

REFERENCES

Welding End Preparations for ASME B16.9

Welding End Preparations for KS/JIS

- Steel Butt-Welding Pipe Fittings For Ordinary Use
- Steel Butt-Welding Pipe Fittings For Special Use
- Steel Plate Butt-Welding Pipe Fittings

Dimensional Tolerances for ASME B16.9

- Wrought Steel Butt Welding Fittings
- Forged Socket Welding Fittings

Dimensional Tolerances for MSS SP-43

Dimensional Tolerances for KS/JIS

- Steel Butt-Welding Pipe Fittings for Ordinary Use
- Steel Butt-Welding Pipe Fittings for Special Use and Steel Plate Butt-Welding Pipe Fittings
- Steel Socket-Welding Pipe Fittings for Special
- Right Angle for Shaft-Center of Pipe Fittings

Standard Threads Specification

- KS B0222 & JIS B0203 Pipe Threads
- ASME B2.1 Taper Pipe Threads. (Except Dryseal)
- BS21-1973 British Standard Taper Pipe Threads. (Except Dryseal)

Approx Weight Equation

- Elbow, Tee, Reducer, Cap

Butt-Welding Fittings Approx Weight

- 90° Elbows, 45° Elbows, Cap, Tee, Reducer
- Stainless Steel Fittings, Lap Joint Stub-end

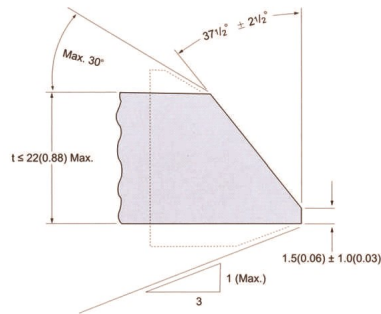
Comparison ASTM Specifications and Similar Standards

Materials Specifications for Butt-Welding Fittings ASTM Materials (A234, A403 and A420)

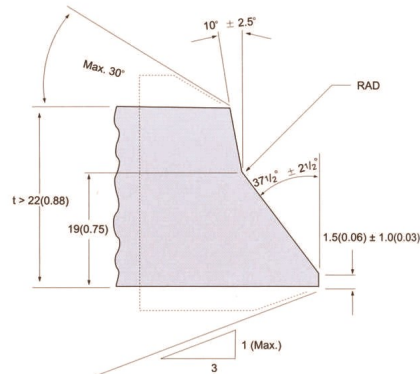
Materials Specifications for Fittings JIS Materials

Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel

ASME B16.9



(a) Plain Bevel



(b) Compound Bevel

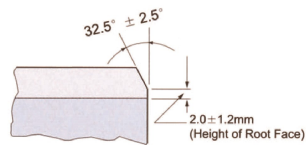
Nominal Pipe Wall Thickness(t)	End Preparation
Less than x*	Cut Square of slightly chamfer, at Mfr's option
x*to 22(0.88), inclusive	Plain bevel as in sketch "a" above
more than 22(0.88)	Compound bevel as in sketch "b" above

*x=5(0.19) for carbon steel, ferritic alloy steel or wrought iron;
3(0.12) for austenitic alloy steel

Notes : 1. End preparations are in accordance with ASME B16.25 Paragraph 4.2
2. End preparations conforming to customer specifications will be specially manufactured upon consultation.

KS / JIS

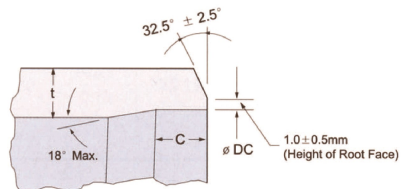
1. Steel Butt-Welding Pipe Fittings For Ordinary Use



{ KS B1522 }
{ JIS B2311 }

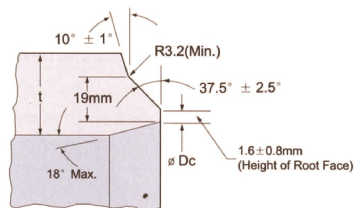
2. Steel Butt-Welding Pipe Fittings For Special Use

C: In the Case Where t is 22.4mm or Less

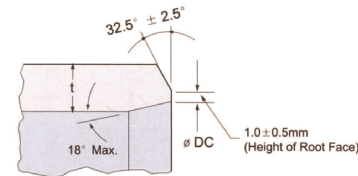


{ KS B1541 }
{ JIS B2312 }

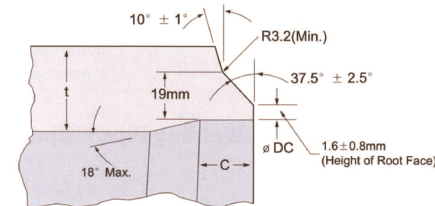
B: In the Case Where t is Over 22.4mm



A: In the Case Where t is 22.4mm or Less



D: In the Case Where t is Over 22.4mm



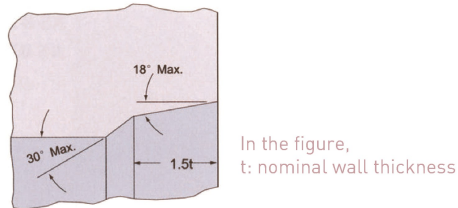
Where t : nominal wall thickness
DC : diameter of machining bore
C : length of machining bore

Remarks

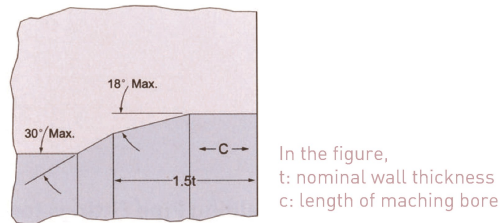
1. Diameter(Dc) and length(C) of machining bore and dimensional tolerances shall be as agreed between parties concerned.
2. Relieving of machining bore may be performed by providing an inclination of 18° or less from the end face to the limits of 1.5 times the wall thickness, or after cutting to the cylindrical surface to the length of machining bore, providing an inclination of 18° or less to the limits above-indicated, and beyond that portion machining with an inclination of 45° or less.

KS / JIS

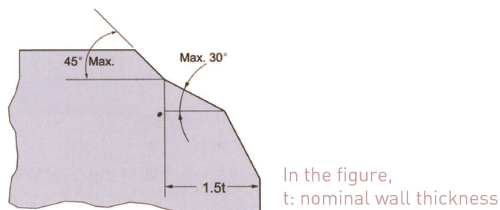
For Types A and B of Bevel Shape



For Types C and D of Bevel Shape



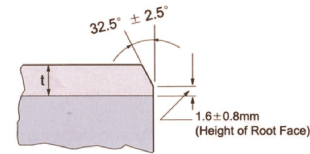
Relieving for outside diameter may be performed by providing an inclination of 30° or less from the end face to the limits of 1.5 times the wall thickness, and beyond that portion machining with an inclination 45° or less



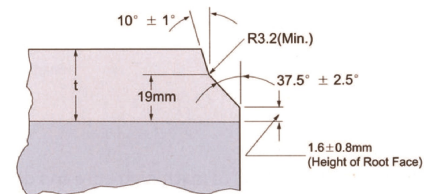
3. Steel Plate Butt-Welding Pipe Fittings

{ KS B1543 }
{ JIS B2313 }

Where $t \leq 22.4\text{mm}$



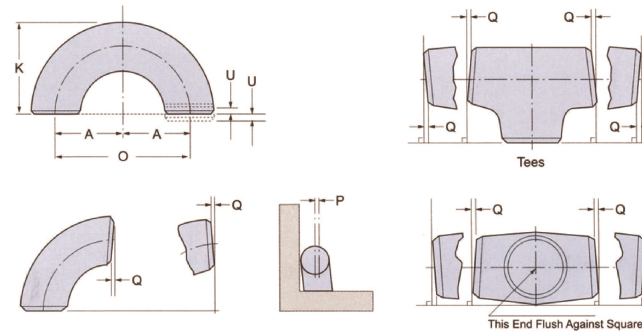
Where $t > 22.4\text{mm}$



Remarks

The shape and dimensions of the special bevel ends are referred to the reference clause stated in JIB B 2312(KS B 1541)

ASME B16.9



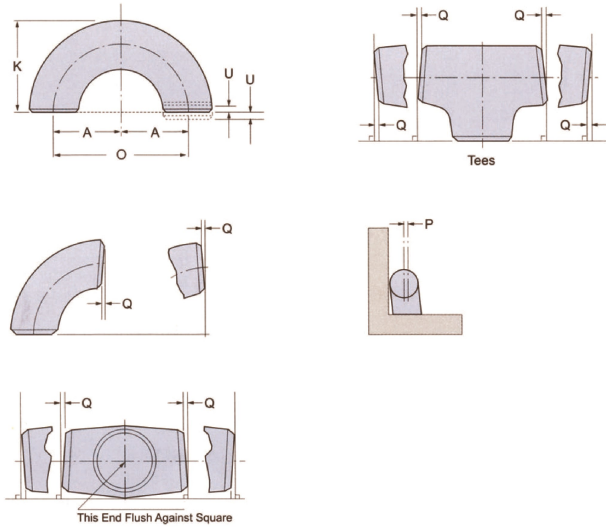
1. Wrought Steel Butt Welding Fittings

All Fittings				90° and 45° Elbows
Nominal Pipe Size	Outside Diameter at Bevel OD	Inside Diameter at End ID	Wall Thickness T	Center-to-End Dimension A, B
1/2 ~ 2 1/2	+ 0.06 - 0.03	± 0.03	Not less than 87 1/2% of nominal thickness	± 0.06
3~4	± 0.06	± 0.06		
5~8	+ 0.09 - 0.06	± 0.12		± 0.09
10~18	+ 0.16 - 0.12			
20~24	+ 0.25 - 0.19	± 0.19		± 0.12
26~30				± 0.19
32~48			± 0.19	

• Dimensions are in inches.

Tees	Reducers	Caps	180° Returns		
Center-to-End Dimension C, M	End to End H	Back to Face E	Center-to-Center Dimension O	Back-to-Face Dimension K	Alignment of Ends U
± 0.06	± 0.06	± 0.12	± 0.25	± 0.25	± 0.03
± 0.09	± 0.09	± 0.25			
± 0.12	± 0.19	± 0.38	-	-	-
± 0.19			-	-	-

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Nominal Pipe Size	Angularity Tolerance	
	Off Angle Q	Off Plane P
1/2 ~ 4	0.03	0.06
5 ~ 8	0.06	0.12
10 ~ 12	0.09	0.19
14 ~ 16		0.25
18 ~ 24	0.12	0.38
26 ~ 30	0.19	0.5
32 ~ 42		0.75
44 ~ 48		

• Dimensions are in inches.

2. Forged Socket Welding Fittings

Nominal Pipe Size	All Fittings			
	Socket Bore Dia	Bore Dia. of Fittings	Concentricity of Bore	Considence of Axis
1/8 ~ 1/4	+0.012 -0.000	±0.03	Socket and Fitting Bores within ±0.030	Maximum variation in alignment of socket and fitting bores for 1/8 in 12
3/8 ~ 3/4	+0.012 -0.000	±0.03		
1 ~ 2	+0.012 -0.000	±0.03		
2 1/2 ~ 3	+0.012 -0.000	±0.06		

Nominal Pipe Size	Elbow, Tee, Cross	Coupling	Half Coupling
	Center to Bottom of Socket	Bottom to Bottom of Socket	Bottom of Socket to Opposite Face
1/8 ~ 1/4	±0.03	±0.06	±0.03
3/8 ~ 3/4	±0.06	±0.12	±0.06
1 ~ 2	±0.08	±0.16	±0.08
2 1/2 ~ 3	±0.10	±0.20	±0.10

• Dimensions are in inches.
• Above table is followed accordingly to ASME B16.11

MSS SP-43

Nominal Pipe Size	All Fittings		90° Elbow 45° Elbow Tee	Reducer Lap Joint Stub Ends
	Outside(1) Diameter at Welding End	Wall Thickness	Center-to-End Dimension A,B,C,M	Overall Length F,H
1/2 ~ 1 1/2	±0.03	Not less than 87 1/2% of nominal thickness	±0.06	±0.06
2 ~ 3 1/2	±0.03		±0.06	±0.06
4	±0.03		±0.06	±0.06
5 ~ 8	±0.06 - 0.03		±0.06	±0.06
10 ~ 18	±0.09 - 0.03		±0.09	±0.09
20 ~ 24	± 0.12 - 0.03		±0.09	±0.09

Nominal Pipe Size	180° Returns		
	Center-to Center Dimension O	Back-to-Face Dimension K	Alignment of Ends U
1/2 ~ 1 1/2	± 0.25	± 0.25	± 0.03
2 ~ 3 1/2	± 0.25	± 0.25	± 0.03
4	± 0.25	± 0.25	± 0.03
5 ~ 8	± 0.25	± 0.25	± 0.03
10 ~ 18	± 0.38	± 0.25	± 0.06
20 ~ 24	± 0.38	± 0.25	± 0.06

• Dimensions are in inches.

• NOTES

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

MSS SP-43

Nominal Pipe Size	All Fittings	
	Outside(1) Diameter at Welding End	Wall Thickness
1/2 ~ 1 1/2	± 0.03	Not less than 87 1/2% of nominal thickness
2 ~ 3 1/2	± 0.03	
4	± 0.03	
5 ~ 8	± 0.06 - 0.03	
10 ~ 18	± 0.09 - 0.03	
20 ~ 24	± 0.12 - 0.03	

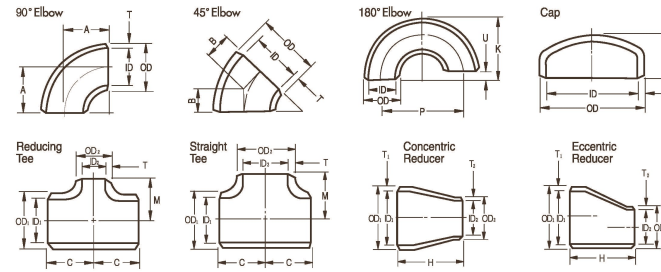
Nominal Pipe Size	Cap	Lap Joint Stub Ends	
	Overall Length E	Fillet(2) Radius of Lap A	Outside Diameter of Lap G
1/2 ~ 1 1/2	±0.12	+3 -0.03	+0 -0.03
2 ~ 3 1/2	±0.12	+0 -0.03	+0 -0.03
4	±0.12	+0 -0.06	+0 -0.03
5 ~ 8	±0.25	+0 -0.06	+0 -0.03
10 ~ 18	±0.25	+0 -0.06	+0 -0.06
20 ~ 24	±0.25	+0 -0.06	+0 -0.06

• Dimensions are in inches.

• NOTES

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

KS / JIS



{ KS B1522 }
{ JIS B2311 }

1. Steel Butt-Welding Pipe Fittings for Ordinary Use

Item	Type of Pipe Fittings
Outside Dia, at end face (OD)	All pipe Fitting
Inside Dia, at end face (ID)	
Wall thickness (T)	
Center-to-end dimension (A, B)	90° Elbow, 45° Elbow
Center-to-Center dimension (P)	180° Elbow
Back-to face dimension (K)	
Alignment of ends (Max.) (U)	
End-to-end dimension (H)	Reducer
Center-to-end dimension (C, M)	Tee
Back-to-face dimension (E)	Cap

• Dimensions are in millimeters.

Nominal Diameter				
1/2 ~ 2 1/2	3 ~ 4	5 ~ 8	10 ~ 18	20
Tolerance				
± 2	± 2.5	± 3.5	± 5 - 4.5	± 6.4 - 4.8
± 2	± 2.5	± 3.5	± 4.5	± 4.8
+ Not specified - 15%				
± 2.0		± 3.2		± 4.8
± 6.4		± 9.5		-
± 6.4				
1.6		3.2		-
± 2.0		± 3.2		
± 2.0		± 3.2		
± 3.2		± 6.4		

KS / JIS

2. Steel Butt-Welding Pipe Fittings for Special Use and Steel Plate Butt-Welding Pipe Fittings

{ KS B1541, JIS B2312 }
{ KS B1543, JIS B2313 }

Item	Type of Pipe Fittings
Outside Dia, at end face (OD)	All pipe Fitting
Inside Dia, at end face (ID)	
Wall thickness (T)	
Center-to-end dimension (A, B)	90° Elbow, 45° Elbow
Center-to-Center dimension (P)	180° Elbow
Back-to face dimension (K)	
Alignment of ends (Max.) (U)	
End-to-end dimension (H)	Reducer
Center-to-end dimension (C, M)	Tee
Back-to-face dimension (E)	Cap
Outside of end Peripheral length	All pipe Fitting

Nominal Diameter						
1/2 ~ 2 1/2	3 ~ 4	5 ~ 8	10 ~ 18	20 ~ 24	26 ~ 30	32 ~ 36
Tolerance						
± 1.6 - 0.8	± 1.6	± 2.4 - 1.6	± 4 - 3.2	± 6.4 - 4.8		
± 0.8			± 3.2	± 4.8		
+ Not specified - 12.5%						
± 1.6		± 2.4		± 3.2	± 4.8	
± 6.4		± 9.5				
± 6.4						
* ± 0.8 ** ± 1.6			* ± 1.6 ** ± 3.2		-	
± 1.6			± 2.4		± 4.8	
± 1.6			± 2.4		± 3.2	± 4.8
± 3.2			± 6.4			
-					± 0.5	

* Application of KS B 1541, JIS B 2312
** Application of KS B 1543, JIS B 2313
• Dimensions are in millimeters.

KS / JIS

{ KS B1542 }
{ JIS B2316 }

3. Steel Socket-Welding Pipe Fittings for Special

Item	Type of Pipe Fittings
Inside Diameter of Socket	All pipe Fitting
Bore diameter	
Eccentricity of inside Diameter of socket to bore diameter	
Inclination of socket hole to fitting bore axis	
Distance from center to bottom of socket	90° Elbow 45° Elbow
Laying Length	Full coupling
Laying Length	Full coupling

• Dimensions are in millimeters.

Nominal Diameter			
1/8 and 1/4	3/8 to 3/4	1 to 2	2 1/2 and 3
Tolerance			
± 0.3		± 0.4	
0		0	
± 0.4		± 0.8	
± 0.8			
1.5 / 300 Max.			
± 0.8	± 1.5	± 2	± 2.5
± 1.5	± 3	± 4	± 5
± 0.8	± 1.5	± 2	± 2.5

KS / JIS

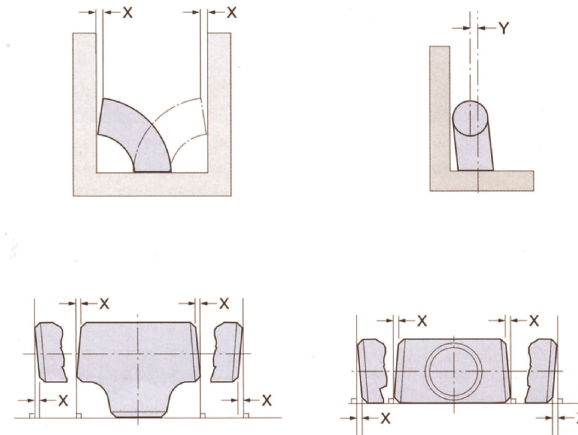
{ KS B1522, JIS B2311
KS B1541, JIS B2312
KS B1543, JIS B2313 }

4. Right Angle for Shaft-Center of Pipe Fittings

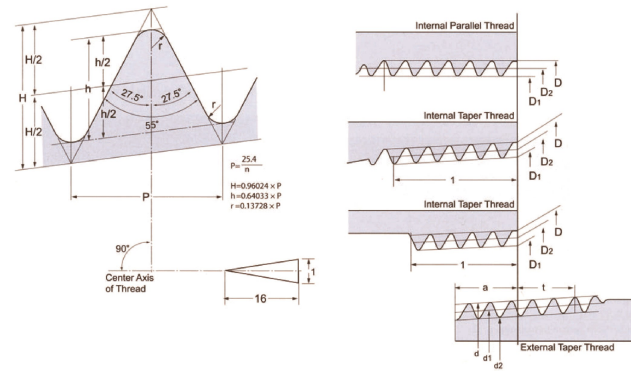
Item	Type of Pipe Fittings	Nominal Diameter	
		1/2 ~ 4	5 ~ 8
Tolerance			
Off Angle [X]	All pipe Fitting	0.8	1.6
Off Plane [Y]		1.6	3.2

• Dimensions are in millimeters.

Nominal Diameter					
10 ~ 12	14 ~ 16	18 ~ 24	26 ~ 30	32 ~ 42	44 ~ 48
Tolerance					
2.4		3.2	4.8		
4.8	6.4	9.5	12.7	19.1	



KS B0222 & JIS B0203
Pipe Threads



REFERENCES

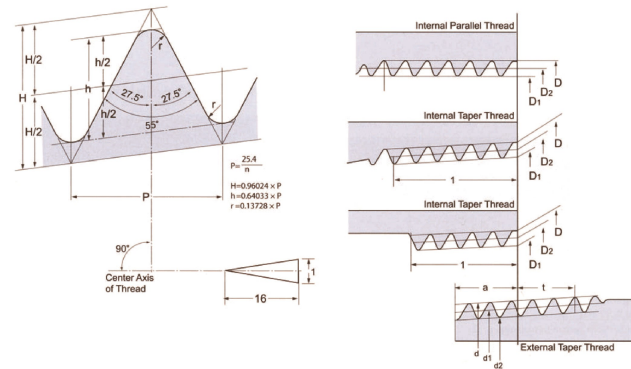
Basic Thread Data

Nominal Size	Number of Threads per Inch	Screw Thread		
		Pitch	Height of Thread	Rounding
PT 15 (1/2)	14	1.8143	1.162	0.25
PT 20 (3/4)	14	1.8143	1.162	0.25
PT 25 (1)	11	2.3091	1.479	0.32
PT 32 (1 1/4)	11	2.3091	1.479	0.32
PT 40 (1 1/2)	11	2.3091	1.479	0.32
PT 50 (2)	11	2.3091	1.479	0.32
PT 65 (2 1/2)	11	2.3091	1.479	0.32
PT 80 (3)	11	2.3091	1.479	0.32
PT 90 (3 1/2)	11	2.3091	1.479	0.32
PT 100 (4)	11	2.3091	1.479	0.32
PT 125 (5)	11	2.3091	1.479	0.32
PT 150 (6)	11	2.3091	1.479	0.32

• Dimensions are in millimeters.

Basic Diameter		
External Thread		
Major Diameter d	Pitch Diameter d ₂	Major Diameter d ₁
Internal Thread		
Major Diameter D	Pitch Diameter D ₂	Major Diameter D ₁
20.955	19.793	18.631
26.441	25.279	24.117
33.249	31.770	30.291
41.910	40.431	38.952
47.803	46.324	44.845
59.614	58.135	56.656
75.184	73.705	72.226
87.884	86.405	84.926
100.330	98.851	97.372
113.030	111.551	110.072
138.430	136.952	135.472
163.830	162.351	160.872

KS B0222 & JIS B0203
Pipe Threads



REFERENCES

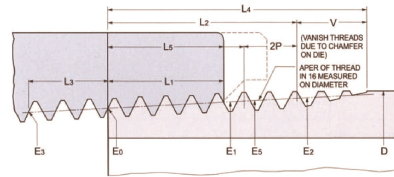
Basic Thread Data

Nominal Size	Position of Basic Diameter			Tolerances on Basic Diameters of Internal Parallel Thread
	External Thread		Internal Thread	
	From the End of Pipe		The End of Pipe	
	Basic Length	Tolerance Axially	Tolerance Axially	
	a	±b	±c	
PT 15 (1/2)	8.16	1.81	2.27	0.142
PT 20 (3/4)	9.53	1.81	2.27	0.142
PT 25 (1)	10.39	2.31	2.89	0.180
PT 32 (1 1/4)	12.70	2.31	2.89	0.180
PT 40 (1 1/2)	12.70	2.31	2.89	0.180
PT 50 (2)	15.88	2.31	2.89	0.180
PT 65 (2 1/2)	17.46	3.56	3.46	0.217
PT 80 (3)	20.64	3.46	3.46	0.217
PT 90 (3 1/2)	22.23	3.46	3.46	0.217
PT 100 (4)	25.40	3.46	3.46	0.217
PT 125 (5)	25.58	3.46	3.46	0.217
PT 150 (6)	28.58	3.46	3.46	0.217

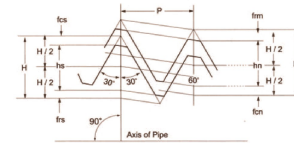
• Dimensions are in millimeters.

External Thread	Effective Thread Length (Min.)			Nominal Pipe Size (For Reference)			
	Internal Thread		When there is no Incomplete thread			Outside Diameter	Wall Thickness
	When there is an Incomplete thread or More						
	Internal Taper Thread	Internal Parallel Thread	Internal Taper & Parallel Thread				
	f	l	l	t			
5.00	12.7	15.0	9.1	21.7	2.8		
5.60	14.1	16.3	10.2	27.2	2.8		
6.40	16.2	19.0	11.5	34.0	3.2		
6.40	18.5	21.4	13.4	42.7	3.5		
6.40	18.5	21.4	13.4	48.6	3.5		
7.50	22.8	25.7	16.9	60.5	3.8		
9.22	26.7	30.2	18.6	76.3	4.2		
9.22	29.9	33.3	21.1	89.1	4.2		
9.30	31.5	34.9	22.4	101.6	4.2		
10.40	35.9	39.3	25.9	114.3	4.5		
11.40	40.1	43.6	29.3	139.8	4.5		
11.50	40.1	43.6	29.3	165.2	5.0		

ASME B2.1 Taper Pipe Threads. (Except Dryseal)



Taper 1 in 16 on Diameter (Shown Exaggerated in Diagram)



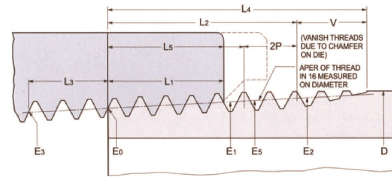
Thread Height Dimensions

Thread Element	27 Threads per inch P=0.03704	18 Threads per inch P=0.05556
$H = 0.866p$	0.0321	0.4810
$hs = hn = 0.760p$	0.0281	0.0422
$frs = frn = 0.033p$	0.0012	0.0088
$fcs = fcn = 0.073p$	0.0027	0.0041

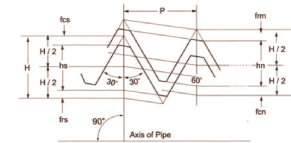
• Dimensions are in Inches.

14 Threads per inch P=0.07143	11 1/2 Threads per inch P=0.08696	8 Threads per inch P=0.12500
0.0619	0.0753	0.1082
0.0543	0.0661	0.0950
0.0024	0.0029	0.0041
0.0052	0.0063	0.0091

ASME B2.1 Taper Pipe Threads. (Except Dryseal)



Taper 1 in 16 on Diameter (Shown Exaggerated in Diagram)



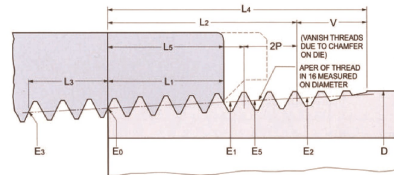
Basic Thread Data

Nominal Pipe Size (NPT)	Outside Diameter of Pipe D	Threads per inch n	Pitch of Thread P	Pitch Diameter at beginning for External Thread
1	2	3	4	5
1/8	0.405	27.0	0.03704	0.36351
1/4	0.540	18.0	0.05556	0.47739
3/8	0.675	18.0	0.05556	0.61201
1/2	0.840	14.0	0.07143	0.75843
3/4	1.050	14.0	0.07143	0.96768
1	1.315	11.5	0.08696	1.21363
1 1/4	1.660	11.5	0.08696	1.55713
1 1/2	1.900	11.5	0.08696	1.79609
2	2.375	11.5	0.08696	2.26902
2 1/2	2.875	8.0	0.12500	2.71953
3	3.500	8.0	0.12500	3.34062
3 1/2	4.000	8.0	0.12500	3.83750
4	4.500	8.0	0.12500	4.33438
5	5.563	8.0	0.12500	5.39073
6	6.625	8.0	0.12500	6.44609

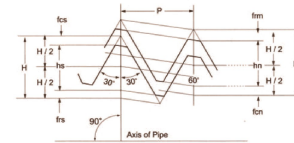
• Dimensions are in Inches.

Handtight Engagement			Effective Thread, External		
Lenght L ₁		Dia	Lenght L ₂		Dia
Ins.	Thds.	D ₁	Ins.	Thds.	D ₂
6	7	8	9	10	11
0.1615	4.36	0.37360	0.2369	7.12	0.38000
0.2278	4.10	0.79160	0.4018	7.23	0.50250
0.2400	4.32	0.62701	0.4078	7.34	0.63750
0.3200	4.48	0.77843	0.5337	7.47	0.79179
0.3390	4.75	0.98887	0.5457	7.64	1.00179
0.4000	4.60	1.23863	0.6828	7.85	1.25630
0.4200	4.83	1.58338	0.7068	8.13	1.60130
0.4200	4.83	1.82234	0.7235	8.32	1.84130
0.4360	5.01	2.29627	0.7565	8.70	2.31630
0.6820	5.46	2.76216	1.1375	9.10	2.79062
0.7660	6.13	3.38850	1.2000	9.60	3.41562
0.8210	6.57	3.88881	1.2500	10.00	3.91562
0.8440	6.75	4.38712	1.3000	10.40	4.41562
0.9370	7.50	5.44929	1.4063	11.25	5.47862
0.9580	7.66	6.50597	1.5125	12.10	6.54062

ASME B2.1 Taper Pipe Threads. (Except Dryseal)



Taper 1 in 16 on Diameter (Shown Exaggerated in Diagram)



Basic Thread Data

Nominal Pipe Size (NPT)	Wrench Makeup Length for External Thread L ₂ L ₁		Wrench Makeup Length for Internal Thread			Vanish Thread V	
			Length L ₃		Dia ⁷		
	In.	Thds.	In.	Thds.	E ₃	In.	Thds.
1	12	13	14	15	16	17	18
1/8	0.1024	2.76	0.1111	3	0.35656	0.1285	3.47
1/4	0.1740	3.13	0.1667	3	0.46697	0.1928	3.47
3/8	0.1678	3.02	0.1667	3	0.60160	0.1928	3.47
1/2	0.2137	2.99	0.2143	3	0.74504	0.2478	3.47
3/4	0.2067	2.89	0.2143	3	0.95429	0.2478	3.47
1	0.2828	3.25	0.2609	3	1.19733	0.3017	3.47
1 1/4	0.2868	3.30	0.2609	3	1.54083	0.3017	3.47
1 1/2	0.3035	3.49	0.2609	3	1.77978	0.3017	3.47
2	0.3205	3.69	0.2609	3	2.25272	0.3017	3.47
2 1/2	0.4555	3.64	0.2500	2	2.70391	0.4337	3.47
3	0.4340	3.47	0.2500	2	3.32500	0.4337	3.47
3 1/2	0.4290	3.43	0.2500	2	3.82188	0.4337	3.47
4	0.4560	3.65	0.2500	2	4.31875	0.4337	3.47
5	0.4693	3.75	0.2500	2	5.37511	0.4337	3.47
6	0.5545	4.44	0.2500	2	6.43047	0.4337	3.47

• Dimensions are in Inches.

Overall Length External Thread L ₄	Nominal, Complete External Threads ⁵		Height of Thread h	Increase in Dia per Thread, 0.0625/n	Basic Minor Dia at Small End of Pipe, K _o
	Length L ₅	Dia, E ₅			
19	20	21	22	23	24
0.3924	0.1898	0.37537	0.2963	0.00231	0.3339
0.5946	0.2907	0.49556	0.4444	0.00347	0.4329
0.6006	0.2967	0.63056	0.4444	0.00347	0.4576
0.7815	0.3909	0.78286	0.5714	0.00446	0.7013
0.7935	0.4029	0.99286	0.5714	0.00446	0.9105
0.9845	0.5089	1.24543	0.6957	0.00543	1.1441
1.0085	0.5329	1.59043	0.6957	0.00543	1.4876
1.0252	0.5496	1.83043	0.6957	0.00543	1.7265
1.0582	0.5826	2.30543	0.6957	0.00543	2.1995
1.5712	0.8875	2.77500	0.100000	0.00781	2.6195
1.6337	0.9500	3.40000	0.100000	0.00781	3.2406
1.6837	1.0000	3.90000	0.100000	0.00781	3.7375
1.7337	1.0500	4.40000	0.100000	0.00781	4.2344
1.8400	1.1563	5.46300	0.100000	0.00781	5.2907
1.9462	1.2625	6.52500	0.100000	0.00781	6.3461

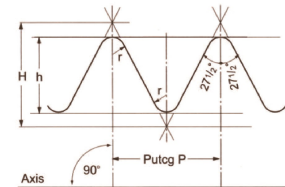
**BS21-1973 British Standard
Taper Pipe Threads. (Except Dryseal)**

Taper 1 in 16 on Diameter
(Shown Exaggerated in Diagram)

$$H = 0.960237 \times P$$

$$h = 0.460327 \times P$$

$$r = 0.137278 \times P$$

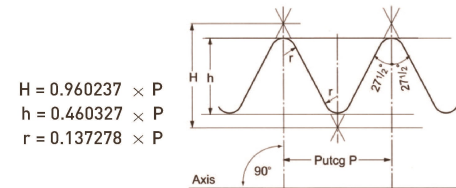


BSP Size (Nominal Bore of Pipe)	No. of Threads per inch	Pitch		Depth of Thread	
		in.	mm	in.	mm
1/2	14	0.07143	1.814	0.0457	1.162
3/4	14	0.07143	1.814	0.0457	1.162
1	11	0.09091	2.039	0.0582	1.479
1 1/4	11	0.09091	2.039	0.0582	1.479
1 1/2	11	0.09091	2.039	0.0582	1.479
2	11	0.09091	2.039	0.0582	1.479
2 1/2	11	0.09091	2.039	0.0582	1.479
3	11	0.09091	2.039	0.0582	1.479
4	11	0.09091	2.039	0.0582	1.479
5	11	0.09091	2.039	0.0582	1.479
6	11	0.09091	2.039	0.0582	1.479

Basic-Diameters at Gauge Plane					
Major (Gauge Diameter)		Effective		Minor	
in.	mm	in.	mm	in.	mm
0.825	20.955	0.7793	19.793	0.7336	18.631
1.041	26.441	0.9953	25.279	0.9496	24.117
1.309	33.249	1.2508	31.770	1.1926	30.291
1.650	41.910	1.5918	40.431	1.5335	38.952
1.882	47.803	1.8238	46.324	1.7656	44.845
2.347	59.614	2.2888	58.135	2.2306	56.656
2.960	75.184	2.9018	73.705	2.8436	72.226
3.460	87.884	3.4018	86.405	3.3436	84.926
4.450	113.030	4.3918	111.551	4.3336	110.072
5.450	138.430	5.3918	136.951	5.3334	135.472
6.450	163.830	6.3918	162.351	6.3336	160.872

**BS21-1973 British Standard
Taper Pipe Threads. (Except Dryseal)**

Taper 1 in 16 on Diameter
(Shown Exaggerated in Diagram)



BSP Size (Nominal Bore of Pipe)	No. of Threads per inch	Gauge Length			
		Basic		Tolerance Plus and Minus	
		in.	mm	in.	mm
1/2	14	0.3214	9.2	0.0714	1.8
3/4	14	0.3750	9.5	0.0714	1.8
1	11	0.4091	10.4	0.0909	2.3
1 1/4	11	0.5000	12.7	0.0909	2.3
1 1/2	11	0.5000	12.7	0.0909	2.3
2	11	0.6250	15.9	0.0909	2.3
2 1/2	11	0.6875	17.5	0.1364	3.5
3	11	0.8125	20.6	0.1364	3.5
4	11	1.0000	25.4	0.1364	3.5
5	11	1.1250	28.6	0.1364	3.5
6	11	1.1250	28.6	0.1364	3.5

Gauge Length			
Max.		Min.	
in.	mm	in.	mm
0.3928	10.0	0.2500	6.4
0.4464	11.3	0.3036	7.7
0.5000	12.7	0.3182	8.1
0.5909	15.0	0.4091	10.4
0.5909	15.0	0.4091	10.4
0.7159	18.2	0.5341	13.6
0.8239	21.0	0.5511	14.0
0.9486	24.1	0.6761	17.1
1.1364	28.9	0.8636	21.9
1.2614	32.1	0.9886	25.1
1.2614	32.1	0.9886	25.1

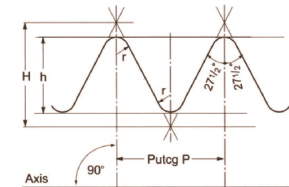
**BS21-1973 British Standard
Taper Pipe Threads. (Except Dryseal)**

Taper 1 in 16 on Diameter
(Shown Exaggerated in Diagram)

$$H = 0.960237 \times P$$

$$h = 0.460327 \times P$$

$$r = 0.137278 \times P$$



BSP Size (Nominal Bore of Pipe)	No. of Threads per inch	Length of Useful Thread on Pipe End Not Less Than.					
		For Basic Gauge Length		For Max. Gauge Length		For Min. Gauge Length	
		in.	mm	in.	mm	in.	mm
1/2	14	0.5178	13.2	0.5892	15.0	0.4464	11.4
3/4	14	0.5714	14.5	0.6428	16.3	0.5000	12.7
1	11	0.6591	16.8	0.7500	19.1	0.5682	14.5
1 1/4	11	0.7500	19.1	0.8509	21.4	0.6591	16.8
1 1/2	11	0.7200	19.1	0.8409	21.4	0.6591	16.8
2	11	0.9204	23.4	1.0113	25.7	0.8295	21.1
2 1/2	11	1.0511	26.7	1.1875	30.2	0.9247	23.2
3	11	1.1761	29.8	1.3125	33.3	1.0397	26.3
4	11	1.4091	35.8	1.5455	39.3	1.2727	32.3
5	11	1.5795	40.1	1.7159	43.6	1.4431	36.6
6	11	1.5795	40.1	1.7159	43.6	1.4431	36.6

Fitting Allowance		Wrenching Allowance		Tolerance of Position of Gauge Plane Relative to Face of Internally Taper Threaded Parts (Plus and Minus)	
in.	mm	in.	mm	in.	mm
0.1964	5.0	0.1071	2.7	0.0893	2.3
0.1964	5.0	0.1071	2.7	0.0893	2.3
0.2500	6.4	0.1364	3.5	0.1136	2.9
0.2500	6.4	0.1364	3.5	0.1136	2.9
0.2500	6.4	0.1364	3.5	0.1136	2.9
0.2954	7.5	0.1818	4.6	0.1136	2.9
0.3636	9.2	0.2273	5.8	0.1364	3.5
0.3636	9.2	0.2273	5.8	0.1364	3.5
0.4091	10.4	0.2727	6.9	0.1364	3.5
0.4545	11.5	0.3182	8.1	0.1364	3.5
0.4545	11.5	0.3182	8.1	0.1364	3.5

90° Elbow (Long, Short)

Long

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
1/2	0.08	0.08	0.08	0.10	0.10	0.15	0.12
3/4	0.10	0.11	0.11	0.14	0.14	0.22	0.13
1	0.15	0.16	0.16	0.20	0.20	0.36	0.25
1 1/4	0.26	0.26	0.26	0.35	0.35	0.64	0.42
1 1/2	0.35	0.37	0.37	0.50	0.50	0.93	0.65
2	0.64	0.66	0.66	0.90	0.90	1.69	1.33
2 1/2	1.12	1.29	1.29	1.79	1.79	3.43	2.33
3	1.58	2.04	2.04	2.74	2.74	5.25	3.83
4	2.91	3.84	3.84	5.36	5.36	10.20	8.02
5	4.49	6.48	6.48	9.13	9.13	17.60	14.70
6	7.09	9.94	9.94	15.00	15.00	29.10	24.20
8	14.40	20.10	20.10	30.50	30.50	51.40	53.20
10	25.40	35.40	35.40	47.70	57.00	82.00	103.00
12	38.10	52.00	57.00	68.70	94.00	134.00	171.00
14	56.70	67.90	79.10	89.90	133.00	-	236.00
16	74.30	89.00	118.00	118.00	195.00	-	350.00
18	94.20	113.00	169.00	150.00	275.00	-	495.00
20	116.00	140.00	220.00	186.00	373.00	-	676.00
22	141.00	169.00	267.00	225.00	493.00	-	886.00
24	168.00	202.00	366.00	268.00	636.00	-	1160.00
26	198.00	237.00	430.00	315.00	-	-	-
28	230.00	276.00	500.00	367.00	-	-	-
30	264.00	316.00	575.00	421.00	-	-	-
32	301.00	361.00	654.00	480.00	-	-	-
34	340.00	408.00	739.00	543.00	-	-	-
36	380.00	457.00	904.00	608.00	-	-	-

Short

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
1/2	-	-	-	-	-	-	-
3/4	-	-	-	-	-	-	-
1	0.10	0.11	0.11	0.14	0.14	0.22	0.17
1 1/4	0.17	0.18	0.18	0.23	0.23	0.39	0.28
1 1/2	0.24	0.25	0.25	0.33	0.33	0.57	0.43
2	0.43	0.44	0.44	0.60	0.60	1.13	0.89
2 1/2	0.75	0.91	0.91	1.19	1.19	2.19	1.46
3	1.05	1.36	1.36	1.83	1.83	3.49	2.55
4	1.94	2.56	2.56	3.58	3.58	6.79	2.35
5	2.99	4.32	4.32	6.09	6.09	11.80	9.79
6	4.73	6.63	6.63	10.00	10.00	19.50	16.20
8	9.61	13.40	13.40	20.30	20.30	34.30	35.50
10	16.90	23.60	23.60	31.80	38.00	61.00	68.60
12	25.40	34.60	38.00	45.80	63.00	89.50	114.00
14	37.80	45.30	53.00	60.00	89.00	-	158.00
16	49.50	59.10	79.00	78.30	130.00	-	234.00
18	62.80	75.30	113.00	99.90	183.00	-	330.00
20	77.70	93.10	147.00	124.00	249.00	-	451.00
22	94.10	113.00	178.00	150.00	329.00	-	591.00
24	112.00	135.00	244.00	179.00	424.00	-	773.00
26	132.00	158.00	287.00	210.00	-	-	-
28	154.00	184.00	334.00	245.00	-	-	-
30	176.00	211.00	383.00	281.00	-	-	-
32	201.00	241.00	436.00	320.00	-	-	-
34	227.00	272.00	493.00	362.00	-	-	-
36	253.00	304.00	603.00	405.00	-	-	-

90° Elbow (Long, Short)

Long

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
38	425.00	510.00	-	679.00			
40	471.00	565.00	-	753.00			
42	518.00	622.00	-	828.00			
44	570.00	684.00	-	912.00	-	-	-
46	623.00	748.00	-	997.00	-	-	-
48	677.00	814.00	-	1085.00	-	-	-
50	735.00	884.00	-	1178.00	-	-	-
52	796.00	956.00	-	1305.00	-	-	-
54	857.00	1031.00	-	1375.00	-	-	-
56	926.00	1109.00	-	1480.00			
58	991.00	1190.00	-	1588.00			
60	1060.00	1274.00	-	1700.00			

Short

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
38	283.00	340.00	-	453.00	-	-	-
40	314.00	377.00	-	502.00	-	-	-
42	346.00	416.00	-	554.00	-	-	-
44	380.00	456.00	-	608.00	-	-	-
46	415.00	499.00	-	665.00	-	-	-
48	452.00	543.00	-	724.00	-	-	-
50	490.00	589.00	-	786.00	-	-	-
52	530.00	637.00	-	870.00	-	-	-
54	572.00	688.00	-	917.00	-	-	-
56	616.00	740.00	-	976.00	-	-	-
58	661.00	794.00	-	1059.00	-	-	-
60	707.00	849.00	-	1133.00	-	-	-

45° Elbow (Long, Short)

Long

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160
1/2	0.04	0.04	0.04	0.05	0.05	-	-
3/4	0.05	0.06	0.06	0.07	0.07	-	-
1	0.08	0.08	0.08	0.10	0.10	0.18	0.13
1 1/4	0.13	0.13	0.13	0.18	0.18	0.32	0.21
1 1/2	0.18	0.19	0.19	0.25	0.25	0.47	0.33
2	0.32	0.33	0.33	0.45	0.45	0.85	0.67
2 1/2	0.60	0.69	0.69	0.90	0.90	1.72	1.17
3	0.79	1.02	1.02	1.37	1.37	2.63	1.92
4	1.46	1.92	1.92	2.68	2.68	5.09	4.01
5	2.25	3.24	3.24	4.57	4.57	8.80	7.35
6	3.55	4.97	4.97	7.50	7.50	14.50	12.10
8	7.20	10.10	10.10	15.30	15.30	25.70	26.60
10	12.70	17.70	17.70	23.90	28.50	41.00	51.50
12	19.00	26.00	28.50	34.40	47.00	65.00	85.50
14	28.40	34.00	40.10	45.00	66.50	-	118.00
16	37.20	44.50	59.00	59.00	97.50	-	175.00
18	47.10	56.50	84.50	75.50	138.00	-	247.00
20	58.30	70.00	110.00	93.00	187.00	-	338.00
22	70.50	84.50	-	113.00	257.00	-	443.00
24	84.10	101.00	183.00	134.00	318.00	-	580.00
26	99.00	119.00	-	158.00	-	-	-
28	115.00	138.00	-	184.00	-	-	-
30	132.00	158.00	-	211.00	-	-	-
32	150.00	180.00	327.00	240.00	-	-	-

Short

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160
1/2	-	-	-	-	-	-	-
3/4	-	-	-	-	-	-	-
1	0.05	0.06	0.06	0.07	0.07	-	-
1 1/4	0.09	0.09	0.09	0.12	0.12	-	-
1 1/2	0.12	0.13	0.13	0.17	0.17	-	-
2	0.22	0.22	0.22	0.30	0.30	0.57	0.45
2 1/2	0.38	0.46	0.46	0.60	0.60	1.10	0.75
3	0.53	0.68	0.68	0.92	0.92	1.75	1.28
4	0.97	1.28	1.28	1.79	1.79	3.40	2.68
5	1.50	2.16	2.16	3.05	3.05	5.88	4.90
6	2.36	3.32	3.32	5.00	5.00	9.75	8.10
8	4.80	6.71	6.71	10.20	10.20	17.20	17.80
10	8.46	11.80	11.80	15.90	19.00	30.50	34.30
12	12.70	17.30	19.00	22.90	31.50	43.50	57.00
14	18.00	22.60	26.50	30.00	44.50	-	79.00
16	24.00	29.50	39.20	39.20	65.00	-	117.00
18	31.00	37.60	56.50	50.00	91.50	-	165.00
20	38.00	46.60	73.50	62.00	124.00	-	225.00
22	47.00	56.50	-	75.00	164.00	-	295.00
24	56.00	67.30	122.00	89.50	212.00	-	386.00
26	66.00	79.10	-	105.00	-	-	-
28	77.00	92.00	-	122.00	-	-	-
30	87.00	105.00	-	140.00	-	-	-
32	101.00	120.00	218.00	160.00	-	-	-

45° Elbow (Long, Short)

Long

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160
34	170.00	204.00	369.00	272.00	-	-	-
36	190.00	228.00	452.00	304.00	-	-	-
38	212.00	255.00	-	339.00	-	-	-
40	235.00	282.00	-	376.00	-	-	-
42	259.00	311.00	-	414.00	-	-	-
44	285.00	342.00	-	456.00	-	-	-
46	312.00	374.00	-	498.00	-	-	-
48	339.00	407.00	-	542.00	-	-	-

Short

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160
34	114.00	136.00	246.00	181.00	-	-	-
36	127.00	152.00	301.00	202.00	-	-	-
38	142.00	170.00	-	226.00	-	-	-
40	157.00	189.00	-	251.00	-	-	-
42	173.00	208.00	-	277.00	-	-	-
44	190.00	228.00	-	304.00	-	-	-
46	208.00	250.00	-	332.00	-	-	-
48	226.00	272.00	-	362.00	-	-	-

CAP

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
1/2	0.03	0.04	0.04	0.05	0.05	0.10	0.06
3/4	0.04	0.05	0.05	0.07	0.07	0.13	0.09
1	0.08	0.11	0.11	0.15	0.15	0.29	0.20
1 1/4	0.11	0.14	0.14	0.20	0.20	0.39	0.25
1 1/2	0.15	0.17	0.17	0.24	0.24	0.50	0.35
2	0.23	0.24	0.24	0.33	0.33	0.68	0.54
2 1/2	0.34	0.42	0.42	0.57	0.57	1.33	0.77
3	0.51	0.67	0.67	0.92	0.92	2.18	1.40
4	0.88	1.17	1.17	1.68	1.68	3.80	2.76
5	1.29	1.90	1.90	2.73	2.73	6.22	4.85
6	1.99	2.83	2.83	4.38	4.38	9.85	7.81
8	3.61	5.11	5.11	7.91	7.91	16.40	15.20
10	6.33	8.92	8.92	12.20	16.40	28.35	28.90
12	9.43	13.10	13.10	17.40	26.40	39.40	47.70
14	13.20	15.90	18.60	21.20	34.90	-	61.20
16	16.60	20.00	26.70	26.70	49.00	-	92.80

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
18	21.20	25.50	41.50	34.10	69.00	-	131.00
20	26.40	31.80	54.10	42.50	93.70	-	179.00
22	31.50	38.80	61.40	51.70	116.00	-	219.00
24	36.60	45.10	90.10	60.10	160.00	-	307.00
26	41.00	50.50	92.30	67.30	-	-	-
28	45.50	56.20	103.00	74.90	-	-	-
30	50.30	62.10	114.00	82.80	-	-	-
32	55.40	68.40	126.00	91.20	-	-	-
34	62.30	75.00	138.00	100.00	-	-	-
36	68.00	81.90	164.00	109.00	-	-	-
38	79.00	94.70	-	126.00	-	-	-
40	95.00	102.00	-	137.00	-	-	-
42	98.00	110.00	-	147.00	-	-	-
44	103.00	126.00	-	167.00	-	-	-
46	111.00	134.00	-	179.00	-	-	-
48	118.00	143.00	-	191.00	-	-	-

TEE

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
1/2 X 1/2	0.09	0.09	0.09	0.11	0.11	0.17	0.12
3/4 X 3/4	0.13	0.13	0.13	0.17	0.17	0.26	0.21
1/2	0.12	0.12	0.12	0.16	0.16	0.24	0.19
1 X 1	0.24	0.25	0.25	0.32	0.32	0.53	0.41
3/4	0.23	0.24	0.24	0.30	0.30	0.49	0.38
1/2	0.22	0.23	0.23	0.26	0.26	0.47	0.37
1 1/4 X 1 1/4	0.42	0.43	0.43	0.56	0.56	0.95	0.69
1	0.39	0.40	0.40	0.53	0.53	0.89	0.65
3/4	0.37	0.37	0.37	0.48	0.48	0.84	0.62
1/2	0.36	0.36	0.36	0.47	0.47	0.81	0.59
1 1/2 X 1 1/2	0.58	0.61	0.61	0.81	0.81	1.40	1.07
1 1/4	0.56	0.59	0.59	0.78	0.78	1.35	1.01
1	0.53	0.56	0.56	0.74	0.74	1.28	0.97
3/4	0.51	0.53	0.53	0.70	0.70	1.21	0.92
1/2	0.49	0.51	0.51	0.67	0.67	1.17	0.90
2 X 2	0.86	0.88	0.88	1.20	1.20	2.16	1.78
1 1/2	0.80	0.82	0.82	1.11	1.11	2.00	1.63
1 1/4	0.77	0.79	0.79	1.07	1.07	1.91	1.56
1	0.73	0.75	0.75	1.01	1.01	1.81	1.50
3/4	0.70	0.71	0.71	0.98	0.98	1.76	1.45
2 1/2 X 2 1/2	1.42	1.74	1.74	2.28	2.28	3.92	2.86
2	1.31	1.56	1.56	2.06	2.06	3.56	2.64
1 1/2	1.25	1.51	1.51	1.98	1.98	3.40	2.48
1 1/4	1.22	1.48	1.48	1.94	1.94	3.32	2.42
1	1.18	1.36	1.36	1.80	1.80	3.22	2.36

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
3 X 3	1.87	2.41	2.41	3.25	3.25	5.90	4.55
2 1/2	1.79	2.29	2.29	3.07	3.07	5.53	4.23
2	1.68	2.12	2.12	2.85	2.85	5.18	4.02
1 1/2	1.62	2.06	2.06	2.77	2.77	5.03	3.87
1 1/4	1.60	2.02	2.02	2.74	2.74	4.95	3.80
4 X 4	3.13	4.12	4.12	5.77	5.77	10.60	8.50
3	2.92	3.83	3.83	5.33	5.33	9.76	7.92
2 1/2	2.84	3.71	3.71	5.15	5.15	9.39	7.56
2	2.72	3.53	3.53	4.94	4.94	9.02	7.34
1 1/2	2.66	3.48	3.48	4.83	4.83	8.87	7.23
5 X 5	4.53	6.54	6.54	9.20	9.20	17.30	14.80
4	4.30	6.13	6.13	8.63	8.63	16.10	13.70
3	4.08	5.83	5.83	8.19	8.19	15.30	13.00
2 1/2	4.00	5.71	5.71	8.01	8.01	15.00	12.80
2	3.90	5.58	5.58	7.92	7.92	14.70	12.50
6 X 6	6.84	9.58	9.58	14.50	14.50	27.20	23.30
5	6.45	9.08	9.08	13.60	13.60	25.60	21.90
4	6.23	8.67	8.67	13.00	13.00	24.50	20.80
3	6.01	8.38	8.38	12.60	12.60	23.70	20.10
2 1/2	5.92	8.36	8.36	12.50	12.50	23.30	19.80
8 X 8	12.80	17.90	17.90	27.10	27.10	45.70	47.20
6	11.90	16.60	16.60	25.20	25.20	43.00	43.50
5	11.50	16.10	16.10	24.30	24.30	41.40	42.10
4	11.30	15.70	15.70	23.70	23.70	41.00	40.30

TEE

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
10 X 10	21.80	30.40	30.40	41.00	49.00	79.20	88.00
8	20.40	28.50	28.50	38.90	45.80	54.40	81.40
6	19.50	27.20	27.20	37.00	43.90	71.50	78.50
5	19.20	26.80	26.80	36.20	43.10	70.00	77.00
4	18.90	26.80	26.80	36.20	42.50	68.90	76.30
12 X 12	32.00	43.60	48.70	57.70	79.20	113.00	143.00
10	30.40	41.60	45.30	55.20	74.80	107.00	135.00
8	29.00	39.70	42.50	53.10	71.40	102.00	128.00
6	28.10	38.40	42.00	51.20	69.50	100.00	125.00
5	27.80	38.70	41.70	51.20	68.70	98.30	124.00
14 X 14	44.70	53.50	62.40	70.90	104.00	-	186.00
12	42.70	51.90	60.20	68.80	100.00	-	179.00
10	41.20	49.90	57.60	66.30	95.90	-	174.00
8	40.00	48.20	55.80	64.50	92.90	-	168.00
6	39.00	47.10	54.50	62.60	91.00	-	164.00
16 X 16	55.20	66.10	88.00	87.70	145.00	-	260.00
14	54.20	64.90	86.00	86.10	140.00	-	255.00
12	52.70	63.10	84.00	83.60	136.00	-	248.00
10	51.20	61.30	82.00	81.20	132.00	-	241.00
8	49.40	59.80	79.00	80.00	129.00	-	235.00
6	48.50	58.50	77.00	77.80	127.00	-	230.00
18 X 18	70.00	83.90	125.00	111.00	204.00	-	356.00
16	67.90	81.40	121.00	108.00	197.00	-	352.00
14	66.90	80.20	119.00	106.00	194.00	-	344.00
12	65.40	78.30	117.00	104.00	189.00	-	337.00
10	63.40	76.90	114.00	102.00	186.00	-	329.00

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
20 X 20	86.60	104.00	163.00	138.00	277.00	-	502.00
18	84.20	101.00	158.00	134.00	268.00	-	488.00
16	82.10	98.40	154.00	131.00	262.00	-	475.00
14	81.10	97.20	152.00	129.00	258.00	-	469.00
12	79.20	96.00	150.00	127.00	254.00	-	462.00
10	77.60	94.00	147.00	125.00	250.00	-	452.00
8	76.30	92.10	145.00	123.00	245.00	-	444.00
22 X 22	106.00	126.00	198.00	167.00	365.00	-	657.00
20	103.00	123.00	193.00	163.00	356.00	-	640.00
18	101.00	120.00	188.00	159.00	347.00	-	624.00
16	98.90	117.00	183.00	156.00	340.00	-	610.00
24 X 24	116.00	139.00	252.00	185.00	438.00	-	800.00
22	115.00	138.00	249.00	183.00	432.00	-	790.00
20	114.00	136.00	247.00	181.00	427.00	-	782.00
18	111.00	133.00	241.00	177.00	418.00	-	764.00
26 X 26	147.00	176.00	319.00	234.00	-	-	-
24	144.00	172.00	312.00	229.00	-	-	-
22	141.00	169.00	308.00	225.00	-	-	-
20	138.00	166.00	302.00	221.00	-	-	-
28 X 28	165.00	198.00	359.00	264.00	-	-	-
26	163.00	197.00	356.00	261.00	-	-	-
24	160.00	193.00	350.00	256.00	-	-	-
22	157.00	190.00	347.00	252.00	-	-	-
30 X 30	190.00	228.00	414.00	304.00	-	-	-
28	188.00	226.00	406.00	301.00	-	-	-
26	185.00	222.00	356.00	296.00	-	-	-
24	182.00	218.00	350.00	291.00	-	-	-

TEE

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
32 X 32	217.00	259.00	474.00	347.00	-	-	-
30	213.00	256.00	466.00	341.00	-	-	-
28	209.00	252.00	458.00	335.00	-	-	-
26	208.00	250.00	455.00	333.00	-	-	-
34 X 34	246.00	295.00	535.00	393.00	-	-	-
32	243.00	292.00	526.00	389.00	-	-	-
30	238.00	290.00	518.00	380.00	-	-	-
28	236.00	288.00	511.00	377.00	-	-	-
36 X 36	276.00	331.00	656.00	441.00	-	-	-
34	271.00	329.00	645.00	434.00	-	-	-
32	269.00	326.00	636.00	431.00	-	-	-
30	264.00	323.00	627.00	422.00	-	-	-
38 X 38	308.00	370.00	-	493.00	-	-	-
36	306.00	367.00	-	489.00	-	-	-
34	302.00	362.00	-	481.00	-	-	-
32	298.00	357.00	-	476.00	-	-	-
40 X 40	342.00	411.00	-	547.00	-	-	-
38	340.00	408.00	-	543.00	-	-	-
36	335.00	402.00	-	536.00	-	-	-
34	331.00	397.00	-	529.00	-	-	-
42 X 42	352.00	422.00	-	562.00	-	-	-
40	350.00	420.00	-	559.00	-	-	-
38	348.00	418.00	-	557.00	-	-	-
36	346.00	416.00	-	554.00	-	-	-

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
44 X 44	396.00	475.00	-	633.00	-	-	-
42	394.00	473.00	-	630.00	-	-	-
40	389.00	467.00	-	623.00	-	-	-
38	385.00	462.00	-	616.00	-	-	-
46 X 46	434.00	521.00	-	695.00	-	-	-
44	432.00	519.00	-	691.00	-	-	-
42	427.00	513.00	-	683.00	-	-	-
40	423.00	507.00	-	676.00	-	-	-
48 X 48	474.00	569.00	-	759.00	-	-	-
46	472.00	566.00	-	755.00	-	-	-
44	470.00	564.00	-	751.00	-	-	-
42	462.00	555.00	-	739.00	-	-	-

REDUCER

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
3/4 X 1/2	0.06	0.06	0.06	0.08	0.08	-	-
1 X 3/4	0.11	0.12	0.12	0.15	0.15	0.25	0.19
1/2	0.10	0.11	0.11	0.14	0.14	0.22	0.17
1 1/4 X 1	0.16	0.16	0.16	0.21	0.21	0.35	0.25
3/4	0.15	0.15	0.15	0.19	0.19	0.31	0.23
1/2	0.13	0.14	0.14	0.18	0.18	-	-
1 1/2 X 1 1/4	0.24	0.25	0.25	0.33	0.33	0.57	0.43
1	0.21	0.22	0.22	0.30	0.30	0.50	0.38
3/4	0.20	0.21	0.21	0.27	0.27	0.45	0.35
1/2	0.18	0.18	0.18	0.24	0.24	0.40	0.32
2 X 1 1/2	0.37	0.38	0.38	0.51	0.51	0.91	0.75
1 1/4	0.35	0.36	0.36	0.48	0.48	0.85	0.70
1	0.31	0.33	0.33	0.44	0.44	0.77	0.64
3/4	0.29	0.30	0.30	0.40	0.40	0.69	0.58
2 1/2 X 2	0.60	0.73	0.73	0.95	0.95	1.68	1.20
1 1/2	0.55	0.67	0.67	0.87	0.87	1.51	1.08
1 1/4	0.52	0.64	0.64	0.83	0.83	1.42	1.02
1	0.48	0.56	0.56	0.73	0.73	1.23	0.93
3 X 2 1/2	0.73	0.94	0.94	1.25	1.25	2.25	1.71
2	0.66	0.85	0.85	1.13	1.13	2.01	1.57
1 1/2	0.62	0.79	0.79	1.04	1.04	1.83	1.44
1 1/4	0.59	0.75	0.75	1.00	1.00	1.74	1.37

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
4 X 3	1.10	1.45	1.45	2.02	2.02	3.65	3.00
2 1/2	1.04	1.37	1.37	1.90	1.90	3.41	2.76
2	0.97	1.27	1.27	1.76	1.76	3.11	2.58
1 1/2	0.91	1.19	1.19	1.64	1.64	2.89	2.41
5 X 4	1.74	2.50	2.50	3.52	3.52	6.47	5.59
3	1.58	2.27	2.27	3.18	3.18	5.78	5.30
2 1/2	1.50	2.16	2.16	3.02	3.02	5.46	4.70
2	1.41	2.03	2.03	2.85	2.85	5.12	4.43
6 X 5	2.55	3.57	3.57	5.38	5.38	9.89	8.63
4	2.36	3.30	3.30	4.96	4.96	8.98	7.88
3	2.18	3.04	3.04	4.56	4.56	8.21	7.21
2 1/2	2.09	2.94	2.94	4.38	4.38	7.88	6.80
8 X 6	4.17	5.71	5.71	8.63	8.63	14.30	15.00
5	3.87	5.40	5.40	8.14	8.14	13.40	14.00
4	3.67	5.10	5.10	7.68	7.68	12.60	13.10
10 X 8	6.87	9.58	9.58	12.90	15.40	24.30	27.50
6	6.32	8.78	8.78	11.80	14.20	22.10	25.10
5	6.06	8.42	8.42	11.30	14.50	21.10	23.90
4	5.80	8.20	8.20	11.00	14.00	20.50	22.60
12 X 10	9.97	13.60	14.70	18.00	24.80	35.00	44.60
8	9.29	12.70	13.70	16.70	22.70	33.00	41.00
6	8.69	11.80	12.80	15.60	21.40	32.00	38.00
5	8.39	11.70	12.60	15.30	20.60	31.00	36.40

REDUCER

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
14 X 12	21.20	25.40	29.50	33.60	49.80	-	88.50
10	19.70	23.60	27.40	31.20	46.10	-	81.60
8	18.30	21.80	25.40	28.90	42.20	-	74.70
6	16.90	20.30	23.60	26.80	39.10	-	68.30
16 X 14	25.90	31.00	41.10	41.10	67.70	-	121.00
12	24.10	29.60	39.20	39.20	65.00	-	116.00
10	22.40	27.80	36.80	36.80	60.80	-	108.00
8	21.70	26.20	34.50	34.50	56.60	-	99.90
18 X 16	31.50	37.80	56.20	50.10	91.40	-	165.00
14	29.80	35.70	53.00	47.40	86.40	-	155.00
12	27.70	33.20	51.70	44.00	83.00	-	149.00
10	27.10	32.70	48.40	43.20	78.50	-	140.00
20 X 18	47.00	56.40	88.40	74.90	150.00	-	-
16	44.70	53.50	83.90	71.10	142.00	-	-
14	42.40	50.80	79.60	67.40	136.00	-	233.00
12	40.80	49.20	76.90	65.10	130.00	-	-
22 X 20	52.10	62.40	98.00	82.90	181.00	-	-
18	49.50	59.40	93.20	78.90	172.00	-	-
16	47.00	56.40	98.40	74.80	164.00	-	-
14	45.30	54.30	83.60	72.10	156.00	-	-
24 X 22	57.10	68.40	124.00	91.00	215.00	-	-
20	54.80	65.70	119.00	87.30	206.00	-	-
18	52.60	63.00	114.00	83.80	197.00	-	-
16	50.40	60.50	109.00	80.30	185.00	-	-

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
26 X 24	74.50	89.40	162.00	119.00	-	-	-
22	71.50	85.80	155.00	114.00	-	-	-
20	68.50	82.10	148.00	109.00	-	-	-
18	66.30	79.50	142.00	106.00	-	-	-
28 X 26	80.60	96.60	175.00	129.00	-	-	-
24	77.50	93.00	168.00	124.00	-	-	-
22	74.50	89.40	162.00	119.00	-	-	-
20	72.40	88.80	155.00	115.00	-	-	-
30 X 28	86.60	104.00	188.00	138.00	-	-	-
26	83.60	100.00	182.00	133.00	-	-	-
24	80.60	96.60	175.00	129.00	-	-	-
22	78.50	94.20	168.00	125.00	-	-	-
32 X 30	92.60	111.00	202.00	148.00	-	-	-
28	89.60	108.00	195.00	143.00	-	-	-
26	86.60	104.00	188.00	138.00	-	-	-
24	84.60	102.00	184.00	135.00	-	-	-
34 X 32	98.70	118.00	215.00	158.00	-	-	-
30	95.60	115.00	208.00	153.00	-	-	-
28	92.60	111.00	205.00	148.00	-	-	-
26	90.70	109.00	200.00	145.00	-	-	-
36 X 34	104.60	125.60	250.00	167.30	-	-	-
32	101.60	122.00	243.00	162.40	-	-	-
30	98.60	118.40	238.00	157.60	-	-	-
28	95.60	114.70	234.00	152.80	-	-	-

REDUCER

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
38 X 36	112.00	133.00	-	177.00	-	-	-
34	108.00	129.00	-	172.00	-	-	-
32	105.00	126.00	-	167.00	-	-	-
30	103.00	124.00	-	165.00	-	-	-
40 X 38	117.00	140.00	-	187.00	-	-	-
36	114.00	137.00	-	182.00	-	-	-
34	111.00	133.00	-	177.00	-	-	-
32	109.00	131.00	-	174.00	-	-	-
42 X 40	123.00	147.00	-	196.00	-	-	-
38	120.00	144.00	-	192.00	-	-	-
36	117.00	140.00	-	187.00	-	-	-
34	115.00	138.00	-	184.00	-	-	-

(Unit : kg)

Nominal Pipe Size	SGP	STD	S40	X-S	S80	XX-S	S160
44 X 44	129.00	155.00	-	206.00	-	-	-
42	126.00	151.00	-	201.00	-	-	-
40	123.00	147.00	-	196.00	-	-	-
38	121.00	146.00	-	194.00	-	-	-
46 X 46	157.00	189.00	-	252.00	-	-	-
44	154.00	185.00	-	246.00	-	-	-
42	150.00	180.00	-	241.00	-	-	-
40	148.00	178.00	-	237.00	-	-	-
48 X 46	164.00	197.00	-	263.00	-	-	-
44	161.00	193.00	-	257.00	-	-	-
42	157.00	189.00	-	252.00	-	-	-
40	155.00	186.00	-	248.00	-	-	-

Stainless Steel Fittings

(Unit : kg)

Nominal Pipe Size	90° Elbow (L)			90° Elbow (S)		
	S5s	S10s	S20s	S5s	S10s	S20s
1/2	0.05	0.06	0.07	-	-	-
3/4	0.05	0.06	0.09	-	-	-
1	0.08	0.13	0.14	0.05	0.08	0.09
1 1/4	0.12	0.20	0.22	0.08	0.13	0.15
1 1/2	0.17	0.28	0.30	0.11	0.19	0.20
2	0.29	0.47	0.59	0.19	0.31	0.39
2 1/2	0.55	0.79	0.94	0.37	0.52	0.63
3	0.81	1.16	1.51	0.54	0.77	1.00
4	1.40	2.00	2.60	0.93	1.33	1.74
5	2.83	3.46	4.97	1.89	2.31	3.31
6	4.06	4.96	7.09	2.71	3.31	4.73
8	7.07	9.55	15.90	4.71	6.37	10.70
10	13.50	16.60	25.00	9.01	11.10	16.70
12	22.40	25.80	35.70	15.00	17.20	23.90
14	28.80	34.60	56.90	19.20	23.10	37.80
16	39.80	45.30	74.50	26.50	30.20	49.50
18	50.40	57.40	94.50	33.60	38.30	62.80
20	71.00	82.10	142.00	47.30	54.70	95.00
22	85.90	99.50	170.00	57.30	66.30	114.00
24	118.00	136.00	202.00	79.00	90.40	135.00

(Unit : kg)

Tee			Reducer			Cap		
S5s	S10s	S20s	S5s	S10s	S20s	S5s	S10s	S20s
0.05	0.07	0.08	-	-	-	0.02	0.03	0.03
0.07	0.10	0.11	0.03	0.04	0.05	0.03	0.04	0.04
0.12	0.20	0.22	0.06	0.09	0.10	0.05	0.09	0.10
0.20	0.33	0.36	0.07	0.12	0.13	0.07	0.11	0.12
0.30	0.46	0.50	0.11	0.18	0.20	0.08	0.13	0.14
0.38	0.63	0.79	0.16	0.27	0.34	0.10	0.17	0.21
0.71	1.00	1.18	0.30	0.43	0.50	0.16	0.23	0.28
0.96	1.38	1.78	0.37	0.52	0.69	0.25	0.37	0.48
1.50	2.15	2.80	0.56	0.80	1.04	0.41	0.59	0.78
2.85	3.48	5.01	1.09	1.33	1.92	0.81	0.99	1.44
3.89	4.75	6.83	1.46	1.78	2.55	1.13	1.39	1.99
6.26	8.43	14.30	2.01	2.72	4.56	1.76	2.38	4.05
11.50	14.20	21.50	3.66	4.49	6.77	3.35	4.13	6.23
18.80	21.60	30.20	5.88	6.78	9.40	5.54	6.39	8.89
22.70	27.30	44.80	10.80	13.00	21.20	6.62	7.99	13.20
29.60	33.70	55.20	13.90	15.80	25.90	8.82	10.10	16.70
37.40	42.70	70.00	17.20	19.20	29.80	11.30	12.90	21.30
52.80	61.00	104.00	28.60	33.10	56.00	16.00	18.50	31.80
63.80	74.10	126.20	31.70	36.70	62.50	19.50	22.60	38.80
81.40	93.90	139.40	40.20	46.00	68.60	26.20	30.10	45.10

Lap Joint Stub-end

(Unit : kg)

Type Thick Size	ASME			MSS		
	S5s	S10s	S40s	S5s	S10s	S40s
1/2	0.06	0.08	0.11	0.04	0.06	0.07
3/4	0.09	0.11	0.15	0.06	0.08	0.10
1	0.14	0.24	0.29	0.08	0.13	0.16
1 1/4	0.19	0.31	0.40	0.10	0.17	0.22
1 1/2	0.22	0.37	0.48	0.12	0.21	0.27
2	0.41	0.68	0.95	0.20	0.33	0.47
2 1/2	0.60	0.86	1.41	0.31	0.44	0.74
3	0.80	0.96	2.02	0.40	0.57	1.01
4	1.05	1.51	2.91	0.60	0.87	1.68
5	2.20	2.69	5.09	0.98	1.21	2.28
6	2.64	3.23	6.12	1.34	1.64	3.37
8	3.47	4.69	10.00	1.96	2.65	5.67
10	6.47	7.95	17.30	3.57	4.38	9.55
12	9.13	10.40	21.30	5.85	6.74	13.80
14	11.70	14.10	-	6.42	7.73	-
16	14.30	16.30	-	7.91	9.00	-
18	16.40	18.70	-	9.24	10.50	-
20	20.80	24.10	-	11.70	13.50	-
22	23.10	26.70	-	16.50	18.90	-
24	29.00	33.40	-	16.50	18.90	-

(Unit : kg)

JIS				JPI			
S5s	S10s	S20s	S40s	S5s	S10s	S20s	S40s
0.04	0.05	0.07	0.07	0.04	0.06	0.06	0.07
0.05	0.07	0.08	0.09	0.06	0.08	0.09	0.10
0.10	0.17	0.18	0.20	0.08	0.13	0.14	0.16
0.13	0.21	0.23	0.27	0.10	0.17	0.19	0.22
0.14	0.24	0.25	0.31	0.12	0.21	0.23	0.27
0.18	0.30	0.38	0.42	0.20	0.33	0.43	0.47
0.30	0.43	0.49	0.73	0.31	0.40	0.53	0.74
0.34	0.48	0.64	0.87	0.40	0.57	0.76	1.01
0.43	0.61	0.81	1.21	0.60	0.87	1.12	1.68
0.72	0.87	1.28	1.68	0.98	1.21	1.73	2.28
0.88	1.07	1.57	2.21	1.34	1.64	2.41	3.37
1.36	1.94	3.12	3.92	1.95	2.78	4.47	5.61
2.15	2.53	4.08	5.80	3.51	4.13	6.65	9.45
2.89	3.25	4.67	7.34	5.81	6.52	9.38	14.70
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Comparison of ASTM, KS Specifications and Similar Standards

Steel Composition		ASTM Specification and Grade				KS Specification and Grade		
		Marking Symbol	Pipe	Plate	Forgings	Marking Symbol	Pipe	Plate
Carbon Steel	Carbon Steel	-	A120	A283-A	-	SPP	SPP	SB41
	Carbon Steel	-	A53-B	A242	-	PS38(W), PS38, PT38(W), PT38	SPPS38	SWS41B
	Carbon Steel	-	A53-B	A242	-	PS42(W), PS42, PT42(W), PT42	SPPS42	SWS41B
	Carbon Steel	WPB	A106-B	A515-65 or 70	A181-2 and A105	HT42, HT42(W)	SPHT42	SBB42
	Carbon Steel	WPC	A106-C	-	-	HT49, HT49(W)	SPHT49	SBB49
	Carbon Steel	WPL6	A333 and A334-6	A516-60	A350-LF2	PL39	SPHL39	SLAL39
	High Strength Carbon Steel	WPHY Grade	API 5L-XGrade	API 5L-XGrade	A694-F Grade	-	-	-
Low Temperature Steel	3 1/2% Ni Steel	WPL3	A333 and A334-3	A203-D	A350-LF3	-	-	-
	2% Ni-1% Cu Steel	WPL9	A333 and A334-9	A203-A	A350-LF9	-	-	-
Alloy Steel	Carbon-Molybdenum Steel	WP1	A335-P1	A204-B	A182-F1	PA12, FA12	SPA12	SBB46M
	1% Cr-1/2% Molybdenum Steel	WP12	A335-P12	A387-12	A182-F12	PA22, FA22	SPA22	SCMV2
	1 1/2% Cr-1/2% Molybdenum Steel	WP11	A335-P11	A387-11	A182-F11	PA23, FA23	SPA23	SCMV3
	2 1/4% Cr-1% Molybdenum Steel	WP22	A335-P22	A387-22	A182-F22	PA24, FA24	SPA24	SCMV4
	5% Cr-1/2% Molybdenum Steel	WP5	A335-P5	A387-5	A182-F5	PA25, FA25	SPA25	SCMV6
Alloy Steel	7% Cr-1/2% Molybdenum Steel	WP7	A335-P7	-	A182-F7	-	-	-
	9% Cr-1% Molybdenum Steel	WP9	A335-P9	-	A182-F9	-	-	-
	9% Cr-1% Mo - 0.2%V + Cb + N	WP91	A335-P91	A387-91	A182-F91	-	-	-
Stainless Steel	18% Cr-8% Ni Steel	WP304	A312-TP304	A240-Type 304	A182-F304	STS304, STS304W, STS304F	STS304TP	STS304
	18% Cr-8% Ni-(0.04-0.10)% C Steel	WP304H	A312-TP304H	A240-Type 304H	A182-F304H	-	-	-
	18% Ni-0.035% C Steel	WP304L	A312-TP304L	A240-Type 304L	A182-F304L	STS304L, STS304LW, STS304LF	STS304LTP	STS304L
	22% Cr-12% Ni Steel	WP309	A312-TP309	A240-Type 309S	-	STS309S, STS309SW, STS309SF	STS309STP	STS309S
	25% Cr-20% Ni Steel	WP310	A312-TP310	A240-Type 310S	A182-F310	STS310S, STS310SW, STS310SF	STS310STP	STS310S
	18% Cr - 8% Ni - Cb + Ta Steel	WP347	A312-TP347	A240-Type 347	A182-F347	STS347, STS347W, STS347F	STS347TP	STS347
	18% Cr-8% Ni-Mo Steel	WP316	A312-TP316	A240-Type 316	A182-F316	STS316, STS316W, STS316F	STS316TP	STS316
	18% Cr-8% Ni-Mo-(0.04-0.10)% C Steel	WP316H	A312-TP316H	A240-Type 316H	A182-F316H	STS316H, STS316HF	STS316HTP	-
	18% Cr-8% Ni-Mo-0.035% C Steel	WP316L	A312-TP316L	A240-Type 316L	A182-F316L	STS316L, STS316LW, STS316LF	STS316LTP	STS316L
	18% Cr-8% Ni-Ti Steel	WP321	A312-TP321	A240-Type 321	A182-F321	STS321, STS321W, STS321F	STS321TP	STS321
	18% Cr-8% Ni-Ti-(0.04-0.10)% C Steel	WP321H	A312-TP321H	A240-Type 321H	A182-F321H	-	-	-
	18% Cr-8% Ni-Cb + Ta-(0.04-0.10)% C Steel	WP347H	A312-TP347H	A240-Type 347H	A182-F347H	STS347H, STS347HF	STS347HTP	-
	Duplex Stainless Steel	UNS S31803	A790 S31803	A240-S31803	A182-F51	-	-	-
	Super Duplex Stainless Steel	UNS S32750	A790 S32750	A240-S32750	A182-F53	-	-	-
	Super Duplex Stainless Steel	UNS S32760	A790 S32760	A240-S32760	A182-F55	-	-	-

Comparison of JIS Specifications and Similar Standards

Steel Composition		JIS Specification and Grade			B.S. Specification and Grade (Pipe)	DIN Specification and Grade (Pipe)
		Marking Symbol	Pipe	Plate		
Carbon Steel	Carbon Steel	FSGP or SGP	SGP	SS41	1378-M	2440-ST33-1
	Carbon Steel	PG370(W), PS370(W), PT370(W), PT370	STPG370	SM41B	3602-ERW 23	1626-ST37
	Carbon Steel	PG410(W), PS410(W), PT410(W), PT410	STPG410	SM41B	3602-ERW 27	-
	Carbon Steel	PS410(W), PT410(W)	STPT410	SB42	3602-Steel 27	17175-ST 45.8
	Carbon Steel	PS480(W), PT480(W)	STPT480	SB49	3602-Steel 35	-
	Carbon Steel	PL380(W)	STPL380	-	3603-Steel 27 LT30	-
Low Temperature Steel	3 1/2% Ni Steel	PL450(W)	STPL450	-	3603-Steel 503 LT100	-
	2% Ni-1% Cu Steel	PL690(W)	STPL690	-	-	-
Alloy Steel	Carbon-Molybdenum Steel	PA12(W), FA12	STPA12	-	-	17175-15 Mo3
	1% Cr-1/2% Molybdenum Steel	PA22(W), FA22	STPA22	-	3604-HF620	17175-13 Cr Mo 44
	1 1/4% Cr-1/2% Molybdenum Steel	PA23(W), FA23	STPA23	-	3604-HF621	-
	2 1/4% Cr-1% Molybdenum Steel	PA24(W), FA24	STPA24	-	3604-HF622,27	17175-10 Cr Mo 910
Alloy Steel	5% Cr-1/2% Molybdenum Steel	PA25(W), FA25	STPA25	-	3604-HF625	-
	7% Cr-1/2% Molybdenum Steel	-	-	-	-	-
	9% Cr-1% Molybdenum Steel	PA26(W), FA26	STPA26	-	-	-
	9% Cr-1% Mo - 0.2%V +Cb +N	-	-	-	-	-
Stainless Steel	18% Cr-8% Ni Steel	SUS304, SUS304W, SUS304F	SUS304TP	SUS304	3605-801	17440-X5 Cr Ni 189
	18% Cr-8% Ni-(0.04-0.10)% C Steel	SUS304H, SUS304HF	SUS304HTP	-	3605-811	-
	18% Cr-8% Ni-0.035% C Steel	SUS304L, SUS304LW	SUS304LTP	SUS304L	3605-811L	17440-X2 Cr Ni 189
	22% Cr-12% Ni Steel	SUS309S, SUS309SW, SUS309SF	SUS309STP	SUS309S	-	-
	25% Cr-20% Ni Steel	SUS310S, SUS310SW, SUS310SF	SUS310STP	SUS310S	3605-805S	-
	18% Cr- 8% Ni - Cb + Ta Steel	SUS347, SUS347W, SUS347F	SUS347TP	SUS347	3605-822 Nb	17440-X 0 Cr Ni Nb 189
	18% Cr-8% Ni-Mo Steel	SUS316, SUS316W, SUS316F	SUS316TP	SUS316	3605-845	17440-X5 Cr Ni Mo1810
	18% Cr-8% Ni-Mo-(0.04-0.10)% C Steel	SUS316H, SUS316HF	SUS316HTP	-	3605-855	-
	18% Cr-8% Ni-Mo-0.035% C Steel	SUS316L, SUS316LW	SUS316LTP	SUS316L	3605-845L	17440-X2 Cr Ni Mo1810
	18% Cr-8% Ni-Ti Steel	SUS321, SUS321W, SUS321F	SUS321TP	SUS321	3605-822Ti	17440-X10 Cr Ni Ti89
	18% Cr-8% Ni-Ti-(0.04-0.10)% C Steel	SUS321H, SUS321HF	SUS321HTP	-	3605-832Ti	-
	18% Cr-8% Ni-Cb +Ta-(0.04-0.10)% C Steel	SUS347H, SUS347HF	SUS347HTP	-	3605-832Nb	-

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form	Chemical Composition (Percent)		
				Max. or Range (Unless otherwise indicated)		
	Grade	Thick		C	Si	Mn
WPB	A106 Gr. B	0~25mm	P	-	0.10min	0.29-1.06
	A515 Gr. 65	25~50	PL	0.28	0.025	0.90
		50~100		0.33		
	A515 Gr. 70	0~25mm	PL	0.31	0.15-0.40	1.20
		25~50		33		
	50~100		0.35			
WPC	A106 Gr. C		P	0.35	0.10min	0.29-1.06
WP1	A335 Gr. P1		P	0.10-0.20	0.10-0.50	0.30-0.80
	A204 Gr. B		PL	0.20-0.27	0.15-0.40	0.90
WP12	A335 Gr. P12		P	0.05-0.15	0.50	0.30-0.61
	A387 Gr. 12		PL	0.05-0.17	0.15-0.40	0.40-0.65
WP11	A335 Gr. P11		P	0.05-0.15	0.50-1.00	0.30-0.60
	A387 Gr. 11		PL	0.05-0.17	0.50-0.80	0.40-0.65
WP22	A335 Gr. P22		P	0.05-0.15	0.50	0.30-0.60
	A387 Gr. 22		PL	0.05-0.15	0.50	0.30-0.60
WP23	A335 P23		P	0.04-0.10	0.50	0.10-0.60
WP5	A335 Gr. P5		P	0.15	0.50	0.30-0.60
	A387 Gr. 5		PL	0.15	0.50	0.30-0.60

A234

Chemical Composition (Percent)						
Max. or Range (Unless otherwise indicated)						Other Elements
P	S	Ni	Cr	Mo	Ti	
0.035	0.035	0.40	0.40	0.15	-	-
0.025	0.025	-	-	-	-	-
0.025	0.025	-	-	-	-	-
0.025	0.025	-	-	-	-	-
0.035	0.035	0.40	0.40	0.15	-	-
0.025	0.025	-	-	0.44-0.65	-	-
0.025	0.025	-	-	0.45-0.60	-	-
0.025	0.025	-	0.80-1.25	0.44-0.65	-	-
0.025	0.025	-	0.80-1.15	0.45-0.60	-	-
0.025	0.025	-	1.00-1.50	0.44-0.65	-	-
0.025	0.025	-	1.00-1.50	0.45-0.65	-	-
0.025	0.025	-	1.90-2.60	0.87-1.13	-	-
0.025	0.025	-	2.00-2.50	0.90-1.10	-	-
0.030	0.010	-	1.90-2.60	0.05-0.30	-	V: 0.20-0.30 Cb: 0.02-0.08 B: 0.0010-0.006 N: 0.030 Al: 0.030 W: 1.45-1.75
0.025	0.025	-	4.00-6.00	0.45-0.65	-	-
0.025	0.025	-	4.00-6.00	0.45-0.65	-	-

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form	Chemical Composition (Percent)		
				Max. or Range (Unless otherwise indicated)		
	Grade	Thick		C	Si	Mn
A234	WP9	A335 P9	P	0.15	0.25-1.00	0.30-0.60
		A387 Gr. 9	PL	0.15	1.00	0.30-0.60
	WP91	A335 P91 A387 Gr. 91	P PL	0.08-0.12	0.20-0.50	0.30-0.60
	WP92	A335 P92	P	0.07-0.13	0.50	0.30-0.60
A403	WP304	A312 Gr. TP304	P	0.08	1.00	2.00
		A240 Type 304	PL	0.07	1.00	2.00
	WP304H	A312 Gr. TP304H	P	0.04-0.10	1.00	2.00
		A240 Type 304H*	PL	0.04-0.10	0.75	2.00
	WP304L	A312 Gr. TP304L †	P	0.035	1.00	2.00
		A240 Type 304L †	PL	0.030	0.75	2.00
WP309	A312 Gr. TP309 A240 Type 309S	P PL	0.08 0.08	1.00 0.75	2.00 2.00	
WP310	A312 Gr. TP310 A240 Type 310S	P PL	0.08 0.08	1.00 1.50	2.00 2.00	

Chemical Composition (Percent)						
Max. or Range (Unless otherwise indicated)						Other Elements
P	S	Ni	Cr	Mo	Ti	
0.025	0.025	-	8.00-10.00	0.90-1.10	-	-
0.025	0.025	-				
0.020	0.010	0.40	8.00-9.50	0.85-1.05	-	V : 0.18-0.25 Cb : 0.06-0.10 N : 0.030-0.070 AL : 0.02 Ti : 0.01max Zr : 0.01max
0.020	0.010	0.40	8.50-9.50	0.30-0.60	-	V : 0.15-0.25 Cb : 0.04-0.09 B : 0.001-0.006 N : 0.03-0.07 Al : 0.02 W : 1.50-2.00 Ti : 0.01max Zr : 0.01max
0.045	0.030	8.00-11.00	18.00-20.00	-	-	-
0.045	0.030	8.00-10.50	17.50-19.50	-	-	-
0.045	0.030	8.00-11.00	18.00-20.00	-	-	-
0.045	0.030	8.00-10.50	18.00-20.00	-	-	-
0.045	0.030	8.00-13.00	18.00-20.00	-	-	-
0.045	0.030	8.00-12.00	17.50-19.50	-	-	-
0.045	0.030	12.00-15.00	22.00-24.00	0.75	-	-
0.045	0.030	12.00-15.00	22.00-24.00	-	-	-
0.045	0.030	19.00-22.00	24.00-26.00	0.75	-	-
0.045	0.030	19.00-22.00	24.00-26.00	-	-	-

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form	Chemical Composition (Percent)		
				Max. or Range (Unless otherwise indicated)		
	Grade	Thick		C	Si	Mn
A403	WP347	A312 Gr. TP347	P	0.08	1.00	2.00
		A240 Type 347	PL	0.08	0.75	2.00
	WP316	A312 Gr. TP316	P	0.08	1.00	2.00
		A240 Type 316	PL	0.08	0.75	2.00
	WP316H	A312 Gr. TP316H	P	0.04-0.10	1.00	2.00
		A240 Type 316H*	PL	0.40-1.10	1.00	2.00
	WP316L	A312 Gr. TP316L	P	0.035	1.00	2.00
		A240 Type 316L †	PL	0.030	1.00	2.00
	WP321	A312 Gr. TP321	P	0.08	0.75	2.00
		A240 Type 321	PL	0.08	1.00	2.00
WP321H	A312 Gr. TP321H	P	0.04-0.10	1.00	2.00	
	A240 Type 321H*	PL	0.04-0.10	1.00	2.00	
WP347H	A312 Gr. TP347H	P	0.04-0.10	1.00	2.00	
	A240 Type 347H*	PL	0.04-0.10	1.00	2.00	
WP S31254	A312 S31254	P	0.020	0.80	1.00	
	A240 S31254	PL	0.020	0.80	1.00	
A420	WPL6	A333 and A334 Gr. 6	P	0.30	0.10min	0.29-1.06
			PL	0.21		
		A516 Gr. 60	PL	0.23	0.15-0.40	0.60-1.30
	WPL3	A333 and A334 Gr. 3	P	0.19	0.18-0.37	0.31-0.64
			PL	0.17		
		A203 Gr. D	PL	0.20	0.13-0.45	0.70-0.80
WPL9	A333 and A334 Gr. 8	P	0.13	-	0.90 Max	
		PL	0.17	0.15-0.40	0.70	

Chemical Composition (Percent)						
Max. or Range (Unless otherwise indicated)						Other Elements
P	S	Ni	Cr	Mo	Ti	
0.045	0.030	9.00-13.00	17.00-19.00	-	-	Ca+Ta10XC-1.00
0.045	0.030	9.00-13.00	17.00-19.00	-	-	Ca+Ta10XC-1.10
0.045	0.030	11.00-14.00	16.00-18.00	2.00-3.00	-	-
0.045	0.030	10.00-14.00	16.00-18.00	2.00-3.00	-	-
0.045	0.030	11.00-14.00	16.00-18.00	2.00-3.00	-	-
0.045	0.030	10.00-14.00	16.00-18.00	2.00-3.00	-	-
0.045	0.030	9.00-12.00	17.00-19.00	-	-	-
0.045	0.030	9.00-12.00	17.00-19.00	-	5XC-0.70	-
0.045	0.030	9.00-12.00	17.00-19.00	-	-	-
0.045	0.030	9.00-13.00	17.00-19.00	-	4XC-0.70	-
0.045	0.030	9.00-13.00	17.00-19.00	-	-	-
0.045	0.030	9.00-13.00	17.00-19.00	-	-	Ca+Ta8XC-1.0
0.030	0.010	17.5-18.5	19.5-20.5	6.00-6.50	-	N:0.18-0.22
0.025	0.025	0.40 Max	-	0.12	-	-
0.025	0.025	-	-	-	-	-
0.025	0.025	3.25-3.75	-	-	-	-
0.025	0.025	3.25-3.75	-	-	-	-
0.025	0.025	8.40-9.60	-	-	-	-
0.035	0.040	2.10-2.50	-	-	-	-

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form	Chemical Composition (Percent)			
				Max. or Range (Unless otherwise indicated)			
	Grade	Thick		C	Si	Mn	
A815	S31803	A790 S31803 A240 S31803		P PL	0.030	1.0	2.0
	S32750	A790 S32750 A240 S32750		P PL	0.030	0.8	1.2
	S32760	A790 S32760 A240 S32760		P PL	0.05 0.030	1.00	1.00
A860	WPHY42	API 5L Gr. X42		P PL	0.14	0.40	1.35
	WPHY60	API 5L Gr. X60		P PL	0.16	0.45	1.65
	WPHY65	API 5L Gr. X65		P PL	0.16	0.45	1.65

- Asterisks[*] denote that the carbon content shall be 0.04 to 0.10%
- Daggers[†] denote that the minimum tensile strength shall be 65,000 psi(450 MPa), and that the minimum yield strength shall be 25,000 psi(170 MPa)
- The yield strength shall be determined by the offset method at 0.2% limiting permanent set in accordance with ASTM A370 Specification. An alternative method of determining yield strength may be based on a total extension under load of 0.5%
- The basic minimum elongation for walls 3/16 (7.94mm) and over in thickness shall be determined according to strip tests:all small sizes are tested in their full section.
- P-denotes Pipe, PL Plate.

Chemical Composition (Percent)						
Max. or Range (Unless otherwise indicated)						Other Elements
P	S	Ni	Cr	Mo	Ti	
0.030	0.020	4.50-6.50	21.0-23.0	2.50-3.50	-	N:0.08-0.20
0.035	0.020	6.0-8.0	24.0-26.0	3.0-5.0	-	N:0.24-0.43
0.030	0.010	6.00-8.00	24.00-26.00	3.00-4.00	-	N:0.20-0.30 Cu:0.50-1.00 W:0.50-1.00 Cr+3.3 Mo+16N=40Min.
0.020	0.010	-	-	-	-	-
0.020	0.010	-	-	-	0.04	-
0.020	0.010	-	-	-	-	-
0.020	0.010	-	-	-	-	-

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form
	Grade	Thick	
WPB	A106 Gr. B		P
	A515 Gr. 65	0~25mm 56~50 50~100	PL
	A515 Gr. 70	0~25mm 26~50 50~100	PL
WPC	A106 Gr. C		P
WP1	A335 Gr. P1		P
	A204 Gr. B		PL
WP12	A335 Gr. P12		P
	A387 Gr. 12		PL
WP11	A335 Gr. P11		P
	A387 Gr. 11		PL
WP22	A335 Gr. P22		P
	A387 Gr. 22		PL
WP23	A335 P23		P
WP5	A335 Gr. P5		P
	A387 Gr. 5		PL
WP9	A335 P9		P
	A387 Gr. 9		PL
WP91	A335 P91		P
	A387 Gr. 91		PL
WP92	A335 P92		P

Tensile Requirements			
Tensile Strength Min. or Range Ksi (Mpa)		Yield Strength Min. Ksi(Mpa)	Longitudinal Elongation in 2 in [50mm] Min. %
60	[415]	35 [240]	30
65-85	[450-585]	35 [240]	23
70-90	[485-620]	38 [260]	21
70	[485]	40 [275]	30
55	[380]	30 [205]	30
70-90	[485-620]	40 [275]	21
60	[415]	30 [205]	30
65-80	[450-585]	40 [275]	22
60	[415]	30 [205]	30
70-100	[515-690]	45 [310]	22
60	[415]	30 [205]	30
75-100	[515-690]	45 [310]	18
74	[510]	58 [400]	20
60	[415]	30 [205]	30
75-100	[515-690]	45 [310]	18
60	[415]	30 [205]	30
75-100		45 [310]	18
85	[585]	60 [415]	20
85-100		60 [415]	18
90	[620]	64 [440]	20

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form
	Grade	Thick	
A403	WP304	A312 Gr. TP304	P
		A240 Type 304	PL
	WP304H	A312 Gr. TP304H	P
		A240 Type 304H*	PL
	WP304L	A312 Gr. TP304L †	P
		A240 Type 304L †	PL
	WP309	A312 Gr. TP309	P
		A240 Type 309S	PL
	WP310	A312 Gr. TP310	P
		A240 Type 310S	PL
	WP347	A312 Gr. TP347	P
		A240 Type 347	PL
	WP316	A312 Gr. TP316	P
		A240 Type 316	PL
	WP316H	A312 Gr. TP316H	P
		A240 Type 316H*	PL
WP316L	A312 Gr. TP316L	P	
	A240 Type 316L †	PL	
WP321	A312 Gr. TP321	P	
	A240 Type 321	PL	
WP321H	A312 Gr. TP321H	P	
	A240 Type 321H*	PL	
WP347H	A312 Gr. TP347H	P	
	A240 Type 347H*	PL	
WP S31254	A312 S31254	P	
	A240 S31254	PL	

Tensile Requirements			
Tensile Strength Min. or Range Ksi (Mpa)		Yield Strength Min. Ksi(Mpa)	Longitudinal Elongation in 2 in (50mm) Min. %
75	(515)	30 (205)	35
75	(515)	30 (205)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
70	(485)	25 (170)	35
70	(485)	25 (170)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
75	(515)	30 (205)	35
75	(515)	30 (205)	40
94	(650)	44(300)	35
119	(820)		

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol	Materials		Form
	Grade	Thick	
A420	WPL6	A333 and A334 Gr. 6	P
		A516 Gr. 60	PL 0~25mm 26~50 50~100
	WPL3	A333 and A334 Gr. 3	P
		A203 Gr. D	PL 0~50mm 50~100
	WPL9	A333 and A334 Gr. 8	P
		A203 Gr. A	PL
A815	S31803	A790 S31803	P
		A240 S31803	PL
	S32750	A790 S32750	P
		A240 S32750	PL
	S32760	A790 S32760	P
		A240 S32760	PL
A860	WPHY42	API 5L Gr. X42	P
		A572 Gr. 42	PL
	WPHY60	API 5L Gr. X60	P
		A572 Gr. 60	PL
	WPHY65	API 5L Gr. X65	P
		A572 Gr. 65	PL

- Asterisks(*) denote that the carbon content shall be 0.04 to 0.10%
- Daggers(†) denote that the minimum tensile strength shall be 65,000 psi(450 MPa), and that the minimum yield strength shall be 25,000 psi(170 MPa)
- The yield strength shall be determined by the offset method at 0.2% limiting permanent set in accordance with ASTM A370 Specification. An alternative method of determining yield strength may be based on a total extension under load of 0.5%

Tensile Requirements			
Tensile Strength Min. or Range Ksi (Mpa)		Yield Strength Min. Ksi(Mpa)	Longitudinal Elongation in 2 in (50mm) Min. %
60	(415)	35 (240)	30
60-80	(415-550)	32 (220)	25
65	(450)	35 (240)	30
65-85	(450-585)	37 (255)	23
63	(435)	46 (315)	28
65-85	(450-585)	37 (255)	23
90	(620)	65 (450)	25
116	(800)	80 (550)	15
116	(795)	80 (550)	15
109	(750)	80 (550)	25
108	(750)	80 (550)	25
60	(415)	42 (290)	24
75	(520)	60 (415)	18
77	(535)	65 (450)	17
80	(550)	65 (450)	17

- The basic minimum elongation for walls 3/16 (7.94mm) and over in thickness shall be determined according to strip tests:all small sizes are tested in their full section.
- P-denotes Pipe, PL Plate.

Materials Specifications for Fittings JIS Materials

Marking Symbol		Chemical Composition (percent)		
		C	Si	Mn
G3452	SGP	-	-	-
G3454	STPG370	0.25 Max.	0.35 Max.	0.30-0.90
	STPG410	0.30 Max.	0.35 Max.	0.30-1.00
G3456	STPT370	0.25 Max.	0.10-0.35	0.30-0.90
	STPT410	0.30 Max.	0.10-0.35	0.30-1.00
	STPT480	0.33 Max.	0.10-0.35	0.30-1.00
G3455	STS370	0.25 Max.	0.10-0.35	0.30-1.10
	STS410	0.30 Max.	0.10-0.35	0.30-1.40
	STS480	0.33 Max.	0.10-0.35	0.30-1.50
G3457	STPY400	0.25 Max.	-	-
G3459	SUS304TP	0.08 Max.	1.00 Max.	2.00 Max.
	SUS304HTP	0.04-1.00	0.75 Max.	2.00 Max.
	SUS304LTP	0.03 Max.	1.00 Max.	2.00 Max.
	SUS316TP	0.08 Max.	1.00 Max.	2.00 Max.

Chemical Composition (percent)				
P	S	Ni	Cr	Mo
0.040 Max.	0.040 Max.	-	-	-
0.040 Max.	0.040 Max.	-	-	-
0.040 Max.	0.040 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.040 Max.	0.040 Max.	-	-	-
0.045 Max.	0.030 Max.	8.00-11.00	18.00-20.00	-
0.040 Max.	0.030 Max.	8.00-11.00	18.00-20.00	-
0.045 Max.	0.030 Max.	9.00-13.00	18.00-20.00	-
0.045 Max.	0.030 Max.	10.00-14.00	16.00-18.00	2.00-3.00

Materials Specifications for Fittings JIS Materials

Marking Symbol		Chemical Composition (percent)		
		C	Si	Mn
G3459	SUS316HTP	0.04-0.10	0.75 Max.	2.00 Max.
	SUS316LTP	0.03 Max.	1.00 Max.	2.00 Max.
G3460	STPL380	0.25 Max.	0.35 Max.	1.35 Max.
	STPL450	0.18 Max.	0.10-0.35	0.30-0.60
G3101	SS400	-	-	-
G3106	SM400B	0.20 Max.	0.35 Max.	0.60-1.50
	SM490B	0.18 Max.	0.55 Max.	1.65 Max.
G3103	SB410	0.24 Max.	0.15-0.40	0.90 Max.
	SB450	0.28 Max.	0.15-0.40	0.90 Max.
G4051	S20C	0.18-0.23	0.15-0.35	0.30-0.60
	S25C	0.22-0.28	0.15-0.35	0.30-0.60
	S45C	0.42-0.48	0.15-0.35	0.60-0.90
G3201	SF45	0.60 Max.	0.15-0.50	0.30-1.20
	SF50	0.60 Max.	0.15-0.50	0.30-1.20

Chemical Composition (percent)				
P	S	Ni	Cr	Mo
0.030 Max.	0.030 Max.	11.00-14.00	16.00-18.00	2.00-3.00
0.045 Max.	0.030 Max.	12.00-16.00	16.00-18.00	2.00-3.00
0.035 Max.	0.035 Max.	-	-	-
0.030 Max.	0.030 Max.	3.20-3.80	-	-
0.050 Max.	0.050 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.035 Max.	0.035 Max.	-	-	-
0.020 Max.	0.020 Max.	-	-	-
0.020 Max.	0.020 Max.	-	-	-
0.030 Max.	0.035 Max.	-	-	-
0.030 Max.	0.035 Max.	-	-	-
0.030 Max.	0.035 Max.	-	-	-
0.030 Max.	0.035 Max.	-	-	-
0.030 Max.	0.035 Max.	-	-	-

Materials Specifications for Fittings JIS Materials

Marking Symbol		Mechanical Requirements	
		Tensile Strength kgf/mm ² (N/mm ²)	Yield Strength kgf/mm ² (N/mm ²)
G3452	SGP	30 Min. (290) Min.	-
G3454	STPG370	38 Min. (370) Min.	22 Min. (215) Min.
	STPG410	42 Min. (410) Min.	25 Min. (245) Min.
G3456	STPT370	38 Min. (370) Min.	22 Min. (215) Min.
	STPT410	42 Min. (410) Min.	25 Min. (245) Min.
	STPT480	49 Min. (480) Min.	28 Min. (275) Min.
G3455	STS370	38 Min. (370) Min.	22 Min. (215) Min.
	STS410	42 Min. (410) Min.	25 Min. (245) Min.
	STS480	49 Min. (480) Min.	28 Min. (275) Min.
G3457	STPY400	41 Min. (400) Min.	23 Min. (225) Min.
G3459	SUS304TP	53 Min. (520) Min.	21 Min. (205) Min.
	SUS304HTP	53 Min. (520) Min.	21 Min. (205) Min.
	SUS304LTP	49 Min. (480) Min.	18 Min. (175) Min.
	SUS316TP	53 Min. (520) Min.	21 Min. (205) Min.

Mechanical Requirements	Elongation (%) Test Piece No.	Reduction of Area	Hardness (HB)
[11.12] 30 Min. (5) 25 Min.	[11.12] 25 Min. (5) 20 Min.	-	-
[11.12] 30 Min. (5) 25 Min.	[11.12] 25 Min. (5) 20 Min.	-	-
[11.12] 30 Min. (5) 25 Min.	[11.12] 25 Min. (5) 20 Min.	-	-
[11.12] 30 Min. (5) 25 Min.	[11.12] 25 Min. (5) 20 Min.	-	-
[11.12] 30 Min. (5) 25 Min.	[11.12] 25 Min. (5) 20 Min.	-	-
[11.12] 35 Min. (5) 25 Min.	[11.12] 35 Min. (5) 25 Min.	-	-
[11.12] 35 Min. (5) 25 Min.	[11.12] 35 Min. (5) 25 Min.	-	-
[11.12] 35 Min. (5) 25 Min.	[11.12] 35 Min. (5) 25 Min.	-	-

Materials Specifications for Fittings JIS Materials

Marking Symbol		Mechanical Requirements	
		Tensile Strength kgf/mm ² (N/mm ²)	Yield Strength kgf/mm ² (N/mm ²)
G3459	SUS316HTP	53 Min. (520) Min.	21 Min. (205) Min.
	SUS316LTP	49 Min. (481) Min.	18 Min. (175) Min.
G3460	STPL380	39 Min. (380) Min.	21 Min. (205) Min.
	STPL450	46 Min. (450) Min.	25 Min. (245) Min.
G3101	SS400	41-52 (400-510)	16tMax.25 Min. (245)
G3106	SM400B	41-52 (400-510)	16tMax.25 Min. (245)
	SM490B	50-62 (490-610)	16tMax.33 Min. (325)
G3103	SB410	42-56 (410-550)	23 Min. (225) Min.
	SB450	46-60 Min. (450-590)	25 Min. (245) Min.
G4051	S20C	41 Min. (402) Min.	(N)25 Min. (245) Min.
	S25C	45 Min. (441) Min.	(N)27 Min. (265) Min.
	S45C	58 Min. (569) Min.	(N)35 Min. (343) Min.
G3201	SF45	45-55 (440-540)	(N)23 Min. (225) Min.
	SF50	50-60 (490-590)	(N)25 Min. (245) Min.

Mechanical Requirements	Elongation (%) Test Piece No.	Reduction of Area	Hardness (HB)
[11.12] 35 Min. (5) 25 Min.	-	-	
[11.12] 35 Min. (5) 25 Min.	-	-	
[11.12] 30 Min. (5) 20 Min.	-	-	
[5] 21 Min. (14) 17 Min.	-	-	
[5] 23 Min. (1A) 18 Min.	-	-	
[5] 22 Min. (1A) 17 Min.	-	-	
[1A] 21 Min. (10) 25 Min.	-	-	
[1A] 19 Min. (10) 23 Min.	-	-	
-	-	-	
-	-	-	
-	-	-	
[14A][A] 24 Min. (T) 19 Min.	(A) 45 (T) 35	121 Min.	
[14A][A] 22 Min. (T) 17 Min.	(A) 40 (T) 30	134 Min.	

Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness	
Inch	A	ASME	KJ/JIS	SPP SGP	Sch 5S
1/8	6	10.29	10.50	-	-
1/4	8	13.72	13.80	-	-
3/8	10	17.14	17.30	-	-
1/2	15	21.34	21.70	2.8	1.65
3/4	20	26.67	27.20	2.8	1.65
1	25	33.40	34.00	3.2	1.65
1 1/4	32	42.16	42.70	3.5	1.65
1 1/2	40	48.26	48.60	3.5	1.65
2	50	60.32	60.50	3.8	1.65
2 1/2	65	73.02	76.30	4.2	2.11
3	80	88.90	89.10	4.2	2.11
3 1/2	90	101.60	101.60	4.2	2.11
4	100	114.30	114.30	4.5	2.11
5	125	141.30	139.80	4.5	2.77
6	150	168.30	165.20	5.0	2.77
8	200	219.08	216.30	5.8	2.77
10	250	273.05	267.40	6.6	3.40
12	300	323.80	318.50	6.9	3.96
14	350	355.60	355.60	7.9	3.96
16	400	406.40	406.40	7.9	4.19
18	450	457.20	457.20	7.9	4.19
20	500	508.00	508.00	7.9	4.78
22	550	558.80	558.80	-	4.78
24	600	609.60	609.60	-	5.54

(Unit : mm)

Nominal Wall Thickness						
Sch 10S	Sch 10	Sch 20S	Sch 20	Sch 30	Sch 40S	STD
1.24	-	1.5	-	-	1.73	1.73
1.65	-	2.0	-	-	2.24	2.24
1.65	-	2.0	-	-	2.31	2.31
2.11	-	2.5	-	-	2.77	2.77
2.11	-	2.5	-	-	2.87	2.87
2.77	-	3.0	-	-	3.38	3.38
2.77	-	3.0	-	-	3.56	3.56
2.77	-	3.0	-	-	3.68	3.68
2.77	-	3.5	3.20	-	3.91	3.91
3.05	-	3.5	4.50	-	5.16	5.16
3.05	-	4.0	4.50	-	5.49	5.49
3.05	-	4.0	4.50	-	5.74	5.74
3.05	-	4.0	4.90	-	6.02	6.02
3.40	-	5.0	5.10	-	6.55	6.55
3.40	-	5.0	5.50	-	7.11	7.11
3.76	-	6.5	6.35	7.04	8.18	8.18
4.19	-	6.5	6.35	7.80	9.27	9.27
4.57	-	6.5	6.35	8.38	9.52	9.52
4.78	6.35	8.0	7.92	9.52	*9.52	9.52
4.78	6.35	8.0	7.92	9.52	*9.52	9.52
4.78	6.35	8.0	7.92	11.12	*9.52	9.52
5.54	6.35	9.5	9.52	12.70	*9.52	9.52
5.54	6.35	-	9.52	12.70	*9.52	9.52
6.35	6.35	-	9.52	14.27	*9.52	9.52

Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness	
Inch	A	ASME	KJ/JIS	SPP SGP	Sch 5S
26	650	660.40	660.40	-	-
28	700	711.20	711.20	-	-
30	750	762.00	762.00	-	6.35
32	800	812.80	812.80	-	-
34	850	863.60	863.60	-	-
36	900	914.40	914.40	-	-
38	950	965.20	965.20	-	-
40	1000	1016.00	1016.00	-	-
42	1050	1066.80	1066.80	-	-
44	1100	1117.60	1117.60	-	-
46	1150	1168.40	1168.40	-	-
48	1200	1219.20	1219.20	-	-

• Asterisks[*] denote TK Corporation Standard as no internationally Recognized Standards for these wall thickness have been established.

(Unit : mm)

Nominal Wall Thickness						
Sch 10S	Sch 10	Sch 20S	Sch 20	Sch 30	Sch 40S	STD
*7.92	7.92	-	12.70	-	*9.52	9.52
*7.92	7.92	-	12.70	15.88	*9.52	9.52
*7.92	7.92	-	12.70	15.88	*9.52	9.52
*7.92	7.92	-	12.70	15.88	*9.52	9.52
*7.92	7.92	-	12.70	15.88	*9.52	9.52
*7.92	7.92	-	12.70	15.88	*9.52	9.52
*7.92	-	-	-	-	*9.52	9.52
*7.92	-	-	-	-	*9.52	9.52
*7.92	-	-	-	-	*9.52	9.52
*7.92	-	-	-	-	*9.52	9.52
*7.92	-	-	-	-	*9.52	9.52

Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness		
Inch	A	ASME	KJ/JIS	Sch 40	Sch 60	Sch 80S
1/8	6	10.29	10.50	1.73	2.20	2.41
1/4	8	13.72	13.80	2.24	2.40	3.02
3/8	10	17.14	17.30	2.31	2.80	3.20
1/2	15	21.34	21.70	2.77	3.20	3.73
3/4	20	26.67	27.20	2.87	3.40	3.91
1	25	33.40	34.00	3.38	3.90	4.55
1 1/4	32	42.16	42.70	3.56	4.50	4.85
1 1/2	40	48.26	48.60	3.68	4.50	5.08
2	50	60.32	60.50	3.91	4.90	5.54
2 1/2	65	73.02	76.30	5.16	6.00	7.01
3	80	88.90	89.10	5.49	6.60	7.62
3 1/2	90	101.60	101.60	5.74	7.00	8.08
4	100	114.30	114.30	6.02	7.10	8.56
5	125	141.30	139.80	6.55	8.10	9.53
6	150	168.30	165.20	7.11	9.30	10.97
8	200	219.08	216.30	8.18	10.31	12.70
10	250	273.05	267.40	9.27	12.70	12.70
12	300	323.80	318.50	10.31	14.27	*12.70
14	350	355.60	355.60	11.13	15.09	*12.70
16	400	406.40	406.40	12.70	16.66	*12.70
18	450	457.20	457.20	14.27	19.05	*12.70
20	500	508.00	508.00	15.09	20.62	*12.70
22	550	558.80	558.80	-	22.22	*12.70
24	600	609.60	609.60	17.48	24.61	*12.70

(Unit : mm)

Nominal Wall Thickness						
X-S	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XX-S
2.41	2.41	-	-	-	3.15	4.83
3.02	3.02	-	-	-	3.68	6.05
3.20	3.20	-	-	-	4.01	6.40
3.73	3.73	-	-	-	4.78	7.47
3.91	3.91	-	-	-	5.56	7.82
4.55	4.55	-	-	-	6.35	9.09
4.85	4.85	-	-	-	6.35	9.70
5.08	5.08	-	-	-	7.14	10.16
5.54	5.54	-	-	-	8.74	11.07
7.01	7.01	-	-	-	9.52	14.02
7.62	7.62	-	-	-	11.12	15.24
8.08	8.08	-	-	-	-	-
8.56	8.56	-	11.12	-	13.49	17.12
9.53	9.53	-	12.70	-	15.88	19.05
10.97	10.97	-	14.27	-	18.26	21.94
12.70	12.70	15.09	18.26	20.62	23.01	22.22
12.70	15.09	18.26	21.44	25.40	28.58	25.40
12.70	17.48	21.44	25.40	28.58	33.32	25.40
12.70	19.05	23.83	27.79	31.75	35.71	-
12.70	21.44	26.19	30.96	36.52	40.49	-
12.70	23.82	29.36	34.92	39.67	45.24	-
12.70	26.19	32.54	38.10	44.45	50.01	-
12.70	28.58	34.92	41.28	47.62	53.98	-
12.70	30.96	38.89	46.02	52.37	59.54	-

Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness		
Inch	A	ASME	KJ/JIS	Sch 40	Sch 60	Sch 80S
26	650	660.40	660.40	-	-	*12.70
28	700	711.20	711.20	-	-	*12.70
30	750	762.00	762.00	-	-	*12.70
32	800	812.80	812.80	17.48	-	*12.70
34	850	863.60	863.60	17.48	-	*12.70
36	900	914.40	914.40	19.05	-	*12.70
38	950	965.20	965.20	-	-	*12.70
40	1000	1016.00	1016.00	-	-	*12.70
42	1050	1066.80	1066.80	-	-	*12.70
44	1100	1117.60	1117.60	-	-	*12.70
46	1150	1168.40	1168.40	-	-	*12.70
48	1200	1219.20	1219.20	-	-	*12.70

• Asterisks[*] denote TK Corporation Standard as no internationally Recognized Standards for these wall thickness have been established.

(Unit : mm)

Nominal Wall Thickness						
X-S	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XX-S
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-
12.70	-	-	-	-	-	-