	122.3	…	115.9	…	109.6	103.2
6	168.3	161.5	…	…	154.1	154.1	…	146.3	146.3	…	139.7	…	131.7	124.4
8	219.1	211.6	206.4	205.0	202.7	202.7	198.5	193.7	193.7	188.9	182.5	177.8	173.1	174.6
10	273.0	265	260	257	255	255	248	243	248	237	230	222	216	222
12	323.8	315	311	307	303	305	295	289	298	281	273	267	257	273
Pipe Size	Outside	Pipe Schedules												
NPS	Diameter	10	20	30	40	Std	60	80	XS	100	120	140	160	XXS
14	355.6	343	340	337	333	337	325	318	330	308	300	292	284	…
16	406.4	394	391	387	381	387	373	364	381	354	344	333	325	…
18	457	445	441	435	429	438	419	410	432	398	387	378	367	…
20	508	495	489	483	478	489	467	456	483	443	432	419	408	…
22	559	546	540	533	…	540	514	502	533	489	476	464	451	…
24	610	597	591	581	575	591	560	548	584	532	518	505	491	…
26	660	645	635	…	…	641	…	…	635	…	…	…	…	…
28	711	695	686	679	…	692	…	…	686	…	…	…	…	…
30	762	746	737	730	…	743	…	…	737	…	…	…	…	…
32	813	797	787	781	778	794	…	…	787	…	…	…	…	…
34	864	848	838	832	829	845	…	…	838	…	…	…	…	…
36	914	899	889	883	876	895	…	…	889	…	…	…	…	…
38	965	…	…	…	…	946	…	…	940	…	…	…	…	…
40	1016	…	…	…	…	997	…	…	991	…	…	…	…	…
42	1067	…	…	…	…	1048	…	…	1041	…	…	…	…	…
44	1118	…	…	…	…	1099	…	…	1092	…	…	…	…	…
46	1150	…	…	…	…	1149	…	…	1143	…	…	…	…	…
48	1219	…	…	…	…	1200	…	…	1194	…	…	…	…	…

All dimensions are given in millimeters.

Nominal Wall Thickness and Weight of Steel Pipe

According to ASME B36.10M-2004

NPS	O.D.	Sch 10		Sch 20		Sch 30		Sch 40		Standard		Sch 60	
		wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft
1/8	10.3	1.24	0.28	...	...	1.45	0.32	1.73	0.37	1.73	0.37	...	...
1/4	13.7	1.65	0.49	...	...	1.85	0.54	2.24	0.63	2.24	0.63	...	...
3/8	17.1	1.65	0.63	...	...	1.85	0.70	2.31	0.84	2.31	0.84	...	...
1/2	21.3	2.11	1.00	...	...	2.41	1.12	2.77	1.27	2.77	1.27	...	...
3/4	26.7	2.11	1.28	...	...	2.41	1.44	2.87	1.69	2.87	1.69	...	...
1	33.4	2.77	2.09	...	...	2.90	2.18	3.38	2.50	3.38	2.50	...	...
1 1/4	42.2	2.77	2.69	...	...	2.97	2.87	3.56	3.39	3.56	3.39	...	...
1 1/2	48.3	2.77	3.11	...	...	3.18	3.53	3.68	4.05	3.68	4.05	...	...
2	60.3	2.77	3.93	...	...	3.18	4.48	3.91	5.44	3.91	5.44	...	...
2 1/2	73.0	3.05	5.26	...	...	4.78	8.04	5.16	8.63	5.16	8.63	...	...
3	88.9	3.05	6.46	...	...	4.78	9.92	5.49	11.29	5.49	11.29	...	...
3 1/2	101.6	3.05	7.41	...	...	4.78	11.41	5.74	13.57	5.74	13.57	...	...
4	114.3	3.05	8.37	...	...	4.78	12.91	6.02	16.08	6.02	16.08	...	...
5	141.3	3.40	11.56	...	...	...	...	6.55	21.77	6.55	21.77	...	...
6	168.3	3.40	13.83	...	...	...	...	7.11	28.26	7.11	28.26	...	...
8	219.1	3.76	19.97	6.35	33.32	7.04	36.82	8.18	42.55	8.18	42.55	10.31	53.09
10	273.0	4.19	27.78	6.35	41.76	7.80	51.01	9.27	60.29	9.27	60.29	12.70	81.53
12	323.8	4.57	35.98	6.35	49.71	8.38	65.19	10.31	79.71	9.53	73.86	14.27	108.93
14	355.6	6.35	54.69	7.92	67.91	9.53	81.33	11.13	94.55	9.53	81.33	15.09	126.72
16	406.4	6.35	62.65	7.92	77.83	9.53	93.27	12.70	123.31	9.53	93.27	16.66	160.13
18	457	6.35	70.57	7.92	87.71	11.13	122.38	14.27	155.81	9.53	105.17	19.05	205.75
20	508	6.35	78.56	9.53	117.15	12.70	155.13	15.09	183.43	9.53	117.15	20.62	247.84
22	559	6.35	86.55	9.53	129.14	12.70	171.10	...	...	9.53	129.14	22.23	294.27
24	610	6.35	94.53	9.53	141.12	14.27	209.65	17.48	255.43	9.53	141.12	24.61	355.28
26	660	7.92	127.36	12.70	202.74	...	...	...	...	9.53	152.88	...	...
28	711	7.92	137.32	12.70	218.71	15.88	272.23	...	...	9.53	164.86	...	...
30	762	7.92	147.29	12.70	234.68	15.88	292.20	...	...	9.53	176.85	...	...
32	813	7.92	157.25	12.70	250.65	15.88	312.17	17.48	342.94	9.53	188.83	...	...
34	864	7.92	167.21	12.70	266.63	15.88	332.14	17.48	364.92	9.53	200.82	...	...
36	914	7.92	176.97	12.70	282.29	15.88	351.73	19.05	420.45	9.53	212.57	...	...
38	950	...	...	...	...	...	...	...	...	9.53	224.56	...	...
40	1000	...	...	...	...	...	...	...	...	9.53	236.54	...	...
42	1050	...	...	...	...	...	...	...	...	9.53	248.53	...	...
44	1100	...	...	...	...	...	...	...	...	9.53	260.52	...	...
46	1150	...	...	...	...	...	...	...	...	9.53	272.27	...	...
48	1200	...	...	...	...	...	...	...	...	9.53	284.25	...	...

All dimensions are given in millimeters, all weights are given in kgs. per meter

Nominal Wall Thickness and Weight of Steel Pipe

According to ASME B36.10M-2004

Sch 80		Extra Strong		Sch 100		Sch 120		Sch 140		Sch 160		Dble. Ex. Strg.		O.D.	NPS
wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft	wt	lb/ft		
2.41	0.47	2.41	0.47	...	...	...	...	...	...	...	...	...	...	10.3	1/8
3.02	0.80	3.02	0.80	...	...	...	...	...	...	...	...	...	...	13.7	1/4
3.20	1.10	3.20	1.10	...	...	...	...	...	...	...	...	...	...	17.1	3/8
3.73	1.62	3.73	1.62	...	...	...	...	...	...	4.78	1.95	7.47	2.55	21.3	1/2
3.91	2.20	3.91	2.20	...	...	...	...	...	...	5.56	2.90	7.82	3.64	26.7	3/4
4.55	3.24	4.55	3.24	...	...	...	...	...	...	6.35	4.24	9.09	5.45	33.4	1
4.85	4.47	4.85	4.47	...	...	...	...	...	...	6.35	5.61	9.70	7.77	42.2	1 1/4
5.08	5.41	5.08	5.41	...	...	...	...	...	...	7.14	7.25	10.15	9.55	48.3	1 1/2
5.54	7.48	5.54	7.48	...	...	...	...	...	...	8.74	11.11	11.07	13.44	60.3	2
7.01	11.41	7.01	11.41	...	...	...	...	...	...	9.53	14.92	14.02	20.39	73.0	2 1/2
7.62	15.27	7.62	15.27	...	...	...	...	...	...	11.13	21.35	15.24	27.68	88.9	3
8.08	18.64	8.08	18.64	...	...	...	...	...	...	...	...	...	...	101.6	3 1/2
8.56	22.32	8.56	22.32	...	...	11.13	28.32	...	...	13.49	33.54	17.12	41.03	114.3	4
9.53	30.97	9.53	30.97	...	...	12.70	40.28	...	...	15.88	49.12	19.05	57.43	141.3	5
10.97	42.56	10.97	42.56	...	...	14.27	54.21	...	...	18.26	67.57	21.95	79.22	168.3	6
12.70	64.64	12.70	64.64	15.09	75.92	18.26	90.44	20.62	100.93	23.01	111.27	22.23	107.93	219.1	8
15.09	95.98	12.70	81.53	18.26	114.71	21.44	133.01	25.40	155.10	28.58	172.27	25.40	155.10	273.0	10
17.48	132.05	12.70	97.44	21.44	159.87	25.40	186.92	28.58	208.08	33.32	238.69	25.40	186.92	323.8	12
19.05	158.11	12.70	107.40	23.83	194.98	27.79	224.66	31.75	253.58	35.71	281.72	...	...	355.6	14
21.44	203.54	12.70	123.31	26.19	245.57	30.96	286.66	36.53	333.21	40.49	365.38	...	...	406.4	16
23.83	254.57	12.70	139.16	29.36	309.64	34.93	363.58	39.67	408.28	45.24	459.39	...	...	457	18
26.19	311.19	12.70	155.13	32.54	381.55	38.10	441.52	44.45	508.15	50.01	564.85	...	...	508	20
28.58	373.85	12.70	171.10	34.93	451.45	41.28	527.05	47.63	600.67	53.98	672.30	...	...	559	22
30.96	442.11	12.70	187.07	38.89	547.74	46.02	640.07	52.37	720.19	59.54	808.27	...	...	610	24
...	...	12.70	202.74	...	...	...	...	...	...	...	...	...	...	660	26
...	...	12.70	218.71	...	...	...	...	...	...	...	...	...	...	711	28
...	...	12.70	234.68	...	...	...	...	...	...	...	...	...	...	762	30
...	...	12.70	250.65	...	...	...	...	...	...	...	...	...	...	813	32
...	...	12.70	266.63	...	...	...	...	...	...	...	...	...	...	864	34
...	...	12.70	282.29	...	...	...	...	...	...	...	...	...	...	914	36
...	...	12.70	298.26	...	...	...	...	...	...	...	...	...	...	950	38
...	...	12.70	314.23	...	...	...	...	...	...	...	...	...	...	1000	40
...	...	12.70	330.21	...	...	...	...	...	...	...	...	...	...	1050	42
...	...	12.70	346.18	...	...	...	...	...	...	...	...	...	...	1100	44
...	...	12.70	361.84	...	...	...	...	...	...	...	...	...	...	1150	46
...	...	12.70	377.81	...	...	...	...	...	...	...	...	...	...	1200	48

All dimensions are given in millimeters, all weights are given in kgs. per meter

ASTM Materials Specifications for Carbon Steels

Specified Elements % by weight (max. unless indicated)		Flanges, Forged Fittings, Branch Outlets		Butt Welding Fittings, Swage Nipples		Pipe, Pipe Nipples	
		A105-13 (1) (2)	A350-LF2-13 (1) (2)	A234-WPB-13 (3)	A420-WPL6-13	A106-B-13 (1)	A333-6-13
Carbon	(C)	0.35	0.30	0.30	0.30	0.30	0.30
Manganese	(Mn)	0.60-1.05**	0.60-1.35	0.29-1.06**	0.50-1.35	0.29-1.06**	0.29-1.06*
Phosphorus	(P)	0.035	0.035	0.050	0.035	0.035	0.025
Sulfur	(S)	0.040	0.040	0.058	0.040	0.035	0.025
Silicon	(Si)	0.10-0.35	0.15-0.30	0.10 min	0.15-0.40	0.10 min	0.10 min
Copper	(Cu)	0.40	0.40	0.40	0.40	0.40	0.40
Nickel	(Ni)	0.40	0.40	0.40	0.40	0.40	0.40
Chromium	(Cr)	0.30	0.30	0.40	0.30	0.40	0.30
Molybdenum	(Mo)	0.12	0.12	0.15	0.12	0.15	0.12
Vanadium	(V)	0.08	0.08	0.08	0.08	0.08	0.08
Columbium/ Niobium	(Cb/Nb)	…	0.02	…	0.02	…	0.02

*For each reduction of 0.01% below the specified C maximum, an increase of 0.05% Mn above the specified maximum is permitted, up to a maximum of 1.35%

**For each reduction of 0.01% below the specified C maximum, an increase of 0.06% Mn above the specified maximum is permitted, up to a maximum of 1.65%

Notes:
1) Cu+Ni+Cr+Mo+V≤ 1.00%
2) Cr+Mo≤ 0.32%
3) Cu+Ni+Cr+Mo≤ 1.00%

Mechanical Requirements		A105	A350-LF2	A234-WPB	A420-WPL6	A106-B	A333-6
Yield (Y)	(min., MPa)	250	250	240	240	240	240
Tensile (T)	(min., MPa)	485	485-655	415	415-655	415	415
Elongation	(%, min.)	22 (1)	22 (1)	22 (1) (2)	22 (1) (2)	22 (1) (2)	22 (1) (2)
Red. of Area	(%, min.)	30	30	…	…	…	…
Hardness	(max., HBW)	197	197	197	…	…	…

Notes:
1) Standard round specimen, 4 D gauge length
2) Longitudinal specimen

Impact Requirements (Std. 10x10mm specimens)	A105	A350-LF2 (Class 1)	A234-WPB	A420-WPL6	A106-B	A333-6
Test Temperature	…	-46C	…	-45C	…	-45C
Min. average of 3 pieces (J)	…	20.00	…	17.6	…	18
Min. value for 1 piece (J)	…	16.00	…	13.6	…	14

Pressure- Temperature Ratings for Flanges, A105 (1) and A350-LF2 (1)

ASME B16.5-2013:

Class Temperature	Working Pressures by Classes, bar						
°C	150	300	400	600	900	1500	2500
-29 to 38	19.6	51.1	68.1	102.1	153.2	255.3	425.5
50	19.2	50.1	66.8	100.2	150.4	250.6	417.7
100	17.7	46.6	62.1	93.2	139.8	233.0	388.3
150	15.8	45.1	60.1	90.2	135.2	225.4	375.6
200	13.8	43.8	58.4	87.6	131.4	219.0	365.0
250	12.1	41.9	55.9	83.9	125.8	209.7	349.5
300	10.2	39.8	53.1	79.6	119.5	199.1	331.8
325	9.3	38.7	51.6	77.4	116.1	193.6	322.6
350	8.4	37.6	50.1	75.1	112.7	187.8	313.0
375	7.4	36.4	48.5	72.7	109.1	181.8	303.1
400	6.5	34.7	46.3	69.4	104.2	173.6	289.3
425	5.5	28.8	38.4	57.5	86.3	143.8	239.7
450	4.6	23.0	30.7	46.0	69.0	115.0	191.7
475	3.7	17.4	23.2	34.9	52.3	87.2	145.3
500	2.8	11.8	15.7	23.5	35.3	58.8	97.9
538	1.4	5.9	7.9	11.8	17.7	29.5	49.2

ASME B16.47-2011:

Class Temperature	Working Pressures by Classes, bar					
°C	75	150	300	400	600	900
-29 to 38	9.8	19.6	51.1	68.1	102.1	153.2
50	9.6	19.2	50.1	66.8	100.2	150.4
100	8.8	17.7	46.6	62.1	93.2	139.8
150	7.9	15.8	45.1	60.1	90.2	135.2
200	6.9	13.8	43.8	58.4	87.6	131.4
250	6.0	12.1	41.9	55.9	83.9	125.8
300	5.1	10.2	39.8	53.1	79.6	119.5
325	4.6	9.3	38.7	51.6	77.4	116.1
350	3.1	8.4	37.6	50.1	75.1	112.7
375	…	7.4	36.4	48.5	72.7	109.1
400	…	6.5	34.7	46.3	69.4	104.2
425	…	5.5	28.8	38.4	57.5	86.3
450	…	4.6	23.0	30.7	46.0	69.0
475	…	3.7	17.4	23.2	34.9	52.3
500	…	2.8	11.8	15.7	23.5	35.3
538	…	1.4	5.9	7.9	11.8	17.7

Notes:

(1) ASME B16.5 and B16.47 provide the following note: Upon prolonged exposure to temperatures above 425^0 C, the carbide phase of steel may be converted to graphite. Permissible, but not recommended for prolonged use above 425^0 C.

Notes