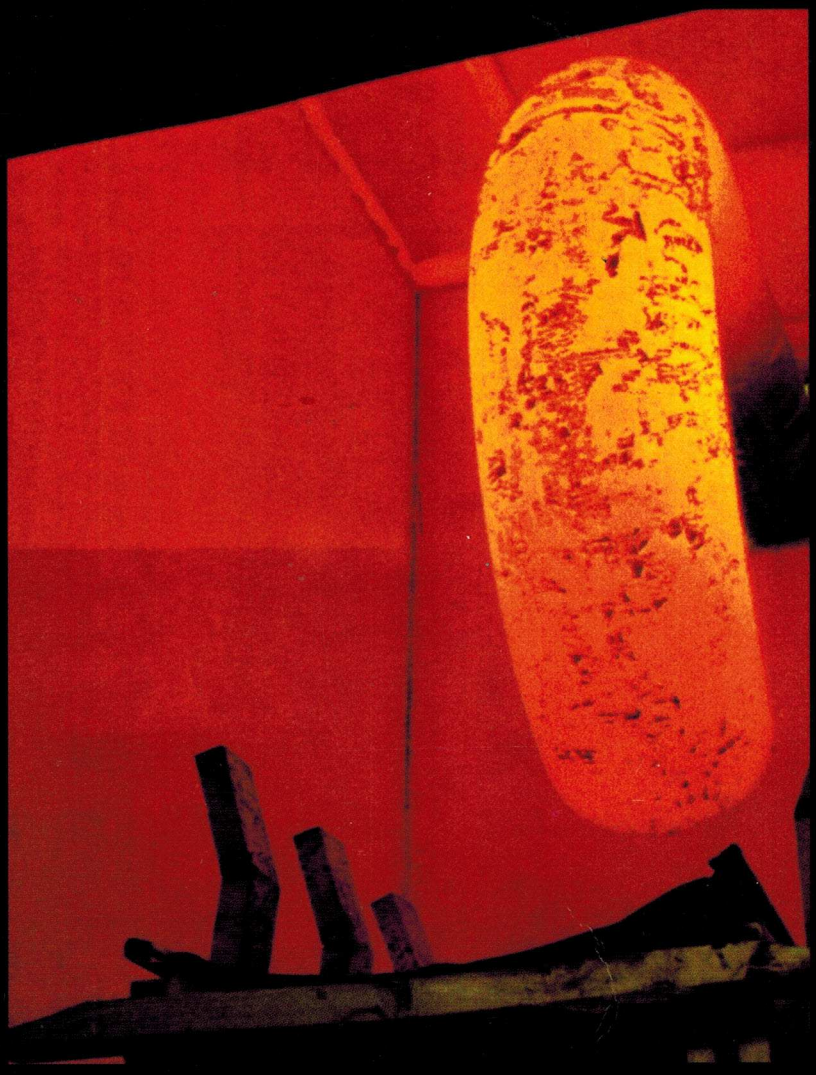
TTU BUTT WELDING FITTINGS

TTU Fittings

MARK OF QUALITY



TTU INDUSTRIAL CORP.,LTD.

TTU Fittings

MARK OF QUALITY

Molybdenum	Nickel	Copper	Others	Tensile Requirements		Marking Symbols
				Tensile Strength Min. or Range ksi (MPa)	Yield Strength Min. ksi (MPa)	
...	...	...	...	60 [415]	35 [240]	WPB
...	...	...	...	70 [485]	40 [275]	WPC
0.44–0.65	...	...	...	55 [380]	30 [205]	WP1
0.44–0.65	...	...	...	70 [485]	40 [275]	WP12
0.44–0.65	...	...	...	60 [415]	30 [205]	WP12b
0.44–0.65	...	...	...	70 [485]	40 [275]	WP11
0.44–0.65	...	...	...	75 [515]	45 [310]	WP11a
0.44–0.65	...	...	...	60 [415]	30 [205]	WP11b
0.44–0.65	...	...	...	75 [515]	45 [310]	WP22
0.87–1.13	...	...	...	60 [415]	30 [203]	WP22a
0.87–1.13	...	...	...	60 [415]	30 [205]	WP5
0.44–0.65	...	...	...	60 [415]	30 [205]	WP7
0.44–0.65	...	...	...	60 [415]	30 [205]	WP9
0.90–1.10	...	...	...	63 [435]	46 [315]	WPR
...	1.60–2.24	0.75–1.25	...	85 [585]	60 [415]	WP91
0.85–1.05	0.40 max	...	Vanadium 0.18–0.25 Columbium 0.06–0.10 Nitrogen 0.03–0.07 Aluminum 0.04 max			

The following table gives the minimum value for various wall thicknesses.

Wall Thickness	Grades		Grade	
	All Grades except WPR		WPR	
mm	Longitudinal	Transverse	Longitudinal	Transverse
7.94	30.0	20.0	28.0	...
7.14	28.5	19.0	26.5	...
6.35	27.0	18.0	25.0	...
5.56	25.5	...	23.5	...
4.76	24.0	...	22.0	...
3.97	22.5	...	20.5	...
3.17	21.0	...	19.0	...
2.38	19.5	...	17.5	...
1.59	18.0	...	16.0	...

NOTE– This table gives the computed minimum elongation values for each 0.79-mm decrease in wall thickness. Where the wall thickness lies between two values above, the minimum elongation value is determined by the following equations:

Direction of Test:	Equation
Longitudinal	$E = 48t + 15.00$
Transverse	$E = 32t + 10.00$

where:

E = elongation in 2 in. or 50 mm, % and

t = actual thickness of specimens, mm

Materials Specifications for Butt-Welding Fittings

ASTM A234-86
Standard Specification for
PIPING FITTINGS OF WROUGHT CARBON STEEL AND ALLOY STEEL FOR MODERATE AND ELEVATED TEMPERATURES

Grade and Marking Symbol[D]	Composition, %					
	Carbon, max	Manganese	Phosphorus, max	Sulfur, max	Silicon	Chromium
WPB[A,B,C]	0.30	0.29–1.06	0.050	0.058	0.10 min	...
WPC[B,C]	0.35	0.29–1.06	0.050	0.058	0.10 min	...
WP1	0.28	0.30–0.90	0.045	0.045	0.10–0.50	...
WP12	0.20	0.30–0.80	0.045	0.045	0.60 max	0.80–1.25
WP12b	0.20	0.30–0.80	0.045	0.045	0.60 max	0.80–1.25
WP11	0.20	0.30–0.80	0.040	0.040	0.50–1.00	1.00–1.50
WP11a	0.20	0.30–0.80	0.040	0.040	0.50–1.00	1.00–1.50
WP11b	0.15	0.30–0.60	0.030	0.030	0.50–1.00	1.00–1.50
WP22	0.15	0.30–0.60	0.040	0.040	0.50 max	1.90–2.60
WP22a	0.15	0.30–0.60	0.040	0.040	0.50 max	1.90–2.60
WP5	0.15	0.30–0.60	0.040	0.030	0.50 max	4.00–6.00
WP7	0.15	0.30–0.60	0.030	0.030	0.50–1.00	6.00–8.00
WP9	0.15	0.30–0.60	0.030	0.030	0.25–1.00	8.00–10.00
WPR	0.20	0.40–1.06	0.045	0.050	...	...
WP91	0.08–0.12	0.30–0.60	0.020	0.010	0.20–0.50	8.00–9.50

A Fittings made from plate may have 0.35 max carbon.

B Fittings made from forgings may have 0.35 max carbon and 0.35 max silicon with no minimum.

C For each reduction of 0.01% carbon below 0.30%, an increase of 0.05% manganese above 1.06% will be permitted to a maximum of 1.35% manganese.

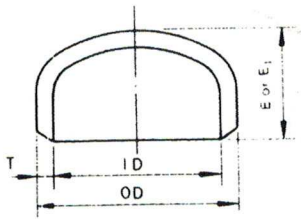
D When fittings are of welded construction, the grade and marking symbol shown above shall be supplemented by letter "W"

	Elongation Requirements					
	Grades					
	All Grades except WPR and WP91		WPR		WP91	
	Longitudinal	Transverse	Longitudinal	Transverse	Longitudinal	Transverse
Elongation:						
Standard round specimen, or small proportional specimen, min % in 4D	22	14	20	...	20	...
Rectangular specimen for wall thickness 7.94mm and over, and for all small sizes tested in full section; min % in 50mm	30	20[A]	29	...	...	...
Rectangular specimen for wall thickness less than 7.94mm, min % in 50mm (40-mm wide specimen)	xx[B]	xx[B]	xx[B]	...	...	...

A WPB and WPC fittings manufactured from plate shall have a minimum elongation of 17%.

B For each 0.79mm decrease in wall thickness below 7.94mm, a deduction of 1.5% for longitudinal and 1.0% for transverse from the values shown above is permitted.

Caps



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

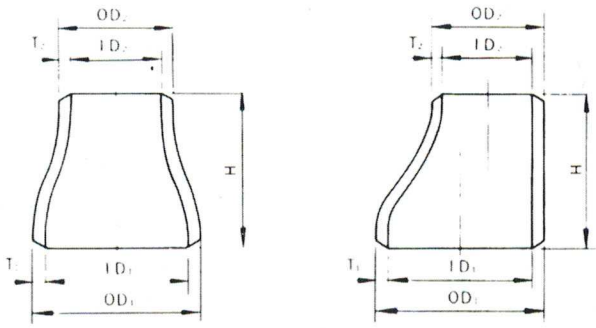
Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Length(2) E	Limiting Wall Thickness for Length E	Length(3) E_1
1/2	21.3	25.4	4.6	25.4
3/4	26.7	25.4	3.8	25.4
1	33.4	38.1	4.6	38.1
1-1/4	42.2	38.1	4.8	38.1
1-1/2	48.3	38.1	5.1	38.1
2	60.3	38.1	5.6	44.4
2-1/2	73.0	38.1	7.1	50.8
3	88.9	50.8	7.6	63.5
3-1/2	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

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Length(2) E
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 thicknesses for Caps up to and including 36" conform to ANSI B36.10 Specifications; Caps 38" and larger conform to XS Specifications for wall thicknesses of 36". These are TTU 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 E_1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller. For NPS 26 and larger, Length E_1 shall be by agreement between manufacturer and purchaser.

Concentric and Eccentric Reducers



MSS SP-75
ANSI B16.9

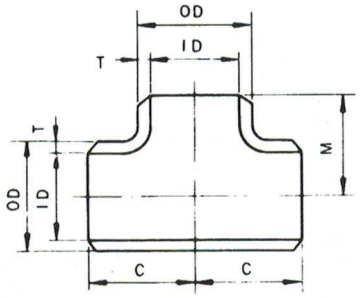
* TTU's standard (in mm)

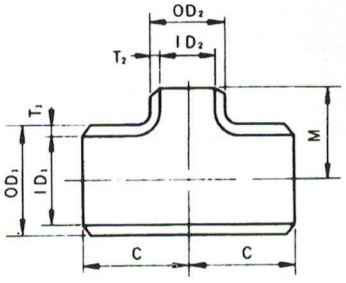
Nominal Pipe Size (NPS)	Outside Diameter at Bevel		End-to-End
	Large End	Small End	
3/4 x 1/2	26.7	21.3	38.1
3/8		17.3	
1 x 3/4	33.4	26.7	50.8
1/2		21.3	
1-1/4 x 1	42.2	33.4	50.8
3/4		26.7	
1/2		21.3	
1-1/2 x 1-1/4	48.3	42.2	63.5
1		33.4	
3/4		26.7	
1/2		21.3	
2 x 1-1/2	60.3	48.3	76.2
1-1/4		42.2	
1		33.4	
3/4		26.7	
2-1/2 x 2	73.0	60.3	88.9
1-1/2		48.3	
1-1/4		42.2	
1		33.4	
3 x 2-1/2	88.9	73.0	88.9
2		60.3	
1-1/2		48.3	
1-1/4		42.2	
3-1/2 x 3	101.6	88.9	101.6
2-1/2		73.0	
2		60.3	
1-1/2		48.3	
1-1/4		42.2	
4 x 3-1/2	114.3	101.6	101.6
3		88.9	
2-1/2		73.0	
2		60.3	
1-1/2		48.3	
5 x 4	141.3	114.3	127.0
3-1/2		101.6	
3		88.9	
2-1/2		73.0	
2		60.3	
6 x 5	168.3	141.3	139.7
4		114.3	
3-1/2		101.6	
3		88.9	
2-1/2		73.0	
8 x 6	219.1	168.3	152.4
5		141.3	
4		114.3	
3-1/2		101.6	
		88.9	
		73.0	

Nominal Pipe Size (NPS)	Outside Diameter at Bevel		End-to-End
	Large End	Small End	
10 x 8	273.1	29.1	177.8
6		168.3	
5		141.3	
4		114.3	
12 x 10	323.9	273.1	203.2
8		219.1	
6		168.3	
5		141.3	
14 x 12	355.6	323.9	330.2
10		273.1	
8		219.1	
6		168.3	
16 x 14	406.4	355.6	355.6
12		323.9	
10		273.1	
8		219.1	
18 x 16	457.2	406.4	381.0
14		355.6	
12		323.9	
10		273.1	
20 x 18	508.0	457.2	508.0
16		406.4	
14		355.6	
12		323.9	
22 x 20	558.8	508.0	508.0
18		457.2	
16		406.4	
14		355.6	
24 x 22	609.6	558.8	508.0
20		508.0	
18		457.2	
16		406.4	
26 x 24	660.4	609.6	609.6
22		558.8	
20		508.0	
18		457.2	
28 x 26	711.2	660.4	609.6
24		609.6	
20		508.0	
18		457.2	
30 x 28	762.0	711.2	609.6
26		660.4	
24		609.6	
20		508.0	
32 x 30	812.8	762.0	609.6
28		711.2	
26		660.4	
24		609.6	

Nominal Pipe Size (NPS)	Outside Diameter at Bevel		End-to-End
	Large End	Small End	
34 x 32	863.6	812.8	609.6
30		762.0	
26		711.2	
24		660.4	
36 x 34	914.4	863.6	609.6
32		812.8	
30		762.0	
26		711.2	
24		660.4	
38 x 36	965.2	914.4	609.6
34		863.6	
32		812.8	
30		762.0	
28		711.2	
26		660.4	
40 x 38	1016.0	965.2	609.6
36		914.4	
34		863.6	
32		812.8	
30		762.0	
42 x 40	1066.8	1016.0	609.6
38		965.2	
36		914.4	
34		863.6	
32		812.8	
30		762.0	
44 x 42	1117.6	1066.8	609.6
40		1016.0	
38		965.2	
36		914.4	
46 x 42	1168.4	1117.6	711.2
42		1066.8	
40		1016.0	
38		965.2	
48 x 46	1219.2	1168.4	711.2
44		1117.6	
42		1066.8	
40		1016.0	

Straight and Reducing Tees





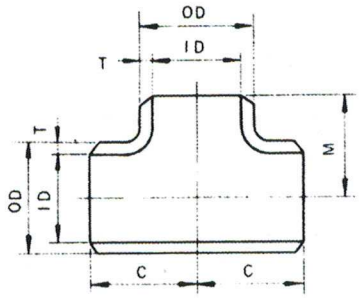
MSS SP-75
ANSI B16.9
* TTU's standard (in mm)

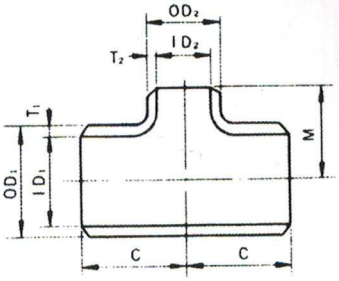
Nominal Pipe Size (NPS)	Outside Diameter at Bevel D		Center-to-End	
	Run	Outlet	Run C	Outlet[1] M
20 x 20	508.0	508.0	381.0	381.0
18		457.2		369.3
16		406.4		355.6
14		355.6		355.6
12		323.9		345.9
10		273.1		333.2
8		219.1		323.8
22 x 22	558.8	558.8	419.1	419.1
20		508.0		406.4
18		457.2		393.7
16		406.4		381.0
14		355.6		381.0
12		323.9		371.3
10		273.1		358.6
24 x 24	609.6	609.6	431.8	431.8
22		558.8		431.8
20		508.0		431.8
18		457.2		419.1
16		406.4		406.4
14		355.6		406.4
12		323.9		396.7
10		273.1		384.0
26 x 26	660.4	660.4	495.3	495.3
24		609.6		482.6
22		558.8		469.9
20		508.0		457.2
18		457.2		444.5
16		406.4		431.8
14		355.6		431.8
12		323.1		422.1
28 x 28	711.2	711.2	520.7	520.7
26		660.4		520.7
24		609.6		508.0
22		558.8		495.3
20		508.0		482.6
18		457.2		469.9
16		406.4		457.2
14		355.6		457.2
12		323.1		447.5
30 x 30	762.0	7620.0	558.8	558.8
28		711.2		546.1
26		660.4		546.1
24		609.6		533.4
22		558.8		520.7
20		508.0		508.0
18		457.2		495.3
16		406.4		482.6
14		355.6		482.6

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D		Center-to-End	
	Run	Outlet	Run C	Outlet[1] M
30 x 12	762.0	323.9	558.8	472.6
10		273.1		460.2
32 x 32	812.8	812.8	596.9	596.9
30		762.0		584.2
28		711.2		571.5
26		660.4		571.5
24		609.6		558.8
22		558.8		546.1
20		508.0		533.4
18		457.2		520.7
16		406.4		508.0
14		355.6		508.0
34 x 34	863.6	863.6	635.0	635.0
32		812.8		622.3
30		762.0		609.6
28		711.2		596.9
26		660.4		596.9
24		609.6		584.2
22		558.8		571.5
20		508.0		558.8
18		457.2		546.1
16		406.4		533.4
36 x 36	914.4	914.4	673.1	673.1
34		863.6		660.4
32		812.8		647.7
30		762.0		635.0
28		711.2		622.3
26		660.4		622.3
24		609.6		609.6
22		558.8		596.9
20		508.0		584.2
18		457.2		571.5
16		406.4		558.8
38 x 38	965.2	965.2	711.2	711.2
36		914.4		711.2
34		863.6		698.5
32		812.8		685.8
30		762.0		673.1
28		711.2		647.7
26		660.4		647.7
24		609.6		635.0
22		558.8		622.3
20		508.0		609.6
18		457.2		596.9

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

Straight and Reducing Tees





MSS SP-75
ANSI B16.9

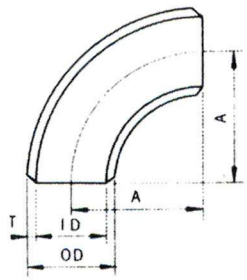
* TTU's standard (in mm)

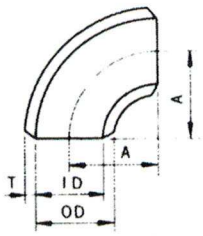
Nominal Pipe Size (NPS)	Outside Diameter at Bevel D		Center-to-End	
	Run	Outlet	Run C	Outlet[1] M
1/2 x 1/2	21.3	21.3	25.4	25.4
3/8		17.1		25.4
1/4		13.7		25.4
3/4 x 3/4	26.7	26.7	28.4	28.4
1/2		21.3		28.4
3/8		17.1		28.4
1 x 1	33.4	33.4	38.1	38.1
3/4		26.7		38.1
1/2		21.3		38.1
1-1/4 x 1-1/4	42.2	42.2	47.8	47.8
1		33.4		47.8
3/4		26.7		47.8
1/2		21.3		47.8
1-1/2 x 1-1/2	48.3	48.3	57.2	57.2
1-1/4		42.2		57.2
1		33.4		57.2
3/4		26.7		57.2
1/2		21.3		57.2
2 x 2	60.3	60.3	63.5	63.5
1-1/2		48.3		60.5
1-1/4		42.2		57.2
1		33.4		50.8
3/4		26.7		44.4
1/2*		21.3		
2-1/2 x 2-1/2	73.0	73.0	76.2	76.2
2		60.3		69.8
1-1/2		48.3		66.5
1-1/4		42.2		63.5
1		33.4		57.2
3 x 3	88.9	88.9	85.9	85.9
2-1/2		73.0		82.6
2		60.3		76.2
1-1/2		48.3		73.2
1-1/4		42.2		69.8
1*		33.4		
3-1/2 x 3-1/2	101.6	101.6	95.2	95.2
3		88.9		91.9
2-1/2		73.0		88.9
2		60.3		82.6
1-1/2		48.3		79.2
4 x 4	114.3	114.3	104.6	104.6
3-1/2		101.6		101.6
3		88.9		98.6
2-1/2		73.0		95.2
2		60.3		88.9
1-1/2		48.3		85.9
1-1/4*		42.2		
1*		33.5		

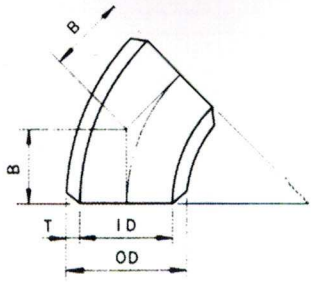
Nominal Pipe Size (NPS)	Outside Diameter at Bevel D		Center-to-End	
	Run	Outlet	Run C	Outlet[1] M
5 x 5	141.3	141.3	124.0	124.0
4		114.3		117.3
3-1/2		101.6		114.3
3		88.9		111.3
2-1/2		73.0		108.0
2		60.3		104.6
1-1/2*		48.3		
6 x 6	168.3	168.3	142.7	142.7
5		141.3		136.7
4		114.3		130.0
3-1/2		101.6		127.0
3		88.9		124.0
2-1/2		73.0		120.6
2*		60.3		
8 x 8	219.1	219.1	177.8	177.8
6		168.3		168.1
5		141.3		162.1
4		114.3		155.4
3-1/2		101.6		152.4
3*		88.9		
10 x 10	273.1	273.1	215.9	215.9
8		219.1		203.2
6		168.3		193.5
5		141.3		190.5
4		114.3		184.2
12 x 12	323.9	323.9	254.0	254.0
10		273.1		241.3
8		219.1		228.6
6		168.3		218.9
5		141.3		215.9
14 x 14	355.6	355.6	279.4	279.4
12		323.9		269.7
10		273.1		257.0
8		219.1		247.6
6		168.3		238.3
16 x 16	406.4	406.4	304.8	304.8
14		355.6		304.8
12		323.9		295.1
10		273.1		282.4
8		219.1		373.0
6		168.3		263.7
18 x 18	457.2	457.2	342.9	342.9
16		406.4		330.2
14		355.6		330.2
12		323.9		320.5
10		273.1		307.8
8		219.1		298.4

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

Long and Short Radius Elbows







ANSI B16.9 B16.28

* TTU's standard (in mm)

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Center-to-End Long Radius Elbow 90 Deg. A	Long Radius Elbow 45 Deg. B	Short Radius Elbow 90 Deg. A	Short Radius Elbow 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
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	378.1
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
54*	1371.6	2057.4	852.2	1371.6	568.1
52*	1320.8	–	–	1320.8	547.1
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	–	–

JIS G3448 **ANSI B36.10M**
JIS G3454 **ANSI B36.19M**
JIS G3455
JIS G3459

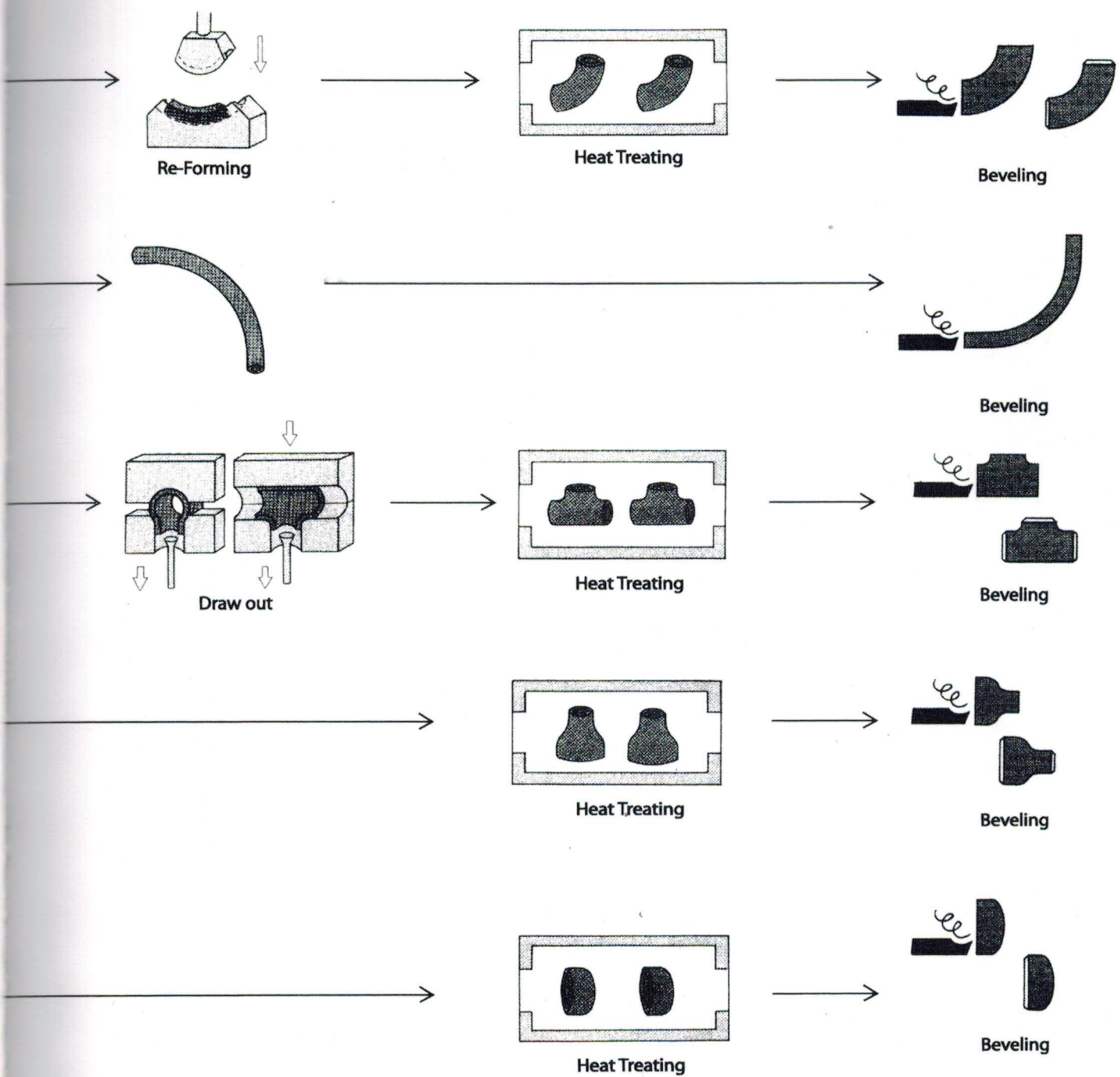
(in mm)

Nominal Wall Thickness									Outside Diameter		Nominal Pipe Size	
Sch 40	Sch 60	XS	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XXS	JIS	ANSI	A	B
2.2	2.4	(3.0)	3.0	–	–	–	–	–	13.8	13.7	8	1/4
2.3	2.8	(3.2)	3.2	–	–	–	–	–	17.3	17.1	10	3/8
2.8	3.2	(3.7)	3.7	–	–	–	4.7	7.5	21.7	21.3	15	1/2
2.9	3.4	(3.9)	3.9	–	–	–	5.5	7.8	27.2	26.7	20	3/4
3.4	3.9	(4.5)	4.5	–	–	–	6.4	9.1	34.0	33.5	25	1
3.6	4.5	(4.9)	4.9	–	–	–	6.4	9.7	42.7	42.2	32	1-1/4
3.7	4.5	(5.1)	5.1	–	–	–	7.1	10.2	48.6	48.3	40	1-1/2
3.9	4.9	(5.5)	5.5	–	–	–	8.7	11.1	60.5	60.3	50	2
5.2	6.0	(7.0)	7.0	–	–	–	9.5	14.0	76.3	73.0	65	2-1/2
5.5	6.6	(7.6)	7.6	–	–	–	11.1	15.2	89.1	88.9	80	3
5.7	7.0	(8.1)	8.1	–	–	–	12.7	–	101.6	101.6	90	3-1/2
6.0	7.1	(8.6)	8.6	–	11.1	–	13.5	17.1	114.3	114.3	100	4
6.6	8.1	(9.5)	9.5	–	12.7	–	15.9	19.0	139.8	141.3	125	5
7.1	9.3	(11.0)	11.0	–	14.3	–	18.2	21.9	165.2	168.3	150	6
–	–	–	–	–	–	–	–	–	190.7	–	175	7
8.2	10.3	(12.7)	12.7	15.1	18.2	20.6	23.0	22.2	216.3	219.1	200	8
–	–	–	–	–	–	–	–	–	241.8	–	225	9
9.3	12.7	12.7	15.1	18.3	21.4	25.4	28.6	25.4	267.4	273.1	250	10
10.3	14.3	12.7	17.4	21.4	25.4	28.6	33.3	25.4	318.5	323.9	300	12
11.1	15.1	12.7	19.0	23.8	27.8	31.8	35.7	–	355.6	355.6	350	14
12.7	16.7	12.7	21.4	26.2	30.9	36.5	40.5	–	406.4	406.4	400	16
14.3	19.0	12.7	23.8	29.4	34.9	39.7	45.2	–	457.2	457.2	450	18
15.1	20.6	12.7	26.2	32.5	38.1	44.4	50.0	–	508.0	508.0	500	20
–	22.2	12.7	28.6	34.9	41.3	47.6	54.0	–	558.8	558.8	550	22
17.5	24.6	12.7	31.0	38.9	46.0	52.4	59.5	–	609.6	609.6	600	24
–	–	12.7	–	–	–	–	–	–	660.4	660.4	650	26
–	–	12.7	–	–	–	–	–	–	711.2	711.2	700	28
–	–	12.7	–	–	–	–	–	–	762.0	762.0	750	30
17.5	–	12.7	–	–	–	–	–	–	812.8	812.8	800	32
17.5	–	12.7	–	–	–	–	–	–	863.6	863.6	850	34
19.1	–	12.7	–	–	–	–	–	–	914.4	914.4	900	36
–	–	12.7	–	–	–	–	–	–	965.2	965.2	950	38
–	–	12.7	–	–	–	–	–	–	1016.0	1016.0	1000	40
–	–	12.7	–	–	–	–	–	–	1066.8	1066.8	1050	42
–	–	12.7	–	–	–	–	–	–	1117.6	1117.6	1100	44
–	–	12.7	–	–	–	–	–	–	1168.4	1168.4	1150	46
–	–	12.7	–	–	–	–	–	–	1219.2	1219.2	1200	48
–	–	*12.7	–	–	–	–	–	–	1270.0	1270.0	1250	50
–	–	*12.7	–	–	–	–	–	–	1320.8	1320.8	1300	52
–	–	*12.7	–	–	–	–	–	–	1371.6	1371.6	1350	54
–	–	*12.7	–	–	–	–	–	–	1422.4	1422.4	1400	56
–	–	*12.7	–	–	–	–	–	–	1473.2	1473.2	1450	58
–	–	*12.7	–	–	–	–	–	–	1524.0	1524.0	1500	60

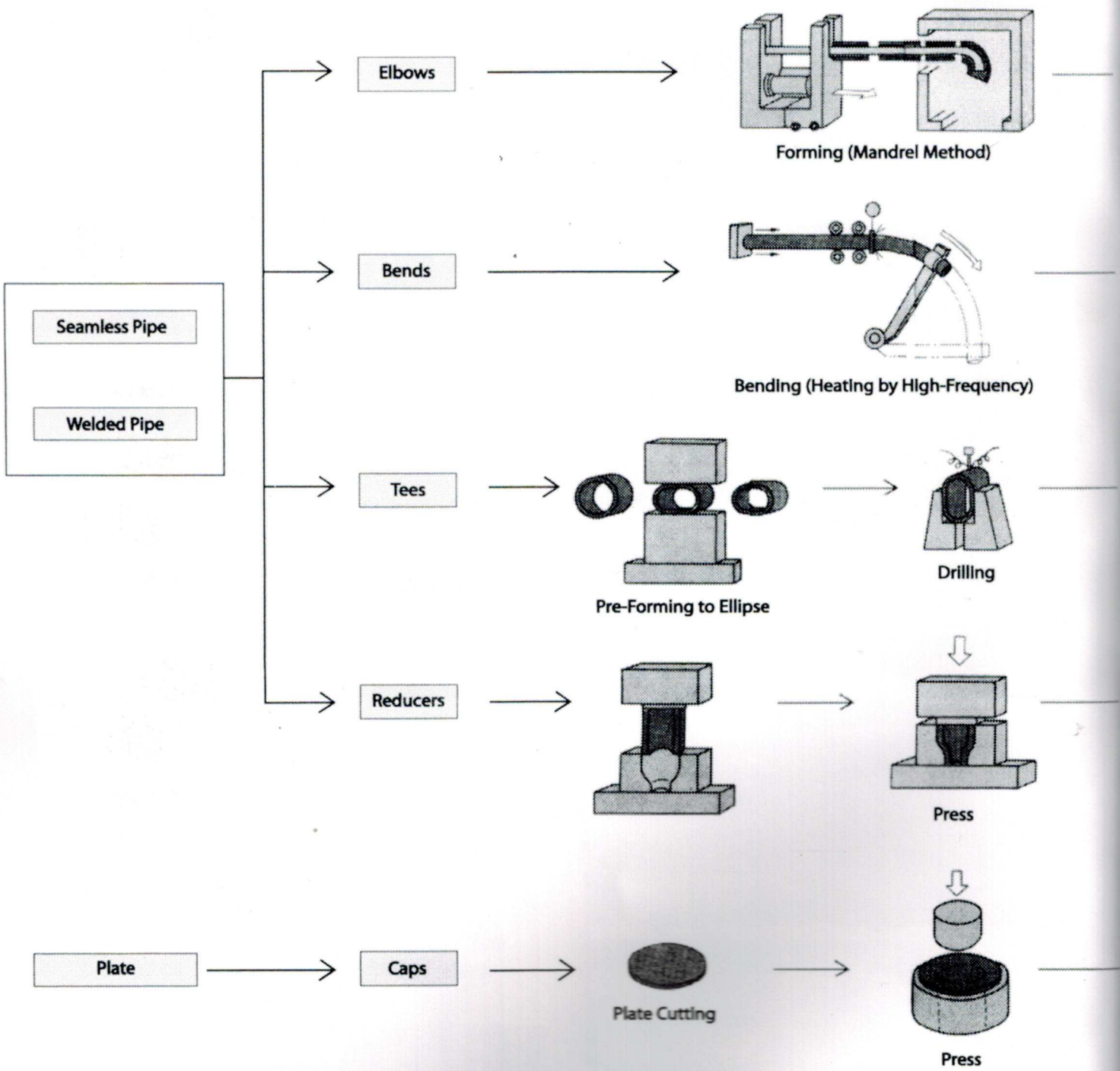
Wall Thickness Schedules

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
8	1/4	13.8	13.7	1.2	1.65	2.0	2.3	–	–	–	–	(2.2)
10	3/8	17.3	17.1	1.2	1.65	2.0	2.3	–	–	–	–	(2.3)
15	1/2	21.7	21.3	1.65	2.1	2.5	2.8	–	–	–	–	(2.8)
20	3/4	27.2	26.7	1.65	2.1	2.5	2.8	–	–	–	–	(2.9)
25	1	34.0	33.4	1.65	2.8	3.0	3.2	–	–	–	–	(3.4)
32	1-1/4	42.7	42.2	1.65	2.8	3.0	3.5	–	–	–	–	(3.6)
40	1-1/2	48.6	48.3	1.65	2.8	3.0	3.5	–	–	–	–	(3.7)
50	2	60.5	60.3	1.65	2.8	3.5	3.8	–	–	–	–	(3.9)
65	2-1/2	76.3	73.0	2.1	3.0	3.5	4.2	–	–	–	–	(5.2)
80	3	89.1	88.9	2.1	3.0	4.0	4.2	–	–	–	–	(5.5)
90	3-1/2	101.6	101.6	2.1	3.0	4.0	4.2	–	–	–	–	(5.7)
100	4	114.3	114.3	2.1	3.0	4.0	4.5	–	–	–	–	(6.0)
125	5	139.8	141.3	2.8	3.4	5.0	4.5	–	–	–	–	(6.6)
150	6	165.2	168.3	2.8	3.4	5.0	5.0	–	5.0**	–	–	(7.1)
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)
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)
300	12	318.5	323.9	4.0	4.6	6.5	6.9	–	6.9**	6.4	8.4	9.5
350	14	355.6	355.6	4.0	4.8	7.9	7.9	6.4	7.9	7.9	9.5	9.5
400	16	406.4	406.4	4.2	4.8	7.9	7.9	6.4	7.9	7.9	9.5	9.5
450	18	457.2	457.2	4.2	4.8	7.9	7.9	6.4	7.9	7.9	11.1	9.5
500	20	508.0	508.0	4.8	5.5	7.9	7.9	6.4	7.9	9.5	12.7	9.5
550	22	558.8	558.8	4.8	5.5	–	–	6.4	7.9	9.5	12.7	9.5
600	24	609.6	609.6	5.5	6.4	–	–	6.4	7.9	9.5	14.3	9.5
650	26	660.4	660.4	–	–	–	–	7.9	7.9	12.7	–	9.5
700	28	711.2	711.2	–	–	–	–	7.9	7.9	12.7	15.9	9.5
750	30	762.0	762.0	6.4	7.9	–	–	7.9	7.9	12.7	15.9	9.5
800	32	812.8	812.8	–	–	–	–	7.9	7.9	12.7	15.9	9.5
850	34	863.6	863.6	–	–	–	–	7.9	7.9	12.7	15.9	9.5
900	36	914.4	914.4	–	–	–	–	7.9	7.9	12.7	15.9	9.5
950	38	965.2	965.2	–	–	–	–	–	7.9	–	–	9.5
1000	40	1016.0	1016.0	–	–	–	–	–	7.9	–	–	9.5
1050	42	1066.8	1066.8	–	–	–	–	–	7.9	–	–	9.5
1100	44	1117.6	1117.6	–	–	–	–	–	7.9	–	–	9.5
1150	46	1168.4	1168.4	–	–	–	–	–	7.9	–	–	9.5
1200	48	1219.2	1219.2	–	–	–	–	–	7.9	–	–	9.5
1250	50	1270.0	1270.0	–	–	–	–	–	*7.9	–	–	*9.5
1300	52	1320.8	1320.8	–	–	–	–	–	*7.9	–	–	*9.5
1350	54	1371.6	1371.6	–	–	–	–	–	*7.9	–	–	*9.5
1400	56	1422.4	1422.4	–	–	–	–	–	*7.9	–	–	*9.5
1450	58	1473.2	1473.2	–	–	–	–	–	*7.9	–	–	*9.5
1500	60	1524.0	1524.0	–	–	–	–	–	*7.9	–	–	*9.5

Note : 1. * TTU'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.


Re-Forming
Heat Treating
Beveling
Beveling
Draw out
Heat Treating
Beveling
Heat Treating
Beveling
Heat Treating
Beveling

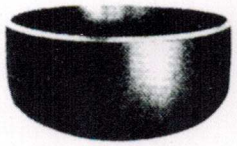
MANUFACTURING PROCESS OF TTU BUTT-WELDING FITTINGS



Wrought Steel Butt-Welding Fittings

(Carbon and Alloy Steel)

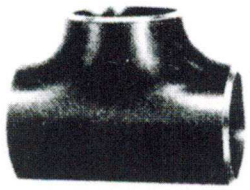
45° Elbow (Long)



Cap

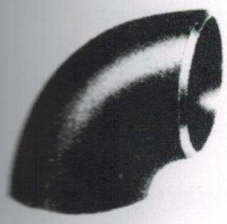
90° Elbow (Long)

180° Elbow (Long)

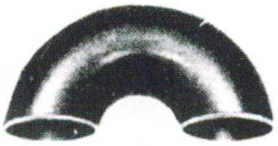


T (Straight)

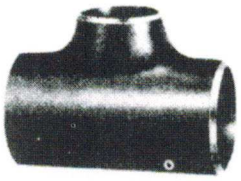
Reducer (Concentric)



90° Elbow (Short)



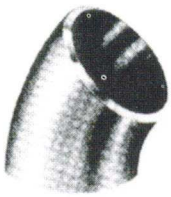
180° Elbow (Short)



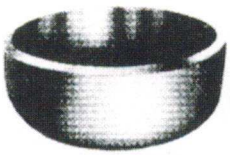
T (Reducing)

Reducer (Eccentric)

Stainless Steel Butt-Welding Fittings

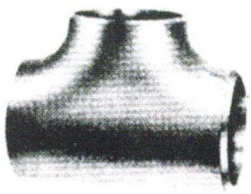


45° Elbow (Long)



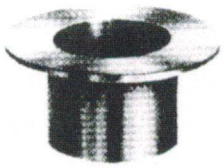
Cap

90° Elbow (Long)

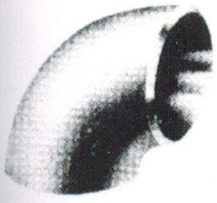


T (Straight)

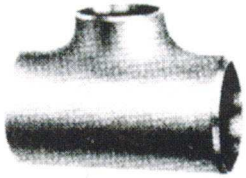
Reducer (Concentric)



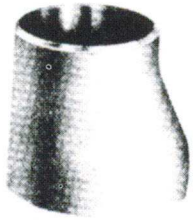
Lap Joint Stub End



90° Elbow (Short)



T (Reducing)



Reducer (Eccentric)

Applicable Standards

ANSI Standards

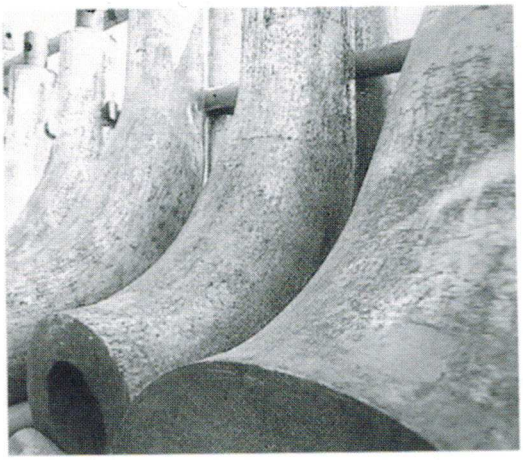
B16.9	Wrought Steel Butt-Welding Fittings
B16.28	Wrought Steel Butt-Welding Fittings Short Radius Elbows and Returns
B16.11	Forged Steel Fittings Socket Welding and Threaded
B36.10	Welded & Seamless Wrought Steel Pipe
B36.19	Stainless Steel Pipe

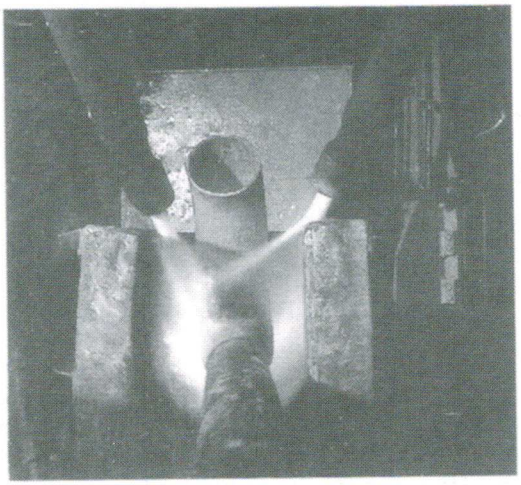
ASTM Standards

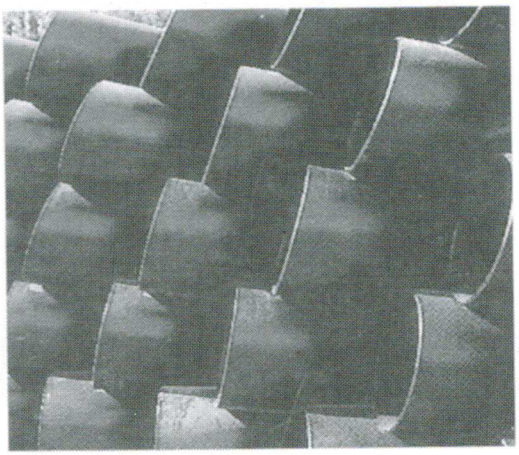
A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel of Moderate and Elevated Temperatures
A403	Wrought Austenitic Stainless Steel Piping Fittings
A420	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low Temperature Service
A182	Forges or Rolled Alloy-Steel Pipe Flanges, Forges Fittings, and Valves and Parts for High Temperatures Service
A105	Forgings, Carbon Steel, For Piping Components
B361	Wrought Aluminium and Aluminium-Alloy Welding Fittings
B363	Seamless and Welde Unalloyed Titanium and Titanium Alloy Welding Fittings
B366	Wrought Nickel and Nickel Alloy Welding Fittings

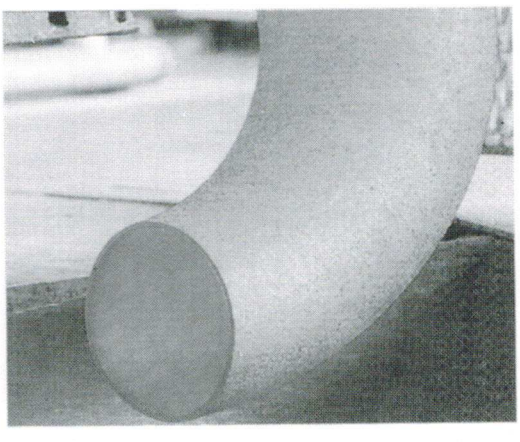
MSS Standards

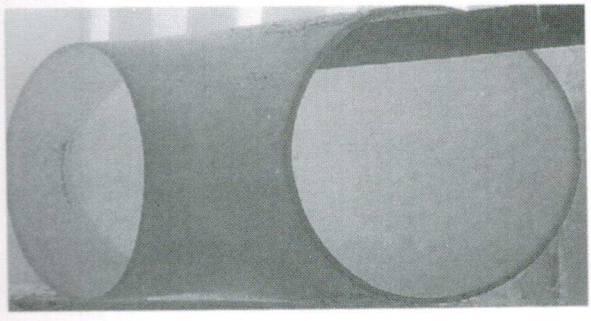
SP-43	Wrought Stainless Steel Butt-Welding Fittings
SP-75	Specification for High Test Wrought Welding Fittings











TTU : Introduction

TTU is the producer of quality *BUTT-WELDING FITTINGS*. Our products are found in various fields such as the petrochemical, chemical, shipbuilding and construction industries.
We are accepted worldwide for our excellence in quality, reliability and our uncompromising services to each of our customers.

PROFILE
OUR FACTORY covers 16,800 square meters on the fastest growing industrial region of South East Asia. With the work force of 150 employees working around the clock, we are able to process over **12,000 metric tons of fittings annually.**

SERVICES
OUR WAREHOUSE holds one of the largest and the most complete lines of fittings available from any single source. We offer fast and on time delivery to our clients. Furthermore, we also tailor each order to suite each of our customer's needs.

QUALITY ASSURANCE
We maintain one of the most strict quality control standards for all of our products to meet the most updated **ASTM, ANSI** and **MSS standard** specifications. All fittings are subjected to a comprehensive and stringent company's established quality assurance system that begins with careful selection of raw material form qualified steel mills and continues through our all production stages up to delivery. We guarantee traceability from the unfurnished pipes to the complete final fittings. Destructive and non-destructive testing such as hardness, tensile, and yield strength tests are performed periodically to ensure consistent high quality.

WORLDWIDE SALES NETWORK
We maintain one of the most extensive sales networks around the world. The following are some of the countries that we regularly contact.

Argentina	Australia	Bahrain
Bangladesh	Brazil	Brunei
Canada	Chile	Colombia
Cyprus	Egypt	France
Germany	India	Indonesia
Iran	Israel	Italy
Japan	Korea	Kuwait
Malaysia	Mexico	New Zealand
Nigeria	Oman	Pakistan
Philippines	Portugal	Qatar
Russia	Saudi Arabia	Singapore
South Africa	Taiwan	UAE
West Indies		