



对焊管件

对焊管件可实现流体流向的改变、管道口径的缩小以及辅助设备的连接。

对焊管件相关内容翻译

对焊管件是一种可焊接管件，能够实现流体流向改变、管道分支、管径缩小或辅助设备连接。锻钢制对焊管件的生产需遵循 ANSI/ASME B16.9 标准（美国国家标准协会 / 美国机械工程师协会 B16.9 标准）。

对焊管件的常见类型包括弯头（elbows）、三通（tees）、管帽（caps）、异径管（reducers）和支管台（outlets/olets）。这类管件是最常用的焊接管件，其规格通过公称管径（nominal pipe size）和管道壁厚等级（pipe schedule）来确定。对焊管件以无缝管或焊管为原材料，经过多道工序加工成型，制成弯头、三通、异径管等不同形状的管件。正如管道的壁厚等级范围覆盖 SCH 10（10 号壁厚）至 SCH 160（160 号壁厚）一样，对焊管件也（遵循相同的壁厚等级体系）。



（对焊管件）也采用相同的（壁厚等级）方式销售。不锈钢制焊接式对焊管件因成本优势更为常见，其中CH 10（10 号壁厚）等级的管件在不锈钢对焊管件中也更为普遍。

对焊管件的常用材料包括 A234 WPB（也有 A 级和 C 级可选）、高屈服强度碳钢、304 不锈钢、316 不锈钢以及镍合金。

对焊管件包含长半径弯头、同心异径管、偏心异径管和三通。在工业管道系统中，它们是实现流向改变、管道分支或将设备与系统进行机械连接的重要组成部分。对焊管件按公称管径（nominal pipe size）销售，并对应特定的管道壁厚等级（pipe schedule）。对焊管件（BW fitting）的尺寸与公差均依据 ASME B16.9 标准（美国机械工程师协会 B16.9 标准）进行界定。





以下列出了部分适用于对焊管件的标准。美国机械工程师协会、美国材料与试验协会、国际标准化组织，制造商标准化协会等众多机构，均已制定出非常完善的对焊管件相关标准及规范。

在设计过程中，设计人员始终有责任确保遵循适用的标准；若企业自身有相关规范，也需同时遵循企业规范。

尺寸标准：ANSI B16.9、ANSI B16.25、ANSI B16.28、MSS SP-43、MSS SP-48、MSS SP-59

材料规范：ASTM A403、ASTM A240、ASTM A312、ASTM A234 WPB

材料牌号：304 不锈钢、304L 不锈钢、316 不锈钢、316L 不锈钢、碳钢



90°弯头



45°弯头



180°弯头



等径三通



异径三通



管帽



同心异径管



偏心异径管

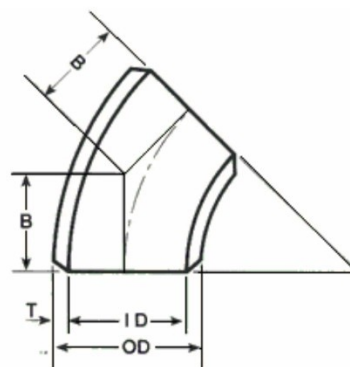
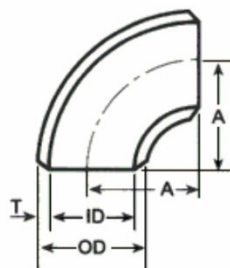
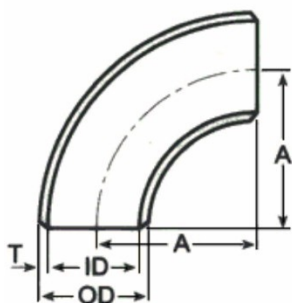


翻边接头





长半径与短半径 45°/90° 弯头



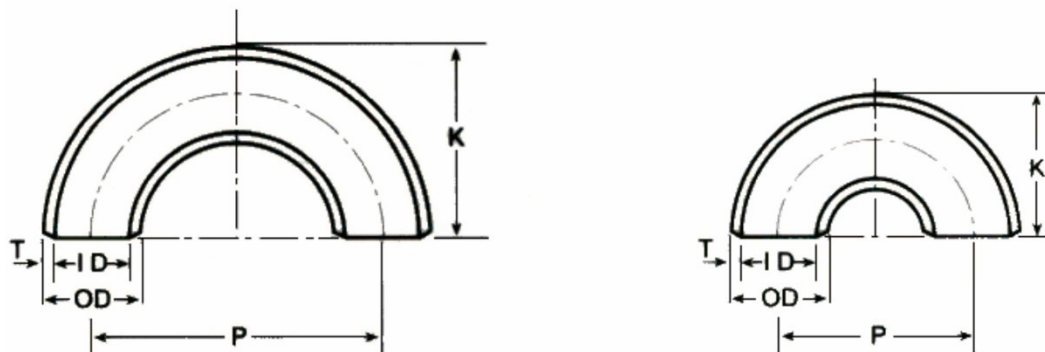
ANSI B16.9 B16.28 (in mm)

* Wellgrow's standard.

公称管径	外径	中心到端部			
		长半径弯头		短半径弯头	
		90° [A]	45° [B]	90° [A]	45° [B]
1/2	21.3	38.1	15.7	-	-
3/4	26.7	38.1	19.1	-	-
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
26	660.4	990.6	406.4	660.4	273.5
28	711.2	1066.8	438.2	711.2	294.6
30	762.0	1143.0	469.9	762.0	315.6
32	812.8	1219.2	501.6	812.8	338.1
34	863.6	1295.4	533.4	863.6	357.7
36	914.4	1371.6	565.2	914.4	378.8
38	965.2	1447.8	599.9	-	-
40	1016.0	1524.0	632.0	1016.0	420.8
42	1066.8	1600.2	660.4	1066.8	441.9
44	1117.6	1676.4	695.5	1117.6	462.9
46	1168.4	1752.6	726.9	-	-
48	1219.2	1828.8	759.0	1219.2	505.0
52*	1320.8	-	-	1320.8	547.1
54*	1371.6	2057.4	852.2	1371.6	568.1
56*	1422.4	2133.6	883.8	1422.4	589.2
60*	1524.0	2286.0	946.9	1524.0	631.3
66*	1676.4	2514.6	1041.6	-	-
68*	1727.0	2591	1073	1727	-
72*	1829.0	2743	1137	1829	-
76*	1930.0	2896	1199	1930	-
80	2032.0	3048	1263	2032	-



Long and Short Radius 180° Elbows

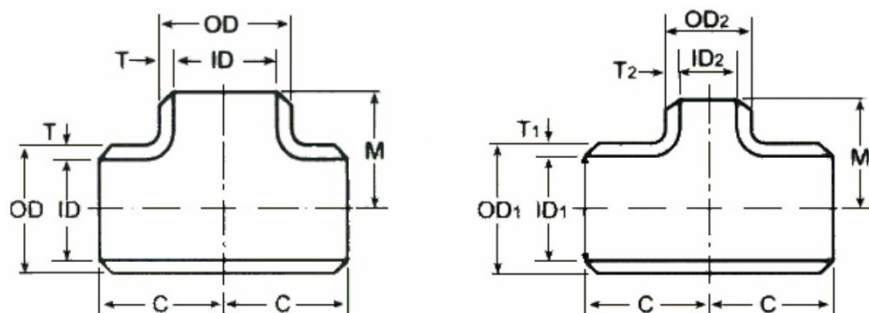


ANSI B16.9 B16.28 (in mm)

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Long Radius Elbows		Short Radius Elbows	
		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	76.2	50.8	-	-
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	323.9	914.4	619.3	609.6	466.9
14	355.6	1066.8	711.2	711.2	533.4
16	406.4	1219.2	812.8	812.8	609.6
18	457.2	1371.6	914.4	914.4	685.8
20	508.0	1524.0	1016.0	1016.0	762.0
22	558.8	1676.4	1117.6	1117.6	838.2
24	609.6	1828.8	1219.2	1219.2	914.4



Equal and Reducing Tees



MSS SP-75 ANSI B16.9 (in mm)
* Wellgrow's standard

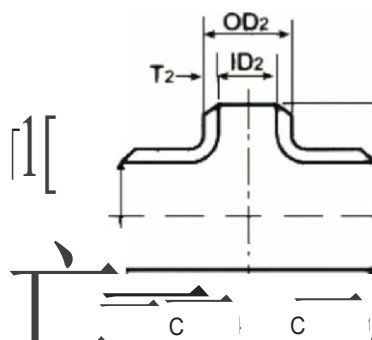
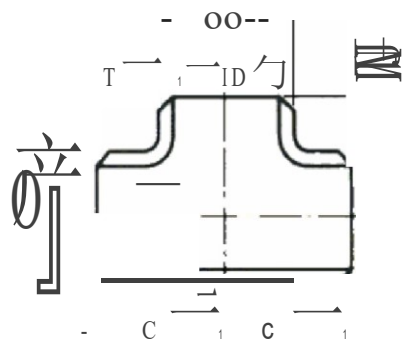
Nominal Pipe Size (NPS)			Outside Diameter At Bevel D		Center to End	
			Run	Outlet	Run C	Outlet (1) M
1/2	x	1/2	21.3	21.3	25.4	25.4
1/2	x	3/8		17.1		25.4
1/2	x	1/4		13.7		25.4
3/4	x	3/4	26.7	26.7	28.4	28.4
3/4	x	1/2		21.3		28.4
3/4	x	3/8		17.1		28.4
1	x	1	33.4	33.4	38.1	38.1
1	x	3/4		26.7		38.1
1	x	1/2		21.3		38.1
1-1/4	x	1-1/4	42.2	42.2	47.8	47.8
1-1/4	x	1		33.4		47.8
1-1/4	x	3/4		26.7		47.8
1-1/4	x	1/2		21.3		47.8
1-1/2	x	1-1/2	48.3	48.3	57.2	57.2
1-1/2	x	1-1/4		42.2		57.2
1-1/2	x	1		33.4		57.2
1-1/2	x	3/4		26.7		57.2
1-1/2	x	1/2		21.3		57.2
2	x	2	60.3	60.3	63.5	63.5
2	x	1-1/2		48.3		60.5
2	x	1-1/4		42.2		57.2
2	x	1		33.4		50.8
2	x	3/4		26.7		44.4
2	x	1/2*		21.3		
2-1/2	x	2-1/2	73.0	73.0	76.2	76.2
2-1/2	x	2		60.3		69.8
2-1/2	x	1-1/2		48.3		66.5
2-1/2	x	1-1/4		42.2		63.5
2-1/2	x	1		33.4		57.2
3	x	3	88.9	88.9	85.9	85.9
3	x	2-1/2		73.0		82.6
3	x	2		60.3		76.2
3	x	1-1/2		48.3		73.2
3	x	1-1/4		42.2		69.8
3	x	1*		33.4		
3-1/2	x	3-1/2	101.6	101.6	95.2	95.2
3-1/2	x	3		88.9		91.9
3-1/2	x	2-1/2		73.0		88.9
3-1/2	x	2		60.3		82.6
3-1/2	x	1-1/2		48.3		79.2

Nominal Pipe Size (NPS)			Outside Diameter At Bevel D		Center to End	
			Run	Outlet	Run C	Outlet (1) M
4	x	4	114.3	114.3	104.6	104.6
4	x	3-1/2		101.6		101.6
4	x	3		88.9		98.6
4	x	2-1/2		73.0		95.2
4	x	2		60.3		88.9
4	x	1-1/2		48.3		85.9
4	x	1-1/4		42.2		
4	x	1*		33.5		
5	x	5	141.3	141.3	124.0	124.0
5	x	4		114.3		117.3
5	x	3-1/2		101.6		114.3
5	x	3		88.9		111.3
5	x	2-1/2		73.0		108.0
5	x	2		60.3		104.6
5	x	1-1/2*		48.3		
6	x	6	168.3	168.3	142.7	142.7
6	x	5		141.3		136.7
6	x	4		114.3		130.0
6	x	3-1/2		101.6		127.0
6	x	3		88.9		124.0
6	x	2-1/2		73.0		120.6
6	x	2*		60.3		
8	x	8	219.1	219.1	177.8	177.8
8	x	6		168.3		168.1
8	x	5		141.3		162.1
8	x	4		114.3		155.4
8	x	3-1/2		101.6		152.4
8	x	3*		88.9		
10	x	10	273.1	273.1	215.9	215.9
10	x	8		219.1		203.2
10	x	6		168.3		193.5
10	x	5		141.3		190.5
10	x	4		114.3		184.2
12	x	12	323.9	323.9	254.0	254.0
12	x	10		273.1		241.3
12	x	8		219.1		228.6
12	x	6		168.3		218.9
12	x	5		141.3		215.9

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



Equal and Reducing Tees



MSS SP-75 ANSI B16.9 (in mm)

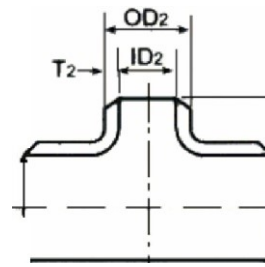
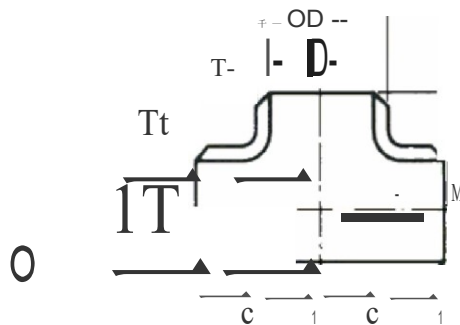
Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
14 x 14	355.6	355.6	279.4	279.4
14 x 12		323.9		269.7
14 x 10		273.1		257.0
14 x 8		219.1		247.6
14 x 6		168.3		238.3
16 x 16	406.4	406.4	304.8	304.8
16 x 14		355.6		304.8
16 x 12		323.9		295.1
16 x 10		273.1		282.4
16 x 8		219.1		373.0
16 x 6		168.3		263.7
18 x 18	457.2	457.2	342.9	342.9
18 x 16		406.4		330.2
18 x 14		355.6		330.2
18 x 12		323.9		320.5
18 x 10		273.1		307.8
18 x 8		219.1		298.4
20 x 20	508.0	508.0	381.0	381.0
20 x 18		457.2		369.3
20 x 16		406.4		355.6
20 x 14		355.6		355.6
20 x 12		323.9		345.9
20 x 10		273.1		333.2
20 x 8		219.1		323.8
22 x 22	558.8	558.8	419.1	419.1
22 x 20		508.0		406.4
22 x 18		457.2		393.7
22 x 16		406.4		381.0
22 x 14		355.6		381.0
22 x 12		323.9		371.3
22 x 10		273.1		358.6
24 x 24	609.6	609.6	431.8	431.8
24 x 22		558.8		431.8
24 x 20		508.0		431.8
24 x 18		457.2		419.1
24 x 16		406.4		406.4
24 x 14		355.6		406.4
24 x 12		323.9		396.7
24 x 10		273.1		384.0
26 x 26	660.4	660.4	495.3	495.3
26 x 24		609.6		482.6

Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
26 x 22		558.8		469.9
26 x 20		508.0		457.2
26 x 18		457.2		444.5
26 x 16		406.4		431.8
26 x 14		355.6		431.8
26 x 12		323.1		422.1
28 x 28	711.2	711.2	520.7	520.7
28 x 26		660.4		520.7
28 x 24		609.6		508.0
28 x 22		558.8		495.3
28 x 20		508.0		482.6
28 x 18		457.2		469.9
28 x 16		406.4		457.2
28 x 14		355.6		457.2
28 x 12		323.1		447.5
30 x 30	762.0	762.0	558.8	558.8
30 x 28		711.2		546.1
30 x 26		660.4		546.1
30 x 24		609.6		533.4
30 x 22		558.8		520.7
30 x 20		508.0		508.0
30 x 18		457.2		495.3
30 x 16		406.4		482.6
30 x 14		355.6		482.6
30 x 12		323.9		472.6
30 x 10		273.1		460.2
32 x 32	812.8	812.8	596.9	596.9
32 x 30		762.0		584.2
32 x 28		711.2		571.5
32 x 26		660.4		571.5
32 x 24		609.6		558.8
32 x 22		558.8		546.1
32 x 20		508.0		533.4
32 x 18		457.2		520.7
32 x 16		406.4		508.0
32 x 14		355.6		508.0
34 x 34	863.6	863.6	635.0	635.0
34 x 32		812.8		622.3
34 x 30		762.0		609.6
34 x 28		711.2		596.9
34 x 26		660.4		596.9

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



Equal and Reducing Tees



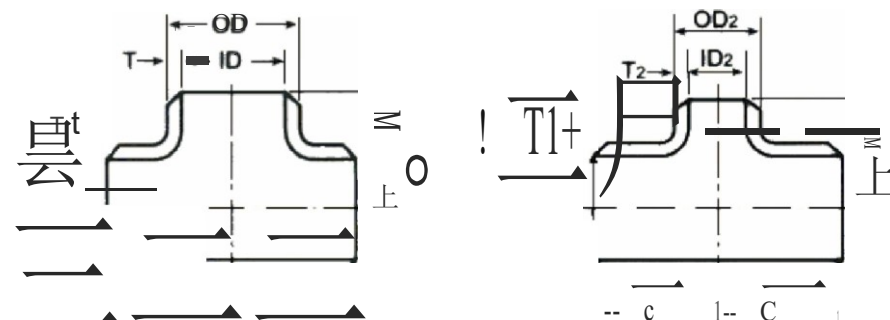
Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
34 x 24		609.6		584.2
34 x 22		558.8		571.5
34 x 20		508.0		558.8
34 x 18		457.2		546.1
34 x 16		406.4		533.4
36 x 36	914.4	914.4	673.1	673.1
36 x 34		863.6		660.4
36 x 32		812.8		647.7
36 x 30		762.0		635.0
36 x 28		711.2		622.3
36 x 26		660.4		622.3
36 x 24		609.6		609.6
36 x 22		558.8		596.9
36 x 20		508.0		584.2
36 x 18		457.2		571.5
36 x 16		406.4		558.8
38 x 38	965.2	965.2	711.2	711.2
38 x 36		914.4		711.2
38 x 34		863.6		698.5
38 x 32		812.8		685.8
38 x 30		762.0		673.1
38 x 28		711.2		647.7
38 x 26		660.4		647.7
38 x 24		609.6		635.0
38 x 22		558.8		622.3
38 x 20		508.0		609.6
38 x 18		457.2		596.9
40 x 40	1016.0	1016.0	749.3	749.3
40 x 38		965.2		749.3
40 x 36		914.4		736.6
40 x 34		863.6		723.9
40 x 32		812.8		711.2
40 x 30		762.0		698.5
40 x 28		711.2		673.1
40 x 26		660.4		673.1
40 x 24		609.6		660.4
40 x 22		558.8		647.7
40 x 20		508.0		635.0
40 x 18		457.2		622.3
42 x 42	1066.8	1066.8	762.0	711.2
42 x 40		1016.0		711.2

Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
42 x 38		965.2		711.2
42 x 36		914.4		711.2
42 x 34		863.6		711.2
42 x 32		812.8		711.2
42 x 30		762.0		711.2
42 x 28	1066.8	711.2	762.0	698.5
42 x 26		660.4		698.5
42 x 24		609.6		660.4
42 x 22		558.8		660.4
42 x 20		508.0		660.4
42 x 18		457.2		647.7
42 x 16		406.4		635.0
44 x 44	1117.6	1117.6	812.8	762.0
44 x 42		1066.8		762.0
44 x 40		1016.0		749.3
44 x 38		965.2 ±		736.6
44 x 36		914.4	p	723.9
44 x 34		863.6	1/4"	723.9
44 x 32		812.8	AW	711.2
44 x 30		762.0	EN	711.2
44 x 28		711.2	ST	698.5
44 x 26		660.4	OUTER	698.5
44 x 24		609.6	1/2"	698.5
44 x 22		558.8	4"	685.8
44 x 20		508.0	mda	685.8
46 x 46	1168.4	1168.4	850.9	800.1
46 x 44		1117.6		800.1
46 x 42		1066.8		787.4
46 x 40		1016.0		774.7
46 x 38		965.2		762.0
46 x 36		914.4		762.0
46 x 34		863.6		749.3
46 x 32		812.8		749.3
46 x 30		762.0		736.6
46 x 28		711.2		736.6
46 x 26		660.4		736.6
46 x 24		609.6		723.9
46 x 22		558.8		723.9
48 x 48	1219.2	1219.2	889.0	838.2
48 x 46		1168.4		838.2
48 x 44		1117.6		838.2

(1) Outlet dimension "M" for run sizes 14 and larger is recommended but not mandatory



Equal and Reducing Tees



MSS SP-75 ANSI B16.9 (in mm)

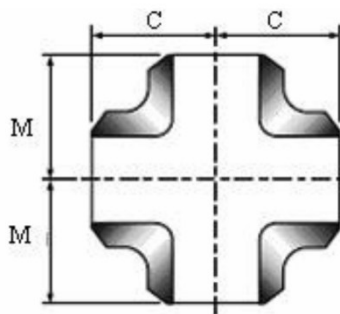
Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
48 x 42		1066.8		812.8
48 x 40		1016.0		812.8
48 x 38		965.2		812.8
48 x 36		914.4		787.4
48 x 34		863.6		787.4
48 x 32	1219.2	812.8	889.0	787.4
48 x 44		1117.6		838.2
48 x 42		1066.8		812.8
48 x 40		1016.0		812.8
48 x 38		965.2		812.8
48 x 36		914.4		787.4
48 x 34		863.6		787.4
48 x 32		812.8		787.4
48 x 30		762.0		762.0
48 x 28		711.2		762.0
48 x 26		660.4		762.0
48 x 24		609.6		736.6
48 x 22		558.8		736.6
52 x 52*	1320.8	1320.8	965.2	914.4
52 x 48*		1219.2		863.6
52 x 44*		1117.6		812.8
52 x 40*		1016.0		762.0
54 x 54*	1371.6	1371.6	1003.3	952.5
54 x 52*		1320.8		914.4
54 x 48*		1219.2		863.6
54 x 44*		1117.6		863.6
54 x 40*		1016.0		812.8
54 x 28*		711.2		787.4
54 x 20*		508.0		787.4
56 x 56*	1422.4	1422.4	1041.4	965.2
56 x 52*		1320.8		914.4
56 x 48*		1219.2		863.6
56 x 44*		1117.6		812.8
56 x 40*		1016.0		812.8
56 x 28*		711.2		812.8
56 x 20*		508.0		812.8
60 x 60*	1524.0	1524.0	1117.6	1016.0
60 x 56*		1422.4		965.2
60 x 52*		1320.8		914.4
60 x 48*		1219.2		863.6

Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
60 x 40*		1016.0		863.6
60 x 28*		711.2		863.6
60 x 20*		508.0		863.6
64 x 64	1626.0	1626.0	1194.0	1092.0
64 x 60*		1524.0		1067.0
64 x 56*		1422.0		1016.0
64 x 52*		1321.0		965.0
64 x 48*		1219.0		914.0
66 x 66*	1676.4	1676.4	1219.2	1066.8
68 x 68*	1727.0	1727.0	1270.0	1168.0
68 x 64*		1626.0		1143.0
68 x 60		1524.0		1118.0
68 x 56*		1422.0		1067.0
68 x 52*		1321.0		1016.0
68 x 48*		1219.0		965.0
72 x 72*	1829.0	1829.0	1320.0	1245.0
72 x 68*		1727.0		1219.0
72 x 64*		1626.0		1194.0
72 x 60*		1524.0		1168.0
72 x 56*	1829.0	1422.0	1320.0	1118.0
72 x 52		1321.0		1067.0
72 x 48*		1219.0		1016.0
76 x 76*	1930.0	1930.0	1422.0	1320.0
76 x 72*		1829.0		1295.0
76 x 68*		1727.0		1270.0
76 x 64		1626.0		1245.0
76 x 60*		1524.0		1219.0
76 x 56*		1422.0		1168.0
76 x 52*		1321.0		1118.0
76 x 48*		1219.0		1067.0
80 x 80*	2032.0	2032.0	1499.0	1397.0
80 x 76*		1930.0		1372.0
80 x 72*		1829a		1346.0
80 x 68*		1727.0		1321.0
80 x 64*		1626.0		1295.0
80 x 60*		1524.0		1270.0
80 x 56		1422.0		1219.0
80 x 52*		1321.0		1168.0
80 x 48*		1219.0		1118.0

(1) Outlet dimension "M" for run sizes 14 and larger is recommended but not mandatory



Equal and Reducing Crosses



MSS SP-75 ANSI B16.9 (in mm)
* Wellgrow's standard

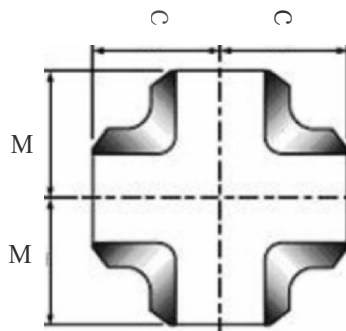
Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
1/2 x 1/2	21.3	21.3	25.4	25.4
1/2 x 3/8		17.1		25.4
1/2 x 1/4		13.7		25.4
3/4 x 3/4	26.7	26.7	28.4	28.4
3/4 x 1/2		21.3		28.4
3/4 x 3/8		17.1		28.4
1 x 1	33.4	33.4	38.1	38.1
1 x 3/4		26.7		38.1
1 x 1/2		21.3		38.1
1-1/4 x 1-1/4	42.2	42.2	47.8	47.8
1-1/4 x 1		33.4		47.8
1-1/4 x 3/4		26.7		47.8
1-1/4 x 1/2		21.3		47.8
1-1/2 x 1-1/2	48.3	48.3	57.2	57.2
1-1/2 x 1-1/4		42.2		57.2
1-1/2 x 1		33.4		57.2
1-1/2 x 3/4		26.7		57.2
1-1/2 x 1/2		21.3		57.2
2 x 2	60.3	60.3	63.5	63.5
2 x 1-1/2		48.3		60.5
2 x 1-1/4		42.2		57.2
2 x 1		33.4		50.8
2 x 3/4		26.7		44.4
2 x 1/2*		21.3		
2-1/2 x 2-1/2	73.0	73.0	76.2	76.2
2-1/2 x 2		60.3		69.8
2-1/2 x 1-1/2		48.3		66.5
2-1/2 x 1-1/4		42.2		63.5
2-1/2 x 1		33.4		57.2
3 x 3	88.9	88.9	85.9	85.9
3 x 2-1/2		73.0		82.6
3 x 2		60.3		76.2
3 x 1-1/2		48.3		73.2
3 x 1-1/4		42.2		69.8
3 x 1*		33.4		
3-1/2 x 3-1/2	101.6	101.6	95.2	95.2
3-1/2 x 3		88.9		91.9
3-1/2 x 2-1/2		73.0		88.9
3-1/2 x 2		60.3		82.6
3-1/2 x 1-1/2		48.3		79.2

Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
4 x 4	114.3	114.3	104.6	104.6
4 x 3-1/2		101.6		101.6
4 x 3		88.9		98.6
4 x 2-1/2		73.0		95.2
4 x 2		60.3		88.9
4 x 1-1/2		48.3		85.9
4 x 1-1/4		42.2		
4 x 1*		33.5		
5 x 5	141.3	141.3	124.0	124.0
5 x 4		114.3		117.3
5 x 3-1/2		101.6		114.3
5 x 3		88.9		111.3
5 x 2-1/2		73.0		108.0
5 x 2		60.3		104.6
5 x 1-1/2*		48.3		
6 x 6	168.3	168.3	142.7	142.7
6 x 5		141.3		136.7
6 x 4		114.3		130.0
6 x 3-1/2		101.6		127.0
6 x 3		88.9		124.0
6 x 2-1/2		73.0		120.6
6 x 2*		60.3		
8 x 8	219.1	219.1	177.8	177.8
8 x 6		168.3		168.1
8 x 5		141.3		162.1
8 x 4		114.3		155.4
8 x 3-1/2		101.6		152.4
8 x 3*		88.9		
10 x 10	273.1	273.1	215.9	215.9
10 x 8		219.1		203.2
10 x 6		168.3		193.5
10 x 5		141.3		190.5
10 x 4		114.3		184.2
12 x 12	323.9	323.9	254.0	254.0
12 x 10		273.1		241.3
12 x 8		219.1		228.6
12 x 6		168.3		218.9
12 x 5		141.3		215.9

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



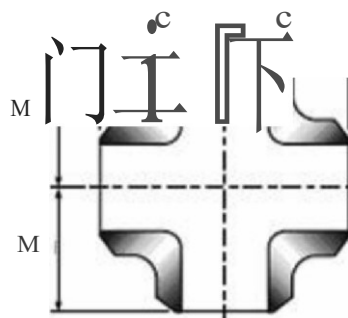
Equal and Reducing Crosses



MSS SP-75 ANSI B16.9 (in mm)

Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
14 x 14	355.6	355.6	279.4	279.4
14 x 12		323.9		269.7
14 x 10		273.1		257.0
14 x 8		219.1		247.6
14 x 6		168.3		238.3
16 x 16	406.4	406.4	304.8	304.8
16 x 14		355.6		304.8
16 x 12		323.9		295.1
16 x 10		273.1		282.4
16 x 8		219.1		373.0
16 x 6		168.3		263.7
18 x 18	457.2	457.2	342.9	342.9
18 x 16		406.4		330.2
18 x 14		355.6		330.2
18 x 12		323.9		320.5
18 x 10		273.1		307.8
18 x 8		219.1		298.4
20 x 20	508.0	508.0	381.0	381.0
20 x 18		457.2		369.3
20 x 16		406.4		355.6
20 x 14		355.6		355.6
20 x 12		323.9		345.9
20 x 10		273.1		333.2
20 x 8		219.1		323.8
22 x 22	558.8	558.8	419.1	419.1
22 x 20		508.0		406.4
22 x 18		457.2		393.7
22 x 16		406.4		381.0
22 x 14		355.6		381.0
22 x 12		323.9		371.3
22 x 10		273.1		358.6
24 x 24	609.6	609.6	431.8	431.8
24 x 22		558.8		431.8
24 x 20		508.0		431.8
24 x 18		457.2		419.1
24 x 16		406.4		406.4
24 x 14		355.6		406.4
24 x 12		323.9		396.7
24 x 10		273.1		384.0
26 x 26	660.4	660.4	495.3	495.3
26 x 24		609.6		482.6
26 x 22		558.8		472.6
26 x 20		508.0		460.2
26 x 18		457.2		447.5
26 x 16		406.4		431.8
26 x 14		355.6		422.1
26 x 12		323.9		406.4
26 x 10		273.1		384.0
26 x 8		219.1		358.6
26 x 6		168.3		323.8
26 x 4		114.3		273.1
26 x 3		88.9		219.1
26 x 2		63.5		168.3
26 x 1		38.1		114.3
26 x 0.75		25.4		76.2
26 x 0.5		12.7		38.1
26 x 0.25		6.35		19.05
26 x 0.125		3.175		9.525
26 x 0.0625		1.5875		4.7625
26 x 0.03125		0.79375		2.38125
26 x 0.015625		0.396875		1.190625
26 x 0.0078125		0.1984375		0.5953125
26 x 0.00390625		0.09921875		0.29765625
26 x 0.001953125		0.049609375		0.148828125
26 x 0.0009765625		0.0248046875		0.0744140625
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Equal and Reducing Crosses



MSS SP-75 ANSI B16.9 (in mm)

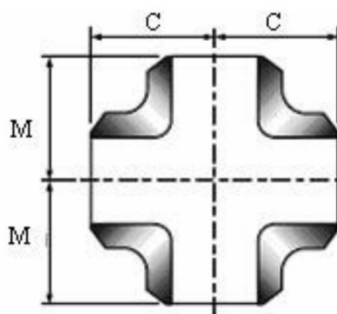
Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet(1) M
34 X 24		6096		584 2
34 X 22		5588		5715
34 X 20		5080		558 8
34 X 18		4572		5461
34 X 16		4064		5334
36 X 36	914.4	914.4	673.1	673.1
36 X 34		8636		6604
36 X 32		8128		647 7
36 X 30		7620		635 0
36 X 28		7112		622 3
36 X 26		6604		622 3
36 X 24		6096		6096
36 X 22		5588		5969
36 X 20		5080		5842
36 X 18		4572		5715
36 X 16		4064		5588
38 X 38	965.2	965 2	7112	711.2
38 X 36		914 4		711.2
38 X 34		863.6		698 .5
38 X 32		812.8		685 .8
38 X 30		7620		6731
38 X 28		711.2		647.7
38 X 26		6604		647 7
38 X 24		6096		635 0
38 X 22		5588		622 3
38 X 20		508.0		609 .6
38 X 18		457.2		5969
40 X 40	1016.0	1016.0	749.3	749.3
40 X 38		965.2		749.3
40 X 36		914 4		736 6
40 X 34		8636		723 9
40 X 32		8128		711.2
40 X 30		762.0		698.5
40 X 28		711.2		673.1
40 X 26		660.4		673.1
40 X 24		609.6		660.4
40 X 22		5588		647 7
40 X 20		5080		635 0
40 X 18		4572		622.3
42 X 42	1066.8	1066.8	762.0	711.2
42 X 40		1016.0		711.2

Nominal Pipe Size (NPS)	Outside Diamete r At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
42 X 38		965.2		7112
42 X 36		914.4		7112
42 X 34		863.6		711.2
42 X 32		812.8		7112
42 X 30		762.0		711.2
42 X 28	1066.8	711.2	762.0	698.5
42 X 26		660.4		698.5
42 X 24		609.6		660.4
42 X 22		558.8		660.4
42 X 20		5080		660.4
42 X 18		457.2		647.7
42 X 16		406.4		635.0
44 X 44	1117.6	1117.6	812 .8	762.0
44 X 42		10668		762.0
44 X 40		10160		749.3
44 X 38		965.2		736.6
44 X 36		914.4		723.9
44 X 34		863.6		723.9
44 X 32		812.8		711.2
44 X 30		762.0		711.2
44 X 28		7112		698 .5
44 X 26		660.4		698.5
44 X 24		609.6		698.5
44 X 22		558.8		685.8
44 X 20		508.0		685.8
46 X 46	1168.4	1168.4	850.9	800.1
46 X 44		1117.6		800.1
46 X 42		1066.8		787.4
46 X 40		1016.0		774.7
46 X 38		965.2		762.0
46 X 36		914.4		762.0
46 X 34		863.6		749.3
46 X 32		812.8		749.3
46 X 30		762.0		736.6
46 X 28		711.2		736.6
46 X 26		660.4		736.6
46 X 24		609.6		723.9
46 X 20*		5080		723.9
48 X 48	1219.2	1219.2	889.0	838.2
48 X 46		11684		838.2
48 X 44		1117.6		838.2

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



Equal and Reducing Crosses



MSS SP-75 ANSI B16.9 (in mm)
* Wellgrow's standard.

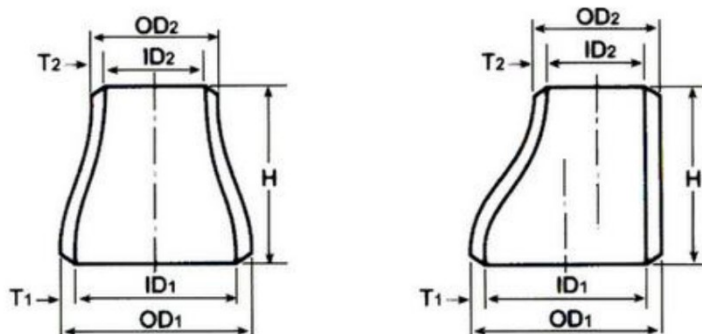
Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
48 x 42		1066.8		812.8
48 x 40		1016.0		812.8
48 x 38		965.2		812.8
48 x 36		914.4		787.4
48 x 34		863.6		787.4
48 x 32	1219.2	812.8	889.0	787.4
48 x 44		1117.6		838.2
48 x 42		1066.8		812.8
48 x 40		1016.0		812.8
48 x 38		965.2		812.8
48 x 36		914.4		787.4
48 x 34		863.6		787.4
48 x 32		812.8		787.4
48 x 30		762.0		762.0
48 x 28		711.2		762.0
48 x 26		660.4		762.0
48 x 24		609.6		736.6
48 x 22		558.8		736.6
52 x 52*	1320.8	1320.8	965.2	914.4
52 x 48*		1219.2		863.6
52 x 44*		1117.6		812.8
52 x 40*		1016.0		762.0
54 x 54*	1371.6	1371.6	1003.3	952.5
54 x 52*		1320.8		914.4
54 x 48*		1219.2		863.6
54 x 44*		1117.6		863.6
54 x 40*		1016.0		812.8
54 x 28*		711.2		787.4
54 x 20*		508.0		787.4
56 x 56*	1422.4	1422.4	1041.4	965.2
56 x 52*		1320.8		914.4
56 x 48*		1219.2		863.6
56 x 44*		1117.6		812.8
56 x 40*		1016.0		812.8
56 x 28*		711.2		812.8
56 x 20*		508.0		812.8
60 x 60*	1524.0	1524.0	1117.6	1016.0
60 x 56*		1422.4		965.2
60 x 52*		1320.8		914.4
60 x 48*		1219.2		863.6

Nominal Pipe Size (NPS)	Outside Diameter At Bevel D		Center to End	
	Run	Outlet	Run C	Outlet (1) M
60 x 40*		1016.0		863.6
60 x 28*		711.2		863.6
60 x 20*		508.0		863.6
64 x 64*	1626.0	1626.0	1194.0	1092.0
64 x 60*		1524.0		1067.0
64 x 56*		1422.0		1016.0
64 x 52*		1321.0		965.0
64 x 48*		1219.0		914
66 x 66*	1676.4	1676.4	1219.2	1066.8
68 x 68*	1727.0	1727.0	1270.0	1168.0
68 x 64*		1626.0		1143.0
68 x 60*		1524.0		1118.0
68 x 56*		1422.0		1067.0
68 x 52*		1321.0		1016.0
68 x 48*		1219.0		965.0
72 x 72*	1829.0	1829.0	1320.0	1245.0
72 x 68*		1727.0		1219.0
72 x 64*		1626.0		1194.0
72 x 60*		1524.0		1168.0
72 x 56*	1829.0	1422.0	1320.0	1118.0
72 x 52*		1321.0		1067.0
72 x 48*		1219.0		1016.0
76 x 76*	1930.0	1930.0	1422.0	1320.0
76 x 72*		1829.0		1295.0
76 x 68*		1727.0		1270.0
76 x 64*		1626.0		1245.0
76 x 60*		1524.0		1219.0
76 x 56*		1422.0		1168.0
76 x 52*		1321.0		1118.0
76 x 48*		1219.0		1067.0
80 x 80*	2032.0	2032.0	1499.0	1397.0
80 x 76*		1930.0		1372.0
80 x 72*		1829.0		1346.0
80 x 68*		1727.0		1321.0
80 x 64*		1626.0		1295.0
80 x 60*		1524.0		1270.0
80 x 56*		1422.0		1219.0
80 x 52*		1321.0		1168.0
80 x 48*		1219.0		1118.0

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



Concentric and Eccentric Reducers



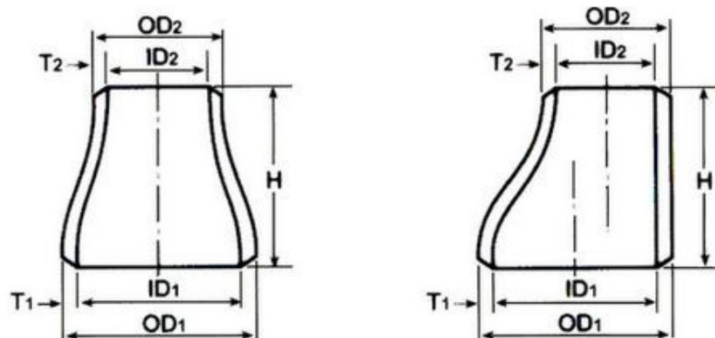
MSS SP-75 ANSI B16.9 (in mm)
* Wellgrow's standard.

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

Nominal Pipe Size (NPS)			Outside Diameter at Bevel		End-to-end
			Large End	Small End	
8	x	6	219.1	168.3	152.4
8	x	5		141.3	
8	x	4		114.3	
8	x	3-1/2		101.6	
8	x	3		88.9	
8	x	2-1/2		73.0	
10	x	8	273.1	29.1	177.8
10	x	6		168.3	
10	x	5		141.3	
10	x	4		114.3	
12	x	10	323.9	273.1	203.2
12	x	8		219.1	
12	x	6		168.3	
12	x	5		141.3	
14	x	12	355.6	323.9	330.2
14	x	10		273.1	
14	x	8		219.1	
14	x	6		168.3	
16	x	14	406.4	355.6	355.6
16	x	12		323.9	
16	x	10		273.1	
16	x	8		219.1	
18	x	16	457.2	406.4	381.0
18	x	14		355.6	
18	x	12		323.9	
18	x	10		273.1	
18	x	8		219.1	
20	x	18	508.0	457.2	508.0
20	x	16		406.4	
20	x	14		355.6	
20	x	12		323.9	
20	x	10		273.0	
22	x	20	558.8	508.0	508.0
22	x	18		457.2	
22	x	16		406.4	
22	x	14		355.6	
22	x	12		323.8	
24	x	22	609.6	558.8	508.0
24	x	20		508.0	
24	x	18		457.2	
24	x	16		406.4	
24	x	16		355.6	
24	x	16		323.8	



Concentric and Eccentric Reducers



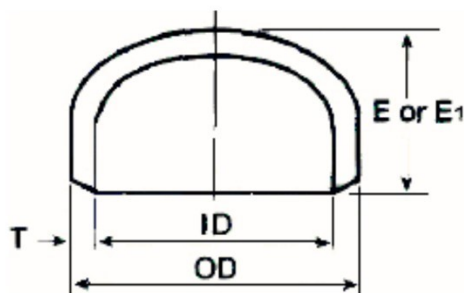
MSS SP-75 ANSI B16.9 (in mm)
* Wellgrow's standard.

Nominal Pipe Size (NPS)	Outside Diameter at Bevel		End-to-end
	Large End	Small End	
26 x 24	660.4	609.6	609.6
26 x 22		558.8	
26 x 20		508.0	
26 x 18		457.2	
26 x 16		406.4	
26 x 14		355.6	
28 x 26	711.2	660.4	609.6
28 x 24		609.6	
28 x 22		559.0	
28 x 20		508.0	
28 x 18		457.2	
28 x 16		406.4	
28 x 14		355.6	
30 x 28	762.0	711.2	609.6
30 x 26		660.4	
30 x 24		609.6	
30 x 22		559.0	
30 x 20		508.0	
30 x 18		457.0	
30 x 16		406.4	
30 x 14		355.6	
32 x 30	813.0	762.0	609.6
32 x 28		711.0	
32 x 26		660.0	
32 x 24		610.0	
32 x 22		559.0	
32 x 20		508.0	
34 x 32	863.6	812.8	609.6
34 x 30		762.0	
34 x 28		711.0	
34 x 26		711.2	
34 x 24		660.4	
34 x 22		559.0	
36 x 34	914.0	864.0	609.6
36 x 32		813.0	
36 x 30		762.0	
36 x 28		711.0	
36 x 26		660.0	
36 x 24		610.0	
36 x 22		559.0	
38 x 36	965.0	914.0	609.6
38 x 34		864.0	
38 x 32		813.0	
38 x 30		762.0	
38 x 28		711.0	
38 x 26		660.0	
38 x 24		610.0	

Nominal Pipe Size (NPS)	Outside Diameter at Bevel		End-to-end
	Large End	Small End	
40 x 38	1016.0	965.0	609.6
40 x 36		914.0	
40 x 34		864.0	
40 x 32		813.0	
40 x 30		762.0	
40 x 28		711.0	
42 x 40	1067.0	1016.0	609.6
42 x 38		965.0	
42 x 36		914.4	
42 x 34		863.6	
42 x 32		812.8	
42 x 30		762.0	
42 x 28		711.0	
44 x 42	1117.6	1066.8	609.6
44 x 40		1016.0	
44 x 38		965.2	
44 x 36		914.4	
44 x 34		864.0	
44 x 32		813.0	
46 x 44	1168.4	1117.6	711.2
46 x 42		1066.8	
46 x 40		1016.0	
46 x 38		965.2	
46 x 36		914.0	
46 x 34		864.0	
48 x 46	1219.2	1168.4	711.2
48 x 44		1117.6	
48 x 42		1066.8	
48 x 40		1016.0	
48 x 38		965.0	
48 x 36		914.0	
52 x 48	1321.0	1219.0	711.2
52 x 46		1168.0	
52 x 44		1118.0	
52 x 42		1067.0	
52 x 40		1016.0	
56 x 52	1422.0	1321.0	711.2
56 x 48		1219.0	
56 x 44		1118.0	
52 x 40		1016.0	
60 x 56	1524.0	1422.0	711.2
60 x 52		1321.0	
60 x 48		1219.0	
60 x 44		1118.0	



Pipe Caps



MSS SP-75 ANSI B16.9 (in mm)

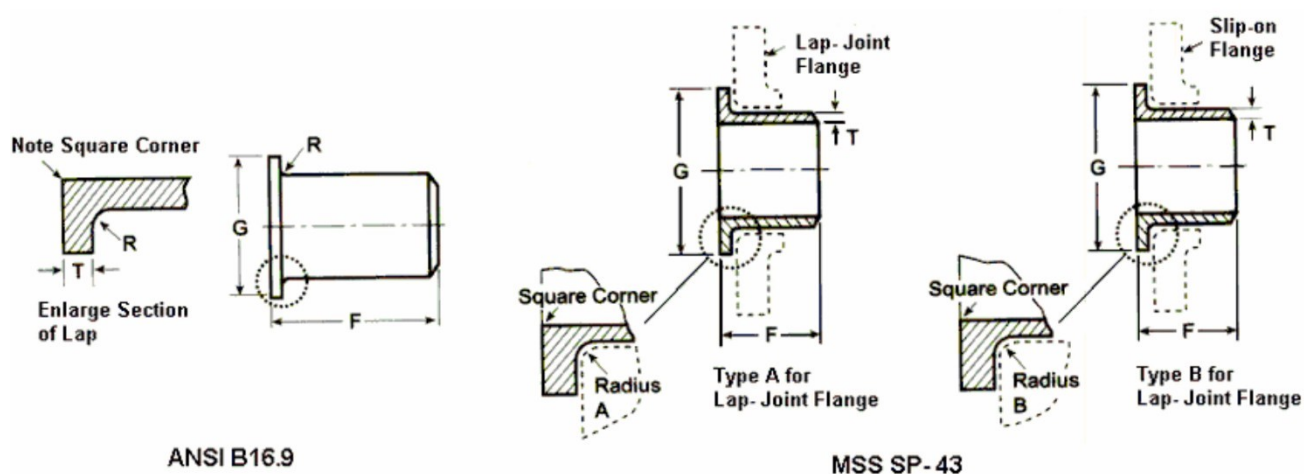
Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Length (2) E	Limiting Wall Thickness for Length E	Length (3) E1
1/2	21.3	25.4	4.6	25.4
3/4	26.7	25.4	3.8	25.4
1	33.4	38.1	4.6	38.1
1-1/4	42.2	38.1	4.8	38.1
1-1/2	48.3	38.1	5.1	38.1
2	60.3	38.1	5.6	44.4
2-1/2	73.0	38.1	7.1	50.8
3	88.9	50.8	7.6	63.5
3-1/2	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
18	457.2	203.2	12.7	228.6
20	508.0	228.6	12.7	254.0
22	558.8	254.0	12.7	254.0
24	609.6	266.7	12.7	304.8
26	660.4	266.7		
28	711.2	266.7		
30	762.0	266.7		
32	812.8	266.7		
34	863.6	266.7		
36	914.4	266.7		
38	965.2	304.8		
40	1016.0	304.8		
42	1066.8	304.8		
44	1117.6	342.9		
46	1168.4	342.9		
48	1219.2	342.9		

Wall thickness for caps up to and including 36" conform to ANSI B36.10 specifications. Caps 38" and larger conform to XS specifications for wall thickness of 36". These are Wellgrow's standards as no internationally recognized standards have been set for such large size wall thickness.

- (1) The shape of these caps shall be ellipsoidal and shall conform to the shape requirements as given 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. For NPS 26 and larger, length E1 shall be by agreement between manufacturer and purchaser.



Stub Ends



MSS SP-43 ANSI B16.9 (in mm)

Nominal Pipe Size (NPS)	Outside Diameter at Bevel	Outside Diameter of Barrel		Length F		Radius of Fillet R		Diameter of Lap G
		Min.	Max.	ANSI	MSS	ANSI & MSS Type A	MSS Type B	
1/2	21.3	20.55	22.76	76.2	50.8	3.0	0.8	35.0
3/4	26.7	25.88	28.09	76.2	50.8	3.0	0.8	42.9
1	33.4	32.61	34.95	101.6	50.8	3.0	0.8	50.8
1-1/4	42.2	41.38	43.59	101.6	50.8	4.8	0.8	63.5
1-1/2	48.3	47.47	49.94	101.6	50.8	6.4	0.8	73.2
2	60.3	59.54	62.38	152.4	63.5	7.9	0.8	91.9
2-1/2	73.0	72.24	75.34	152.4	63.5	7.9	0.8	104.6
3	88.9	88.11	91.34	152.4	63.5	9.7	0.8	127.0
3-1/2	101.6	100.81	104.04	152.4	76.2	9.7	0.8	139.7
4	114.3	113.51	116.66	152.4	76.2	11.2	0.8	157.2
5	141.3	140.51	144.35	203.2	76.2	11.2	1.5	185.7
6	168.3	167.49	171.27	203.2	88.9	12.7	1.5	215.9
8	219.1	218.29	222.07	203.2	101.6	12.7	1.5	269.7
10	273.1	272.26	277.19	254.0	127.0	12.7	1.5	323.9
12	323.9	323.06	327.99	254.0	152.4	12.7	1.5	381.0
14	355.6	354.81	359.92	304.8	152.4	12.7	1.5	412.8
16	406.4	405.61	410.97	304.8	152.4	12.7	1.5	469.9
18	457.2	456.41	462.03	304.8	152.4	12.7	1.5	533.4
20	508.0	507.21	514.10	304.8	152.4	12.7	1.5	584.2
22	558.8	558.01	564.90	304.8	152.4	12.7	1.5	641.4
24	609.6	608.81	615.70	304.8	152.4	12.7	1.5	692.2



Wall Thickness Schedule

JIS G3448 JIS G3455 ANSI B36.10M
JIS G3454 JIS G3459 ANSI B36.19M (in mm)

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness																	
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
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	-	-	-	-	-
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	-	-	-	-	-
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
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
25	1	34.0	33.4	1.65	2.8	3.0	3.2	-	-	-	-	(3.4)	3.4	3.9	(4.5)	4.5	-	-	-	6.4	9.1
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
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
50	2	60.5	60.3	1.65	2.8	3.5	3.8	-	-	-	-	(3.9)	3.9	4.9	(5.5)	5.5	-	-	-	8.7	11.1
65	2-1/2	76.3	73.0	2.1	3.0	3.5	4.2	-	-	-	-	(5.2)	5.2	6.0	(7.0)	7.0	-	-	-	9.5	14.0
80	3	89.1	88.9	2.1	3.0	4.0	4.2	-	-	-	-	(5.5)	5.5	6.6	(7.6)	7.6	-	-	-	11.1	15.2
90	3-1/2	101.6	101.6	2.1	3.0	4.0	4.2	-	-	-	-	(5.7)	5.7	7.0	(8.1)	8.1	-	-	-	12.7	-
100	4	114.3	114.3	2.1	3.0	4.0	4.5	-	-	-	-	(6.0)	6.0	7.1	(8.6)	8.6	-	11.1	-	13.5	17.1
125	5	139.8	141.3	2.8	3.4	5.0	4.5	-	-	-	-	(6.6)	6.6	8.1	(9.5)	9.5	-	12.7	-	15.9	19.0
150	6	165.2	168.3	2.8	3.4	5.0	5.0	-	5.0**	-	-	(7.1)	7.1	9.3	(11.0)	11.0	-	14.3	-	18.2	21.9
175	7	190.7	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	8	216.3	219.1	2.8	3.8	6.5	5.8	-	5.8**	6.4	7.0	(8.2)	8.2	10.3	(12.7)	12.7	15.1	18.2	20.6	23.0	22.2
225	9	241.8	-	-	-	-	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
250	10	267.4	273.1	3.4	4.2	6.5	6.6	-	6.6**	6.4	7.8	(9.3)	9.3	12.7	12.7	15.1	18.3	21.4	25.4	28.6	25.4
300	12	318.5	323.9	4.0	4.6	6.5	6.9	-	6.9**	6.4	8.4	9.5	10.3	14.3	12.7	17.4	21.4	25.4	28.6	33.3	25.4
350	14	355.6	355.6	4.0	4.8	7.9	7.9	6.4	7.9	7.9	9.5	9.5	11.1	15.1	12.7	19.0	23.8	27.8	31.8	35.7	-
400	16	406.4	406.4	4.2	4.8	7.9	7.9	6.4	7.9	7.9	9.5	9.5	12.7	16.7	12.7	21.4	26.2	30.9	36.5	40.5	-
450	18	457.2	457.2	4.2	4.8	7.9	7.9	6.4	7.9	7.9	11.1	9.5	14.3	19.0	12.7	23.8	29.4	34.9	39.7	45.2	-
500	20	508.0	508.0	4.8	5.5	7.9	7.9	6.4	7.9	9.5	12.7	9.5	15.1	20.6	12.7	26.2	32.5	38.1	44.4	50.0	-
550	22	558.8	558.8	4.8	5.5	-	-	6.4	7.9	9.5	12.7	9.5	-	22.2	12.7	28.6	34.9	41.3	47.6	54.0	-
600	24	609.6	609.6	5.5	6.4	-	-	6.4	7.9	9.5	14.3	9.5	17.5	24.6	12.7	31.0	38.9	46.0	52.4	59.5	-
650	26	660.4	660.4	-	-	-	-	7.9	7.9	12.7	-	9.5	-	-	12.7	-	-	-	-	-	-
700	28	711.2	711.2	-	-	-	-	7.9	7.9	12.7	15.9	9.5	-	-	12.7	-	-	-	-	-	-
750	30	762.0	762.0	6.4	7.9	-	-	7.9	7.9	12.7	15.9	9.5	-	-	12.7	-	-	-	-	-	-
800	32	812.8	812.8	-	-	-	-	7.9	7.9	12.7	15.9	9.5	17.5	-	12.7	-	-	-	-	-	-
850	34	863.6	863.6	-	-	-	-	7.9	7.9	12.7	15.9	9.5	17.5	-	12.7	-	-	-	-	-	-
900	36	914.4	914.4	-	-	-	-	7.9	7.9	12.7	15.9	9.5	19.1	-	12.7	-	-	-	-	-	-
950	38	965.2	965.2	-	-	-	-	-	7.9	12.7	-	9.5	-	-	12.7	-	-	-	-	-	-
1000	40	1016.0	1016.0	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1050	42	1066.8	1066.8	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1100	44	1117.6	1117.6	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1150	46	1168.4	1168.4	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1200	48	1219.2	1219.2	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1250	50	1270.0	1270.0	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1300	52	1320.8	1320.8	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1350	54	1371.6	1371.6	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1400	56	1422.4	1422.4	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1450	58	1473.2	1473.2	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1500	60	1524.0	1524.0	-	-	-	-	-	7.9	-	-	9.5	-	-	12.7	-	-	-	-	-	-
1600	64	1626.0																			
1700	68	1727.0																			
1800	72	1829.0																			
1900	76	1932.0																			
2000	80	2032.0																			

(1) * Wellgrow'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.

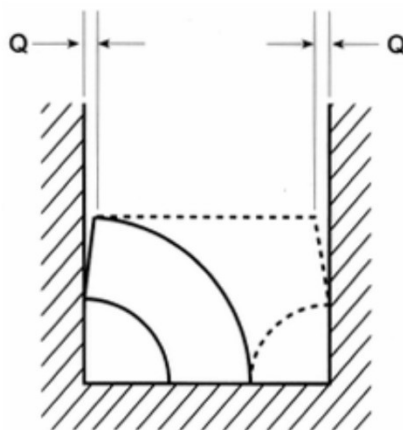


ANSI Dimensional Tolerances

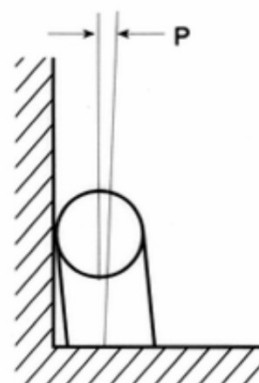
ANSI B16.9, B16.28 (in mm)
* Wellgrow's standard

Nominal Pipe Size	All Fittings			90° and 45° Elbows	Tees	Reducers	Caps	180° Returns			
	Outside Diameter at Bevel OD	Inside Diameter at End ID	Wall Thickness	Center-to-end Dimension	Center-to-end Dimension	Overall Length	Overall Length	Center-to- center Dimension P	Back-to-face Dimension K	Alignment of Ends U	
			T	A, B	C, M	H	E				
1/2~2-1/2	+1.5 -0.7	0.7	Not less than 87.5% of nominal thickness	1.5	1.5	1.5	3.0	6.3	6.3	0.7	
3~4	1.5	1.5					6.3				0.7
5~8	+2.2 -1.5										
10~18	+4.0 -3.0	3.0		2.2	2.2	2.2	6.3	9.6	0.7		
20~24	+6.3 -4.8	4.8					4.8			9.6	
26~30				3.0	3.0						
32~48				4.8	4.8						
*50~60	+9.5 -6.4	6.4		9.5	9.5	9.5	-	-	-		
*62~70	+12.7 -9.5	9.5		12.7	-	-					
*72~80	+15.9 -11.9	11.9		15.9							

Nominal Pipe Size	Angularity Tolerance	
	Off Angle	Off Plane
	Q	P
1/2~4	0.7	1.5
5~8	1.5	3.0
10~12	2.2	4.8
14~16		6.3
18~24	3.0	9.6
26~30	4.8	
32~42		12.7
44~48		19.0
*50~60	6.4	
*62~70	9.5	
*72~80	11.9	



Off Angle



Off Plane



MSS Dimensional Tolerances

MSS SP-43 (in mm)

Nominal Pipe Size	All Fittings		90° Elbows 45° Elbows Tees	Reducers Lap Joint Stub Ends	Caps	180° Returns			Lap Joint Stub Ends	
	Outside (1) Diameter at Welding End	Wall Thickness	Center-to-end Dimension A, B, C, M	Overall Length F, H	Overall Length E	Center-to-center Dimension O	Back-to-face Dimension K	Alignment of Ends U	Fillet (2) Radius of Lap A	Outside Diameter of Lap G
1/2~1-1/2	0.8	Not less than 87.5% of nominal thickness	1.6	1.6	3.0	6.4	6.4	0.8	+0 -0.8	+0 -0.8
2~3-1/2	0.8		1.6	1.6	3.0	6.4	6.4	0.8	+0 -0.8	+0 -0.8
4	0.8		1.6	1.6	3.0	6.4	6.4	0.8	+0 -1.6	+0 -0.8
5~8	+1.6 -0.8		1.6	1.6	6.4	6.4	6.4	0.8	+0 -1.6	+0 -0.8
10~18	+2.3 -0.8		2.3	2.3	6.4	9.7	6.4	1.6	+0 -1.6	+0 -1.6
20~24	+3.0 -0.8		2.3	2.3	6.4	9.7	6.4	1.6	+0 -1.6	+0 -1.6

- (1) Out of roundness is the vector sum of the plus and minus tolerance.
(2) Fillet B radius is the maximum.

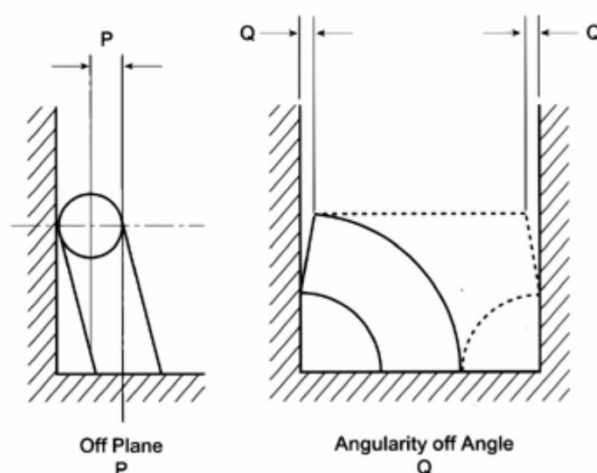
MSS Dimensional Tolerances

MSS SP-75 (in mm)

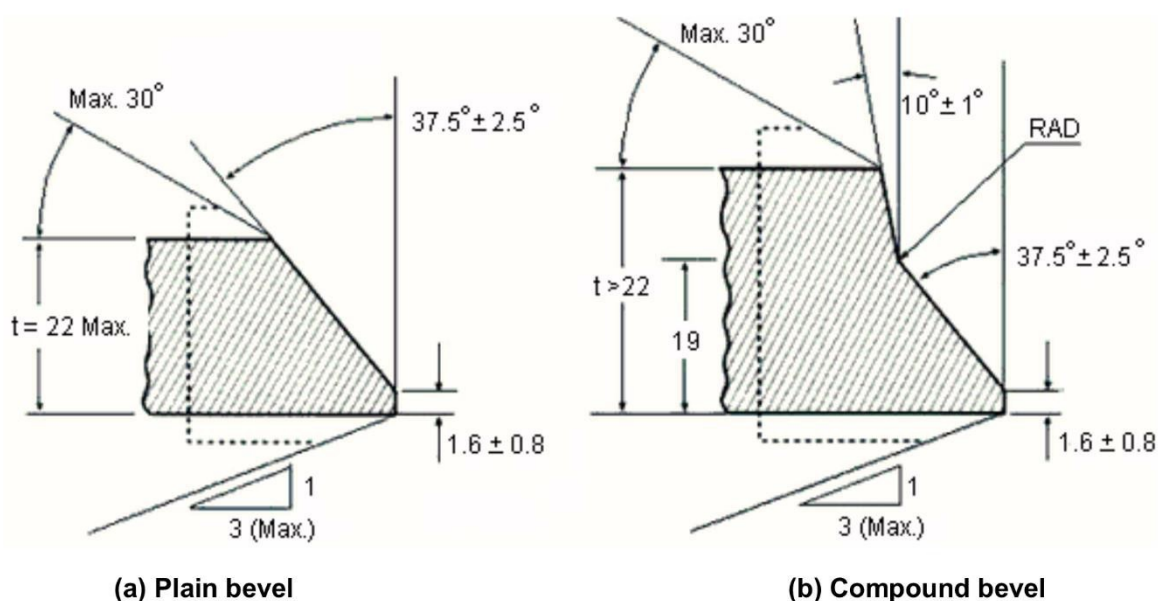
Nominal Pipe Size	Inside (1) Diameter at End	Minimum (3) Wall Thickness	Out-of-roundness (2)			90°, 60°, 45°, 30° Elbows & Tees Center-to-end Dimension A, B, C, M		Reducers Overall Length	Caps Overall Length	Angularity Off Angle	Elbows Off Plane	Eccentric and Concentric Reducers Off Plane
			At Ends of fittings		Throughout (4) Body of Elbows	1-1/2R & Tee		H	E	Q	P	P (6)
			Elbows (5)	Other		3R	3R					
16~24	2.3	Nominal	4.8	3.0	2.5%	2.3	3.0	2.3	6.4	1.5	6.4	2.5%
26~36	2.3	-0.25	(5)	3.0	2.5%	3.0	6.4	4.8	9.6	2.3	12.7	2.5%
38~48	3.0		(5)	3.0	2.5%	4.8	9.6	9.6	9.6	3.0	19.1	2.5%

- (1) The inside diameter at end shall be determined by circumferential measurement, and the tolerance refers to variations from nominal I.D. calculation by $(OD \text{ nom} - 2t) / \text{nom}$.
(2) Out-of-roundness tolerances shall be the difference between the maximum and minimum diameters measured on any radial cross-section.
(3) Minus 0.01 in. except that isolated non-continuous reductions are permitted in accordance with subsection 13.2.1. Excess thickness whether on inside or outside is to be treated in accordance with sketch given in figure 3.
(4) When elbows are intended for field segmenting, out-of-roundness tolerance may be furnished to 1% by agreement between the manufacturer and the purchaser. It is recognized that extra thickness, if any, may be on the I.D.
(5) Out-of-roundness tolerances at ends shall be 1% of diameter for NPS 26 and larger.
(6) Percent of O.D.

Outside diameter may be tapered at angle up to 30° beyond weld level.



Weld End Preparation



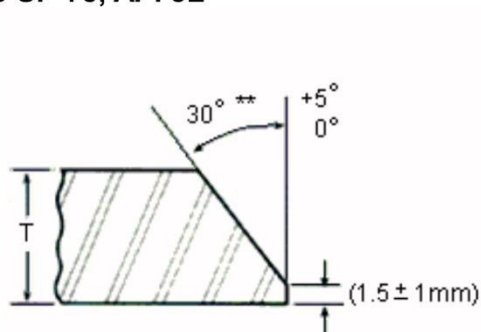
Nominal Pipe Wall Thickness (t)	End Preparation
Less than x*	Cut square or slightly chamfer, at manufacturer's option
X* to 22 included	Plain bevel as in sketch "a" above
More than 22	Compound bevel as in sketch "b" above
X* = 5 for carbon steel, ferritic alloy steel or wrought iron; 4 for austenitic alloy steel	

(in mm)

Notes:

- (1) End preparations are in accordance with ANSI B16.25 Paragraph 4.2.
- (2) End preparations conforming to customer specifications will be specially manufactured upon consultation.

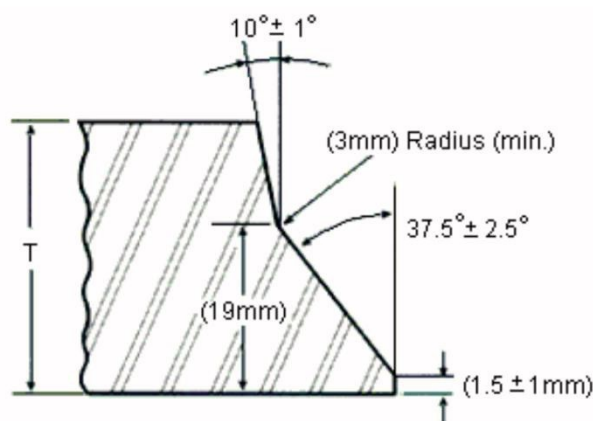
MSS SP-75, API 5L



* Or 1 inch (25mm) at option of the manufacturer.

** Fittings size 24 and smaller may be furnished with 37-1/2 bevel at option of manufacturer.

**Recommended bevel for wall thickness (T)
at end of fitting, 19mm* or less.**



**Recommended bevel for wall thickness (T)
at end of fitting, greater than 19mm.**





List of Core values

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