



WROUGHT STEEL BUTT - WELDING FITTINGS
(CARBON AND ALLOY STEEL)



JIS G3452 ANSI B36.10M
JIS G3454 ANSI B36.19M
JIS G3455
JIS G3458
JIS G3459

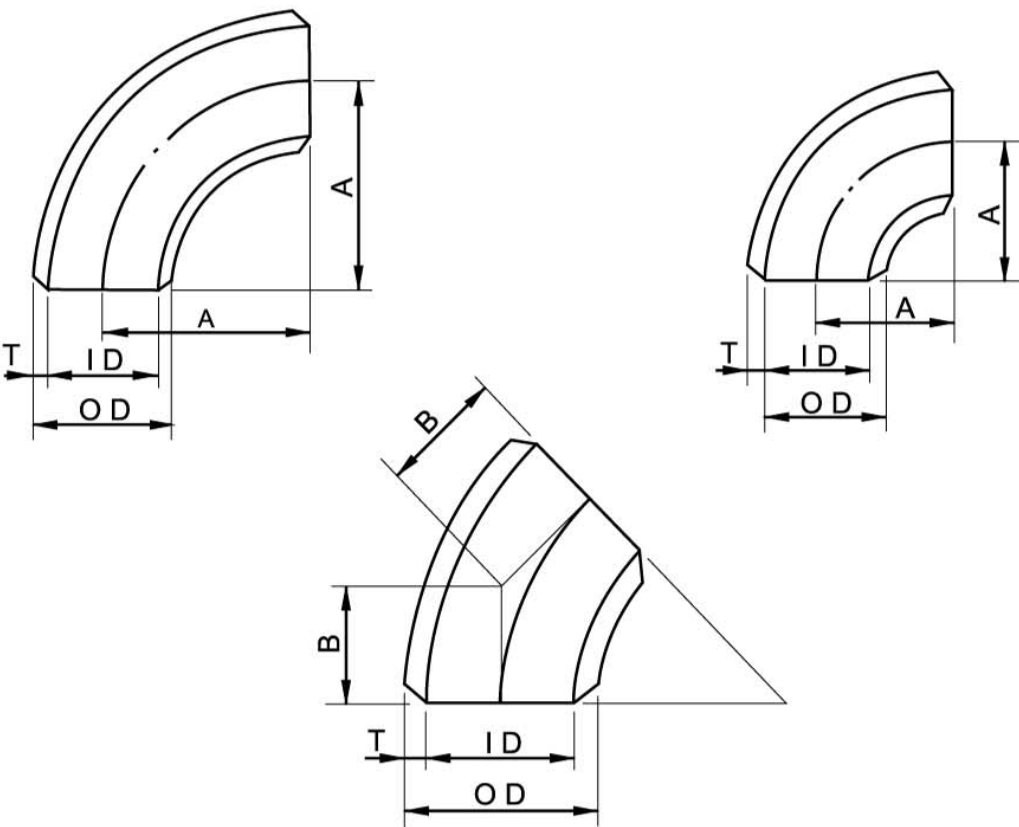
WALL THICKNESS SCHEDULES

[in mm]

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness																Outside Diameter		Nominal Pipe Size				
A	B	JIS	ANSI	Sch 5S	Sch 10S	Sch 20S	Gs	Sch 10	LG[7.9]	Sch 20	Sch 30	STD	Sch 40	Sch 60	XS	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XXS	JIS	ANSI	A	B	
8	1/4	13.8	13.7	1.2	1.65	2.0	2.3	-	-	-	-	[2.2]	2.2	2.4	[3.0]	3.0	-	-	-	-	-	-	13.8	13.7	8	1/4
10	3/8	17.3	17.1	1.2	1.65	2.0	2.3	-	-	-	-	[2.3]	2.3	2.8	[3.2]	3.2	-	-	-	-	-	-	17.3	17.1	10	3/8
15	1/2	21.7	21.3	1.65	2.1	2.5	2.8	-	-	-	-	[2.8]	2.8	3.2	[3.7]	3.7	-	-	-	-	4.7	7.5	21.7	21.3	15	1/2
20	3/4	27.2	26.7	1.65	2.1	2.5	2.8	-	-	-	-	[2.9]	2.9	3.4	[3.9]	3.9	-	-	-	-	5.5	7.8	27.2	26.7	20	3/4
25	1	34.0	33.5	1.65	2.8	3.0	3.2	-	-	-	-	[3.4]	3.4	3.9	[4.5]	4.5	-	-	-	-	6.4	9.1	34.0	33.5	25	1
32	1-1/4	42.7	42.2	1.65	2.8	3.0	3.5	-	-	-	-	[3.6]	3.6	4.5	[4.9]	4.9	-	-	-	-	6.4	9.7	42.7	42.2	32	1-1/4
40	1-1/2	48.6	48.3	1.65	2.8	3.0	3.5	-	-	-	-	[3.7]	3.7	4.5	[5.1]	5.1	-	-	-	-	7.1	10.2	48.6	48.3	40	1-1/2
50	2	60.5	60.5	1.65	2.8	3.5	3.8	-	-	3.2	-	[3.9]	3.9	4.9	[5.5]	5.5	-	-	-	-	8.7	11.1	60.5	60.5	50	2
65	2-1/2	76.3	73.2	2.1	3.0	3.5	4.2	-	-	4.5	-	[5.2]	5.2	6.0	[7.0]	7.0	-	-	-	-	9.5	14.0	76.3	73.2	65	2-1/2
80	3	89.1	88.9	2.1	3.0	4.0	4.2	-	-	4.5	-	[5.5]	5.5	6.6	[7.6]	7.6	-	-	-	-	11.1	15.2	89.1	88.9	80	3
90	3-1/2	101.6	101.6	2.1	3.0	4.0	4.2	-	-	4.5	-	[5.7]	5.7	7.0	[8.1]	8.1	-	-	-	-	12.7	-	101.6	101.6	90	3-1/2
100	4	114.3	114.3	2.1	3.0	4.0	4.5	-	-	4.9	-	[6.0]	6.0	7.1	[8.6]	8.6	-	11.1	-	13.5	17.1	114.3	114.3	100	4	
125	5	139.8	141.2	2.8	3.4	5.0	4.5	-	-	5.1	-	[6.6]	6.6	8.1	[9.5]	9.5	-	12.7	-	15.9	19.0	139.8	141.2	125	5	
150	6	165.2	168.1	2.8	3.4	5.0	5.0	-	5.0**	5.5	-	[7.1]	7.1	9.3	[11.0]	11.0	-	14.3	-	18.2	21.9	165.2	168.1	150	6	
175	7	190.7	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190.7	-	175	7
200	8	216.3	218.9	2.8	4.0	6.5	5.8	-	5.8**	6.4	7.0	[8.2]	8.2	10.3	[12.7]	12.7	-	18.2	20.6	23.0	22.2	216.3	218.9	200	8	
225	9	241.8	-	-	-	-	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	241.8	-	225	9	
250	10	267.4	273.0	3.4	4.0	6.5	6.6	-	6.6**	6.4	7.8	[9.3]	9.3	12.7	12.7	15.1	-	21.4	25.4	28.6	25.4	267.4	273.0	250	10	
300	12	318.5	323.8	4.0	4.5	6.5	6.9	-	6.9**	6.4	8.4	9.5	10.3	14.3	12.7	17.4	-	25.4	28.6	33.3	25.4	318.5	323.8	300	12	
350	14	355.6	355.6	4.0	5.0	8.0	7.9	6.4	7.9	7.9	9.5	9.5	11.1	15.1	12.7	19.0	-	27.8	31.8	35.7	-	355.6	355.6	350	14	
400	16	406.4	406.4	4.5	5.0	8.0	7.9	6.4	7.9	7.9	9.5	9.5	12.7	16.7	12.7	21.4	-	30.9	36.5	40.5	-	406.4	406.4	400	16	
450	18	457.2	457.2	4.5	5.0	8.0	7.9	6.4	7.9	7.9	11.1	9.5	14.3	19.0	12.7	23.8	-	34.9	39.7	45.2	-	457.2	457.2	450	18	
500	20	508.0	508.0	5.0	5.5	9.5	7.9	6.4	7.9	9.5	12.7	9.5	15.1	20.6	12.7	26.2	-	38.1	44.4	50.0	-	508.0	508.0	500	20	
550	22	558.8	558.8	5.0	5.5	-	-	6.4	7.9	9.5	12.7	9.5	-	22.2	12.7	18.6	-	41.3	47.6	54.0	-	558.8	558.8	550	22	
600	24	609.6	609.6	5.5	6.5	-	-	6.4	7.9	9.5	14.3	9.5	17.5	24.6	12.7	31.0	-	46.0	52.4	59.5	-	609.6	609.6	600	24	
650	26	660.4	660.4	-	-	-	-	7.9	7.9	12.7	-	9.5	-	-	12.7	-	-	-	-	-	-	-	660.4	660.4	650	26
700	28	711.2	711.2	-	-	-	-	7.9	7.9	12.7	15.9	9.5	-	-	12.7	-	-	-	-	-	-	-	711.2	711.2	700	28
750	30	762.0	762.0	6.5	8.0	-	-	7.9	7.9	12.7	15.9	9.5	-	-	12.7	-	-	-	-	-	-	-	762.0	762.0	750	30
800	32	812.8	812.8	-	-	-	-	7.9	7.9	12.7	15.9	9.5	17.5	-	12.7	-	-	-	-	-	-	-	812.8	812.8	800	32
850	34	863.6	863.6	-	-	-	-	7.9	7.9	12.7	15.9	9.5	17.5	-	12.7	-	-	-	-	-	-	-	863.6	863.6	850	34
900	36	914.4	914.4	-	-	-	-	7.9	7.9	12.7	15.9	9.5	19.1	-	12.7	-	-	-	-	-	-	-	914.4	914.4	900	36
950	38	965.2	965.2	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-	-	965.2	965.2	950	38
1000	40	1016.0	1016.0	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-	-	1016.0	1016.0	1000	40
1050	42	1066.8	1066.8	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-	-	1066.8	1066.8	1050	42
1100	44	1117.6	1117.6	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-	-	1117.6	1117.6	1100	44
1150	46	1168.4	1168.4	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-	-	1168.4	1168.4	1150	46
1200	48	1219.2	1219.2	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-	-	1219.2	1219.2	1200	48
1250	50	1270.0	1270.0	-	-	-	-	-	*7.9	-	-	*9.5	-	-	*12.7	-	-	-	-	-	-	-	1270.0	1270.0	1250	50
1300	52	1320.8	1320.8	-	-	-	-	-	*7.9	-	-	*9.5	-	-	*12.7	-	-	-	-	-	-	-	1320.8	1320.8	1300	52
1350	54	1371.6	1371.6	-	-	-	-	-	*7.9	-	-	*9.5	-	-	*12.7	-	-	-	-	-	-	-	1371.6	1371.6	1350	54
1400	56	1422.4	1422.4	-	-	-	-	-	*7.9	-	-	*9.5	-	-	*12.7	-	-	-	-	-	-	-	1422.4	1422.4	1400	56
1450	58	1473.2	1473.2	-	-	-	-	-	*7.9	-	-	*9.5	-	-	*12.7	-	-	-	-	-	-	-	1473.2	1473.2	1450	58
1500	60	1524.0	1524.0	-	-	-	-	-	*7.9	-	-	*9.5	-	-	*12.7	-	-	-	-	-	-	-	1524.0	1524.0	1500	60

NOTE : 1. *Factory's standard.
2. **Applied only small end side of the tee and reducers.
3. The numerical values in parenthesis are the same thickness as Sch. 40 or Sch. 80.

90° - 45° LONG AND SHORT RADIUS ELBOWS

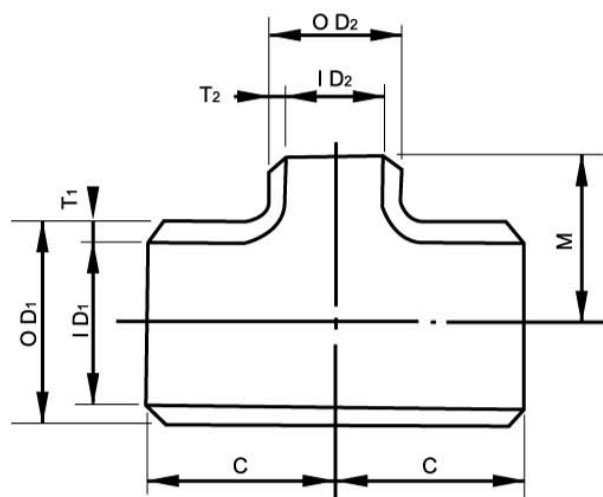
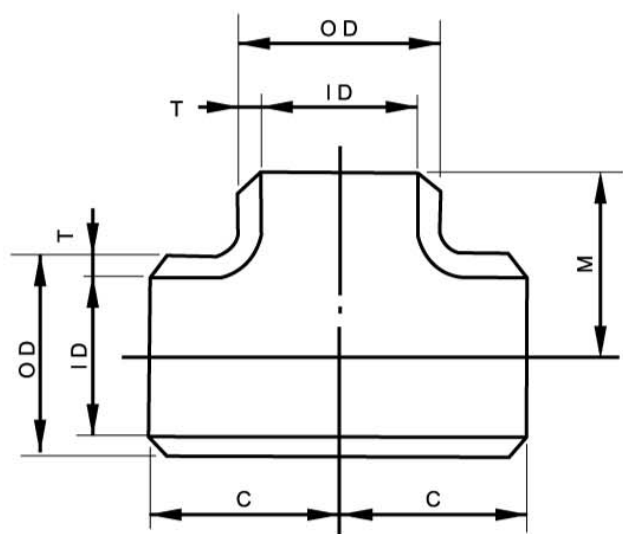


ANSI B 16.9, B 16.28

[in mm]

Nominal Pipe Size [NPS]	Outside Diameter at Bevel D	Center-to-End			
		Long Radius Elbow		Short Radius Elbow	
		90 Deg. A	45 Deg. B	90 Deg. A	45 Deg.* B
1/2	21.3	38.1	15.7	-	-
3/4	26.7	28.4	11.2	-	-
1	33.4	38.1	22.4	25.4	-
1-1/4	42.2	47.8	25.4	31.8	-
1-1/2	48.3	57.2	28.4	38.1	-
2	60.3	76.2	35.1	50.8	-
2-1/2	73.0	95.2	44.4	63.5	-
3	88.9	114.3	50.8	76.2	31.6
3-1/2	101.6	133.4	57.2	88.9	36.8
4	114.3	152.4	63.5	101.6	42.1
5	141.3	190.5	79.2	127.0	52.6
6	168.3	228.6	95.2	152.4	63.4
8	219.1	304.8	127.0	203.2	84.2
10	273.1	381.0	158.8	254.0	105.2
12	323.9	457.2	190.5	304.8	126.3
14	355.6	533.4	222.2	355.6	147.3
16	406.4	609.6	254.0	406.4	168.3
18	457.2	685.8	285.8	457.2	189.4
20	508.0	762.0	317.5	508.0	210.4
22	558.8	838.2	342.9	558.8	231.5
24	609.6	914.4	381.0	609.6	252.5

STRAIGHT AND REDUCING TEES



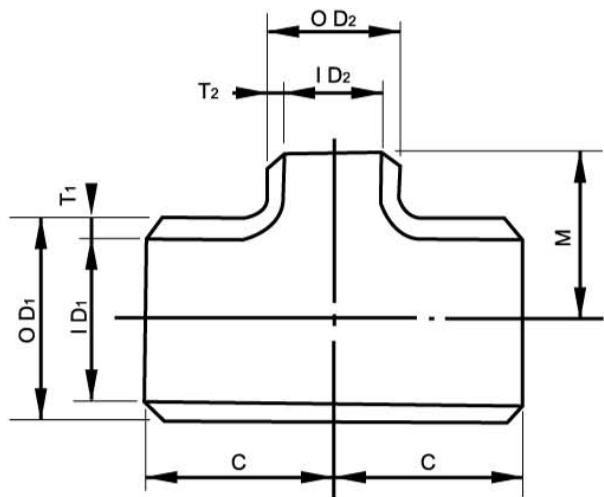
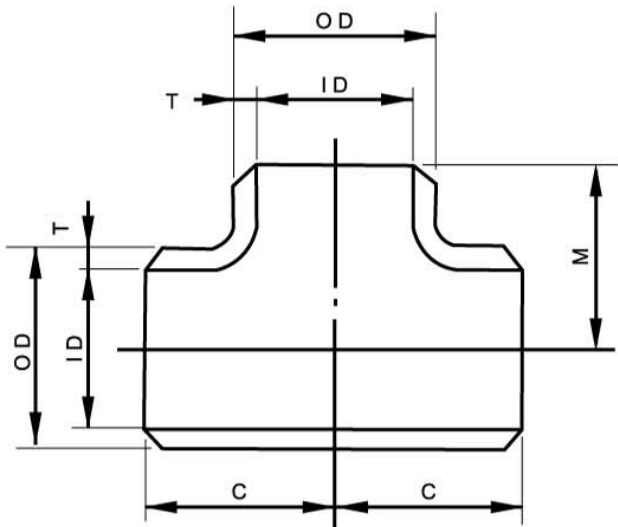
MSS SP-75
ANSI B 16.9

Nominal Pipe Size [NPS]	Outside Diameter at Bevel D		Center-to-End	
			Run C	Outlet ^[1] M
	Run	Outlet		
1 1/2 X 1/2 3/8 1/4	21.3	21.3 17.1 13.7	25.4	25.4 25.4 25.4
3/4 X 3/4 1/2 3/8	26.7	26.7 21.3 17.1	28.4	28.4 28.4 28.4
1 X 1 3/4 1/2	33.4	33.4 26.7 21.3	38.1	38.1 38.1 38.1
1-1/4 X 1-1/4 1 3/4 1/2	42.2	42.2 33.4 26.7 21.3	47.8	47.8 47.8 47.8 47.8
1-1/2 X 1-1/2 1-1/4 1 3/4 1/2	48.3	48.3 42.2 33.4 26.7 21.3	57.2	57.2 57.2 57.2 57.2 57.2
2 X 2 1-1/2 1-1/4 1 3/4 1/2*	60.3	60.3 48.3 42.2 33.4 26.7 21.3	63.5	63.5 60.5 57.2 50.8 44.4
2-1/2 X 2-1/2 2 1-1/2 1-1/4 1	73.0	73.0 60.3 48.3 42.2 33.4	76.2	76.2 69.8 66.5 63.5 57.2

Nominal Pipe Size [NPS]	Outside Diameter at Bevel D		Center-to-End	
			Run C	Outlet ^[1] M
	Run	Outlet		
3 X 3 2-1/2 2 1-1/2 1-1/4 1*	88.9	88.9 73.0 60.3 48.3 42.2 33.4	85.9	85.9 82.6 76.2 73.2 69.8
3-1/2 X 3-1/2 3 2-1/2 2 1-1/2	101.6	101.6 88.9 73.0 60.3 48.3	95.2	95.2 91.9 88.9 82.6 79.2
4 X 4 3-1/2 3 2-1/2 2 1-1/2 1-1/4* 1*	114.3	114.3 101.6 88.9 73.0 60.3 48.3 42.2 33.5	104.6	104.6 101.6 98.6 95.2 88.9 85.9
5 X 5 4 3-1/2 3 2-1/2 2 1-1/2*	141.3	141.3 114.3 101.6 88.9 73.0 60.3 48.3	124.0	124.0 117.3 114.3 111.3 108.0 104.6
6 X 6 5 4	168.3	168.3 141.3 114.3	142.7	142.7 136.7 130.0

NOTE [1] Outlet dimension "M" for run sizes 14 and larger is recommended but not mandatory.

STRAIGHT AND REDUCING TEES



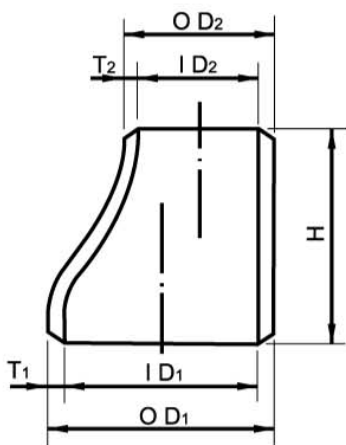
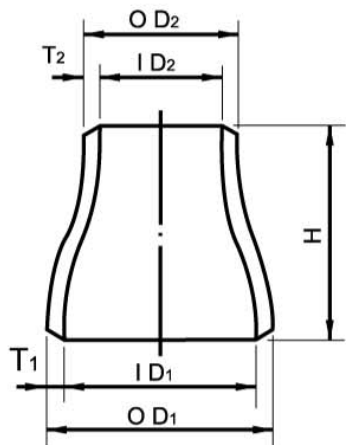
MSS SP-75
ANSI B 16.9

[CONTINUE]		[in mm]		
Nominal Pipe Size [NPS]	Outside Diameter at Bevel D		Center-to-End	
	Run	Outlet	Run C	Outlet ^[1] M
6 X 3-1/2 3 2-1/2 2*	168.3	101.6	142.7	127.0
		88.9		124.0
		73.0		120.6
		60.3		
8 X 8 6 5 4 3-1/2 3*	219.1	219.1	177.8	177.8
		168.3		168.1
		141.3		162.1
		114.3		155.4
		101.6		152.4
		88.9		-
10 X 10 8 6 5 4	273.1	273.1	215.9	215.9
		219.1		203.2
		168.3		193.5
		141.3		190.5
		114.3		184.2
12 X 12 10 8 6 5	323.9	323.9	254.0	254.0
		273.1		241.3
		219.1		228.6
		168.3		218.9
		141.3		215.9
14 X 14 12 10 8 6	355.6	355.6	279.4	179.4
		323.9		269.7
		273.1		257.0
		219.1		247.6
		168.3		238.3
16 X 16 14 12 10	406.4	406.4	304.8	304.8
		355.6		304.8
		323.9		295.1
		273.1		282.4

[CONTINUE]		[in mm]		
Nominal Pipe Size [NPS]	Outside Diameter at Bevel D		Center-to-End	
	Run	Outlet	Run C	Outlet ^[1] M
16 X 8 6	406.4	219.1	304.8	373.0
		168.3		263.7
18 X 18 16 14 12 10 8	457.2	457.2	342.9	342.9
		406.4		330.2
		355.6		330.2
		323.9		320.5
		273.1		307.8
		219.1		298.4
20 X 20 18 16 14 12 10 8	508.0	508.0	381.0	381.0
		457.2		369.3
		406.4		355.6
		355.6		355.6
		323.9		345.9
		273.1		333.2
		219.1		323.8
22 X 22 20 18 16 14 12 10	558.8	558.8	419.1	419.1
		508.0		406.4
		457.2		393.7
		406.4		381.0
		355.6		381.0
		323.9		371.3
		273.1		358.6
24 X 24 22 20 18 16 14 12 10	609.6	609.6	431.8	431.8
		558.8		431.8
		508.0		431.8
		457.2		419.1
		406.4		406.4
		355.6		406.4
		323.6		396.7
		273.1		384.0

NOTE [1] Outlet dimension "M" for run sizes 14 and larger is recommended but not mandatory.

CONCENTRIC AND ECCENTRIC REDUCERS



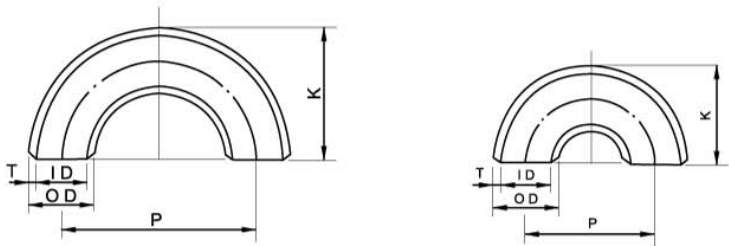
MSS SP-75
ANSI B 16.9

Nominal Pipe Size [NPS]	Outside Diameter at Bevel		End-to-End
	Large End	Small End	
3/4 X 1/2 3/8	26.7	21.3 17.3	38.1
1 X 3/4 1/2	33.4	26.7 21.3	50.8
1-1/4 X 1 3/4 1/2	42.2	33.4 26.7 21.3	50.8
1-1/2 X 1-1/4 1 3/4 1/2	48.3	42.2 33.4 26.7 21.3	63.5
2 X 1-1/2 1-1/4 1 3/4	60.3	48.3 42.2 33.4 26.7	76.2
2-1/2 X 2 1-1/2 1-1/4 1	73.0	60.3 48.3 42.2 33.4	88.9
3 X 2-1/2 2 1-1/2 1-1/4	88.9	73.0 60.3 48.3 42.2	88.9
3-1/2 X 3 2-1/2 2 1-1/2 1-1/4	101.6	88.9 73.0 60.3 48.3 42.2	101.6
4 X 3-1/2 3 2-1/2 2 1-1/2	114.3	101.6 88.9 73.0 60.3 48.3	101.6
5 X 4 3-1/2 3 2-1/2 2	141.3	114.3 101.6 88.9 73.0 60.3	127.0
6 X 5 4 3-1/2 3 2-1/2	168.3	141.3 114.3 101.6 88.9 73.0	139.7

Nominal Pipe Size [NPS]	Outside Diameter at Bevel		End-to-End
	Large End	Small End	
8 X 6 5 4 3-1/2	219.1	168.3 141.3 114.3 101.6 88.9 73.0	152.4
10 X 8 6 5 4	273.1	29.1 168.3 141.3 114.3	177.8
12 X 10 8 6 5	323.9	273.1 219.1 168.3 141.3	203.2
14 X 12 10 8 6	355.6	323.9 273.1 219.1 168.3	330.2
16 X 14 12 10 8	406.4	355.6 323.9 273.1 219.1	355.6
18 X 16 14 12 10	457.2	406.4 355.6 323.9 273.1	381.0
20 X 18 16 14 12	508.0	457.2 406.4 355.6 323.9	508.0
22 X 20 18 16 14	558.8	508.0 457.2 406.4 355.6	508.0
24 X 22 20 18 16	609.6	558.8 508.0 457.2 406.4	508.0

NOTE : [1] The shape of Reducer sizes 16" and larger can be manu factured to conical type without the tangent.

180° LONG AND SHORT RADIUS RETURN ELBOWS

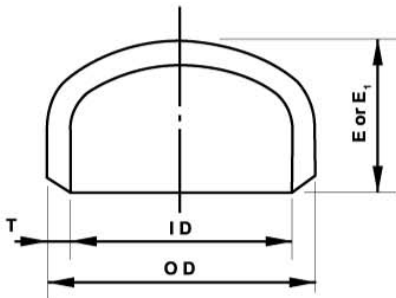


ANSI B 16.9, B 16.28

[in mm]

Nominal Pipe Size [NPS]	Outside Diameter at Bevel D	Long Radius		Short Radius	
		Center-to- Center P	Back-to- Face K	Center-to- Center P	Back-to- Face K
1/2	21.3	76.2	47.8	-	-
3/4	26.7	57.2	42.9	-	-
1	33.4	76.2	55.6	50.8	41.1
1-1/4	42.2	95.2	69.8	63.5	52.3
1-1/2	48.3	114.3	82.6	76.2	62.0
2	60.3	152.4	106.4	101.6	81.0
2-1/2	73.0	109.5	131.8	127.0	100.1
3	88.9	228.6	158.8	152.4	120.7
3-1/2	101.6	266.7	184.2	177.8	139.7
4	114.3	304.8	209.6	203.2	158.8
5	141.3	381.0	261.9	254.0	196.9
6	168.3	457.2	312.7	304.8	236.5
8	219.1	609.6	414.3	406.4	312.7
10	273.1	762.0	517.7	508.0	390.7
12	-	-	-	-	-
14	-	-	-	-	-
16	-	-	-	-	-

CAPS



MSS SP-75

ANSI B 16.9

[in mm]

Nominal Pipe Size [NPS]	Outside Diameter at Bevel D	Length E ^[2]	Limiting Wall Thickness for Length E	Length E ₁ ^[3]
1/2	21.3	25.4	4.6	25.4
3/4	26.7	25.4	3.8	25.4
1	33.4	38.1	4.6	38.1
1-1/4	42.2	38.1	4.8	38.1
1-1/2	48.3	38.1	5.1	38.1
2	60.3	38.1	5.6	44.4
2-1/2	73.0	38.1	7.1	50.8
3	88.9	50.8	7.6	63.5
3-1/2	101.6	63.5	8.1	76.2
4	114.3	63.5	8.6	76.2
5	141.3	76.2	9.7	88.9
6	168.3	88.9	10.9	101.6
8	219.1	101.6	12.7	127.0
10	273.1	127.0	12.7	152.4
12	323.9	152.4	12.7	177.8
14	355.6	165.1	12.7	190.5
16	406.4	177.8	12.7	203.2

[1] The shape of these caps shall be ellipsoidal and shall conform to the shape requirements as give in the ASME Boiler and Pressure Vessel Code.

[2] Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E"

[3] Length E1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller.

