www.hanilfitting.co.kr

HANIL

Pipe Fitting Total Solution

TK Corporation
Authorized Distributor

주식회사 한일배관
HANIL FITTING CO., LTD.

Pipe Fitting Total Solution

TK Corporation
Authorized Distributor

- **Butt Weld Pipe Fittings**
  Wrought Steel including various High Alloy and Stainless Steel
- **High Pressure Fittings**
  Carbon Steel, Alloy Steel and Stainless Steel
- **Forged Steel Fittings**
  Socket-welding type and Threaded type
- **Flange, Bolt & Nut, Gasket**
- **Raw Material**
  Special specification/Small quantity - Plate, Pipe, and Fitting

Wrought Steel Butt Weld Pipe Fittings

• Carbon & Alloy Steel

90° Elbow (Long)	180° Elbow (Long)	Reducer (Concentric)	Reducer (Concentric)
90° Elbow (Short)	180° Elbow (Short)	Reducer (Eccentric)	Reducer (Eccentric)
45° Elbow (Long)	Tee (Straight)	Tee (Reducing)	Cap

• Stainless Steel (6Mo / Duplex / Super Duplex)

90° Elbow (Long)	Reducer (Concentric)	Tee (Straight)
90° Elbow (Short)	Reducer (Eccentric)	Tee (Reducing)
45° Elbow (Long)	Lap Joint Stub End	Cap

Forged Steel Fittings

• Socket Welding Fittings

90° Elbow	45° Elbow	Tee	Cross
Coupling	Reducer	Cap	Union

• Threaded Fittings

90° Elbow	45° Elbow	Tee	Cross
Coupling	Half Coupling	Cap	Union
Hex. Head Plug	S.Q. Head Plug	Round Head Plug	Hex. Head Bushing
Boss	Insert	Nipple	Swage Nipple

• Outlets

Socket-Outlet	Welding-Outlet	Thread-Outlet	Nipple-Outlet

• Flange
- Welding Neck
- Socket Welding
- etc.

Production Range (Max., Inch)

Item	Mold Type	Welded Type
Elbow	96”	158”
Tee	84”	158”
Reducer	48”	158”
Cap	132”	158”
Flange	~ 80”	
Forged fitting	~ 4”	
Outlet	~ 36”	
Stub-ends	~ 10” : Seamless, Over 10” : Welded	

Applicable Material for Pipe Fittings

Type	Applicable Material
Ferrous Material	
Carbon & Alloy Steel (A234)	WPB, WPL6, WP1, WP11, WP22, WP5, WP9, WP91
Austenitic Stainless Steel Grade	WP304/L, WP316/L, WP321/H, WP347/H, S31254(6Mo)
Ferritic-Austenitic Grade	A815 UNS S31803, UNS 32760, UNS S32750
Non-ferrous Material	
	Copper Alloy (70600)
	Titanium (ASTM B337)
	Aluminium (ASTM B361)
Nickel Alloy	N04400 (MONEL), N06625 (INCONEL), N08825 (INCOLOY)
Hastelloy	B366-WPHC276

DNV BV ASME ISO API 6A PED GERMANISCHER LIOYD KR NORSOK M-650

Technical Data HandBook for Butt Weld Pipe Fitting and Forged Steel Fittings

TK corporation

Material

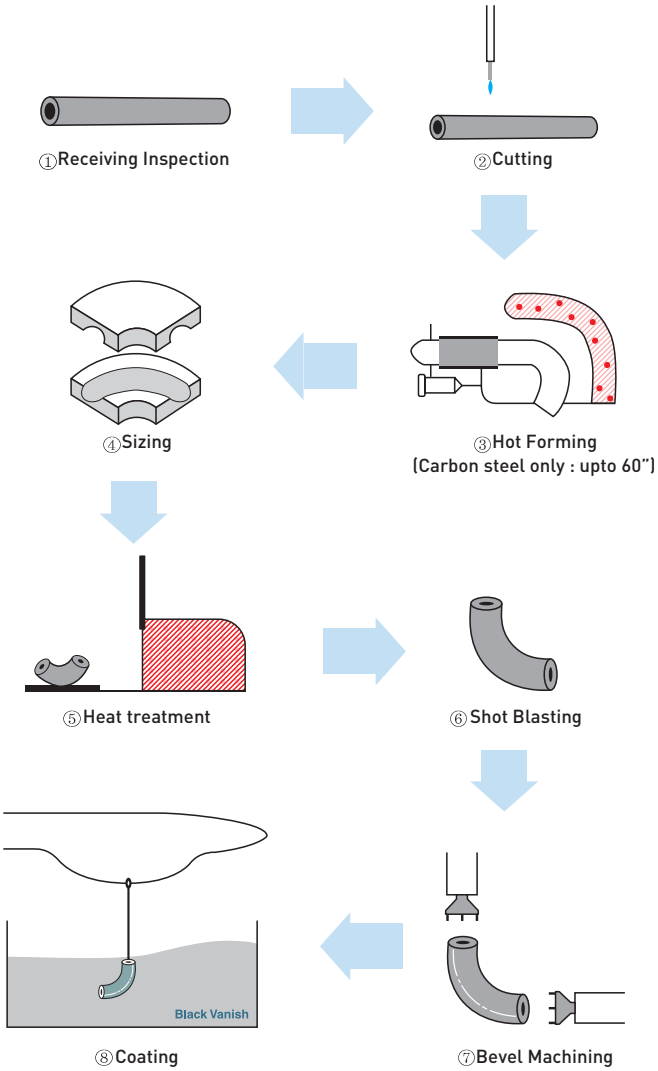
Ferrous Material					
Material Classification				Comparison as nations	
Large	Middle	Small		ASTM (U.S.A)	
				Designation	Identification
Ferrous (Base Mat'l:Fe)	Carbon Steel	Ambient and Higher Temperature Service		A234	WPB
					WPC
		Low Temperature Service		A420	WPL3
					WPL6
					WPL9
	Alloy Steel (Cr ≥ 1%)	Low Alloy (1% ≤ Cr ≤ 9%)		A234	WP1
					WP12
					WP11
					WP22
					WP5
					WP23
					WP9
					WP91
					WP92
		High Alloy (Cr ≥ 12%) :Stainless Steel	Martensitic Stainless Steel	A815	WP410
			Ferritic Stainless Steel		WP430
			Austenitic Stainless Steel	A403	WP304/L
					WP316/L
					WP317/L
					WP321/H
					WP347/H
			Super Austenitic Stainless Steel	A403	S31254
					904L
			Ferritic / Austenitic (Duplex / Super Duplex)	A815	S31803
					S32750
					S32760

- Applicable Code/Standard : ASTM Part A, Latest Edition,
  Non Registered materials on ASTM Latest Edition.

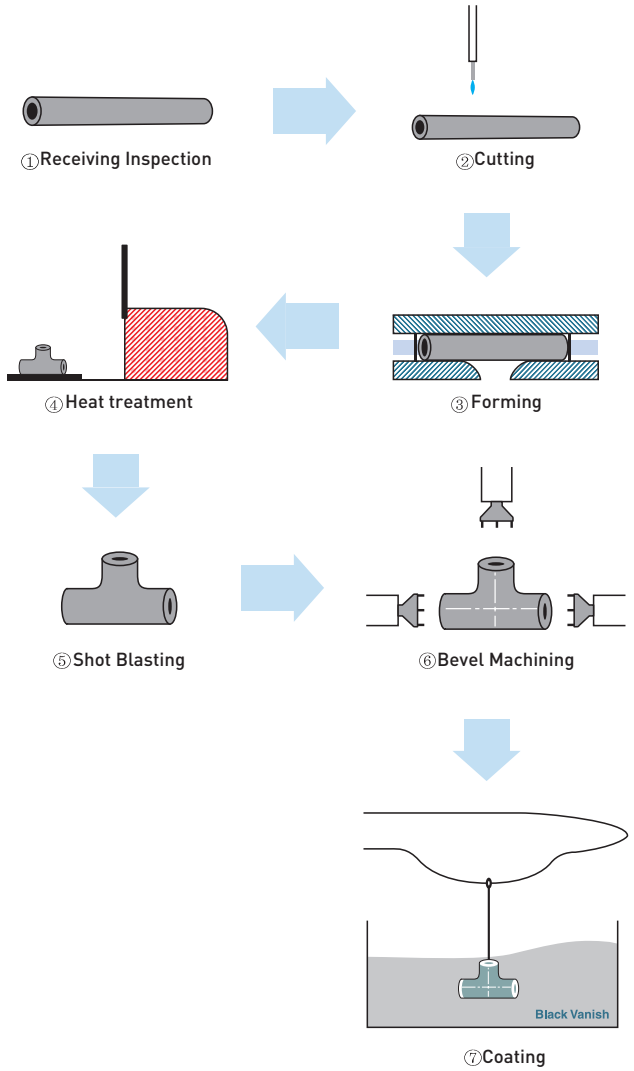
Non-Ferrous Material Comparison		
Material Classification	Trade Mark	UNS NO.
Non-Ferrous (Base Mat'l : Ni)	Inconel 600	N06600
	Inconel 690	N06690
	Inconel 800H / 800HT	N08810 / N08811
	Inconel 625	N06625
	Incoloy 825	N08825
	Hastelloy B2	N10665
	Hastelloy C276	N10276
	Hastelloy C22	N06022
	Incoloy 020	N08020
	Monel 400	N04400
	Monel K500	N05500
Non-Ferrous (Base Mat'l : Cu)	Cu-Ni 70/30	C71500
	Cu-Ni 90/10	C70600

- Applicable Code/Standard : ASTM Part B, Latest Edition.

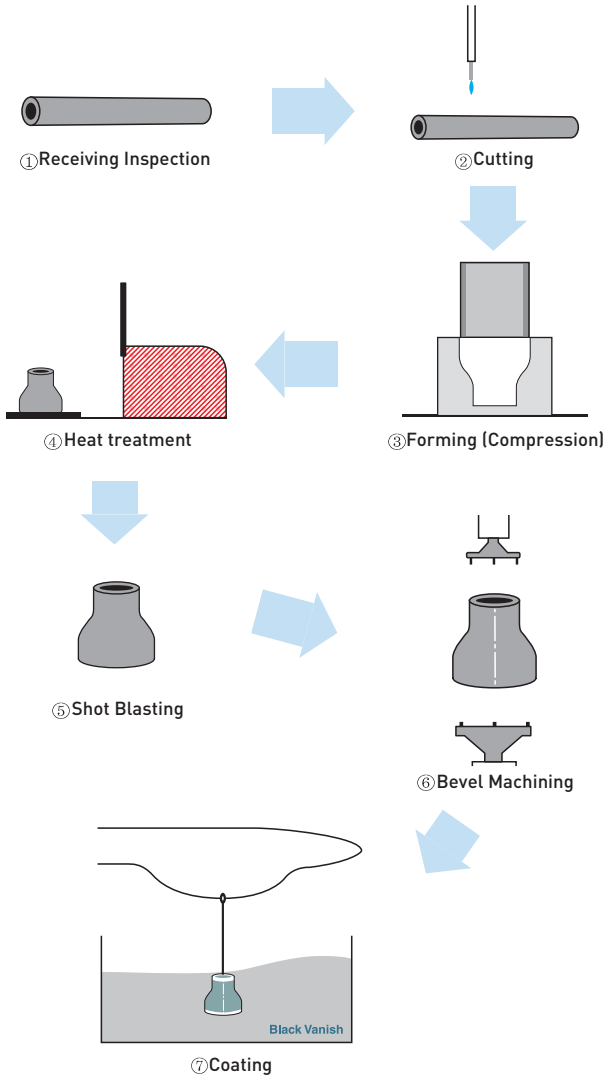
Elbow by mandrel



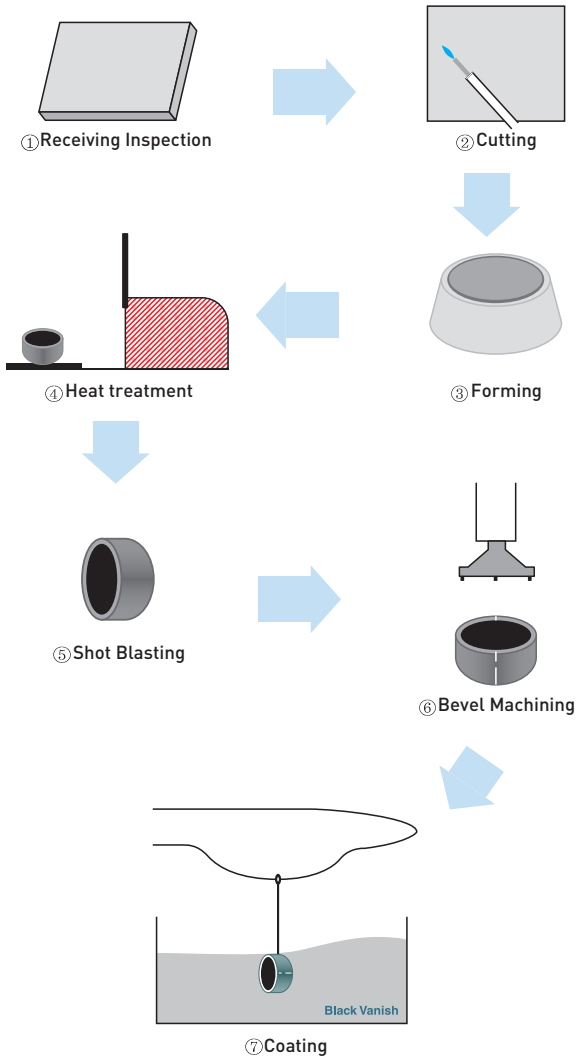
Tee by cold forming



Reducer by cold forming



Cap by cold forming



Specification

KS : KOREAN INDUSTRIAL STANDARDS

KS B 1522	Steel Butt Welding Pipe Fittings for Oidinary use and Fuel Gas.
KS B 1541	Steel Butt Welding Pipe Fittings.
KS B 1542	Steel Socket Welding Pipe Fittings.
KS B 1543	Steel Plate Butt Welding Pipe Fittings.

JIS : JAPANESE INDUSTRIAL STANDARDS

JIS B 2311	Steel Butt Welding Pipe Fittings for Ordinary use.
JIS B 2312	Steel Butt Welding Pipe Fittings.
JIS B 2313	Steel Plate Butt Welding Pipe Fittings.
JIS B 2316	Steel Socket Welding Pipe Fittings.

ASTM : AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM A 105	Carbon Steel Forgings for Piping Applications
ASTM A 182	Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for high Temperature Service
ASTM A 234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 350	Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
ASTM A 403	Wrought Austenitic Stainless Steel Piping Fittings
ASTM A 420	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
ASTM A 694	Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service
ASTM A 815	Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings
ASTM A 860	Wrought High-Strength Low-Alloy Steel Butt-Welding Fittings
ASTM B 366	Factory-Made Wrought Nickel and Nickel Alloy Fittings

MSS : MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY

MSS SP-25	Standard Marketing System for Valves, Fittings, Flanges and Unions.
MSS SP-43	Wrought Stainless Steel Butt Welding Fittings.
MSS SP-44	Standard for Steel Pipe Line Flanges.
MSS SP-75	Specification for High Test Wrought Butt Welding Fittings.
MSS SP-79	Socket Welding Reducer Inserts.
MSS SP-83	Carbon Steel Pipe Union Socket welding and Threaded.
MSS SP-87	Factory-Made Butt Welding Fittings for Class 1 Nuclear Piping Applications.
MSS SP-95	Swage(d) Nipples and Bull Plugs.
MSS SP-97	Integrally Reinforced Forged Branch Outlet Fittings-socket Welding, Threaded and Butt Welding Ends.

ASME : AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASME : ASME BOILER AND PRESSURE VESSEL CODE AN INTERNATIONAL CODE

ASME B 16.5	Pipe Flanges and Flanged Fittings.
ASME B 16.9	Factory Made Wrought Steel Butt Welding Fittings.
ASME B 16.11	Forged Fittings, Socket welding and Threaded
ASME B 16.25	Butt Welding Ends.
ASME B 36.10	Welded and Seamless Wrought Steel Pipe.
ASME B 36.19	Stainless Steel Pipe.
ASME B31.1	Power piping.
ASME B31.3	Process piping.
ASME SECTION Ⅱ	Materials.
ASME SECTION Ⅲ	Rules for Construction of Nuclear Facirity Components.
ASME SECTION Ⅴ	Nondestructive Examination.
ASME SECTION Ⅷ	Rule for Construction of Pressure Vessels.
ASME SECTION Ⅸ	Welding and Brazing Qualifications.

API : AMERICAN PETROLEUM INSTITUTE

API 5L	Line Pipe.

Certificates

TK Corporation's goal is best quality for our products and confidence in domestic and international markets, maintaining the following certificates related to the various kinds of standards and codes.

International & Nuclear Certificates

- ISO 9001:2008 (International Organization for Standardization / Quality Management System)
- ISO 14001:2004 (International Organization for Standardization / Environmental Management System)
- OHSAS 18001:2007 (Occupational Health & Safety Management System)
- API Monogram-6A Licence (American Petroleum Institute)
- PED (Pressure Equipment Directive)
- KEPIC (Korea Electric Power Industry Code)
- JIS (Japanese Industrial Standards)
- Achilles JQS(Joint Qualification System)

Classfication of Societies Certificates

- (L/R) Lloyd's Register of Shipping
- (G/L) Germanischer Lloyd
- (K/R) Korean Register of Shipping
- (B/V) Bureau Veritas
- (DNV) Det Norske Veritas

Statoil-TR2000 NORSOK M-650 Ed.4 Qualified and Accepted Manufacturers

DNV BV ASME ISO API 6A PED Germanischer Lloyd KR NORSOK M-650

API Certificate 2015

세계일류상품인증서(영문)

세계일류상품인증서(국문)

코스닥대상

특허(배관용 T관 성형기계)

특허(배관용 T관 성형기계)

ISO9001:2008

ISO14001:2004

OHSAS 18001 인증서

PED 97/23/EC

NORSOK M650-Ed.4(QTR)

KEPIC CERTIFICATE

TR-CU 010

TR-CU 032

Achilles JQS

JIS B 2311

JIS B 2312

JIS B 2313

선급(BV)

선급(GL)

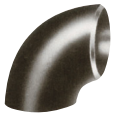
선급 (KR)

선급 (RINA)-01

선급 (RINA)-02

Wrought Steel Butt Weld Pipe Fittings

• Carbon & Alloy Steel

90° Elbow (Long)	180° Elbow (Long)	Reducer (Concentric)	Reducer (Concentric)
 90° Elbow (Short)	180° Elbow (Short)	Reducer (Eccentric)	Reducer (Eccentric)
45° Elbow (Long)	Tee (Straight)	Tee (Reducing)	Cap

• Stainless Steel (6Mo / Duplex / Super Duplex)

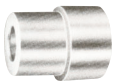
90° Elbow (Long)	Reducer (Concentric)	Tee (Straight)
90° Elbow (Short)	Reducer (Eccentric)	Tee (Reducing)
45° Elbow (Long)	Lap Joint Stub End	Cap

Forged Steel Fittings

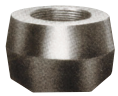
• Socket Welding Fittings

90° Elbow	45° Elbow	Tee	Cross
Coupling	Reducer	Cap	Union

• Threaded Fittings

90° Elbow	45° Elbow	Tee	Cross
Coupling	Half Coupling	Cap	Union
Hex. Head Plug	S.Q. Head Plug	Round Head Plug	Hex. Head Bushing
Boss	 Insert	Nipple	Swage Nipple

• Outlets

Socket-Outlet	Welding-Outlet	 Thread-Outlet	Nipple-Outlet

Marking Systems

Every TK Corporation's Pipe Fittings is permanently marked with all essential information:

• KS / JIS Products

Steel Butt Weld Pipe Fittings

1. Manufacturer identification mark.
2. KS or JIS material designation the symbol identifying the type of material.
3. Symbol denoting "Long(L)" or "Short(S)".
4. Thickness designation or schedule number.
5. Nominal size.
6. KS or JIS mark.
7. JIS Cert. NO. for JIS items.

Steel Socket Welding & Threaded Fittings

1. Manufacturer identification mark.
2. KS or JIS material designation the symbol identifying the type of material from which the products.
3. Nominal size.
4. Thickness designation or schedule number.

• ASME Producuts

Steel Butt Weld Pipe Fittings

1. Manufacturer identification mark.
2. ASTM material designation the symbol identifying the type of material from which the products was manufactured.
3. Schedule number or nominal wall thickness designation.
4. Nominal size.
5. Heat number.

Steel Socket Welding & Threaded Fittings

1. Manufacturer identification mark.
2. ASTM material designation the symbol identifying the type of material from which the products was manufactured.
3. Service design : The fitting Pressure class.
4. Nominal size.
5. Heat number.

Contents

ASME

ASME(Inch)

- Wrought Carbon Steel Butt Weld Pipe Fittings ··· 020
- Wrought Stainless Steel Butt Weld Pipe Fittings ·· 087

ASME(mm)

- Wrought Carbon Steel Butt Weld Pipe Fittings ··· 110
- Wrought Stainless Steel Butt Weld Pipe Fittings ·· 169

KS/JIS

- Wrought Carbon Steel Butt Weld Pipe Fittings ··· 192
- Wrought Stainless Steel Butt Weld Pipe Fittings ·· 239

High Pressure Fittings

- High Pressure Manifold Fittings ····· 262
- Api Flange Studded Crosses & Tees ····· 266
- Api Flange - Type 6bx ····· 270

Forged Steel Fittings

- Forged Steel Socket-Welding & Threaded Fittings ·· 282
- Socket-Welding Type (ASME) ····· 288
- Threaded Type ····· 310
- Outlet ····· 328
- Socket-Welding Type (KS/JIS) ····· 336

References

- Welding End Preparations for ASME B16.9 ····· 356
- Welding End Preparations for KS/JIS ····· 358
- Dimensional Tolerances for ASME B16.9 ····· 362
- Dimensional Tolerances for MSS SP-43 ····· 366
- Dimensional Tolerances for KS/JIS ····· 370
- Standard Threads Specification ····· 378
- Approx Weight Equation ····· 394
- Butt-Welding Fittings Approx Weight ····· 396
- Comparison ASTM Specifications and Similar Standards ·· 422
- Materials Specifications for Butt-Welding Fittings ASTM Materials (A234, A403 and A420) ····· 426
- Materials Specifications for Fittings JIS Materials ·· 440
- Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel ····· 448

Appendix

- About Weld Fittings and Flanges ····· 458
- Useful Formulas ····· 466
- Conversion Factors ····· 470
- Fittings ····· 474
- Weld Ends ····· 476
- Welding Guide ····· 478

TK corporation

TK corporation

ASME (Unit:Inch)

Wrought Carbon Steel Butt Weld Pipe Fittings 020

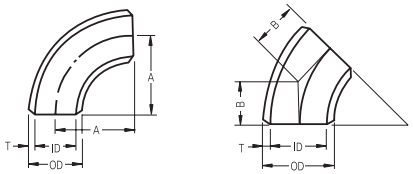
- 90° Elbow, 45° Elbow 020
- 180° Elbow 026
- Tee (Straight / Reducing / Special Fittings) 030
- Reducer 054
- Cap 066
- Lateral - A, B, C 072
- Lap Joint (Stub Ends) 076
- Pipe Bend 080
- General Bending Range 086

Wrought Stainless Steel Butt Weld Pipe Fittings 087

- 90° Elbow, 45° Elbow 088
- Tee (Straight / Reducing) 090
- Reducer 098
- 180° Elbow, Cap 104
- Special Fittings Elbow (90°, 45°) 106
- Special Fittings Reducer, Cap 107

90° Elbow (Long, Short)
45° Elbow (Long)

STD, Sch40, X-S, Sch80, Sch160, XX-S



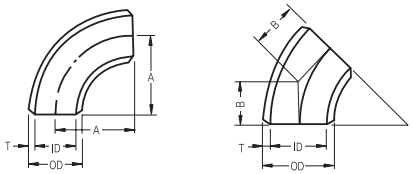
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Center to End			STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
		Long		Short													
		A	B	A	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
1/2	0.840	1.50	0.62		0.109	0.622	0.109	0.622	0.147	0.546	0.147	0.546	0.188	0.464	0.294	0.252	1/2
3/4	1.050	1.50	0.75		0.113	0.824	0.113	0.824	0.154	0.742	0.154	0.742	0.219	0.612	0.308	0.434	3/4
1	1.315	1.50	0.88	1.00	0.133	1.049	0.133	1.049	0.179	0.957	0.179	0.957	0.250	0.815	0.358	0.599	1
1 - 1/4	1.660	1.88	1.00	1.25	0.140	1.380	0.140	1.380	0.191	1.278	0.191	1.278	0.250	1.160	0.382	0.896	1 - 1/4
1 - 1/2	1.900	2.25	1.12	1.50	0.145	1.610	0.145	1.610	0.200	1.500	0.200	1.500	0.281	1.338	0.400	1.100	1 - 1/2
2	2.375	3.00	1.38	2.00	0.154	2.067	0.154	2.067	0.218	1.939	0.218	1.939	0.344	1.687	0.436	1.503	2
2 - 1/2	2.875	3.75	1.75	2.50	0.203	2.469	0.203	2.469	0.276	2.323	0.276	2.323	0.375	2.125	0.552	1.771	2 - 1/2
3	3.500	4.25	2.00	3.00	0.216	3.068	0.216	3.068	0.300	2.900	0.300	2.900	0.438	2.624	0.600	2.800	3
3 - 1/2	4.000	5.25	2.25	3.50	0.226	3.548	0.226	3.548	0.318	3.364	0.318	3.364					3 - 1/2
4	4.500	6.00	2.50	4.00	0.237	4.026	0.237	4.026	0.337	3.826	0.337	3.826	0.531	3.438	0.674	3.152	4
5	5.563	7.50	3.12	5.00	0.258	5.047	0.258	5.047	0.375	4.813	0.375	4.813	0.625	4.313	0.750	4.063	5
6	6.625	9.00	3.75	6.00	0.280	6.065	0.280	6.065	0.432	5.761	0.432	5.761	0.719	5.187	0.864	4.897	6
8	8.625	12.00	5.00	8.00	0.322	7.981	0.322	7.981	0.500	7.625	0.500	7.625	0.906	6.813	0.875	6.875	8
10	10.750	15.00	6.25	10.00	0.365	10.020	0.365	10.020	0.500	9.750	0.500	9.750	1.125	8.500	1.000	8.750	10
12	12.750	18.00	7.50	12.00	0.375	12.000	0.406	11.938	0.500	11.750	0.688	11.374	1.312	10.126	1.000	10.750	12
14	14.000	21.00	8.75	14.00	0.375	13.250	0.438	13.124	0.500	13.000	0.750	12.500	1.406	11.188			14
16	16.000	24.00	10.00	16.00	0.375	15.250	0.500	15.000	0.500	15.000	0.844	14.312	1.594	12.812			16
18	18.000	27.00	11.25	18.00	0.375	17.250	0.562	16.876	0.500	17.000	0.938	16.124	1.781	14.438			18
20	20.000	30.00	12.50	20.00	0.375	19.250	0.594	18.812	0.500	19.000	1.031	17.938	1.969	16.062			20
22	22.000	33.00	13.50	22.00	0.375	21.250			0.500	21.000	1.125	19.750	2.125	17.750			22
24	24.000	36.00	15.00	24.00	0.375	23.250	0.688	22.624	0.500	23.000	1.219	21.562	2.344	19.312			24
26	26.000	39.00	16.00		0.375	25.250			0.500	25.000							26
28	28.000	42.00	17.25		0.375	27.250			0.500	27.000							28
30	30.000	45.00	18.50		0.375	29.250			0.500	29.000							30
32	32.000	48.00	19.75		0.375	31.250	0.688	30.624	0.500	31.000							32

90° Elbow (Long, Short)
45° Elbow (Long)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

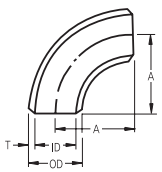
(Unit : inch)

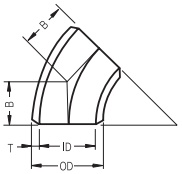
Nominal Pipe Size	Outside Diameter O.D	Center to End			STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
		Long		Short													
		A	B	A	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
34	34.000	51.00	21.00		0.375	33.250	0.688	32.624	0.500	33.000							34
36	36.000	54.00	22.25		0.375	35.250	0.750	34.500	0.500	35.000							36
38	38.000	57.00	23.62		0.375	37.250			0.500	37.000							38
40	40.000	60.00	24.88		0.375	39.250			0.500	39.000							40
42	42.000	63.00	26.00		0.375	41.250			0.500	41.000							42
44	44.000	66.00	27.38		0.375	43.250			0.500	43.000							44
46	46.000	69.00	28.62		0.375	45.250			0.500	45.000							46
48	48.000	72.00	29.88		0.375	47.250			0.500	47.000							48

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

90° Elbow (Long, Short)
45° Elbow (Long)

Sch20, Sch60, Sch100, Sch120, Sch140





ASME B16.9

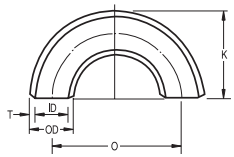
(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Center to End			Sch20		Sch60		Sch100		Sch120		Sch140		-	-	Nominal Pipe Size
		Long		Short	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	-	-	
		A	B	A													
4	4.500	6.00	2.50	4.00							0.438	3.624					4
5	5.563	7.50	3.12	5.00							0.500	4.563					5
6	6.625	9.00	3.75	6.00							0.562	5.501					6
8	8.625	12.00	5.00	8.00	0.250	8.125	0.406	7.813	0.594	7.437	0.719	7.187	0.812	7.001			8
10	10.750	15.00	6.25	10.00	0.250	10.250	0.500	9.750	0.719	9.312	0.844	9.062	1.000	8.750			10
12	12.750	18.00	7.50	12.00	0.250	12.250	0.562	11.626	0.844	11.062	1.000	10.750	1.125	10.500			12
14	14.000	21.00	8.75	14.00	0.312	13.376	0.594	12.812	0.938	12.124	1.094	11.812	1.250	11.500			14
16	16.000	24.00	10.00	16.00	0.312	15.376	0.656	14.688	1.031	13.938	1.219	13.562	1.438	13.124			16
18	18.000	27.00	11.25	18.00	0.312	17.376	0.750	16.500	1.156	15.688	1.375	15.250	1.562	14.876			18
20	20.000	30.00	12.50	20.00	0.375	19.250	0.812	18.376	1.281	17.438	1.500	17.000	1.750	16.500			20
22	22.000	33.00	13.50	22.00	0.375	21.250	0.875	20.250	1.375	19.250	1.625	18.750	1.875	18.250			22
24	24.000	36.00	15.00	24.00	0.375	23.250	0.969	22.062	1.531	20.938	1.812	20.376	2.062	19.876			24

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

180° Elbow (Long, Short)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Long		Short		STD	
		O	K	O	K	T	I.D
1/2	0.840	3.00	1.88			0.109	0.622
3/4	1.050	3.00	2.00			0.113	0.824
1	1.315	3.00	2.19	2.00	1.62	0.133	1.049
1-1/4	1.660	3.75	2.75	2.50	2.06	0.140	1.380
1-1/2	1.900	4.50	3.25	3.00	2.44	0.145	1.610
2	2.375	6.00	4.19	4.00	3.19	0.154	2.067
2-1/2	2.875	7.50	5.19	5.00	3.94	0.203	2.469
3	3.500	9.00	6.25	6.00	4.75	0.216	3.068
3-1/2	4.000	10.50	7.25	7.00	5.50	0.226	3.548
4	4.500	12.00	8.25	8.00	6.25	0.237	4.026
5	5.563	15.00	10.31	10.00	7.75	0.258	5.047
6	6.625	18.00	12.31	12.00	9.31	0.280	6.065
8	8.625	24.00	16.31	16.00	12.31	0.322	7.981
10	10.750	30.00	20.38	20.00	15.38	0.365	10.020
12	12.750	36.00	24.38	24.00	18.38	0.375	12.000
14	14.000	42.00	28.00	28.00	21.00	0.375	13.250
16	16.000	48.00	32.00	32.00	24.00	0.375	15.250
18	18.000	54.00	36.00	36.00	27.00	0.375	17.250
20	20.000	60.00	40.00	40.00	30.00	0.375	19.250
22	22.000	66.00	44.00	44.00	33.00	0.375	21.250
24	24.000	72.00	48.00	48.00	36.00	0.375	23.250

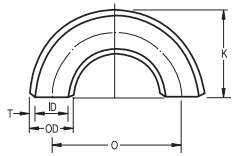
Sch40		X-S		Sch80		Sch160		XX-S	
T	I.D	T	I.D	T	I.D	T	I.D	T	I.D
0.109	0.622	0.147	0.546	0.147	0.546	0.188	0.464	0.294	0.252
0.113	0.824	0.154	0.742	0.154	0.742	0.219	0.612	0.308	0.434
0.133	1.049	0.179	0.957	0.179	0.957	0.250	0.815	0.358	0.599
0.140	1.380	0.191	1.278	0.191	1.278	0.250	1.160	0.382	0.896
0.145	1.610	0.200	1.500	0.200	1.500	0.281	1.338	0.400	1.100
0.154	2.067	0.218	1.939	0.218	1.939	0.344	1.687	0.436	1.503
0.203	2.469	0.276	2.323	0.276	2.323	0.375	2.125	0.552	1.771
0.216	3.068	0.300	2.900	0.300	2.900	0.438	2.624	0.600	2.300
0.226	3.548	0.318	3.364	0.318	3.364				
0.237	4.026	0.337	3.826	0.337	3.826	0.531	3.438	0.674	3.152
0.258	5.047	0.375	4.813	0.375	4.813	0.625	4.313	0.750	4.063
0.280	6.065	0.432	5.761	0.432	5.761	0.719	5.187	0.864	4.897
0.322	7.981	0.500	7.625	0.500	7.625	0.906	6.813	0.875	6.875
0.365	10.020	0.500	9.750	*0.594	9.562	1.125	8.500	1.000	8.750
*0.406	11.938	0.500	11.750	*0.688	11.374	1.312	10.126	1.000	10.750
*0.438	13.124	0.500	13.000	*0.750	12.500	1.406	11.188		
*0.500	15.000	0.500	15.000	*0.844	14.312	1.594	12.812		
*0.562	16.876	0.500	17.000	*0.938	16.124	1.781	14.438		
*0.594	18.812	0.500	19.000	*1.031	17.938	1.969	16.062		
		0.500	21.000	*1.125	19.750	2.125	17.750		
*0.688	22.624	0.500	23.000	*1.219	21.562	2.344	19.312		

- Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."
- Length E_1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

180° Elbow (Long, Short)

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9

(Unit : inch)

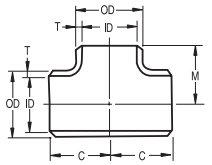
Nominal Pipe Size	Outside Diameter O.D	Long		Short		Sch20		Sch60		Sch100		Sch120		Sch140		Nominal Pipe Size
		O	K	O	K	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
4	4.500	12.00	8.25	8.00	6.25							0.438	3.624			4
5	5.563	15.00	10.31	10.00	7.75							0.500	4.563			5
6	6.625	18.00	12.31	12.00	9.31							0.562	5.501			6
8	8.625	24.00	16.31	16.00	12.31	0.250	8.125	0.406	7.813	0.594	7.437	0.719	7.187	0.812	7.001	8
10	10.750	30.00	20.38	20.00	15.38	0.250	10.250	0.500	9.750	0.719	9.312	0.844	9.062	1.000	8.750	10
12	12.750	36.00	24.38	24.00	18.38	0.250	12.250	0.562	11.626	0.844	11.062	1.000	10.750	1.125	10.500	12
14	14.000	42.00	28.00	28.00	21.00	0.312	13.376	0.594	12.812	0.938	12.124	1.094	11.812	1.250	11.500	14
16	16.000	48.00	32.00	32.00	24.00	0.312	15.376	0.656	14.688	1.031	13.938	1.219	13.562	1.438	13.124	16
18	18.000	54.00	36.00	36.00	27.00	0.312	17.376	0.750	16.500	1.156	15.688	1.375	15.250	1.562	14.876	18
20	20.000	60.00	40.00	40.00	30.00	0.375	19.250	0.812	18.376	1.281	17.438	1.500	17.000	1.750	16.500	20
22	22.000	66.00	44.00	44.00	33.00	0.375	21.250	0.875	20.250	1.375	19.250	1.625	18.750	1.875	18.250	22
24	24.000	72.00	48.00	48.00	36.00	0.375	23.250	0.969	22.062	1.531	20.938	1.812	20.376	2.062	19.876	24

- Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."
- Length E_1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Straight)

STD, Sch40, X-S, Sch80, Sch160, XX-S



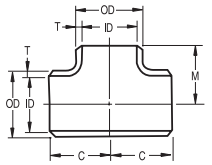
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
		Run C	Outlet M	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
1/2	0.840	1.00	1.00	0.109	0.622	0.109	0.622	0.147	0.546	0.147	0.546	0.188	0.464	0.294	0.252	1/2
3/4	1.050	1.12	1.12	0.113	0.824	0.113	0.824	0.154	0.742	0.154	0.742	0.219	0.612	0.308	0.434	3/4
1	1.315	1.50	1.50	0.133	1.049	0.133	1.049	0.179	0.957	0.179	0.957	0.250	0.815	0.358	0.599	1
1-1/4	1.660	1.88	1.88	0.140	1.380	0.140	1.380	0.191	1.278	0.191	1.278	0.250	1.160	0.382	0.896	1-1/4
1-1/2	1.900	2.25	2.25	0.145	1.610	0.145	1.610	0.200	1.500	0.200	1.500	0.281	1.338	0.400	1.100	1-1/2
2	2.375	2.50	2.50	0.154	2.067	0.154	2.067	0.218	1.939	0.218	1.939	0.344	1.687	0.436	1.503	2
2-1/2	2.875	3.00	3.00	0.203	2.469	0.203	2.469	0.276	2.323	0.276	2.323	0.375	2.125	0.552	1.771	2-1/2
3	3.500	3.38	3.38	0.216	3.068	0.216	3.068	0.300	2.900	0.300	2.900	0.438	2.624	0.600	2.300	3
3-1/2	4.000	3.75	3.75	0.226	3.548	0.226	3.548	0.318	3.364	0.318	3.364					3-1/2
4	4.500	4.12	4.12	0.237	4.026	0.237	4.026	0.337	3.826	0.337	3.826	0.531	3.438	0.674	3.152	4
5	5.563	4.88	4.88	0.258	5.047	0.258	5.047	0.375	4.813	0.375	4.813	0.625	4.313	0.750	4.063	5
6	6.625	5.62	5.62	0.280	6.065	0.280	6.065	0.432	5.761	0.432	5.761	0.719	5.187	0.864	4.897	6
8	8.625	7.00	7.00	0.322	7.981	0.322	7.981	0.500	7.625	0.500	7.625	0.906	6.813	0.875	6.875	8
10	10.750	8.50	8.50	0.365	10.020	0.365	10.020	0.500	9.750	0.594	9.562	1.125	8.500	1.000	8.750	10
12	12.750	10.00	10.00	0.375	12.000	0.406	11.938	0.500	11.750	0.688	11.374	1.312	10.126	1.000	10.750	12
14	14.000	11.00	11.00	0.375	13.250	0.438	13.124	0.500	13.000	0.750	12.500	1.406	11.188			14
16	16.000	12.00	12.00	0.375	15.250	0.500	15.000	0.500	15.000	0.844	14.312	1.594	12.812			16
18	18.000	13.50	13.50	0.375	17.250	0.562	16.876	0.500	17.000	0.938	16.124	1.781	14.438			18
20	20.000	15.00	15.00	0.375	19.250	0.594	18.812	0.500	19.000	1.031	17.938	1.969	16.062			20
22	22.000	16.50	16.50	0.375	21.250			0.500	21.000	1.125	19.750	2.125	17.750			22
24	24.000	17.00	17.00	0.375	23.250	0.688	22.624	0.500	23.000	1.219	21.562	2.344	19.312			24
26	26.000	19.50	19.50	0.375	25.250			0.500	25.000							26
28	28.000	20.50	20.50	0.375	27.250			0.500	27.000							28
30	30.000	22.00	22.00	0.375	29.250			0.500	29.000							30
32	32.000	23.50	23.50	0.375	31.250	0.688	30.624	0.500	31.000							32
34	34.000	25.00	25.00	0.375	33.250	0.688	32.624	0.500	33.000							34

Tee (Straight)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

(Unit : inch)

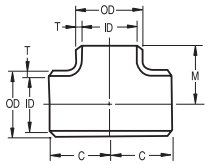
Nominal Pipe Size	Outside Diameter O.D	Center to End		STD		Sch40	
		Run C	Outlet M	T	I.D	T	I.D
36	36.000	26.50	26.50	0.375	35.250	0.750	34.500
38	38.000	28.00	28.00	0.375	37.250		
40	40.000	29.50	29.50	0.375	39.250		
42	42.000	30.00	28.00	0.375	41.250		
44	44.000	32.00	30.00	0.375	43.250		
46	46.000	33.50	31.50	0.375	45.250		
48	48.000	35.00	33.00	0.375	47.250		

X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
T	I.D	T	I.D	T	I.D	T	I.D	
0.500	35.000							36
0.500	37.000							38
0.500	39.000							40
0.500	41.000							42
0.500	43.000							44
0.500	45.000							46
0.500	47.000							48

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Straight)

Sch20, Sch60, Sch100, Sch120



ASME B16.9

(Unit : inch)

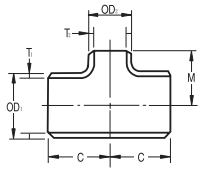
Nominal Pipe Size	Outside Diameter O.D	Center to End		Sch20	
		Run C	Outlet M	T	I.D
4	4.500	4.12	4.12		
5	5.563	4.88	4.88		
6	6.625	5.62	5.62		
8	8.625	7.00	7.00	0.250	8.125
10	10.750	8.50	8.50	0.250	10.250
12	12.750	10.00	10.00	0.250	12.250
14	14.000	11.00	11.00	0.312	13.376
16	16.000	12.00	12.00	0.312	15.376
18	18.000	13.50	13.50	0.312	17.376
20	20.000	15.00	15.00	0.375	19.250
22	22.000	16.50	16.50	0.375	21.250
24	24.000	17.00	17.00	0.375	23.250

Nominal Pipe Size	Sch60		Sch100		Sch120	
	T	I.D	T	I.D	T	I.D
4					0.438	3.624
5					0.500	4.563
6					0.562	5.501
8	0.406	7.813	0.594	7.437	0.719	7.187
10	0.500	9.750	0.719	9.312	0.844	9.062
12	0.562	11.626	0.844	11.062	1.000	10.750
14	0.594	12.812	0.938	12.124	1.094	11.812
16	0.656	14.688	1.031	13.938	1.219	13.562
18	0.750	16.500	1.156	15.688	1.375	15.250
20	0.812	18.376	1.281	17.438	1.500	17.000
22	0.875	20.250	1.375	19.250	1.625	18.750
24	0.969	22.062	1.531	20.938	1.812	20.376

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



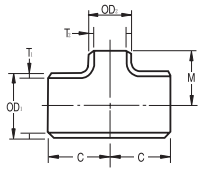
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
3/4 X 3/4 X 1/2	1.050	0.840	1.12	1.12	0.113	0.109	0.113	0.109	0.154	0.147	0.154	0.147	0.219	0.188	0.308	0.294
1 X 1 X 3/4	1.315	1.050	1.50	1.50	0.133	0.113	0.133	0.113	0.179	0.154	0.179	0.154	0.250	0.219	0.358	0.308
1 X 1 X 1/2	1.315	0.840	1.50	1.50	0.133	0.109	0.133	0.109	0.179	0.147	0.179	0.147	0.250	0.188	0.358	0.294
1-1/4 X 1-1/4 X 1	1.660	1.315	1.88	1.88	0.140	0.133	0.140	0.133	0.191	0.179	0.191	0.179	0.250	0.250	0.382	0.358
1-1/4 X 1-1/4 X 3/4	1.660	1.050	1.88	1.88	0.140	0.113	0.140	0.113	0.191	0.154	0.191	0.154	0.250	0.219	0.382	0.308
1-1/2 X 1-1/2 X 1-1/4	1.900	1.660	2.25	2.25	0.145	0.140	0.145	0.140	0.200	0.191	0.200	0.191	0.281	0.250	0.400	0.382
1-1/2 X 1-1/2 X 1	1.900	1.315	2.25	2.25	0.145	0.133	0.145	0.133	0.200	0.179	0.200	0.179	0.281	0.250	0.400	0.358
1-1/2 X 1-1/2 X 3/4	1.900	1.050	2.25	2.25	0.145	0.113	0.145	0.113	0.200	0.154	0.200	0.154	0.281	0.219	0.400	0.308
2 X 2 X 1-1/2	2.375	1.900	2.50	2.38	0.154	0.145	0.154	0.145	0.218	0.200	0.218	0.200	0.344	0.281	0.436	0.400
2 X 2 X 1-1/4	2.375	1.660	2.50	2.25	0.154	0.140	0.154	0.140	0.218	0.191	0.218	0.191	0.344	0.250	0.436	0.382
2 X 2 X 1	2.375	1.315	2.50	2.00	0.154	0.133	0.154	0.133	0.218	0.179	0.218	0.179	0.344	0.250	0.436	0.358
2-1/2 X 2-1/2 X 2	2.875	2.375	3.00	2.75	0.203	0.154	0.203	0.154	0.276	0.218	0.276	0.218	0.375	0.344	0.552	0.436
2-1/2 X 2-1/2 X 1-1/2	2.875	1.900	3.00	2.62	0.203	0.145	0.203	0.145	0.276	0.200	0.276	0.200	0.375	0.281	0.552	0.400
2-1/2 X 2-1/2 X 1-1/4	2.875	1.660	3.00	2.50	0.203	0.140	0.203	0.140	0.276	0.191	0.276	0.191	0.375	0.250	0.552	0.382
3 X 3 X 2-1/2	3.500	2.875	3.38	3.25	0.216	0.203	0.216	0.203	0.300	0.276	0.300	0.276	0.438	0.375	0.600	0.552
3 X 3 X 2	3.500	2.375	3.38	3.00	0.216	0.154	0.216	0.154	0.300	0.218	0.300	0.218	0.438	0.344	0.600	0.436
3 X 3 X 1-1/2	3.500	1.900	3.38	2.88	0.216	0.145	0.216	0.145	0.300	0.200	0.300	0.200	0.438	0.281	0.600	0.400
3-1/2 X 3-1/2 X 3	4.000	3.500	3.75	3.62	0.226	0.216	0.226	0.216	0.318	0.300	0.318	0.300		0.438		0.600
3-1/2 X 3-1/2 X 2-1/2	4.000	2.875	3.75	3.50	0.226	0.203	0.226	0.203	0.318	0.276	0.318	0.276		0.375		0.552
3-1/2 X 3-1/2 X 2	4.000	2.375	3.75	3.25	0.226	0.154	0.226	0.154	0.318	0.218	0.318	0.218		0.344		0.436
3-1/2 X 3-1/2 X 1-1/2	4.000	1.900	3.75	3.12	0.226	0.145	0.226	0.145	0.318	0.200	0.318	0.200		0.281		0.400
4 X 4 X 3-1/2	4.500	4.000	4.12	4.00	0.237	0.226	0.237	0.226	0.337	0.318	0.337	0.318	0.531		0.674	
4 X 4 X 3	4.500	3.500	4.12	3.88	0.237	0.216	0.237	0.216	0.337	0.300	0.337	0.300	0.531	0.438	0.674	0.600
4 X 4 X 2-1/2	4.500	2.875	4.12	3.75	0.237	0.203	0.237	0.203	0.337	0.276	0.337	0.276	0.531	0.375	0.674	0.552
4 X 4 X 2	4.500	2.375	4.12	3.50	0.237	0.154	0.237	0.154	0.337	0.218	0.337	0.218	0.531	0.344	0.674	0.436
5 X 5 X 4	5.563	4.500	4.88	4.62	0.258	0.237	0.258	0.237	0.375	0.337	0.375	0.337	0.625	0.531	0.750	0.674

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



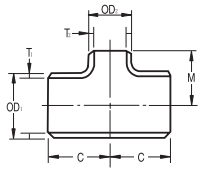
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
5 X 5 X 3-1/2	5.563	4.000	4.88	4.50	0.258	0.226	0.258	0.226	0.375	0.318	0.375	0.318	0.625		0.750	
5 X 5 X 3	5.563	3.500	4.88	4.38	0.258	0.216	0.258	0.216	0.375	0.300	0.375	0.300	0.625	0.438	0.750	0.600
5 X 5 X 2-1/2	5.563	2.875	4.88	4.25	0.258	0.203	0.258	0.203	0.375	0.276	0.375	0.276	0.625	0.375	0.750	0.552
6 X 6 X 5	6.625	5.563	5.62	5.38	0.280	0.258	0.280	0.258	0.432	0.375	0.432	0.375	0.719	0.625	0.864	0.750
6 X 6 X 4	6.625	4.500	5.62	5.12	0.280	0.237	0.280	0.237	0.432	0.337	0.432	0.337	0.719	0.531	0.864	0.674
6 X 6 X 3-1/2	6.625	4.000	5.62	5.00	0.280	0.226	0.280	0.226	0.432	0.318	0.432	0.318	0.719		0.864	
6 X 6 X 3	6.625	3.500	5.62	4.88	0.280	0.216	0.280	0.216	0.432	0.300	0.432	0.300	0.719	0.438	0.864	0.600
8 X 8 X 6	8.625	6.625	7.00	6.62	0.322	0.280	0.322	0.280	0.500	0.432	0.500	0.432	0.906	0.719	0.875	0.864
8 X 8 X 5	8.625	5.563	7.00	6.38	0.322	0.258	0.322	0.258	0.500	0.375	0.500	0.375	0.906	0.625	0.875	0.750
8 X 8 X 4	8.625	4.500	7.00	6.12	0.322	0.237	0.322	0.237	0.500	0.337	0.500	0.337	0.906	0.531	0.875	0.674
10 X 10 X 8	10.750	8.625	8.50	8.00	0.365	0.322	0.365	0.322	0.500	0.500	0.594	0.500	1.125	0.906	1.000	0.875
10 X 10 X 6	10.750	6.625	8.50	7.62	0.365	0.280	0.365	0.280	0.500	0.432	0.594	0.432	1.125	0.719	1.000	0.864
10 X 10 X 5	10.750	5.563	8.50	7.50	0.365	0.258	0.365	0.258	0.500	0.375	0.594	0.375	1.125	0.625	1.000	0.750
12 X 12 X 10	12.750	10.750	10.00	9.50	0.375	0.365	0.406	0.365	0.500	0.500	0.688	0.500	1.312	1.125	1.000	1.000
12 X 12 X 8	12.750	8.625	10.00	9.00	0.375	0.322	0.406	0.322	0.500	0.500	0.688	0.500	1.312	0.906	1.000	0.875
12 X 12 X 6	12.750	6.625	10.00	8.62	0.375	0.280	0.406	0.280	0.500	0.432	0.688	0.432	1.312	0.719	1.000	0.864
14 X 14 X 12	14.000	12.750	11.00	10.62	0.375	0.375	0.438	0.375	0.500	0.500	0.750	0.500	1.406	1.312		1.000
14 X 14 X 10	14.000	10.750	11.00	10.12	0.375	0.365	0.438	0.365	0.500	0.500	0.750	0.500	1.406	1.125		1.000
14 X 14 X 8	14.000	8.625	11.00	9.75	0.375	0.322	0.438	0.322	0.500	0.500	0.750	0.500	1.406	0.906		0.875
16 X 16 X 14	16.000	14.000	12.00	12.00	0.375	0.375	0.500	0.375	0.500	0.500	0.844	0.500	1.594	1.406		
16 X 16 X 12	16.000	12.750	12.00	11.62	0.375	0.375	0.500	0.375	0.500	0.500	0.844	0.500	1.594	1.312		1.000
16 X 16 X 10	16.000	10.750	12.00	11.12	0.375	0.365	0.500	0.365	0.500	0.500	0.844	0.500	1.594	1.125		1.000
18 X 18 X 16	18.000	16.000	13.50	13.00	0.375	0.375	0.562	0.375	0.500	0.500	0.938	0.500	1.781	1.594		
18 X 18 X 14	18.000	14.000	13.50	13.00	0.375	0.375	0.562	0.375	0.500	0.500	0.938	0.500	1.781	1.406		
18 X 18 X 12	18.000	12.750	13.50	12.62	0.375	0.375	0.562	0.375	0.500	0.500	0.938	0.500	1.781	1.312		1.000
20 X 20 X 18	20.000	18.000	15.00	14.50	0.375	0.375	0.594	0.375	0.500	0.500	1.031	0.500	1.969	1.781		

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



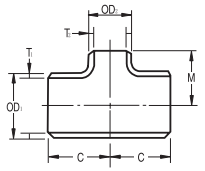
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
20 X 20 X 16	20.000	16.000	15.00	14.00	0.375	0.375	0.594	0.375	0.500	0.500	1.031	0.844	1.969	1.594		
20 X 20 X 14	20.000	14.000	15.00	14.00	0.375	0.375	0.594	0.375	0.500	0.500	1.031	0.750	1.969	1.406		
22 X 22 X 20	22.000	20.000	16.50	16.00	0.375	0.375		0.594	0.500	0.500	1.125	1.031	2.125	1.969		
22 X 22 X 18	22.000	18.000	16.50	15.50	0.375	0.375		0.562	0.500	0.500	1.125	0.938	2.125	1.781		
22 X 22 X 16	22.000	16.000	16.50	15.00	0.375	0.375		0.375	0.500	0.500	1.125	0.844	2.125	1.594		
24 X 24 X 22	24.000	22.000	17.00	17.00	0.375	0.375	0.688		0.500	0.500	1.219	1.125	2.344	2.125		
24 X 24 X 20	24.000	20.000	17.00	17.00	0.375	0.375	0.688	0.594	0.500	0.500	1.219	1.031	2.344	1.969		
24 X 24 X 18	24.000	18.000	17.00	16.50	0.375	0.375	0.688	0.562	0.500	0.500	1.219	0.938	2.344	1.781		
26 X 26 X 22	26.000	22.000	19.50	18.50	0.375	0.375			0.500	0.500		1.125		2.125		
26 X 26 X 18	26.000	18.000	19.50	17.50	0.375	0.375		0.562	0.500	0.500		0.738		1.781		
26 X 26 X 16	26.000	16.000	19.50	17.00	0.375	0.375		0.375	0.500	0.500		0.844		1.594		
28 X 28 X 24	28.000	24.000	20.50	20.00	0.375	0.375		0.688	0.500	0.500		1.219		2.344		
28 X 28 X 20	28.000	20.000	20.50	19.00	0.375	0.375		0.594	0.500	0.500		1.031		1.969		
28 X 28 X 18	28.000	18.000	20.50	18.50	0.375	0.375		0.562	0.500	0.500		0.938		1.781		
30 X 30 X 26	30.000	26.000	22.00	21.50	0.375	0.375			0.500	0.500						
30 X 30 X 22	30.000	22.000	22.00	20.50	0.375	0.375			0.500	0.500		1.125		2.125		
30 X 30 X 20	30.000	20.000	22.00	20.00	0.375	0.375		0.594	0.500	0.500		1.031		1.969		
32 X 32 X 28	32.000	28.000	23.50	22.50	0.375	0.375	0.688	0.375	0.500	0.500						
32 X 32 X 24	32.000	24.000	23.50	22.00	0.375	0.375	0.688	0.375	0.500	0.500		1.219		2.344		
32 X 32 X 22	32.000	22.000	23.50	21.50	0.375	0.375	0.688	0.375	0.500	0.500		1.125		2.125		
34 X 34 X 30	34.000	30.000	25.00	24.00	0.375	0.375	0.688		0.500	0.500						
34 X 34 X 26	34.000	26.000	25.00	23.50	0.375	0.375	0.688		0.500	0.500						
34 X 34 X 22	34.000	22.000	25.00	22.50	0.375	0.375	0.688		0.500	0.500		1.125		2.125		
36 X 36 X 32	36.000	32.000	26.50	25.50	0.375	0.375	0.750	0.375	0.500	0.500						
36 X 36 X 28	36.000	28.000	26.50	24.50	0.375	0.375	0.750		0.500	0.500						
36 X 36 X 24	36.000	24.000	26.50	24.00	0.375	0.375	0.750	0.375	0.500	0.500		1.219		2.344		

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

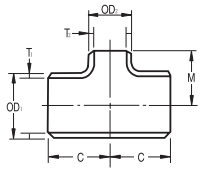
(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
38 X 38 X 34	38.000	34.000	28.00	27.50	0.375	0.375		0.688	0.500	0.500						
38 X 38 X 30	38.000	30.000	28.00	26.50	0.375	0.375			0.500	0.500						
38 X 38 X 26	38.000	26.000	28.00	25.50	0.375	0.375			0.500	0.500						
40 X 40 X 36	40.000	36.000	29.50	29.00	0.375	0.375		0.750	0.500	0.500						
40 X 40 X 32	40.000	32.000	29.50	28.00	0.375	0.375		0.688	0.500	0.500						
40 X 40 X 28	40.000	28.000	29.50	26.50	0.375	0.375			0.500	0.500						
42 X 42 X 38	42.000	38.000	30.00	28.00	0.375	0.375			0.500	0.500						
42 X 42 X 34	42.000	34.000	30.00	28.00	0.375	0.375		0.688	0.500	0.500						
42 X 42 X 30	42.000	30.000	30.00	28.00	0.375	0.375			0.500	0.500						
44 X 44 X 40	44.000	40.000	32.00	29.50	0.375	0.375			0.500	0.500						
44 X 44 X 36	44.000	36.000	32.00	28.50	0.375	0.375		0.750	0.500	0.500						
44 X 44 X 32	44.000	32.000	32.00	28.00	0.375	0.375		0.688	0.500	0.500						
46 X 46 X 42	46.000	42.000	33.50	31.00	0.375	0.375			0.500	0.500						
46 X 46 X 38	46.000	38.000	33.50	30.00	0.375	0.375			0.500	0.500						
46 X 46 X 34	46.000	34.000	33.50	29.50	0.375	0.375		0.688	0.500	0.500						
48 X 48 X 44	48.000	44.000	35.00	33.00	0.375	0.375			0.500	0.500						
48 X 48 X 40	48.000	40.000	35.00	32.00	0.375	0.375			0.500	0.500						
48 X 48 X 36	48.000	36.000	35.00	31.00	0.375	0.375		0.750	0.500	0.500						

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Reducing)

Sch20, Sch60, Sch100, Sch120, Sch140



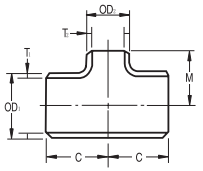
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
5 x 5 x 4	5.563	4.500	4.88	4.62							0.500	0.438		
6 x 6 x 5	6.625	5.563	5.62	5.38							0.562	0.500		
6 x 6 x 4	6.625	4.500	5.62	5.12							0.562	0.438		
8 x 8 x 6	8.625	6.625	7.00	6.62	0.250		0.406		0.594		0.719	0.562	0.812	
8 x 8 x 5	8.625	5.563	7.00	6.38	0.250		0.406		0.594		0.719	0.500	0.812	
8 x 8 x 4	8.625	4.500	7.00	6.12	0.250		0.406		0.594		0.719	0.438	0.812	
10 x 10 x 8	10.750	8.625	8.50	8.00	0.250	0.250	0.500	0.406	0.719	0.594	0.844	0.719	1.000	0.812
10 x 10 x 6	10.750	6.625	8.50	7.62	0.250		0.500		0.719		0.844	0.562	1.000	
10 x 10 x 5	10.750	5.563	8.50	7.50	0.250		0.500		0.719		0.844	0.500	1.000	
12 x 12 x 10	12.750	10.750	10.00	9.50	0.250	0.250	0.562	0.500	0.844	0.719	1.000	0.844	1.125	1.000
12 x 12 x 8	12.750	8.625	10.00	9.00	0.250	0.250	0.562	0.406	0.844	0.594	1.000	0.719	1.125	0.812
12 x 12 x 6	12.750	6.625	10.00	8.62	0.250		0.562		0.844		1.000	0.562	1.125	
14 x 14 x 12	14.000	12.750	11.00	10.62	0.312	0.250	0.594	0.562	0.938	0.844	1.094	1.000	1.250	1.125
14 x 14 x 10	14.000	10.750	11.00	10.12	0.312	0.250	0.594	0.500	0.938	0.719	1.094	0.844	1.250	1.000
14 x 14 x 8	14.000	8.625	11.00	9.75	0.312	0.250	0.594	0.406	0.938	0.594	1.094	0.719	1.250	0.812
16 x 16 x 14	16.000	14.000	12.00	12.00	0.312	0.312	0.656	0.594	1.031	0.938	1.219	1.094	1.438	1.250
16 x 16 x 12	16.000	12.750	12.00	11.62	0.312	0.250	0.656	0.562	1.031	0.844	1.219	1.000	1.438	1.125
16 x 16 x 10	16.000	10.750	12.00	11.12	0.312	0.250	0.656	0.500	1.031	0.719	1.219	0.844	1.438	1.000
18 x 18 x 16	18.000	16.000	13.50	13.00	0.312	0.312	0.750	0.656	1.156	1.031	1.375	1.219	1.562	1.438
18 x 18 x 14	18.000	14.000	13.50	13.00	0.312	0.312	0.750	0.594	1.156	0.938	1.375	1.094	1.562	1.250
18 x 18 x 12	18.000	12.750	13.50	12.62	0.312	0.250	0.750	0.562	1.156	0.844	1.375	1.000	1.562	1.125
20 x 20 x 18	20.000	18.000	15.00	14.50	0.375	0.312	0.812	0.750	1.281	1.156	1.500	1.375	1.750	1.562
20 x 20 x 16	20.000	16.000	15.00	14.00	0.375	0.312	0.812	0.656	1.281	1.031	1.500	1.219	1.750	1.438
20 x 20 x 14	20.000	14.000	15.00	14.00	0.375	0.312	0.812	0.594	1.281	0.938	1.500	1.094	1.750	1.250
22 x 22 x 20	22.000	20.000	16.50	16.00	0.375	0.375	0.875	0.812	1.375	1.281	1.625	1.500	1.875	1.750
22 x 22 x 18	22.000	18.000	16.50	15.50	0.375	0.312	0.875	0.750	1.375	1.156	1.625	1.375	1.875	1.562

Tee (Reducing)

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9

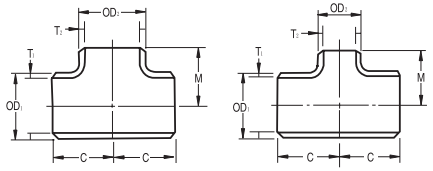
(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
22 x 22 x 16	22.000	20.000	16.50	16.00	0.375	0.375	0.875	0.812	1.375	1.281	1.625	1.500	1.875	1.750
24 x 24 x 22	24.000	22.000	17.00	17.00	0.375	0.375	0.969	0.875	1.531	1.375	1.812	1.625	2.062	1.875
24 x 24 x 20	24.000	20.000	17.00	17.00	0.375	0.375	0.969	0.812	1.531	1.281	1.812	1.500	2.062	1.750
24 x 24 x 18	24.000	18.000	17.00	16.50	0.375	0.312	0.969	0.750	1.531	1.156	1.812	1.375	2.062	1.562

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee

Special Fittings



(Unit : inch)

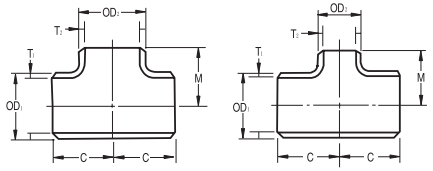
Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
50x50x50	50.000	50.000	36.500	34.500
50x50x48	50.000	48.000	36.500	33.000
50x50x46	50.000	46.000	36.500	32.000
50x50x44	50.000	44.000	36.500	31.000
50x50x42	50.000	42.000	36.500	30.000
50x50x40	50.000	40.000	36.500	29.000
50x50x38	50.000	38.000	36.500	29.000
52x52x52	52.000	52.000	38.000	36.000
52x52x50	52.000	50.000	38.000	35.000
52x52x48	52.000	48.000	38.000	34.000
52x52x46	52.000	46.000	38.000	33.000
52x52x44	52.000	44.000	38.000	32.000
52x52x42	52.000	42.000	38.000	31.000
52x52x40	52.000	40.000	38.000	30.000
52x52x38	52.000	38.000	38.000	30.000
54x54x54	54.000	54.000	39.500	37.500
54x54x52	54.000	52.000	39.500	36.000
54x54x50	54.000	50.000	39.500	35.000
54x54x48	54.000	48.000	39.500	34.000
54x54x46	54.000	46.000	39.500	33.000
54x54x44	54.000	44.000	39.500	32.000
54x54x40	54.000	40.000	39.500	31.000
54x54x28	54.000	28.000	39.500	31.000
54x54x20	54.000	20.000	39.500	31.000
56x56x56	56.000	56.000	41.000	38.000
56x56x54	56.000	54.000	41.000	37.000

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
56x56x52	56.000	52.000	41.000	36.000
56x56x50	56.000	50.000	41.000	35.000
56x56x48	56.000	48.000	41.000	34.000
56x56x46	56.000	46.000	41.000	33.000
56x56x44	56.000	44.000	41.000	32.000
56x56x40	56.000	40.000	41.000	32.000
56x56x28	56.000	28.000	41.000	32.000
56x56x20	56.000	20.000	41.000	32.000
58x58x58	58.000	58.000	42.500	39.000
58x58x56	58.000	56.000	42.500	38.000
58x58x54	58.000	54.000	42.500	37.000
58x58x52	58.000	52.000	42.500	36.000
58x58x50	58.000	50.000	42.500	35.000
58x58x48	58.000	48.000	42.500	34.000
58x58x46	58.000	46.000	42.500	33.000
58x58x44	58.000	44.000	42.500	33.000
60x60x60	60.000	60.000	44.000	40.000
60x60x58	60.000	58.000	44.000	39.000
60x60x56	60.000	56.000	44.000	38.000
60x60x54	60.000	54.000	44.000	37.000
60x60x52	60.000	52.000	44.000	36.000
60x60x50	60.000	50.000	44.000	35.000
60x60x48	60.000	48.000	44.000	34.000
60x60x46	60.000	46.000	44.000	34.000
60x60x40	60.000	40.000	44.000	34.000
60x60x28	60.000	28.000	44.000	34.000

Tee

Special Fittings



(Unit : inch)

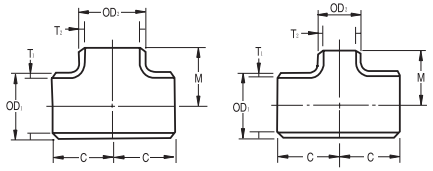
Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
60x60x20	60.000	20.000	44.000	34.000
62x62x62	62.000	62.000	45.000	40.500
62x62x60	62.000	60.000	45.000	39.000
62x62x58	62.000	58.000	45.000	38.000
62x62x56	62.000	56.000	45.000	37.000
62x62x54	62.000	54.000	45.000	36.000
62x62x52	62.000	52.000	45.000	35.000
62x62x50	62.000	50.000	45.000	35.000
64x64x64	64.000	64.000	46.000	41.000
64x64x62	64.000	62.000	46.000	40.000
64x64x60	64.000	60.000	46.000	39.000
64x64x58	64.000	58.000	46.000	38.000
64x64x56	64.000	56.000	46.000	37.000
64x64x54	64.000	54.000	46.000	36.000
64x64x52	64.000	52.000	46.000	36.000
66x66x66	66.000	66.000	48.000	42.000
66x66x64	66.000	64.000	48.000	41.000
66x66x62	66.000	62.000	48.000	40.000
66x66x60	66.000	60.000	48.000	39.000
66x66x58	66.000	58.000	48.000	38.000
66x66x56	66.000	56.000	48.000	37.000
66x66x54	66.000	54.000	48.000	37.000
68x68x68	68.000	68.000	49.000	43.000
68x68x66	68.000	66.000	49.000	42.000
68x68x64	68.000	64.000	49.000	41.000
68x68x62	68.000	62.000	49.000	40.000

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
68x68x60	68.000	60.000	49.000	39.000
68x68x58	68.000	58.000	49.000	38.000
68x68x56	68.000	56.000	49.000	38.000
70x70x70	70.000	70.000	50.000	44.000
70x70x68	70.000	68.000	50.000	43.000
70x70x66	70.000	66.000	50.000	42.000
70x70x64	70.000	64.000	50.000	41.000
70x70x62	70.000	62.000	50.000	40.000
70x70x60	70.000	60.000	50.000	39.000
70x70x58	70.000	58.000	50.000	39.000
72x72x72	72.000	72.000	52.000	45.000
72x72x70	72.000	70.000	52.000	44.000
72x72x68	72.000	68.000	52.000	43.000
72x72x66	72.000	66.000	52.000	42.000
72x72x64	72.000	64.000	52.000	41.000
72x72x62	72.000	62.000	52.000	40.000
72x72x60	72.000	60.000	52.000	40.000
74x74x74	74.000	74.000	53.000	46.000
74x74x72	74.000	72.000	53.000	45.000
74x74x70	74.000	70.000	53.000	44.000
74x74x68	74.000	68.000	53.000	43.000
74x74x66	74.000	66.000	53.000	42.000
74x74x64	74.000	64.000	53.000	41.000
74x74x62	74.000	62.000	53.000	41.000
76x76x76	76.000	76.000	54.000	47.000
76x76x74	76.000	74.000	54.000	46.000

Tee

Special Fittings



(Unit : inch)

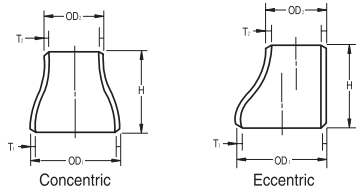
Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
76x76x72	76.000	72.000	54.000	45.000
76x76x70	76.000	70.000	54.000	44.000
76x76x68	76.000	68.000	54.000	43.000
76x76x66	76.000	66.000	54.000	42.000
76x76x64	76.000	64.000	54.000	42.000
78x78x78	78.000	78.000	55.000	48.000
78x78x76	78.000	76.000	55.000	47.000
78x78x74	78.000	74.000	55.000	46.000
78x78x72	78.000	72.000	55.000	45.000
78x78x70	78.000	70.000	55.000	44.000
78x78x68	78.000	68.000	55.000	43.000
78x78x66	78.000	66.000	55.000	43.000
80x80x80	80.000	80.000	56.000	49.000
80x80x78	80.000	78.000	56.000	48.000

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
80x80x76	80.000	76.000	56.000	47.000
80x80x74	80.000	74.000	56.000	46.000
80x80x72	80.000	72.000	56.000	45.000
80x80x70	80.000	70.000	56.000	44.000
80x80x68	80.000	68.000	56.000	44.000
82x82x82	82.000	82.000	57.000	50.000
82x82x80	82.000	80.000	57.000	49.000
82x82x78	82.000	78.000	57.000	48.000
82x82x76	82.000	76.000	57.000	47.000
82x82x74	82.000	74.000	57.000	46.000
82x82x72	82.000	72.000	57.000	45.000
82x82x70	82.000	70.000	57.000	45.000
84x84x84	84.000	84.000	58.000	51.000

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



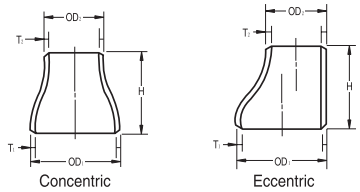
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
3/4 X 1/2	1.050	0.840	1.50	0.113	0.109	0.113	0.109	0.154	0.147	0.154	0.147	0.219	0.188	0.308	0.294	3/4 X 1/2
1 X 3/4	1.315	1.050	2.00	0.133	0.113	0.133	0.113	0.179	0.154	0.179	0.154	0.250	0.219	0.358	0.308	1 X 3/4
1 X 1/2	1.315	0.840	2.00	0.133	0.109	0.133	0.109	0.179	0.147	0.179	0.147	0.250	0.188	0.358	0.294	1 X 1/2
1-1/4 X 1	1.660	1.315	2.00	0.140	0.133	0.140	0.133	0.191	0.179	0.191	0.179	0.250	0.250	0.382	0.358	1-1/4 X 1
1-1/4 X 3/4	1.660	1.050	2.00	0.140	0.113	0.140	0.113	0.191	0.154	0.191	0.154	0.250	0.219	0.382	0.308	1-1/4 X 3/4
1-1/4 X 1/2	1.660	0.840	2.00	0.140	0.109	0.140	0.109	0.191	0.147	0.191	0.147	0.250	0.188	0.382	0.294	1-1/4 X 1/2
1-1/2 X 1-1/4	1.900	1.660	2.50	0.145	0.140	0.145	0.140	0.200	0.191	0.200	0.191	0.281	0.250	0.400	0.382	1-1/2 X 1-1/4
1-1/2 X 1	1.900	1.315	2.50	0.145	0.133	0.145	0.133	0.200	0.179	0.200	0.179	0.281	0.400	0.400	0.358	1-1/2 X 1
1-1/2 X 3/4	1.900	1.050	2.50	0.145	0.113	0.145	0.113	0.200	0.154	0.200	0.154	0.281	0.219	0.400	0.308	1-1/2 X 3/4
2 X 1-1/2	2.375	1.900	3.00	0.154	0.145	0.154	0.145	0.218	0.200	0.218	0.200	0.344	0.281	0.436	0.400	2 X 1-1/2
2 X 1-1/4	2.375	1.660	3.00	0.154	0.140	0.154	0.140	0.218	0.191	0.218	0.191	0.344	0.250	0.436	0.382	2 X 1-1/4
2 X 1	2.375	1.315	3.00	0.154	0.133	0.154	0.133	0.218	0.179	0.218	0.179	0.344	0.250	0.436	0.358	2 X 1
2 X 3/4	2.375	1.050	3.00	0.154	0.113	0.154	0.113	0.218	0.154	0.218	0.154	0.344	0.219	0.436	0.508	2 X 3/4
2-1/2 X 2	2.875	2.375	3.50	0.203	0.154	0.203	0.154	0.276	0.218	0.276	0.218	0.375	0.344	0.552	0.436	2-1/2 X 2
2-1/2 X 1-1/2	2.875	1.900	3.50	0.203	0.145	0.203	0.145	0.276	0.200	0.276	0.200	0.375	0.281	0.552	0.400	2-1/2 X 1-1/2
2-1/2 X 1-1/4	2.875	1.660	3.50	0.203	0.140	0.203	0.140	0.276	0.191	0.276	0.191	0.375	0.250	0.552	0.382	2-1/2 X 1-1/4
2-1/2 X 1	2.875	1.315	3.50	0.203	0.133	0.203	0.133	0.276	0.179	0.276	0.179	0.375	0.250	0.552	0.358	2-1/2 X 1
3 X 2-1/2	3.500	2.875	3.50	0.216	0.203	0.216	0.203	0.300	0.276	0.300	0.276	0.438	0.375	0.600	0.552	3 X 2-1/2
3 X 2	3.500	2.375	3.50	0.216	0.154	0.216	0.154	0.300	0.218	0.300	0.218	0.438	0.344	0.600	0.436	3 X 2
3 X 1-1/2	3.500	1.900	3.50	0.216	0.145	0.216	0.145	0.300	0.200	0.300	0.200	0.438	0.281	0.600	0.400	3 X 1-1/2
3 X 1-1/4	3.500	1.660	3.50	0.216	0.140	0.216	0.140	0.300	0.191	0.300	0.191	0.438	0.250	0.600	0.382	3 X 1-1/4
3-1/2 X 3	4.000	3.500	4.00	0.226	0.216	0.226	0.216	0.318	0.300	0.318	0.300		0.438		0.600	3-1/2 X 3
3-1/2 X 2-1/2	4.000	2.875	4.00	0.226	0.203	0.226	0.203	0.318	0.276	0.318	0.276		0.375		0.552	3-1/2 X 2-1/2
3-1/2 X 2	4.000	2.375	4.00	0.226	0.154	0.226	0.154	0.318	0.218	0.318	0.218		0.344		0.436	3-1/2 X 2
3-1/2 X 1-1/2	4.000	1.900	4.00	0.226	0.145	0.226	0.145	0.318	0.200	0.318	0.200		0.281		0.400	3-1/2 X 1-1/2
4 X 3-1/2	4.500	4.000	4.00	0.237	0.226	0.237	0.226	0.337	0.318	0.337	0.318	0.531		0.674		4 X 3-1/2

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



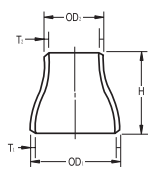
ASME B16.9

(Unit : inch)

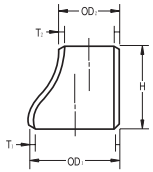
Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
4 X 3	4.500	3.500	4.00	0.237	0.216	0.237	0.216	0.337	0.300	0.337	0.300	0.531	0.438	0.674	0.600	4 X 3
4 X 2-1/2	4.500	2.880	4.00	0.237	0.203	0.237	0.203	0.337	0.276	0.337	0.276	0.531	0.375	0.674	0.552	4 X 2-1/2
4 X 2	4.500	2.380	4.00	0.237	0.154	0.237	0.154	0.337	0.218	0.337	0.218	0.531	0.344	0.674	0.436	4 X 2
5 X 4	5.560	4.500	5.00	0.258	0.237	0.258	0.237	0.375	0.337	0.375	0.337	0.625	0.531	0.750	0.674	5 X 4
5 X 3-1/2	5.560	4.000	5.00	0.258	0.226	0.258	0.226	0.375	0.318	0.375	0.318	0.625		0.750		5 X 3-1/2
5 X 3	5.560	3.500	5.00	0.258	0.216	0.258	0.216	0.375	0.300	0.375	0.300	0.625	0.438	0.750	0.600	5 X 3
5 X 2-1/2	5.560	2.875	5.00	0.258	0.203	0.258	0.203	0.375	0.276	0.375	0.276	0.625	0.375	0.750	0.552	5 X 2-1/2
6 X 5	6.620	5.560	5.50	0.280	0.258	0.280	0.258	0.432	0.375	0.432	0.375	0.719	0.625	0.864	0.750	6 X 5
6 X 4	6.620	4.500	5.50	0.280	0.237	0.280	0.237	0.432	0.337	0.432	0.337	0.719	0.531	0.864	0.674	6 X 4
6 X 3-1/2	6.620	4.000	5.50	0.280	0.226	0.280	0.226	0.432	0.318	0.432	0.318	0.719		0.864		6 X 3-1/2
6 X 3	6.620	3.500	5.50	0.280	0.216	0.280	0.216	0.432	0.300	0.432	0.300	0.719	0.438	0.864	0.600	6 X 3
6 X 2-1/2	6.620	2.880	5.50	0.280	0.203	0.280	0.203	0.432	0.276	0.432	0.276	0.719	0.375	0.864	0.552	6 X 2-1/2
8 X 6	8.620	6.620	6.00	0.322	0.280	0.322	0.280	0.500	0.432	0.500	0.432	0.906	0.719	0.875	0.864	8 X 6
8 X 5	8.620	5.560	6.00	0.322	0.258	0.322	0.258	0.500	0.375	0.500	0.375	0.906	0.625	0.875	0.750	8 X 5
8 X 4	8.620	4.500	6.00	0.322	0.237	0.322	0.237	0.500	0.337	0.500	0.337	0.906	0.531	0.875	0.674	8 X 4
8 X 3-1/2	8.620	4.000	6.00	0.322	0.226	0.322	0.226	0.500	0.318	0.500	0.318	0.906		0.875		8 X 3-1/2
10 X 8	10.750	8.620	7.00	0.365	0.322	0.365	0.322	0.500	0.500	0.594	0.500	1.125	0.906	1.000	0.875	10 X 8
10 X 6	10.750	6.620	7.00	0.365	0.280	0.365	0.280	0.500	0.432	0.594	0.432	1.125	0.719	1.000	0.864	10 X 6
10 X 5	10.750	5.560	7.00	0.365	0.258	0.365	0.258	0.500	0.375	0.594	0.375	1.125	0.625	1.000	0.750	10 X 5
10 X 4	10.750	4.500	7.00	0.365	0.237	0.365	0.237	0.500	0.337	0.594	0.337	1.125	0.531	1.000	0.674	10 X 4
12 X 10	12.750	10.750	8.00	0.375	0.365	0.406	0.365	0.500	0.500	0.688	0.594	1.312	1.125	1.000	1.000	12 X 10
12 X 8	12.750	8.620	8.00	0.375	0.322	0.406	0.322	0.500	0.500	0.688	0.500	1.312	0.906	1.000	0.875	12 X 8
12 X 6	12.750	6.620	8.00	0.375	0.280	0.406	0.280	0.500	0.432	0.688	0.432	1.312	0.719	1,000	0.864	12 X 6
12 X 5	12.750	5.560	8.00	0.375	0.258	0.406	0.258	0.500	0.375	0.688	0.375	1.312	0.625	1,000	0.750	12 X 5
14 X 12	14.000	12.750	13.00	0.375	0.375	0.438	0.375	0.500	0.500	0.750	0.688	1.406	1.312		1,000	14 X 12
14 X 10	14.000	10.750	13.00	0.375	0.365	0.438	0.365	0.500	0.500	0.750	0.594	1.406	1.125		1,000	14 X 10

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



Concentric



Eccentric

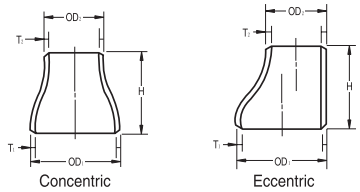
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
14 X 8	14.000	8.620	13.00	0.375	0.322	0.438	0.322	0.500	0.500	0.750	0.500	1.406	0.906		0.875	14 X 8
16 X 14	16.000	14.000	14.00	0.375	0.375	0.500	0.438	0.500	0.500	0.844	0.750	1.594	1.406			16 X 14
16 X 12	16.000	12.750	14.00	0.375	0.375	0.500	0.406	0.500	0.500	0.844	0.688	1.594	1.312		1.000	16 X 12
16 X 10	16.000	10.750	14.00	0.375	0.365	0.500	0.365	0.500	0.500	0.844	0.594	1.594	1.125		1.000	16 X 10
18 X 16	18.000	16.000	15.00	0.375	0.375	0.562	0.500	0.500	0.500	0.938	0.844	1.781	1.594			18 X 16
18 X 14	18.000	14.000	15.00	0.375	0.375	0.562	0.438	0.500	0.500	0.938	0.750	1.781	1.406			18 X 14
18 X 12	18.000	12.750	15.00	0.375	0.375	0.562	0.406	0.500	0.500	0.938	0.688	1.781	1.312		1.000	18 X 12
20 X 18	20.000	18.000	20.00	0.375	0.375	0.594	0.562	0.500	0.500	1.031	0.938	1.969	1.781			20 X 18
20 X 16	20.000	16.000	20.00	0.375	0.375	0.594	0.500	0.500	0.500	1.031	0.844	1.969	1.594			20 X 16
20 X 14	20.000	14.000	20.00	0.375	0.375	0.594	0.438	0.500	0.500	0.031	0.750	1.969	1.406			20 X 14
22 X 20	22.000	20.000	20.00	0.375	0.375		0.594	0.500	0.500	1.125	1.031	2.125	1.969			22 X 20
22 X 18	22.000	18.000	20.00	0.375	0.375		0.562	0.500	0.500	1.125	0.938	2.125	1.781			22 X 18
22 X 16	22.000	16.000	20.00	0.375	0.375		0.500	0.500	0.500	1.125	0.844	2.125	1.594			22 X 16
24 X 22	24.000	22.000	20.00	0.375	0.375	0.688		0.500	0.500	1.219	1.125	2.344	2.125			24 X 22
24 X 20	24.000	20.000	20.00	0.375	0.375	0.688	0.594	0.500	0.500	1.219	1.031	2.344	1.969			24 X 20
24 X 18	24.000	18.000	20.00	0.375	0.375	0.688	0.562	0.500	0.500	1.219	0.938	2.344	1.781			24 X 18
26 X 22	26.000	22.000	24.00	0.375	0.375			0.500	0.500		1.125		2.125			26 X 22
26 X 18	26.000	18.000	24.00	0.375	0.375		0.562	0.500	0.500		0.938		1.781			26 X 18
26 X 16	26.000	16.000		0.375	0.375		0.500	0.500	0.500		0.844		1.594			26 X 16
28 X 24	28.000	24.000	24.00	0.375	0.375		0.688	0.500	0.500		1.219		2.344			28 X 24
28 X 20	28.000	20.000	24.00	0.375	0.375		0.594	0.500	0.500		1.031		1.969			28 X 20
28 X 18	28.000	18.000	24.00	0.375	0.375		0.562	0.500	0.500		0.938		1.781			28 X 18
30 X 26	30.000	26.000	24.00	0.375	0.375			0.500	0.500							30 X 26
30 X 22	30.000	22.000		0.375	0.375			0.500	0.500		1.125		2.125			30 X 22
30 X 20	30.000	20.000	24.00	0.375	0.375		0.594	0.500	0.500		1.031		1.969			30 X 20
32 X 28	32.000	28.000	24.00	0.375	0.375	0.688		0.500	0.500							32 X 28

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



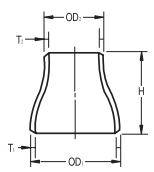
ASME B16.9

(Unit : inch)

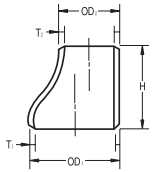
Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
32 X 24	32.000	24.000	24.00	0.375	0.375	0.688	0.375	0.500	0.500		1.129		2.344			32 X 24
32 X 22	32.000	22.000		0.375	0.375	0.688		0.500	0.500		1.125		2.125			32 X 22
34 X 30	34.000	30.000	24.00	0.375	0.375	0.688		0.500	0.500							34 X 30
34 X 26	34.000	26.000	24.00	0.375	0.375	0.688		0.500	0.500							34 X 26
34 X 22	34.000	22.000		0.375	0.375	0.688		0.500	0.500		1.125		2.125			34 X 22
36 X 32	36.000	32.000	24.00	0.375	0.375	0.750	0.375	0.500	0.500							36 X 32
36 X 28	36.000	28.000		0.375	0.375	0.750		0.500	0.500							36 X 28
36 X 24	36.000	24.000	24.00	0.375	0.375	0.750	0.375	0.500	0.500		1.129		2.344			36 X 24
38 X 34	38.000	34.000	24.00	0.375	0.375		0.688	0.500	0.500							38 X 34
38 X 30	38.000	30.000	24.00	0.375	0.375			0.500	0.500							38 X 30
38 X 26	38.000	26.000	24.00	0.375	0.375			0.500	0.500							38 X 26
40 X 36	40.000	36.000	24.00	0.375	0.375		0.750	0.500	0.500							40 X 36
40 X 32	40.000	32.000	24.00	0.375	0.375		0.688	0.500	0.500							40 X 32
40 X 28	40.000	28.000		0.375	0.375			0.500	0.500							40 X 28
42 X 38	42.000	38.000	24.00	0.375	0.375			0.500	0.500							42 X 38
42 X 34	42.000	34.000	24.00	0.375	0.375		0.688	0.500	0.500							42 X 34
42 X 30	42.000	30.000	24.00	0.375	0.375			0.500	0.500							42 X 30
44 X 40	44.000	40.000	24.00	0.375	0.375			0.500	0.500							44 X 40
44 X 36	44.000	36.000	24.00	0.375	0.375		0.750	0.500	0.500							44 X 36
44 X 32	44.000	32.000		0.375	0.375		0.688	0.500	0.500							44 X 32
46 X 42	46.000	42.000	28.00	0.375	0.375			0.500	0.500							46 X 42
46 X 38	46.000	38.000	28.00	0.375	0.375			0.500	0.500							46 X 38
46 X 34	46.000	34.000		0.375	0.375		0.688	0.500	0.500							46 X 34
48 X 44	48.000	44.000	28.00	0.375	0.375			0.500	0.500							48 X 44
48 X 40	48.000	40.000	28.00	0.375	0.375			0.500	0.500							48 X 40
48 X 36	48.000	36.000		0.375	0.375		0.750	0.500	0.500							48 X 36

Reducer

Sch20, Sch60, Sch100, Sch120, Sch140



Concentric



Eccentric

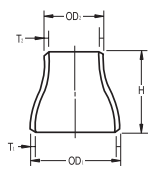
ASME B16.9

(Unit : inch)

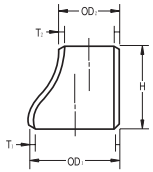
Nominal Pipe Size	Outside Diameter		End to End	Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
5 X 4	5.563	4.500	5.00							0.500	0.438		
6 X 5	6.625	5.563	5.50							0.562	0.500		
6 X 4	6.625	4.500	5.50							0.562	0.438		
8 X 6	8.625	6.625	6.00	0.250		0.406		0.594		0.719	0.562	0.812	
8 X 5	8.625	5.563	6.00	0.250		0.406		0.594		0.719	0.500	0.812	
8 X 4	8.625	4.500	6.00	0.250		0.406		0.594		0.719	0.438	0.812	
10 X 8	10.750	8.625	7.00	0.250	0.250	0.500	0.406	0.719	0.594	0.844	0.719	1.000	0.812
10 X 6	10.750	6.625	7.00	0.250		0.500		0.719		0.844	0.562	1.000	
10 X 5	10.750	5.563	7.00	0.250		0.500		0.719		0.844	0.500	1.000	
10 X 4	10.750	4.500	7.00	0.250		0.500		0.719		0.844	0.438	1.000	
12 X 10	12.750	10.750	8.00	0.250	0.250	0.562	0.500	0.844	0.719	1.000	0.844	1.125	1.000
12 X 8	12.750	8.625	8.00	0.250	0.250	0.562	0.406	0.844	0.594	1.000	0.719	1.125	0.812
12 X 6	12.750	6.625	8.00	0.250		0.562		0.844		1.000	0.562	1.125	
14 X 12	14.000	12.750	13.00	0.312	0.250	0.594	0.562	0.938	0.844	1.094	1.000	1.250	1.125
14 X 10	14.000	10.750	13.00	0.312	0.250	0.594	0.500	0.938	0.719	1.094	0.844	1.250	1.000
14 X 8	14.000	8.625	13.00	0.312	0.250	0.594	0.406	0.938	0.594	1.094	0.719	1.250	0.812
16 X 14	16.000	14.000	14.00	0.312	0.312	0.656	0.594	1.031	0.938	1.219	1.094	1.438	1.250
16 X 12	16.000	12.750	14.00	0.312	0.250	0.656	0.562	1.031	0.844	1.219	1.000	1.438	1.125
16 X 10	16.000	10.750	14.00	0.312	0.250	0.656	0.500	1.031	0.719	1.219	0.844	1.438	1.000
18 X 16	18.000	16.000	15.00	0.312	0.312	0.750	0.656	1.156	1.031	1.375	1.219	1.562	1.438
18 X 14	18.000	14.000	15.00	0.312	0.312	0.750	0.594	1.156	0.938	1.375	1.094	1.562	1.250
18 X 12	18.000	12.750	15.00	0.312	0.250	0.750	0.562	1.156	0.844	1.375	1.000	1.562	1.125
20 X 18	20.000	18.000	20.00	0.375	0.312	0.812	0.750	1.281	1.156	1.500	1.375	1.750	1.562
20 X 16	20.000	16.000	20.00	0.375	0.312	0.812	0.656	1.281	1.031	1.500	1.219	1.750	1.438
20 X 14	20.000	14.000	20.00	0.375	0.312	0.812	0.594	1.281	0.938	1.500	1.094	1.750	1.250
22 X 20	22.000	20.000	20.00	0.375	0.375	0.875	0.812	1.375	1.281	1.625	1.500	1.875	1.750

Reducer

Sch20, Sch60, Sch100, Sch120, Sch140



Concentric



Eccentric

ASME B16.9

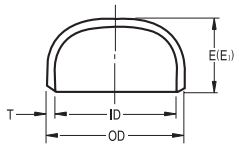
(Unit : inch)

Nominal Pipe Size	Outside Diameter		End to End	Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
22 X 18	22.000	18.000	20.00	0.375	0.312	0.875	0.750	1.375	1.156	1.625	1.375	1.875	1.562
22 X 16	22.000	16.000	20.00	0.375	0.312	0.875	0.656	1.375	1.031	1.625	1.219	1.875	1.438
24 X 22	24.000	22.000	20.00	0.375	0.375	0.969	0.875	1.531	1.375	1.812	1.625	2.062	1.875
24 X 20	24.000	20.000	20.00	0.375	0.375	0.969	0.812	1.531	1.281	1.812	1.500	2.062	1.750
24 X 18	24.000	18.000	20.00	0.375	0.312	0.969	0.750	1.531	1.156	1.812	1.375	2.062	1.562

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Cap

STD, Sch40, X-S, Sch80, Sch160, XX-S



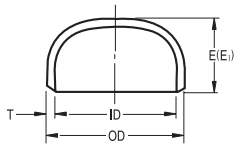
ASME B16.9

(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Length E	Limiting Wall Thickness for Length E	Length E1	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
					T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
1/2	0.840	1.00	0.18	1.00	0.109	0.622	0.109	0.622	0.147	0.546	0.147	0.546	0.188	0.464	0.294	0.252	1/2
3/4	1.050	1.00	0.15	1.00	0.113	0.824	0.113	0.824	0.154	0.742	0.154	0.742	0.219	0.612	0.308	0.434	3/4
1	1.315	1.50	0.18	1.50	0.133	1.049	0.133	1.049	0.179	0.957	0.179	0.957	0.250	0.815	0.358	0.599	1
1-1/4	1.660	1.50	0.19	1.50	0.140	1.380	0.140	1.380	0.191	1.278	0.191	1.278	0.250	1.160	0.382	0.896	1-1/4
1-1/2	1.900	1.50	0.20	1.50	0.145	1.610	0.145	1.610	0.200	1.500	0.200	1.500	0.281	1.338	0.400	1.100	1-1/2
2	2.375	1.50	0.22	1.75	0.154	2.067	0.154	2.067	0.218	1.939	0.218	1.939	0.344	1.687	0.436	1.503	2
2-1/2	2.875	1.50	0.28	2.00	0.203	2.469	0.203	2.469	0.276	2.323	0.276	2.323	0.375	2.125	0.552	1.771	2-1/2
3	3.500	2.00	0.30	2.50	0.216	3.068	0.216	3.068	0.300	2.900	0.300	2.900	0.438	3.124	0.600	2.800	3
3-1/2	4.000	2.50	0.32	3.00	0.226	3.548	0.226	3.548	0.318	3.364	0.318	3.364					3-1/2
4	4.500	2.50	0.34	3.00	0.237	4.026	0.237	4.026	0.337	3.826	0.337	3.826	0.531	3.438	0.674	3.152	4
5	5.563	3.00	0.38	3.50	0.258	5.047	0.258	5.047	0.375	4.813	0.375	4.813	0.625	4.313	0.750	4.063	5
6	6.625	3.50	0.43	4.00	0.280	6.065	0.280	6.065	0.432	5.761	0.432	5.761	0.719	5.187	0.864	4.897	6
8	8.625	4.00	0.50	5.00	0.322	7.981	0.322	7.981	0.500	7.625	0.500	7.625	0.906	6.813	0.875	6.875	8
10	10.750	5.00	0.50	6.00	0.365	10.020	0.365	10.020	0.500	9.750	0.594	9.750	1.125	8.500	1.000	8.750	10
12	12.750	6.00	0.50	7.00	0.375	12.000	0.406	11.938	0.500	11.750	0.688	11.374	1.312	10.126	1.000	10.750	12
14	14.000	6.50	0.50	7.50	0.375	13.250	0.438	13.124	0.500	13.000	0.750	12.500	1.406	11.188			14
16	16.000	7.00	0.50	8.00	0.375	15.250	0.500	15.000	0.500	15.000	0.844	14.312	1.594	12.812			16
18	18.000	8.00	0.50	9.00	0.375	17.250	0.562	16.876	0.500	17.000	0.938	16.124	1.781	14.438			18
20	20.000	9.00	0.50	10.00	0.375	19.250	0.594	18.812	0.500	19.000	1.031	17.938	1.969	16.062			20
22	22.000	10.00	0.50	10.00	0.375	21.250			0.500	21.000	1.125	19.756	2.125	17.750			22
24	24.000	10.50	0.50	12.00	0.375	23.250	0.688	22.624	0.500	23.000	1.218	21.579	2.344	19.312			24
26	26.000	10.50			0.375	25.250			0.500	25.000							26
28	28.000	10.50			0.375	27.250			0.500	27.000							28
30	30.000	10.50			0.375	29.250			0.500	29.000							30
32	32.000	10.50			0.375	31.250	0.688	30.624	0.500	31.000							32
34	34.000	10.50			0.375	33.250	0.688	32.624	0.500	33.000							34

Cap

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

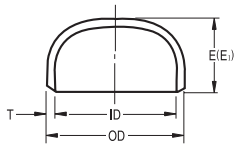
(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Length E	Limiting Wall Thickness for Length E	Length E1	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
					T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
36	36.000	10.50			0.375	35.250	0.750	34.500	0.500	35.000							36
38	38.000	12.00			0.375	37.250			0.500	37.000							38
40	40.000	12.00			0.375	39.250			0.500	39.000							40
42	42.000	12.00			0.375	41.250			0.500	41.000							42
44	44.000	13.50			0.375	43.250			0.500	43.000							44
46	46.000	13.50			0.375	45.250			0.500	45.000							46
48	48.000	13.50			0.375	47.250			0.500	47.000							48

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Cap

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9

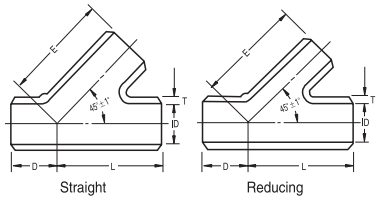
(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Length E	Limiting Wall Thickness for Length E	Length E1	Sch20		Sch60		Sch100		Sch120		Sch140	
					T	I.D	T	I.D	T	I.D	T	I.D	T	I.D
4	4.500	2.50	0.34	3.00							0.438	3.624		
5	5.563	3.00	0.38	3.50							0.500	4.563		
6	6.625	3.50	0.43	4.00							0.562	5.501		
8	8.625	4.00	0.50	5.00	0.250	8.125	0.406	7.813	0.594	7.437	0.719	7.187	0.812	7.001
10	10.750	5.00	0.50	6.00	0.250	10.250	0.500	9.750	0.719	9.312	0.844	9.062	1.000	8.750
12	12.750	6.00	0.50	7.00	0.250	12.250	0.562	11.626	0.844	11.062	1.000	10.750	1.125	10.500
14	14.000	6.50	0.50	7.50	0.312	13.376	0.594	12.812	0.938	12.124	1.094	11.812	1.250	11.500
16	16.000	7.00	0.50	8.00	0.312	15.376	0.656	14.688	1.031	13.938	1.219	13.562	1.438	13.124
18	18.000	8.00	0.50	9.00	0.312	17.376	0.750	16.500	1.156	15.688	1.375	15.250	1.562	14.876
20	20.000	9.00	0.50	10.00	0.375	19.250	0.812	18.376	1.281	17.438	1.500	17.000	1.750	16.500
22	22.000	10.00	0.50	10.00	0.375	21.250	0.875	20.250	1.375	19.250	1.625	18.750	1.875	18.250
24	24.000	10.50	0.50	12.00	0.375	23.250	0.969	22.062	1.531	20.938	1.812	20.376	2.062	19.876

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Lateral - A

STD, XS (Type A)



MAKER STD

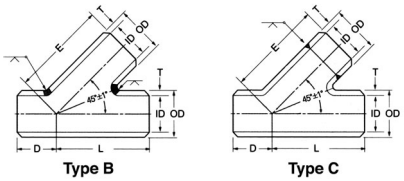
(Unit : inch)

Nominal Pipe Size of Run	Center to End Dimension		STD		X-S	
	L & E	D	T	I.D	T	I.D
1	3.50	1.75	0.133	1.049	0.179	0.957
1-1/4	4.25	2.00	0.140	1.380	0.191	1.278
1-1/2	5.00	2.50	0.145	1.610	0.200	1.500
2	6.00	3.25	0.154	2.067	0.218	1.939
2-1/2	7.00	3.50	0.203	2.469	0.276	2.323
3	7.75	3.75	0.216	3.068	0.300	2.900
3-1/2	8.38	4.00	0.226	3.548	0.318	3.364
4	8.50	4.50	0.237	4.026	0.337	3.826
5	11.00	4.75	0.258	5.047	0.375	4.813
6	12.50	5.25	0.280	6.065	0.432	5.761
8	15.25	6.25	0.322	7.981	0.500	7.625
10	18.00	7.00	0.365	10.020	0.500	9.750
12	21.50	8.00	0.375	12.000	0.500	11.750
14	25.00	10.00	0.375	13.250	0.500	13.000
16	28.50	12.00	0.375	15.250	0.500	15.000
18	32.00	13.00	0.375	17.250	0.500	17.000
20	35.00	14.00	0.375	19.250	0.500	19.000
24	41.25	16.25	0.375	23.250	0.500	23.000

- Presure-temperature ratings : Laterals are rated for either 40% of the maximum allowable working pressure for the size and weight schedule of the mating pipe, or 100% of the maximum allowable working pressue for the size and weight schedule of the mating pipe in the latter case, ASME B31.3 is used to calculate reinforcement requirements unless otherwise specified.
- Wall Thickness Conform to ASME B 36.10M Specifications

Lateral - B, C

STD, XS (Type B, Type C)



MAKER STD

(Unit : inch)

Nominal Pipe Size of Run	Type	Outside Diameter O.D	STD					X-S				
			Center to End Dimension		Wall Thick.	Insid Dim.	Weight (kg)	Center to End Dimension		Wall Thick.	Insid Dim.	Weight (kg)
			L & E	D	T	I.D		L & E	D	T	I.D	
1	B	1.315	5.75	1.75	0.133	1.049	1.049	6.50	2.00	0.179	0.957	1.049
1-1/4	B	1.660	6.25	1.75	0.140	1.380	1.380	7.25	2.25	0.191	1.278	1.380
1-1/2	B	1.900	7.00	2.00	0.145	1.610	1.610	8.50	2.50	0.200	1.500	1.610
2	B/C	2.375	8.00	2.50	0.154	2.067	2.067	*9.00 **8.00	2.50	0.218	1.939	2.067
2-1/2	B	2.875	9.50	2.50	0.203	2.469	2.469	10.50	2.50	0.276	2.323	2.469
3	B	3.500	10.00	3.00	0.216	3.068	3.068	11.00	3.00	0.300	2.900	3.068
3-1/2	B	4.000	11.50	3.00	0.226	3.548	3.548	12.50	3.00	0.318	3.364	3.548
4	B/C	4.500	12.00	3.00	0.237	4.026	4.026	*13.50 **12.50	3.00	0.337	3.826	4.026
5	B	5.562	13.50	3.50	0.258	5.047	5.047	15.00	3.50	0.375	4.813	5.047
6	B/C	6.625	14.50	3.50	0.280	6.065	6.065	*17.50 **14.50	*4.00 **3.50	0.432	5.761	6.065
8	B	8.625	17.50	4.50	0.322	7.981	7.981	20.50	5.00	0.500	7.625	7.981
10	B	10.750	20.50	5.00	0.365	10.020	10.020	24.00	5.50	0.500	9.750	10.020
12	B	12.750	24.50	5.50	0.375	12.000	12.000	27.50	6.00	0.500	11.750	12.000
14	B	14.000	27.00	6.00	0.375	13.250	13.250	31.00	6.50	0.500	13.000	13.250
16	B	16.000	30.00	6.50	0.375	15.250	15.250	34.50	7.50	0.500	15.000	15.250
18	B	18.000	32.00	7.00	0.375	17.250	17.250	37.50	8.00	0.500	17.000	17.250
20	B	20.000	35.00	8.00	0.375	19.250	19.250	40.50	8.50	0.500	19.000	19.250
24	B	24.000	40.50	9.00	0.375	23.250	23.250	47.50	10.00	0.500	23.000	23.250

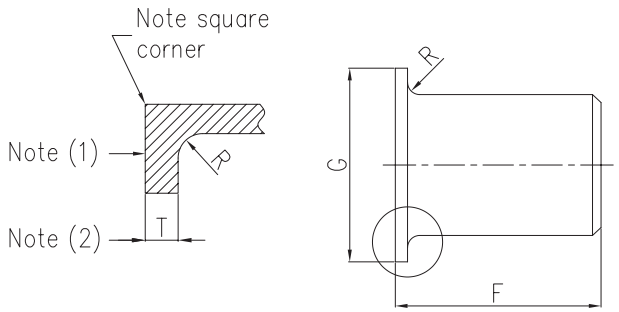
* B TYPE, ** C TYPE

- Presure-temperature ratings : Laterals are rated for either 40% of the maximum allowable working pressure for the size and weight schedule of the mating pipe, or 100% of the maximum allowable working pressue for the size and weight schedule of the mating pipe in the latter case, ASME B31.3 is used to calculate reinforcement requirements unless otherwise specified.
- Wall Thickness Conform to ASME B 36.10M Specifications

Lap Joint (Stub Ends)

ASME B16.9 (Unit : inch)

Nominal Pipe Size (NPS)	Outside Diameter of Barrel		Long Pattern Length, *F* [Notes (3), (4)]	Short Pattern Length, *F* [Notes (3), (4)]	Radius of Fillet, *R* [Note (5)]	Diameter of Lap, *G* [Note (6)]
	Max.	Min.				
1/2	0.896	0.809	3.00	2.00	0.12	1.38
3/4	1.106	1.019	3.00	2.00	0.12	1.69
1	1.376	1.284	4.00	2.00	0.12	2.00
1 1/4	1.716	1.629	4.00	2.00	0.19	2.50
1 1/2	1.965	1.869	4.00	2.00	0.25	2.88
2	2.456	2.344	6.00	2.50	0.31	3.62
2 1/2	2.966	2.844	6.00	2.50	0.31	4.12
3	3.596	3.469	6.00	2.50	0.38	5.00
3 1/2	4.096	3.969	6.00	3.00	0.38	5.50
4	4.593	4.469	6.00	3.00	0.44	6.19
5	5.683	5.532	8.00	3.00	0.44	7.31
6	6.743	6.594	8.00	3.50	0.50	8.50
8	8.743	8.594	8.00	4.00	0.50	10.62
10	10.913	10.719	10.00	5.00	0.50	12.75
12	12.913	12.719	10.00	6.00	0.50	15.00
14	14.170	13.969	12.00	6.00	0.50	16.25
16	16.180	15.969	12.00	6.00	0.50	18.50
18	18.190	17.969	12.00	6.00	0.50	21.00
20	20.240	19.969	12.00	6.00	0.50	23.00
22	22.240	21.969	12.00	6.00	0.50	25.25
24	24.240	23.969	12.00	6.00	0.50	27.25

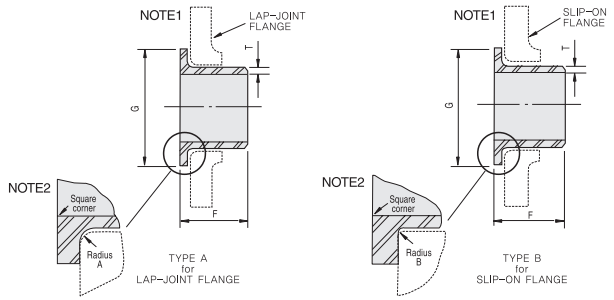


GENERAL NOTES:
- All dimensions are in millimeters.
- See Page 362 for tolerances.
- Service conditions and joint construction often dictate stub end length requirements. Therefore, the purchaser must specify long or short pattern fitting when ordering.

NOTES:
1. Gasket face finish shall be in accordance with ASME B16.5 for raised face flanges.
2. The lap thickness, *T*, shall not be less than nominal pipe wall thickness. See Page 362 for maximum tolerance.
3. When short pattern stub ends are used with larger flanges in Classed 300 and 600, with most sizes in Classes 900 and higher, and when long pattern stub ends are used with larger flanges in Classes 1500 and 2500, it may be necessary to increase the legnth of the stub ends in order to avoid covering the weld with the flange. Such increases in length shall be a matter of agreement between the manufacturer and purchaser.
4. When special facings such as tongue and groove, male and female, etc., are employed, additional lap thickness must be provided and such additional thickness shall be in addition to (not included in) the basic length, *F*.
5. These dimensions conform to the radius estblished for lap joint flanges in ASME B16.5.
6. This dimension conforms to standard machined facings shown in ASME B16.5. The back face of the lap shall be machined to conform to the surface on shich it sits. Where ring joint facings are to be appled, use dimension *K* as given in ASME B16.5.

Lap Joint (Stub Ends)

Sch5s, 10s, 40s



MSS SP-43

(Unit : inch)

Nominal Pipe Size	Outside Diameter OD	Length F	Dia. of Lap-G Nominal & Maximum	Radius of Fillet	
				A Nominal Max.	B Max.
1/2	0.84	2.00	1.38	0.12	0.03
3/4	1.05	2.00	1.69	0.12	0.03
1	1.32	2.00	2.00	0.12	0.03
1 1/4	1.66	2.00	2.50	0.19	0.03
1 1/2	1.90	2.00	2.88	0.25	0.03
2	2.38	2.50	3.62	0.31	0.03
2 1/2	2.88	2.50	4.12	0.31	0.03
3	3.50	2.50	5.00	0.38	0.03
3 1/2	4.00	3.00	5.50	0.38	0.03
4	4.50	3.00	5.50	0.38	0.03
5	5.56	3.00	7.31	0.44	0.06
6	6.62	3.50	8.50	0.50	0.06
8	8.62	4.00	10.62	0.50	0.06
10	10.75	5.00	12.75	0.50	0.06
12	12.75	6.00	15.00	0.50	0.06
14	14.00	6.00	16.25	0.50	0.06
16	16.00	6.00	18.50	0.50	0.06
18	18.00	6.00	21.00	0.50	0.06
20	20.00	6.00	23.00	0.50	0.06
24	24.00	6.00	27.25	0.50	0.06

Wall Thickness T			Approx. Weight (kg)		
Sch 5s	Sch 10s	Sch 40s	Sch 5s	Sch 10s	Sch 40s
0.065	0.083	0.109	0.049	0.062	0.079
0.065	0.083	0.113	0.064	0.081	0.101
0.065	0.109	0.133	0.082	0.134	0.160
0.065	0.109	0.140	0.109	0.178	0.225
0.065	0.109	0.145	0.129	0.213	0.279
0.065	0.109	0.154	0.204	0.338	0.471
0.083	0.120	0.203	0.313	0.448	0.740
0.083	0.120	0.216	0.400	0.574	1.010
0.083	0.120	0.226	0.522	0.750	1.380
0.083	0.120	0.237	0.606	0.870	1.680
0.109	0.134	0.258	0.985	1.210	2.280
0.109	0.134	0.280	1.340	1.640	3.370
0.109	0.148	0.322	1.960	2.650	5.670
0.134	0.165	0.365	3.570	4.380	9.550
0.156	0.180	0.375	5.850	6.740	13.800
0.156	0.188	×	6.420	7.730	×
0.165	0.188	×	7.910	9.000	×
0.165	0.188	×	9.240	10.500	×
0.188	0.218	×	11.700	13.500	×
0.218	0.250	×	16.500	18.900	×

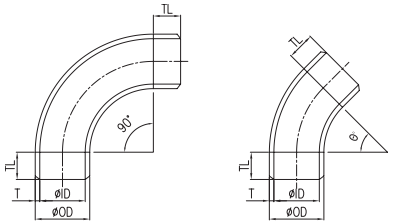
- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362

- Wall Thickness Conform to ASME B 36.10M Specifications

1. Minimun Lap Thickness Shall Not Be Less Than Nominnal Wall Thickness.
2. Contact Faces of Stub Ends Shall Have a Modified Spiral or Concentric Serration.

Pipe Bend

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9 / PFI STD ES-24

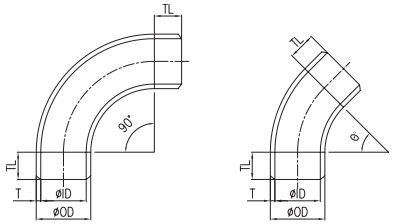
(Unit : inch)

Nominal Pipe Size	Outside Diameter OD	STD		Sch40	
		T	ID	T	ID
1/2	0.840	0.109	0.622	0.109	0.622
3/4	1.050	0.113	0.827	0.113	0.827
1	1.315	0.133	1.047	0.133	1.047
1 1/4	1.660	0.140	1.382	0.140	1.382
1 1/2	1.900	0.145	1.610	0.145	1.610
2	2.375	0.154	2.067	0.154	2.067
2 1/2	2.875	0.203	2.469	0.203	2.469
3	3.500	0.216	3.067	0.216	3.067
3 1/2	4.000	0.226	3.547	0.226	3.547
4	4.500	0.237	4.028	0.237	4.028
5	5.563	0.258	5.047	0.258	5.047
6	6.625	0.280	6.067	0.280	6.067
8	8.625	0.322	7.980	0.322	7.980
10	10.750	0.365	10.020	0.365	10.020
12	12.750	0.375	11.996	0.406	11.937
14	14.000	0.375	13.248	0.438	13.122
16	16.000	0.375	15.248	0.500	15.000
18	18.000	0.375	17.240	0.562	16.870
20	20.000	0.375	19.248	0.594	18.811
22	22.000	0.375	21.256		
24	24.000	0.375	23.264	0.688	22.638
26	26.000	0.375	25.232		
28	28.000	0.375	27.240		

X-S		Sch80		Sch160		XX-S	
T	ID	T	ID	T	ID	T	ID
0.147	0.543	0.147	0.543	0.188	0.461	0.294	0.252
0.154	0.744	0.154	0.744	0.219	0.614	0.308	0.437
0.179	0.957	0.179	0.957	0.250	0.815	0.358	0.598
0.191	1.280	0.191	1.280	0.250	1.161	0.382	0.898
0.200	1.500	0.200	1.500	0.281	1.339	0.400	1.102
0.218	1.937	0.218	1.937	0.344	1.685	0.436	1.504
0.276	2.323	0.276	2.323	0.375	2.122	0.552	1.772
0.300	2.902	0.300	2.902	0.438	2.622	0.600	2.299
0.318	3.362	0.318	3.362				
0.337	3.827	0.337	3.827	0.531	3.437	0.674	3.154
0.375	4.811	0.375	4.811	0.625	4.311	0.750	4.063
0.432	5.764	0.432	5.764	0.719	5.189	0.864	4.898
0.500	7.626	0.500	7.626	0.906	6.815	0.875	6.874
0.500	9.748	0.594	9.559	1.125	8.496	1.000	8.748
0.500	11.748	0.688	11.370	1.312	10.126	1.000	10.748
0.500	13.000	0.750	12.500	1.406	11.189		
0.500	15.000	0.844	14.311	1.594	12.811		
0.500	16.992	0.938	16.114	1.781	14.429		
0.500	19.000	1.031	17.937	1.969	16.063		
0.500	21.008	1.125	19.756	2.125	17.756		
0.500	23.016	1.219	21.579	2.344	19.327		
0.500	24.984						
0.500	26.992						

Pipe Bend

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9 / PFI STD ES-24

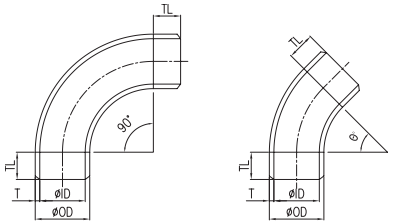
(Unit : inch)

Nominal Pipe Size	Outside Diameter OD	STD		Sch40		X-S		Sch80		Sch160		XX-S	
		T	ID	T	ID	T	ID	T	ID	T	ID	T	ID
30	30.000	0.375	29.248			0.500	29.000						
32	32.000	0.375	31.256	0.688	30.630	0.500	31.008						
34	34.000	0.375	33.264	0.688	32.638	0.500	33.016						
36	36.000	0.375	35.232	0.750	34.484	0.500	34.984						
38	38.000	0.375	37.240			0.500	36.992						
40	40.000	0.375	39.248			0.500	39.000						
42	42.000	0.375	41.256			0.500	41.008						
44	44.000	0.375	43.264			0.500	43.016						
46	46.000	0.375	45.232			0.500	44.984						
48	48.000	0.375	47.240			0.500	46.992						

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- TL, R, Ø : Specified in Purchaser order
- For General Bending Range See Page 086

Pipe Bend

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9 / PFI STD ES-24

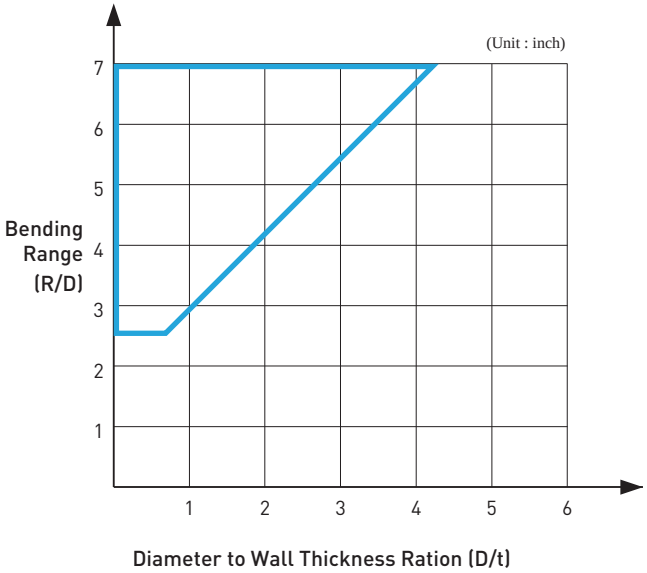
(Unit : inch)

Nominal Pipe Size	Outside Diameter OD	Sch20		Sch60		Sch100		Sch120		Sch140	
		T	ID	T	ID	T	ID	T	ID	T	ID
4	4.500							0.438	3.622		
5	5.563							0.500	4.563		
6	6.625							0.562	5.504		
8	8.625	0.250	8.126	0.406	7.815	0.594	7.437	0.719	7.189	0.812	7.004
10	10.750	0.250	10.248	0.500	9.748	0.719	9.311	0.844	9.059	1.000	8.748
12	12.750	0.250	12.248	0.562	11.626	0.844	11.059	1.000	10.748	1.125	10.496
14	14.000	0.312	13.378	0.594	12.811	0.938	12.122	1.094	11.811	1.250	11.500
16	16.000	0.312	15.378	0.656	14.689	1.031	13.937	1.219	13.563	1.438	13.122
18	18.000	0.312	17.370	0.750	16.492	1.156	15.681	1.375	15.240	1.562	14.870
20	20.000	0.375	19.248	0.812	18.378	1.281	17.437	1.500	17.000	1.750	16.500
22	22.000	0.375	21.256	0.875	20.256	1.375	19.256	1.625	18.756	1.875	18.256
24	24.000	0.375	23.264	0.969	22.079	1.531	20.953	1.812	20.394	2.062	19.894

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- TL, R, Ø : Specified in Purchaser order
- For General Bending Range See Page 086

TK corporation

General Bending Range



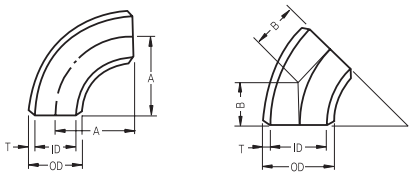
Where :
D = Pipe Outside Diameter in inch
t = Pipe Wall Thickness in inch
R = Bending Radius in inch

※ Bending Capacity (Carbon Steel)
- Min. OD = 12inch, Max. OD = 98inch
- Max. Wall Thickness : 8inch at Min. OD of 20inch

WROUGHT STAINLESS STEEL BUTT WELD PIPE FITTINGS

90° Elbow (Long, Short)
45° Elbow (Long)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : inch)

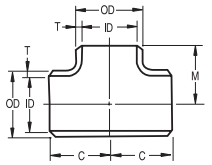
Nominal Pipe Size	Outside Diameter O.D	Center to End			5S	
		Long		Short	T	I.D
		A	B	A		
1/2	0.840	1.50	0.62		0.065	0.710
3/4	1.050	1.05	0.75		0.065	0.920
1	1.315	1.50	0.88	1.00	0.065	1.185
1-1/4	1.660	1.88	1.00	1.25	0.065	1.530
1-1/2	1.900	2.25	1.12	1.50	0.065	1.770
2	2.375	3.00	1.38	2.00	0.065	2.245
2-1/2	2.875	3.75	1.75	2.50	0.083	2.709
3	3.500	4.25	2.00	3.00	0.083	3.334
3-1/2	4.000	5.25	2.25	3.50	0.083	3.834
4	4.500	6.00	2.50	4.00	0.083	4.334
5	5.563	7.50	3.12	5.00	0.109	5.345
6	6.625	9.00	3.75	6.00	0.109	6.407
8	8.625	12.00	5.00	8.00	0.109	8.407
10	10.750	15.00	6.25	10.00	0.134	10.482
12	12.750	18.00	7.50	12.00	0.156	12.438
14	14.000	21.00	8.75	14.00	0.156	13.688
16	16.000	24.00	10.00	16.00	0.165	15.670
18	18.000	27.00	11.25	18.00	0.165	17.670
20	20.000	30.00	12.50	20.00	0.188	19.624
22	22.000	33.00	13.50	22.00	0.188	21.624
24	24.000	36.00	15.00	24.00	0.218	23.564
30	30.000	45.00	18.50		0.250	29.500

Nominal Pipe Size	10S		40S		80S	
	T	I.D	T	I.D	T	I.D
1/2	0.083	0.674	0.109	0.622	0.147	0.546
3/4	0.083	0.884	0.113	0.824	0.154	0.742
1	0.109	1.097	0.133	1.049	0.179	0.957
1-1/4	0.109	1.442	0.140	1.380	0.191	1.278
1-1/2	0.109	1.682	0.145	1.610	0.200	1.500
2	0.109	2.157	0.154	2.067	0.218	1.939
2-1/2	0.120	2.635	0.203	2.469	0.276	2.323
3	0.120	3.260	0.216	3.068	0.300	2.900
3-1/2	0.120	3.760	0.226	3.548	0.318	3.364
4	0.120	4.260	0.237	4.026	0.337	3.826
5	0.134	5.295	0.258	5.047	0.375	4.813
6	0.134	6.357	0.280	6.065	0.432	5.761
8	0.148	8.329	0.322	7.981	0.500	7.625
10	0.165	10.420	0.365	10.020	0.500	9.750
12	0.180	12.390	0.375	12.000	0.500	11.750
14	0.188	13.624	0.375	13.250	0.500	13.000
16	0.188	15.624	0.375	15.250	0.500	15.000
18	0.188	17.624	0.375	17.250	0.500	17.000
20	0.218	19.564	0.375	19.250	0.500	19.000
22	0.218	21.564				
24	0.250	23.500	0.375	23.250	0.500	23.000
30	0.312	29.376				

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Tee (Straight)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

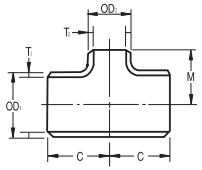
(Unit : inch)

Nominal Pipe Size	Outside Diameter O.D	Center to End		5S		10S		40S		80S	
		Run C	Outlet M	T	I.D	T	I.D	T	I.D	T	I.D
1/2	0.840	1.00	1.00	0.065	0.710	0.083	0.674	0.109	0.622	0.147	0.546
3/4	1.050	1.12	1.12	0.065	0.920	0.083	0.884	0.113	0.824	0.154	0.742
1	1.315	1.50	1.50	0.065	1.185	0.109	1.097	0.133	1.049	0.179	0.957
1-1/4	1.660	1.88	1.88	0.065	1.530	0.109	1.442	0.140	1.380	0.191	1.278
1-1/2	1.900	2.25	2.25	0.065	1.770	0.109	1.682	0.145	1.610	0.200	1.500
2	2.375	2.50	2.50	0.065	2.245	0.109	2.157	0.154	2.067	0.218	1.939
2-1/2	2.875	3.00	3.00	0.083	2.709	0.120	2.635	0.203	2.469	0.276	2.323
3	3.500	3.38	3.38	0.083	3.334	0.120	3.260	0.216	3.068	0.300	2.900
3-1/2	4.000	3.75	3.75	0.083	3.834	0.120	3.760	0.226	3.548	0.318	3.364
4	4.500	4.12	4.12	0.083	4.334	0.120	4.260	0.237	4.026	0.337	3.826
5	5.563	4.88	4.88	0.109	5.345	0.134	5.295	0.258	5.047	0.375	4.813
6	6.625	5.62	5.62	0.109	6.407	0.134	6.402	0.280	6.065	0.432	5.761
8	8.625	7.00	7.00	0.109	8.407	0.148	8.402	0.322	7.981	0.500	7.625
10	10.750	8.50	8.50	0.134	10.482	0.165	10.420	0.365	10.020	0.500	9.750
12	12.750	10.00	10.00	0.156	12.438	0.180	12.390	0.375	12.000	0.500	11.750
14	14.000	11.00	11.00	0.156	13.688	0.188	13.624	0.375	13.250	0.500	13.000
16	16.000	12.00	12.00	0.165	15.670	0.188	15.624	0.375	15.250	0.500	15.000
18	18.000	13.50	13.50	0.165	17.670	0.188	17.624	0.375	17.250	0.500	17.000
20	20.000	15.00	15.00	0.188	19.624	0.218	19.564	0.375	19.250	0.500	19.000
22	22.000	16.50	16.50	0.188	21.624	0.218	21.564				
24	24.000	17.00	17.00	0.218	23.564	0.250	23.500	0.375	23.250	0.500	23.000
30	30.000	22.00	22.00	0.250	29.500	0.312	29.376				

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Tee (Reducing)

Sch5s, Sch10s, Sch40s, Sch80s



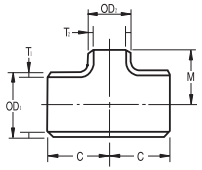
ASME B16.9, MSS SP-43

(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		5S		10S		40S		80S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2
3/4 X 3/4 X 1/2	1.050	0.840	1.12	1.12	0.065	0.065	0.083	0.083	0.113	0.109	0.154	0.147
1 X 1 X 3/4	1.315	1.050	1.50	1.50	0.065	0.065	0.109	0.083	0.133	0.113	0.179	0.154
1 X 1 X 1/2	1.315	0.840	1.50	1.50	0.065	0.065	0.109	0.083	0.133	0.109	0.179	0.147
1-1/4 X 1-1/4 X 1	1.660	1.315	1.88	1.88	0.065	0.065	0.109	0.109	0.140	0.133	0.191	0.179
1-1/4 X 1-1/4 X 3/4	1.660	1.050	1.88	1.88	0.065	0.065	0.109	0.083	0.140	0.113	0.191	0.154
1-1/2 X 1-1/2 X 1-1/4	1.900	1.660	2.25	2.25	0.065	0.065	0.109	0.109	0.145	0.140	0.200	0.191
1-1/2 X 1-1/2 X 1	1.900	1.315	2.25	2.25	0.065	0.065	0.109	0.109	0.145	0.133	0.200	0.179
1-1/2 X 1-1/2 X 3/4	1.900	1.050	2.25	2.25	0.065	0.065	0.109	0.083	0.145	0.113	0.200	0.154
2 X 2 X 1-1/2	2.375	1.900	2.50	2.38	0.065	0.065	0.109	0.109	0.154	0.145	0.218	0.200
2 X 2 X 1-1/4	2.375	1.660	2.50	2.25	0.065	0.065	0.109	0.109	0.154	0.140	0.218	0.191
2 X 2 X 1	2.375	1.315	2.50	2.00	0.065	0.065	0.109	0.109	0.154	0.133	0.218	0.179
2-1/2 X 2-1/2 X 2	2.875	2.375	3.00	2.75	0.083	0.065	0.120	0.109	0.203	0.154	0.276	0.218
2-1/2 X 2-1/2 X 1-1/2	2.875	1.900	3.00	2.62	0.083	0.065	0.120	0.109	0.203	0.145	0.276	0.200
2-1/2 X 2-1/2 X 1-1/4	2.875	1.660	3.00	2.50	0.083	0.065	0.120	0.109	0.203	0.140	0.276	0.191
3 X 3 X 2-1/2	3.500	2.875	3.38	3.25	0.083	0.065	0.120	0.120	0.216	0.203	0.300	0.276
3 X 3 X 2	3.500	2.375	3.38	3.00	0.083	0.083	0.120	0.109	0.216	0.154	0.300	0.218
3 X 3 X 1-1/2	3.500	1.900	3.38	2.88	0.083	0.065	0.120	0.109	0.216	0.145	0.300	0.200
3-1/2 X 3-1/2 X 3	4.000	3.500	3.75	3.62	0.083	0.083	0.120	0.120	0.226	0.216	0.318	0.300
3-1/2 X 3-1/2 X 2-1/2	4.000	2.875	3.75	3.50	0.083	0.083	0.120	0.120	0.226	0.203	0.318	0.276
3-1/2 X 3-1/2 X 2	4.000	2.375	3.75	3.25	0.083	0.065	0.120	0.109	0.226	0.154	0.318	0.218
3-1/2 X 3-1/2 X 1-1/2	4.000	1.900	3.75	3.12	0.083	0.065	0.120	0.109	0.226	0.145	0.318	0.200
4 X 4 X 3-1/2	4.500	4.000	4.12	4.00	0.083	0.083	0.120	0.120	0.237	0.226	0.337	0.318
4 X 4 X 3	4.500	3.500	4.12	3.88	0.083	0.083	0.120	0.120	0.237	0.216	0.337	0.300
4 X 4 X 2-1/2	4.500	2.875	4.12	3.75	0.083	0.083	0.120	0.120	0.237	0.203	0.337	0.276
4 X 4 X 2	4.500	2.375	4.12	3.50	0.083	0.065	0.120	0.109	0.237	0.154	0.337	0.218

Tee (Reducing)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

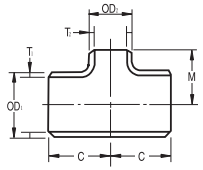
(Unit : inch)

Nominal Pipe Size	Outside Diameter		Center to End		5S	
	OD1	OD2	Run C	Outlet M	T1	T2
5 X 5 X 4	5.563	4.500	4.88	4.62	0.109	0.083
5 X 5 X 3-1/2	5.563	4.000	4.88	4.50	0.109	0.083
5 X 5 X 3	5.563	3.500	4.88	4.38	0.109	0.083
5 X 5 X 2-1/2	5.563	2.875	4.88	4.25	0.109	0.083
6 X 6 X 5	6.625	5.563	5.62	5.38	0.109	0.109
6 X 6 X 4	6.625	4.500	5.62	5.12	0.109	0.083
6 X 6 X 3-1/2	6.625	4.000	5.62	5.00	0.109	0.083
6 X 6 X 3	6.625	3.500	5.62	4.88	0.109	0.083
8 X 8 X 6	8.625	6.625	7.00	6.62	0.109	0.109
8 X 8 X 5	8.625	5.563	7.00	6.38	0.109	0.109
8 X 8 X 4	8.625	4.500	7.00	6.12	0.109	0.083
10 X 10 X 8	10.750	8.625	8.50	8.00	0.134	0.109
10 X 10 X 6	10.750	6.625	8.50	7.62	0.134	0.109
10 X 10 X 5	10.750	5.563	8.50	7.50	0.134	0.109
12 X 12 X 10	12.750	10.750	10.00	9.50	0.156	0.134
12 X 12 X 8	12.750	8.625	10.00	9.00	0.156	0.109
12 X 12 X 6	12.750	6.625	10.00	8.62	0.156	0.109
14 X 14 X 12	14.000	12.750	11.00	10.62	0.156	0.156
14 X 14 X 10	14.000	10.750	11.00	10.12	0.156	0.134
14 X 14 X 8	14.000	8.625	11.00	9.75	0.156	0.109
16 X 16 X 14	16.000	14.000	12.00	12.00	0.165	0.156
16 X 16 X 12	16.000	12.750	12.00	11.62	0.165	0.156
16 X 16 X 10	16.000	10.750	12.00	11.12	0.165	0.134
18 X 18 X 16	18.000	16.000	13.50	13.00	0.165	0.165
18 X 18 X 14	18.000	14.000	13.50	13.00	0.165	0.156

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
5 X 5 X 4	0.134	0.120	0.258	0.237	0.395	0.337
5 X 5 X 3-1/2	0.134	0.120	0.258	0.226	0.395	0.318
5 X 5 X 3	0.134	0.120	0.258	0.216	0.395	0.300
5 X 5 X 2-1/2	0.134	0.120	0.258	0.203	0.395	0.276
6 X 6 X 5	0.134	0.134	0.280	0.258	0.432	0.375
6 X 6 X 4	0.134	1.120	0.280	0.237	0.432	0.337
6 X 6 X 3-1/2	0.134	1.120	0.280	0.226	0.432	0.318
6 X 6 X 3	0.134	1.120	0.280	0.216	0.432	0.300
8 X 8 X 6	0.148	0.134	0.322	0.280	0.500	0.432
8 X 8 X 5	0.148	0.134	0.322	0.258	0.500	0.375
8 X 8 X 4	0.148	0.120	0.322	0.237	0.500	0.337
10 X 10 X 8	0.165	0.148	0.365	0.322	0.500	0.500
10 X 10 X 6	0.165	0.134	0.365	0.280	0.500	0.432
10 X 10 X 5	0.165	0.134	0.365	0.258	0.500	0.375
12 X 12 X 10	0.180	0.165	0.375	0.365	0.500	0.500
12 X 12 X 8	0.180	0.148	0.375	0.322	0.050	0.500
12 X 12 X 6	0.180	0.134	0.375	0.280	0.500	0.432
14 X 14 X 12	0.188	0.180	0.375	0.375	0.500	0.500
14 X 14 X 10	0.188	0.165	0.375	0.365	0.500	0.500
14 X 14 X 8	0.188	0.148	0.375	0.322	0.500	0.500
16 X 16 X 14	0.188	0.188	0.375	0.375	0.500	0.500
16 X 16 X 12	0.188	0.180	0.375	0.375	0.500	0.500
16 X 16 X 10	0.188	0.165	0.375	0.365	0.500	0.500
18 X 18 X 16	0.188	0.188	0.375	0.375	0.500	0.500
18 X 18 X 14	0.188	0.188	0.375	0.375	0.500	0.500

Tee (Reducing)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : inch)

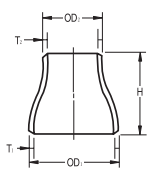
Nominal Pipe Size	Outside Diameter		Center to End		5S	
	OD1	OD2	Run C	Outlet M	T1	T2
18 X 18 X 12	18.000	12.750	13.50	12.62	0.165	0.156
20 X 20 X 18	20.000	18.000	15.00	14.50	0.188	0.165
20 X 20 X 16	20.000	16.000	15.00	14.00	0.188	0.165
20 X 20 X 14	20.000	14.000	15.00	14.00	0.188	0.156
22 X 22 X 20	22.000	20.000	16.50	16.00	0.188	0.188
22 X 22 X 18	22.000	18.000	16.50	15.50	0.188	0.165
22 X 22 X 16	22.000	16.000	16.50	15.00	0.188	0.165
24 X 24 X 22	24.000	22.000	17.00	17.00	0.218	0.188
24 X 24 X 20	24.000	20.000	17.00	17.00	0.218	0.188
24 X 24 X 18	24.000	18.000	17.00	16.50	0.218	0.165
30 X 30 X 24	30.000	24.000	22.00	21.00	0.250	0.218
30 X 30 X 22	30.000	22.000	22.00	20.50	0.250	0.188
30 X 30 X 20	30.000	20.000	22.00	20.00	0.250	0.188

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
18 X 18 X 12	0.188	0.180	0.375	0.375	0.500	0.500
20 X 20 X 18	0.218	0.188	0.375	0.375	0.500	0.500
20 X 20 X 16	0.218	0.188	0.375	0.375	0.500	0.500
20 X 20 X 14	0.218	0.188	0.375	0.375	0.500	0.500
22 X 22 X 20	0.218	0.218		0.375		0.500
22 X 22 X 18	0.218	0.188		0.375		0.500
22 X 22 X 16	0.218	0.188		0.375		0.500
24 X 24 X 22	0.250	0.218	0.375		0.500	
24 X 24 X 20	0.250	0.218	0.375	0.375	0.500	0.500
24 X 24 X 18	0.250	0.188	0.375	0.375	0.500	0.500
30 X 30 X 24	0.312	0.250		0.375		0.500
30 X 30 X 22	0.312	0.218				
30 X 30 X 20	0.312	0.218		0.375		0.500

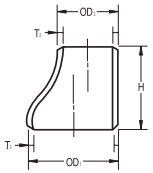
- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Reducer

Sch5s, Sch10s, Sch40s, Sch80s



Concentric



Eccentric

ASME B16.9, MSS SP-43

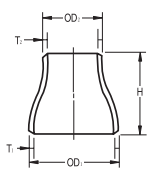
(Unit : inch)

Nominal Pipe Size	Outside Diameter		End to End	5S	
	OD1	OD2	H	T1	T2
3/4 X 1/2	1.050	0.840	1.50	0.065	0.065
1 X 3/4	1.315	1.050	2.00	0.065	0.065
1 X 1/2	1.315	0.840	2.00	0.065	0.065
1-1/4 X 1	1.660	1.315	2.00	0.065	0.065
1/4 X 3/4	1.660	1.050	2.00	0.065	0.065
1-1/4 X 1/2	1.660	0.840	2.00	0.065	0.065
1-1/2 X 1-1/4	1.900	1.660	2.50	0.065	0.065
1-1/2 X 1	1.900	1.315	2.50	0.065	0.065
1-1/2 X 3/4	1.900	1.050	2.50	0.065	0.065
1-1/2 X 1/2	1.900	0.840	2.50	0.065	0.065
2 X 1-1/2	2.375	1.900	3.00	0.065	0.065
2 X 1-1/4	2.375	1.660	3.00	0.065	0.065
2 X 1	2.375	1.315	3.00	0.065	0.065
2 X 3/4	2.375	1.050	3.00	0.065	0.065
2-1/2 X 2	2.875	2.375	3.50	0.083	0.065
2-1/2 X 1-1/2	2.875	1.900	3.50	0.083	0.065
2-1/2 X 1-1/4	2.875	1.660	3.50	0.083	0.065
3 X 2-1/2	3.500	2.875	3.50	0.083	0.083
3 X 2	3.500	2.375	3.50	0.083	0.065
3 X 1-1/2	3.500	1.900	3.50	0.083	0.065
3 X 1-1/4	3.500	1.660	3.50	0.083	0.065
3-1/2 X 3	4.000	3.500	4.00	0.083	0.083
3-1/2 X 2-1/2	4.000	2.875	4.00	0.083	0.083
3-1/2 X 2	4.000	2.375	4.00	0.083	0.065
4 X 3-1/2	4.500	4.000	4.00	0.083	0.083
4 X 3	4.500	3.500	4.00	0.083	0.083

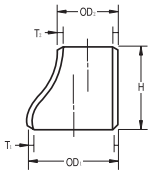
Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
3/4 X 1/2	0.083	0.083	0.113	0.109	0.154	0.147
1 X 3/4	0.109	0.083	0.133	0.113	0.179	0.154
1 X 1/2	0.109	0.083	0.133	0.109	0.179	0.147
1-1/4 X 1	0.109	0.109	0.140	0.133	0.191	0.179
1/4 X 3/4	0.109	0.083	0.140	0.113	0.191	0.154
1-1/4 X 1/2	0.109	0.083	0.140	0.109	0.191	0.147
1-1/2 X 1-1/4	0.109	0.109	0.145	0.140	0.200	0.191
1-1/2 X 1	0.109	0.109	0.145	0.133	0.200	0.179
1-1/2 X 3/4	0.109	0.083	0.145	0.113	0.200	0.154
1-1/2 X 1/2	0.109	0.083	0.145	0.109	0.200	0.147
2 X 1-1/2	0.109	0.109	0.154	0.145	0.218	0.200
2 X 1-1/4	0.109	0.109	0.154	0.140	0.218	0.191
2 X 1	0.109	0.109	0.154	0.133	0.218	0.179
2 X 3/4	0.109	0.083	0.154	0.113	0.218	0.154
2-1/2 X 2	0.120	0.109	0.203	0.154	0.276	0.218
2-1/2 X 1-1/2	0.120	0.109	0.203	0.145	0.276	0.200
2-1/2 X 1-1/4	0.120	0.109	0.203	0.140	0.276	0.191
3 X 2-1/2	0.120	0.120	0.216	0.203	0.300	0.276
3 X 2	0.120	0.109	0.216	0.154	0.300	0.218
3 X 1-1/2	0.120	0.109	0.216	0.145	0.300	0.200
3 X 1-1/4	0.120	0.109	0.216	0.140	0.300	0.191
3-1/2 X 3	0.120	0.120	0.226	0.216	0.318	0.300
3-1/2 X 2-1/2	0.120	0.120	0.226	0.203	0.318	0.276
3-1/2 X 2	0.120	0.109	0.226	0.154	0.318	0.218
4 X 3-1/2	0.120	0.120	0.237	0.226	0.337	0.318
4 X 3	0.120	0.120	0.237	0.216	0.337	0.300

Reducer

Sch5s, Sch10s, Sch40s, Sch80s



Concentric



Eccentric

ASME B16.9, MSS SP-43

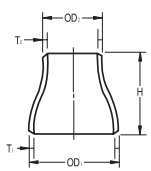
(Unit : inch)

Nominal Pipe Size	Outside Diameter		End to End	5S	
	OD1	OD2	H	T1	T2
4 X 2-1/2	4.500	2.875	4.00	0.083	0.083
4 X 2	4.500	2.375	4.00	0.083	0.065
5 X 4	5.563	4.500	5.00	0.109	0.083
5 X 3-1/2	5.563	4.000	5.00	0.109	0.083
5 X 3	5.563	3.500	5.00	0.109	0.083
5 X 2-1/2	5.563	2.875	5.00	0.109	0.083
6 X 5	6.625	5.563	5.50	0.109	0.109
6 X 4	6.625	4.500	5.50	0.109	0.083
6 X 3-1/2	6.625	4.000	5.50	0.109	0.083
6 X 3	6.625	3.500	5.50	0.109	0.083
8 X 6	8.625	6.625	6.00	0.109	0.109
8 X 5	8.625	5.563	6.00	0.109	0.109
8 X 4	8.625	4.500	6.00	0.109	0.083
10 X 8	10.750	8.625	7.00	0.134	0.109
10 X 6	10.750	6.625	7.00	0.134	0.109
10 X 5	10.750	5.563	7.00	0.134	0.109
12 X 10	12.750	10.750	8.00	0.156	0.134
12 X 8	12.750	8.625	8.00	0.156	0.109
12 X 6	12.750	6.625	8.00	0.156	0.109
14 X 12	14.000	12.750	13.00	0.156	0.156
14 X 10	14.000	10.750	13.00	0.156	0.134
14 X 8	14.000	8.625	13.00	0.156	0.109
16 X 14	16.000	14.000	14.00	0.165	0.156
16 X 12	16.000	12.750	14.00	0.165	0.156
16 X 10	16.000	10.750	14.00	0.165	0.134
18 X 16	18.000	16.000	15.00	0.165	0.165

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
4 X 2-1/2	0.120	0.120	0.237	0.203	0.337	0.276
4 X 2	0.120	0.109	0.237	0.154	0.337	0.218
5 X 4	0.134	0.120	0.258	0.237	0.375	0.337
5 X 3-1/2	0.134	0.120	0.258	0.226	0.375	0.318
5 X 3	0.134	0.120	0.258	0.216	0.375	0.300
5 X 2-1/2	0.134	0.120	0.258	0.203	0.375	0.276
6 X 5	0.134	0.134	0.280	0.258	0.432	0.375
6 X 4	0.134	1.120	0.280	0.237	0.432	0.337
6 X 3-1/2	0.134	1.120	0.280	0.226	0.432	0.318
6 X 3	0.134	1.120	0.280	0.216	0.432	0.300
8 X 6	0.148	0.134	0.322	0.280	0.500	0.432
8 X 5	0.148	0.134	0.322	0.258	0.500	0.375
8 X 4	0.148	0.120	0.322	0.237	0.500	0.337
10 X 8	0.165	0.148	0.365	0.322	0.500	0.500
10 X 6	0.165	0.134	0.365	0.280	0.500	0.432
10 X 5	0.165	0.134	0.365	0.258	0.500	0.375
12 X 10	0.180	0.165	0.375	0.365	0.500	0.500
12 X 8	0.180	0.148	0.375	0.322	0.500	0.500
12 X 6	0.180	0.134	0.375	0.280	0.500	0.432
14 X 12	0.188	0.180	0.375	0.375	0.500	0.500
14 X 10	0.188	0.165	0.375	0.365	0.500	0.500
14 X 8	0.188	0.148	0.375	0.322	0.500	0.500
16 X 14	0.188	0.188	0.375	0.375	0.500	0.500
16 X 12	0.188	0.180	0.375	0.375	0.500	0.500
16 X 10	0.188	0.165	0.375	0.365	0.500	0.500
18 X 16	0.188	0.188	0.375	0.375	0.500	0.500

Reducer

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : inch)

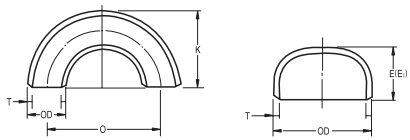
Nominal Pipe Size	Outside Diameter		End to End	5S	
	OD1	OD2	H	T1	T2
18 X 14	18.000	14.000	15.00	0.165	0.156
18 X 12	18.000	12.750	15.00	0.165	0.156
20 X 18	20.000	18.000	20.00	0.188	0.165
20 X 16	20.000	16.000	20.00	0.188	0.165
20 X 14	20.000	14.000	20.00	0.188	0.156
22 X 20	22.000	20.000	20.00	0.188	0.188
22 X 18	22.000	18.000	20.00	0.188	0.165
22 X 16	22.000	16.000	20.00	0.188	0.165
24 X 22	24.000	22.000	20.00	0.218	0.188
24 X 20	24.000	20.000	20.00	0.218	0.188
24 X 18	24.000	18.000	20.00	0.218	0.165
30 X 24	30.000	26.000	24.00	0.250	0.218
30 X 22	30.000	22.000	24.00	0.250	0.188
30 X 20	30.000	20.000	24.00	0.250	0.188

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
18 X 14	0.188	0.188	0.375	0.375	0.500	0.500
18 X 12	0.188	0.180	0.375	0.375	0.500	0.500
20 X 18	0.218	0.188	0.375	0.375	0.500	0.500
20 X 16	0.218	0.188	0.375	0.375	0.500	0.500
20 X 14	0.218	0.188	0.375	0.375	0.500	0.500
22 X 20	0.218	0.218		0.375		0.500
22 X 18	0.218	0.188		0.375		0.500
22 X 16	0.218	0.188		0.375		0.500
24 X 22	0.250	0.218	0.375		0.500	
24 X 20	0.250	0.218	0.375	0.375	0.500	0.500
24 X 18	0.250	0.188	0.375	0.375	0.500	0.500
30 X 24	0.312	0.250		0.375		0.500
30 X 22	0.312	0.218				
30 X 20	0.312	0.218		0.375		0.500

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

180° Elbow (Long, Short) Cap

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : inch)

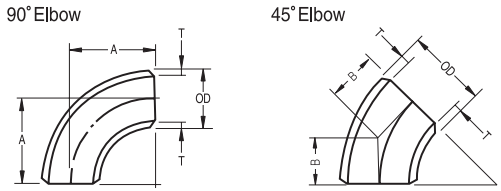
Nominal Pipe Size	Outside Diameter O.D	Wall Thickness				Length
		5S	10S	40S	80S	E
1/2	0.840	0.065	0.083	0.109	0.147	1.00
3/4	1.050	0.065	0.083	0.113	0.154	1.00
1	1.315	0.065	0.109	0.133	0.179	1.50
1-1/4	1.660	0.065	0.109	0.140	0.191	1.50
1-1/2	1.900	0.065	0.109	0.145	0.200	1.50
2	2.375	0.065	0.109	0.154	0.218	1.50
2-1/2	2.875	0.083	0.120	0.203	0.276	1.50
3	3.500	0.083	0.120	0.216	0.300	2.00
3-1/2	4.000	0.083	0.120	0.226	0.318	2.50
4	4.500	0.083	0.120	0.237	0.337	2.50
5	5.563	0.109	0.134	0.258	0.375	3.00
6	6.625	0.109	0.134	0.280	0.432	3.50
8	8.625	0.109	0.148	0.322	0.500	4.00
10	10.750	0.134	0.165	0.365	0.500	5.00
12	12.750	0.156	0.180	0.375	0.500	6.00
14	14.000	0.156	0.188	0.375	0.500	6.50
16	16.000	0.165	0.188	0.375	0.500	7.00
18	18.000	0.165	0.188	0.375	0.500	8.00
20	20.000	0.188	0.218	0.375	0.500	9.00
22	22.000	0.188	0.218			10.00
24	24.000	0.218	0.250	0.375	0.500	10.50
30	30.000	0.250	0.312			10.50

- Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."
- Length E_1 applies for thickness greater than that given in column 'Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

Nominal Pipe Size	Limiting Wall Thickness for Length E	Length	180° Elbow			
		E1	Long		Short	
			O	K	O	K
1/2	0.18	1.00		1.88		
3/4	0.15	1.00		1.69		
1	0.18	1.50		2.19	2.00	1.62
1-1/4	0.19	1.50	3.75	2.75	2.50	2.06
1-1/2	0.20	1.50	4.50	3.25	3.00	2.44
2	0.22	1.75	6.00	4.19	4.00	3.19
2-1/2	0.28	2.00	7.50	5.19	5.00	3.94
3	0.30	2.50	9.00	6.25	6.00	4.75
3-1/2	0.32	3.00	10.50	7.25	7.00	5.50
4	0.34	3.00	12.00	8.25	8.00	6.25
5	0.38	3.50	15.00	10.31	10.00	7.75
6	0.43	4.00	18.00	12.31	12.00	9.31
8	0.50	5.00	24.00	16.31	16.00	12.31
10	0.50	6.00	30.00	20.38	20.00	15.38
12	0.50	7.00	36.00	24.38	24.00	18.38
14	0.50	7.50	42.00	28.00	28.00	21.00
16	0.50	8.00	48.00	32.00	32.00	24.00
18	0.50	9.00	54.00	36.00	36.00	27.00
20	0.50	10.00	60.00	40.00	40.00	30.00
22	0.50	10.00	66.00	44.00	44.00	33.00
24	0.50	12.00	72.00	48.00	48.00	36.00
30						

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Special Fittings
Elbow (90°,45°)

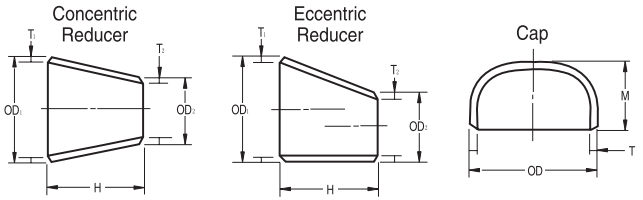


(Unit : inch)

Nominal Pipe Size	ELBOW					
	OD	Wall Thickness		LONG		SHORT
		STD	X-S	A	B	A
50	50.000	0.375	0.500	75.000	31.125	50.000
52	52.000	0.375	0.500	78.000	32.250	52.000
54	54.000	0.375	0.500	81.000	33.500	54.000
56	56.000	0.375	0.500	84.000	34.750	56.000
58	58.000	0.375	0.500	87.000	36.000	58.000
60	60.000	0.375	0.500	90.000	37.250	60.000
62	62.000	0.375	0.500	93.000	38.500	62.000
64	64.000	0.375	0.500	96.000	39.750	64.000
66	66.000	0.375	0.500	99.000	41.000	66.000
68	68.000	0.375	0.500	102.000	42.250	68.000
70	70.000	0.375	0.500	105.000	43.500	70.000
72	72.000	0.375	0.500	108.000	44.750	72.000
74	74.000	0.375	0.500	111.000	46.000	74.000
76	76.000	0.375	0.500	114.000	47.250	76.000
78	78.000	0.375	0.500	117.000	48.500	78.000
80	80.000	0.375	0.500	120.000	49.750	80.000
82	82.000	0.375	0.500	123.000	51.000	82.000

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.19M Specifications

Special Fittings
Reducer, Cap



(Unit : inch)

Nominal Pipe Size	REDUCER / CAP		
	OD	Wall Thickness	
		STD	X-S
50	50.000	0.375	0.500
52	52.000	0.375	0.500
54	54.000	0.375	0.500
56	56.000	0.375	0.500
58	58.000	0.375	0.500
60	60.000	0.375	0.500
62	62.000	0.375	0.500
64	64.000	0.375	0.500
66	66.000	0.375	0.500
68	68.000	0.375	0.500
70	70.000	0.375	0.500
72	72.000	0.375	0.500
74	74.000	0.375	0.500
76	76.000	0.375	0.500
78	78.000	0.375	0.500
80	80.000	0.375	0.500
82	82.000	0.375	0.500

- Reducer for 50" and above shall be Conical shape.
- Dimension 'H' to be provided by customer or agreed.
- Dimension 'M' for caps for 50" and above o be provided by customer or agreed.

TK corporation

ASME (Unit:mm)

Wrought Carbon Steel Butt Weld Pipe Fittings 110

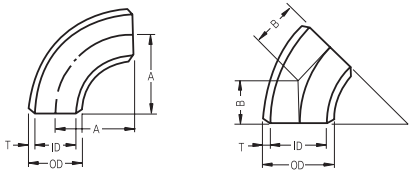
- 90° Elbow, 45° Elbow 110
- 180° Elbow 116
- Tee (Straight / Reducing / Special Fittings) 120
- Reducer 144
- Cap 156
- Pipe Bend 162
- General Bending Range 168

Wrought Stainless Steel Butt Weld Pipe Fittings 169

- 90° Elbow, 45° Elbow 170
- Tee (Straight / Reducing) 172
- Reducer 180
- 180° Elbow, Cap 186
- Special Fittings Elbow (90°, 45°) 188
- Special Fittings Reducer, Cap 189

90° Elbow (Long, Short)
45° Elbow (Long)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

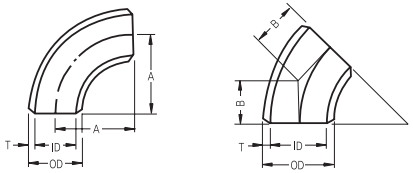
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Center to End			STD		Sch40	
		Long		Short	T	I.D	T	I.D
		A	B	A				
1/2	21.3	38	16		2.77	15.8	2.77	15.8
3/4	26.7	38	19		2.87	21.0	2.87	21.0
1	33.4	38	22	25	3.38	26.6	3.38	26.6
1 - 1/4	42.2	48	25	32	3.56	35.1	3.56	35.1
1 - 1/2	48.3	57	29	38	3.68	40.9	3.68	40.9
2	60.3	76	35	51	3.91	52.5	3.91	52.5
2 - 1/2	73.0	95	44	64	5.16	62.7	5.16	62.7
3	88.9	114	51	76	5.49	77.9	5.49	77.9
3 - 1/2	101.6	133	57	89	5.74	90.1	5.74	90.1
4	114.3	152	64	102	6.02	102.3	6.02	102.3
5	141.3	190	79	127	6.55	128.2	6.55	128.2
6	168.3	229	95	152	7.11	154.1	7.11	154.1
8	219.1	305	127	203	8.18	202.7	8.18	202.7
10	273.0	381	159	254	9.27	254.5	9.27	254.5
12	323.8	457	190	305	9.53	304.7	10.31	303.2
14	355.6	533	222	356	9.53	336.5	11.13	333.3
16	406.4	610	254	406	9.53	387.3	12.70	381.0
18	457.0	686	286	457	9.53	437.9	14.27	428.5
20	508.0	762	318	508	9.53	488.9	15.09	477.8
22	559.0	838	343	559	9.53	539.9		
24	610.0	914	381	610	9.53	590.9	17.48	575.0
26	660.0	991	406		9.53	640.9		
28	711.0	1067	438		9.53	691.9		
30	762.0	1143	470		9.53	742.9		
32	813.0	1219	502		9.53	793.9	17.48	778.0

X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
T	I.D	T	I.D	T	I.D	T	I.D	
3.73	13.8	3.73	13.8	4.78	11.7	7.47	6.4	1/2
3.91	18.9	3.91	18.9	5.56	15.6	7.82	11.1	3/4
4.55	24.3	4.55	24.3	6.35	20.7	9.09	15.2	1
4.85	32.5	4.85	32.5	6.35	29.5	9.70	22.8	1 - 1/4
5.08	38.1	5.08	38.1	7.14	34.0	10.15	28.0	1 - 1/2
5.54	49.2	5.54	49.2	8.74	42.8	11.07	38.2	2
7.01	59.0	7.01	59.0	9.53	53.9	14.02	45.0	2 - 1/2
7.62	73.7	7.62	73.7	11.13	66.6	15.24	58.4	3
8.08	85.4	8.08	85.4					3 - 1/2
8.56	97.2	8.56	97.2	13.49	87.3	17.12	80.1	4
9.53	122.2	9.53	122.2	15.88	109.5	19.05	103.2	5
10.97	146.4	10.97	146.4	18.26	131.8	21.95	124.4	6
12.70	193.7	12.70	193.7	23.01	173.1	22.23	174.6	8
12.70	247.6	15.09	242.8	28.58	215.8	25.40	222.2	10
12.70	298.4	17.48	288.8	33.32	257.2	25.40	273.0	12
12.70	330.2	19.05	317.5	35.71	284.2			14
12.70	381.0	21.44	363.5	40.49	325.4			16
12.70	431.6	23.83	409.3	45.24	366.5			18
12.70	482.6	26.19	455.6	50.01	408.0			20
12.70	533.6	28.58	501.8	53.98	451.0			22
12.70	584.6	30.96	548.1	59.54	490.9			24
12.70	634.6							26
12.70	685.6							28
12.70	736.6							30
12.70	787.6							32

90° Elbow (Long, Short)
45° Elbow (Long)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

(Unit : mm)

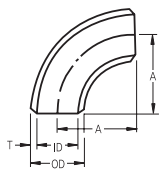
Nominal Pipe Size	Outside Diameter O.D	Center to End			STD		Sch40	
		Long		Short	T	I.D	T	I.D
		A	B	A				
34	864.0	1295	533		9.53	844.9	17.48	829.0
36	914.0	1372	565		9.53	894.9	19.05	875.9
38	965.0	1448	600		9.53	945.9		
40	1016.0	1524	632		9.53	996.9		
42	1067.0	1600	660		9.53	1047.9		
44	1118.0	1676	695		9.53	1098.9		
46	1168.0	1753	727		9.53	1148.9		
48	1219.0	1829	759		9.53	1199.9		

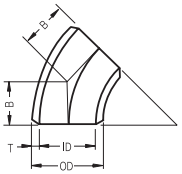
X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
T	I.D	T	I.D	T	I.D	T	I.D	
12.70	838.6							34
12.70	888.6							36
12.70	939.6							38
12.70	990.6							40
12.70	1041.6							42
12.70	1092.6							44
12.70	1142.6							46
12.70	1193.6							48

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

90° Elbow (Long, Short)
45° Elbow (Long)

Sch20, Sch60, Sch100, Sch120, Sch140





ASME B16.9

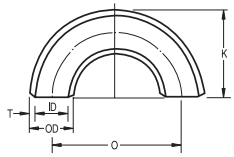
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Center to End			Sch20		Sch60		Sch100		Sch120		Sch140		-	-	Nominal Pipe Size
		Long		Short	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	-	-	
		A	B	A													
4	114.3	152	64	64							11.13	92.0					4
5	141.3	190	79	79							12.70	115.9					5
6	168.3	229	95	95							14.27	139.8					6
8	219.1	305	127	127	6.35	206.4	10.31	198.5	15.09	188.9	18.26	182.6	20.62	177.9			8
10	273.0	381	159	159	6.35	260.3	12.70	247.6	18.26	236.5	21.44	230.1	25.40	222.2			10
12	323.8	457	190	190	6.35	311.1	14.27	295.3	21.44	280.9	25.40	273.0	28.58	266.6			12
14	355.6	533	222	222	7.92	339.8	15.09	325.4	23.83	307.9	27.79	300.0	31.75	292.1			14
16	406.4	610	254	254	7.92	390.6	16.66	373.1	26.19	354.0	30.96	344.5	36.53	333.3			16
18	457.0	686	286	286	7.92	441.2	19.05	418.9	29.36	398.3	34.93	387.1	39.67	377.7			18
20	508.0	762	318	318	9.53	488.9	20.62	466.8	32.54	442.9	38.10	431.8	44.45	419.1			20
22	559.0	838	343	343	9.53	539.9	22.23	514.5	34.93	489.1	41.28	476.4	47.63	463.7			22
24	610.0	914	381	381	9.53	590.9	24.61	560.8	38.89	532.2	46.02	518.0	52.37	505.3			24

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

180° Elbow (Long, Short)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Long		Short		STD	
		O	K	O	K	T	I.D
1/2	21.3	76	48			2.77	15.8
3/4	26.7	76	51			2.87	21.0
1	33.4	76	56	51	41	3.38	26.6
1-1/4	42.2	95	70	64	52	3.56	35.1
1-1/2	48.3	114	83	76	62	3.68	40.9
2	60.3	152	106	102	81	3.91	52.5
2-1/2	73.0	190	132	127	100	5.16	62.7
3	88.9	229	159	152	121	5.49	77.9
3-1/2	101.6	267	184	178	140	5.74	90.1
4	114.3	305	210	203	159	6.02	102.3
5	141.3	381	262	254	197	6.55	128.2
6	168.3	457	313	305	237	7.11	154.1
8	219.1	610	414	406	313	8.18	202.7
10	273.0	762	518	508	391	9.27	254.5
12	323.8	914	619	610	467	9.53	304.7
14	355.6	1067	711	711	533	9.53	336.5
16	406.4	1219	813	813	610	9.53	387.3
18	457.0	1372	914	914	686	9.53	437.9
20	508.0	1524	1016	1016	762	9.53	488.9
22	559.0	1676	1118	1118	838	9.53	539.9
24	610.0	1829	1219	1219	914	9.53	590.9

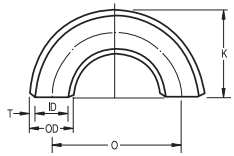
Sch40		X-S		Sch80		Sch160		XX-S	
T	I.D	T	I.D	T	I.D	T	I.D	T	I.D
2.77	15.8	3.73	13.8	3.73	13.8	4.78	11.7	7.47	6.4
2.87	21.0	3.91	18.9	3.91	18.9	5.56	15.6	7.82	11.1
3.38	26.6	4.55	24.3	4.55	24.3	6.35	20.7	9.09	15.2
3.56	35.1	4.85	32.5	4.85	32.5	6.35	29.5	9.70	22.8
3.68	40.9	5.08	38.1	5.08	38.1	7.14	34.0	10.15	28.0
3.91	52.5	5.54	49.2	5.54	49.2	8.74	42.8	11.07	38.2
5.16	62.7	7.01	59.0	7.01	59.0	9.53	53.9	14.02	45.0
5.49	77.9	7.62	73.7	7.62	73.7	11.13	66.6	15.24	58.4
5.74	90.1	8.08	85.4	8.08	85.4				
6.02	102.3	8.56	97.2	8.56	97.2	13.49	87.3	17.12	80.1
6.55	128.2	9.53	122.2	9.53	122.2	15.88	109.5	19.05	103.2
7.11	154.1	10.97	146.4	10.97	146.4	18.26	131.8	21.95	124.4
8.18	202.7	12.70	193.7	12.70	193.7	23.01	173.1	22.23	174.6
9.27	254.5	12.70	247.6	15.09	242.8	28.58	215.8	25.40	222.2
10.31	303.2	12.70	298.4	17.48	288.8	33.32	257.2	25.40	273.0
11.13	333.3	12.70	330.2	19.05	317.5	35.71	284.2		
12.70	381.0	12.70	381.0	21.44	363.5	40.49	325.4		
14.27	428.5	12.70	431.6	23.83	409.3	45.24	366.5		
15.09	477.8	12.70	482.6	26.19	455.6	50.01	408.0		
		12.70	533.6	28.58	501.8	53.98	451.0		
17.48	575.0	12.70	584.6	30.96	548.1	59.54	490.9		

- Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."
- Length E_1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

180° Elbow (Long, Short)

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9

(Unit : mm)

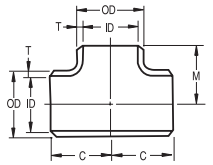
Nominal Pipe Size	Outside Diameter O.D	Long		Short		Sch20		Sch60		Sch100		Sch120		Sch140		Nominal Pipe Size
		O	K	O	K	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
4	114.3	305	210	203	159							11.13	92.0			4
5	141.3	381	262	254	197							12.70	115.9			5
6	168.3	457	313	305	237							14.27	139.8			6
8	219.1	610	414	406	313	6.35	206.4	10.31	198.5	15.09	188.9	18.26	182.6	20.62	177.9	8
10	273.0	762	518	508	391	6.35	260.3	12.70	247.6	18.26	236.5	21.44	230.1	25.40	222.2	10
12	323.8	914	619	610	467	6.35	311.1	14.27	295.3	21.44	280.9	25.40	273.0	28.58	266.6	12
14	355.6	1067	711	711	533	7.92	339.8	15.09	325.4	23.83	307.9	27.79	300.0	31.75	292.1	14
16	406.4	1219	813	813	610	7.92	390.6	16.66	373.1	26.19	354.0	30.96	344.5	36.53	333.3	16
18	457.0	1372	914	914	686	7.92	441.2	19.05	418.9	29.36	398.3	34.93	387.1	39.67	377.7	18
20	508.0	1524	1016	1016	762	9.53	488.9	20.62	466.8	32.54	442.9	38.10	431.8	44.45	419.1	20
22	559.0	1676	1118	1118	838	9.53	539.9	22.23	514.5	34.93	489.1	41.28	476.4	47.63	463.7	22
24	610.0	1829	1219	1219	914	9.53	590.9	24.61	560.8	38.89	532.2	46.02	518.0	52.37	505.3	24

- Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."
- Length E_1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Straight)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

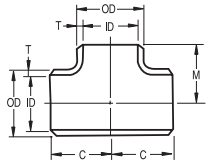
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Center to End		STD		Sch40	
		Run C	Outlet M	T	I.D	T	I.D
1/2	21.3	25	25	2.77	15.8	2.77	15.8
3/4	26.7	29	29	2.87	21.0	2.87	21.0
1	33.4	38	38	3.38	26.6	3.38	26.6
1-1/4	42.2	48	48	3.56	35.1	3.56	35.1
1-1/2	48.3	57	57	3.68	40.9	3.68	40.9
2	60.3	64	64	3.91	52.5	3.91	52.5
2-1/2	73.0	76	76	5.16	62.7	5.16	62.7
3	88.9	86	86	5.49	77.9	5.49	77.9
3-1/2	101.6	95	95	5.74	90.1	5.74	90.1
4	114.3	105	105	6.02	102.3	6.02	102.3
5	141.3	124	124	6.55	128.2	6.55	128.2
6	168.3	143	143	7.11	154.1	7.11	154.1
8	219.1	178	178	8.18	202.7	8.18	202.7
10	273.0	216	216	9.27	254.5	9.27	254.5
12	323.8	254	254	9.53	304.7	10.31	303.2
14	355.6	279	279	9.53	336.5	11.13	333.3
16	406.4	305	305	9.53	387.3	12.70	381.0
18	457.0	343	343	9.53	437.9	14.27	428.5
20	508.0	381	381	9.53	488.9	15.09	477.8
22	559.0	419	419	9.53	539.9		
24	610.0	432	432	9.53	590.9	17.48	575.0
26	660.0	495	495	9.53	640.9		
28	711.0	521	521	9.53	691.9		
30	762.0	559	559	9.53	742.9		
32	813.0	597	597	9.53	793.9	17.48	778.0
34	864.0	635	635	9.53	844.9	17.48	829.0

X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
T	I.D	T	I.D	T	I.D	T	I.D	
3.73	13.8	3.73	13.8	4.78	11.7	7.47	6.4	1/2
3.91	18.9	3.91	18.9	5.56	15.6	7.82	11.1	3/4
4.55	24.3	4.55	24.3	6.35	20.7	9.09	15.2	1
4.85	32.5	4.85	32.5	6.35	29.5	9.70	22.8	1-1/4
5.08	38.1	5.08	38.1	7.14	34.0	10.15	28.0	1-1/2
5.54	49.2	5.54	49.2	8.74	42.8	11.07	38.2	2
7.01	59.0	7.01	59.0	9.53	53.9	14.02	45.0	2-1/2
7.62	73.7	7.62	73.7	11.13	66.6	15.24	58.4	3
8.08	85.4	8.08	85.4					3-1/2
8.56	97.2	8.56	97.2	13.49	87.3	17.12	80.1	4
9.53	122.2	9.53	122.2	15.88	109.5	19.05	103.2	5
10.97	146.4	10.97	146.4	18.26	131.8	21.95	124.4	6
12.70	193.7	12.70	193.7	23.01	173.1	22.23	174.6	8
12.70	247.6	15.09	242.8	28.58	215.8	25.40	222.2	10
12.70	298.4	17.48	288.8	33.32	257.2	25.40	273.0	12
12.70	330.2	19.05	317.5	35.71	284.2			14
12.70	381.0	21.44	363.5	40.49	325.4			16
12.70	431.6	23.83	409.3	45.24	366.5			18
12.70	482.6	26.19	455.6	50.01	408.0			20
12.70	533.6	28.58	501.8	53.98	451.0			22
12.70	584.6	30.96	548.1	59.54	490.9			24
12.70	634.6							26
12.70	685.6							28
12.70	736.6							30
12.70	787.6							32
12.70	838.6							34

Tee (Straight)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

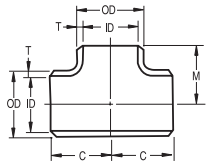
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
		Run C	Outlet M	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
36	914.0	673	673	9.53	894.9	19.05	875.9	12.70	888.6							36
38	965.0	711	711	9.53	945.9			12.70	939.6							38
40	1016.0	749	749	9.53	996.9			12.70	990.6							40
42	1067.0	762	711	9.53	1047.9			12.70	1041.6							42
44	1118.0	813	762	9.53	1098.9			12.70	1092.6							44
46	1168.0	851	800	9.53	1148.9			12.70	1142.6							46
48	1219.0	889	838	9.53	1199.9			12.70	1193.6							48

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Straight)

Sch20, Sch60, Sch100, Sch120



ASME B16.9

(Unit : mm)

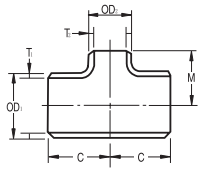
Nominal Pipe Size	Outside Diameter O.D	Center to End		Sch20	
		Run C	Outlet M	T	I.D
4	114.3	105	105		
5	141.3	124	124		
6	168.3	143	143		
8	219.1	178	178	6.35	206.4
10	273.0	216	216	6.35	260.3
12	323.8	254	254	6.35	311.1
14	355.6	279	279	7.92	339.8
16	406.4	305	305	7.92	390.6
18	457.0	343	343	7.92	441.2
20	508.0	381	381	9.53	488.9
22	559.0	419	419	9.53	539.9
24	610.0	432	432	9.53	590.9

Nominal Pipe Size	Sch60		Sch100		Sch120	
	T	I.D	T	I.D	T	I.D
4					11.13	92.0
5					12.70	115.9
6					14.27	139.8
8	10.31	198.5	15.09	188.9	18.26	182.6
10	12.70	247.6	18.26	236.5	21.44	230.1
12	14.27	295.3	21.44	280.9	25.40	273.0
14	15.09	325.4	23.83	307.9	27.79	300.0
16	16.66	373.1	26.19	354.0	30.96	344.5
18	19.05	418.9	29.36	398.3	34.93	387.1
20	20.62	466.8	32.54	442.9	38.10	431.8
22	22.23	514.5	34.93	489.1	41.28	476.4
24	24.61	560.8	38.89	532.2	46.02	518.0

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



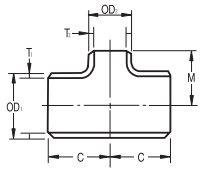
ASME B16.9

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
3/4 X 3/4 X 1/2	26.7	21.3	29	29	2.87	2.77	2.87	2.77	3.91	3.73	3.91	3.73	5.56	4.78	7.82	7.47
1 X 1 X 3/4	33.4	26.7	38	38	3.38	2.87	3.38	2.87	4.55	3.91	4.55	3.91	6.35	5.56	9.09	7.82
1 X 1 X 1/2	33.4	21.3	38	38	3.38	2.77	3.38	2.77	4.55	3.73	4.55	3.73	6.35	4.78	9.09	7.47
1-1/4 X 1-1/4 X 1	42.2	33.4	48	48	3.56	3.38	3.56	3.38	4.85	4.55	4.85	4.55	6.35	6.35	9.70	9.09
1-1/4 X 1-1/4 X 3/4	42.2	26.7	48	48	3.56	2.87	3.56	2.87	4.85	3.91	4.85	3.91	6.35	5.56	9.70	7.82
1-1/2 X 1-1/2 X 1-1/4	48.3	42.2	57	57	3.68	3.56	3.68	3.56	5.08	4.85	5.08	4.85	7.14	6.35	10.15	9.70
1-1/2 X 1-1/2 X 1	48.3	33.4	57	57	3.68	3.38	3.68	3.38	5.08	4.55	5.08	4.55	7.14	6.35	10.15	9.09
1-1/2 X 1-1/2 X 3/4	48.3	26.7	57	57	3.68	2.87	3.68	2.87	5.08	3.91	5.08	3.91	7.14	5.56	10.15	7.82
2 X 2 X 1-1/2	60.3	48.3	64	60	3.91	3.68	3.91	3.68	5.54	5.08	5.54	5.08	8.74	7.14	11.07	10.15
2 X 2 X 1-1/4	60.3	42.2	64	57	3.91	3.56	3.91	3.56	5.54	4.85	5.54	4.85	8.74	6.35	11.07	9.70
2 X 2 X 1	60.3	33.4	64	51	3.91	3.38	3.91	3.38	5.54	4.55	5.54	4.55	8.74	6.35	11.07	9.09
2-1/2 X 2-1/2 X 2	73.0	60.3	76	70	5.16	3.91	5.16	3.91	7.01	5.54	7.01	5.54	9.53	8.74	14.02	11.07
2-1/2 X 2-1/2 X 1-1/2	73.0	48.3	76	67	5.16	3.68	5.16	3.68	7.01	5.08	7.01	5.08	9.53	7.14	14.02	10.15
2-1/2 X 2-1/2 X 1-1/4	73.0	42.2	76	64	5.16	3.56	5.16	3.56	7.01	4.85	7.01	4.85	9.53	6.35	14.02	9.70
3 X 3 X 2-1/2	88.9	73.0	86	83	5.49	5.16	5.49	5.16	7.62	7.01	7.62	7.01	11.13	9.53	15.24	14.02
3 X 3 X 2	88.9	60.3	86	76	5.49	3.91	5.49	3.91	7.62	5.54	7.62	5.54	11.13	8.74	15.24	11.07
3 X 3 X 1-1/2	88.9	48.3	86	73	5.49	3.68	5.49	3.68	7.62	5.08	7.62	5.08	11.13	7.14	15.24	10.15
3-1/2 X 3-1/2 X 3	101.6	88.9	95	92	5.74	5.49	5.74	5.49	8.08	7.62	8.08	7.62		11.13		15.24
3-1/2 X 3-1/2 X 2-1/2	101.6	73.0	95	89	5.74	5.16	5.74	5.16	8.08	7.01	8.08	7.01		9.53		14.02
3-1/2 X 3-1/2 X 2	101.6	60.3	95	83	5.74	3.91	5.74	3.91	8.08	5.54	8.08	5.54		8.74		11.07
3-1/2 X 3-1/2 X 1-1/2	101.6	48.3	95	79	5.74	3.68	5.74	3.68	8.08	5.08	8.08	5.08		7.14		10.15
4 X 4 X 3-1/2	114.3	101.6	105	102	6.02	5.74	6.02	5.74	8.56	8.08	8.56	8.08	13.49		17.12	
4 X 4 X 3	114.3	88.9	105	98	6.02	5.49	6.02	5.49	8.56	7.62	8.56	7.62	13.49	11.13	17.12	15.24
4 X 4 X 2-1/2	114.3	73.0	105	95	6.02	5.16	6.02	5.16	8.56	7.01	8.56	7.01	13.49	9.53	17.12	14.02
4 X 4 X 2	114.3	60.3	105	89	6.02	3.91	6.02	3.91	8.56	5.54	8.56	5.54	13.49	8.74	17.12	11.07
5 X 5 X 4	141.3	114.3	124	117	6.55	6.02	6.55	6.02	9.53	8.56	9.53	8.56	15.88	13.49	19.05	17.12

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



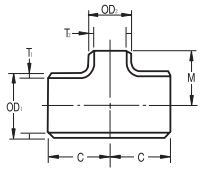
ASME B16.9

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
5 X 5 X 3-1/2	141.3	101.6	124	114	6.55	5.74	6.55	5.74	9.53	8.08	9.53	8.08	15.88		19.05	
5 X 5 X 3	141.3	88.9	124	111	6.55	5.49	6.55	5.49	9.53	7.62	9.53	7.62	15.88	11.13	19.05	15.24
5 X 5 X 2-1/2	141.3	73.0	124	108	6.55	5.16	6.55	5.16	9.53	7.01	9.53	7.01	15.88	9.53	19.05	14.02
6 X 6 X 5	168.3	141.3	143	137	7.11	6.55	7.11	6.55	10.97	9.53	10.97	9.53	18.26	15.88	21.95	19.05
6 X 6 X 4	168.3	114.3	143	130	7.11	6.02	7.11	6.02	10.97	8.56	10.97	8.56	18.26	13.49	21.95	17.12
6 X 6 X 3-1/2	168.3	101.6	143	127	7.11	5.74	7.11	5.74	10.97	8.08	10.97	8.08	18.26		21.95	
6 X 6 X 3	168.3	88.9	143	124	7.11	5.49	7.11	5.49	10.97	7.62	10.97	7.62	18.26	11.13	21.95	15.24
8 X 8 X 6	219.1	168.3	178	168	8.18	7.11	8.18	7.11	12.70	10.97	12.70	10.97	23.01	18.26	22.23	21.95
8 X 8 X 5	219.1	141.3	178	162	8.18	6.55	8.18	6.55	12.70	9.53	12.70	9.53	23.01	15.88	22.23	19.05
8 X 8 X 4	219.1	114.3	178	156	8.18	6.02	8.18	6.02	12.70	8.56	12.70	8.56	23.01	13.49	22.23	17.12
10 X 10 X 8	273.0	219.1	216	203	9.27	8.18	9.27	8.18	12.70	12.70	15.09	12.70	28.58	23.01	25.40	22.23
10 X 10 X 6	273.0	168.3	216	194	9.27	7.11	9.27	7.11	12.70	10.97	15.09	10.97	28.58	18.26	25.40	21.95
10 X 10 X 5	273.0	141.3	216	191	9.27	6.55	9.27	6.55	12.70	9.53	15.09	9.53	28.58	15.88	25.40	19.05
12 X 12 X 10	323.8	273.0	254	241	9.53	9.27	10.31	9.27	12.70	12.70	17.48	15.09	33.32	28.58	25.40	25.40
12 X 12 X 8	323.8	219.1	254	229	9.53	8.18	10.31	8.18	12.70	12.70	17.48	12.70	33.32	23.01	25.40	22.23
12 X 12 X 6	323.8	168.3	254	219	9.53	7.11	10.31	7.11	12.70	10.97	17.48	10.97	33.32	18.26	25.40	21.95
14 X 14 X 12	355.6	323.8	279	270	9.53	9.53	11.13	10.31	12.70	12.70	19.05	17.48	35.71	33.32		25.40
14 X 14 X 10	355.6	273.0	279	257	9.53	9.27	11.13	9.27	12.70	12.70	19.05	15.09	35.71	28.58		25.40
14 X 14 X 8	355.6	219.1	279	248	9.53	8.18	11.13	8.18	12.70	12.70	19.05	12.70	35.71	23.01		22.23
16 X 16 X 14	406.4	355.6	305	305	9.53	9.53	12.70	11.13	12.70	12.70	21.44	19.05	40.49	35.71		
16 X 16 X 12	406.4	323.8	305	295	9.53	9.53	12.70	10.31	12.70	12.70	21.44	17.48	40.49	33.32		25.40
16 X 16 X 10	406.4	273.0	305	283	9.53	9.27	12.70	9.27	12.70	12.70	21.44	15.09	40.49	28.58		25.40
18 X 18 X 16	457.0	406.4	343	330	9.53	9.53	14.27	12.70	12.70	12.70	23.83	21.44	45.24	40.49		
18 X 18 X 14	457.0	355.6	343	330	9.53	9.53	14.27	11.13	12.70	12.70	23.83	19.05	45.24	35.71		
18 X 18 X 12	457.0	323.8	343	321	9.53	9.53	14.27	10.31	12.70	12.70	23.83	17.48	45.24	33.32		25.40
20 X 20 X 18	508.0	457.0	381	368	9.53	9.53	15.09	14.27	12.70	12.70	26.19	23.83	50.01	45.24		

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



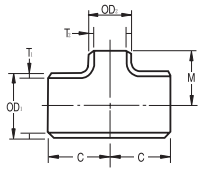
ASME B16.9

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
20 X 20 X 16	508.0	406.4	381	356	9.53	9.53	15.09	12.70	12.70	12.70	26.19	21.44	50.01	40.49		
20 X 20 X 14	508.0	355.6	381	356	9.53	9.53	15.09	11.13	12.70	12.70	26.19	19.05	50.01	35.71		
22 X 22 X 20	559.0	508.0	419	406	9.53	9.53		15.09	12.70	12.70	28.58	26.19	53.98	50.01		
22 X 22 X 18	559.0	457.0	419	394	9.53	9.53		14.27	12.70	12.70	28.58	23.83	53.98	45.24		
22 X 22 X 16	559.0	406.4	419	381	9.53	9.53		12.70	12.70	12.70	28.58	21.44	53.98	40.49		
24 X 24 X 22	610.0	559.0	432	432	9.53	9.53	17.48		12.70	12.70	30.96	28.58	59.54	53.98		
24 X 24 X 20	610.0	508.0	432	432	9.53	9.53	17.48	15.09	12.70	12.70	30.96	26.19	59.54	50.01		
24 X 24 X 18	610.0	457.0	432	419	9.53	9.53	17.48	14.27	12.70	12.70	30.96	23.83	59.54	45.24		
26 X 26 X 22	660.0	559.0	495	470	9.53	9.53			12.70	12.70		28.58		53.98		
26 X 26 X 18	660.0	457.0	495	444	9.53	9.53		14.27	12.70	12.70		23.83		45.24		
26 X 26 X 16	660.0	406.4	495	432	9.53	9.53		12.70	12.70	12.70		21.44		40.49		
28 X 28 X 24	711.0	610.0	521	508	9.53	9.53		17.48	12.70	12.70		30.96		59.54		
28 X 28 X 20	711.0	508.0	521	483	9.53	9.53		15.09	12.70	12.70		26.19		50.01		
28 X 28 X 18	711.0	457.0	521	470	9.53	9.53		14.27	12.70	12.70		23.83		45.24		
30 X 30 X 26	762.0	660.0	559	546	9.53	9.53			12.70	12.70						
30 X 30 X 22	762.0	559.0	559	521	9.53	9.53			12.70	12.70		28.58		53.98		
30 X 30 X 20	762.0	508.0	559	508	9.53	9.53		15.09	12.70	12.70		26.19		50.01		
32 X 32 X 28	813.0	711.0	597	559	9.53	9.53	17.48	17.48	12.70	12.70						
32 X 32 X 24	813.0	610.0	597	546	9.53	9.53	17.48	17.48	12.70	12.70		30.96		59.54		
32 X 32 X 22	813.0	559.0	597	559	9.53	9.53	17.48	17.48	12.70	12.70		28.58		53.98		
34 X 34 X 30	864.0	762.0	635	610	9.53	9.53	17.48		12.70	12.70						
34 X 34 X 26	864.0	660.0	635	597	9.53	9.53	17.48		12.70	12.70						
34 X 34 X 22	864.0	559.0	635	572	9.53	9.53	17.48		12.70	12.70		28.58		53.98		
36 X 36 X 32	914.0	813.0	673	648	9.53	9.53	19.05	17.48	12.70	12.70						
36 X 36 X 28	914.0	711.0	673	622	9.53	9.53	19.05		12.70	12.70						
36 X 36 X 24	914.0	610.0	673	610	9.53	9.53	19.05	17.48	12.70	12.70		30.96		59.54		

Tee (Reducing)

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

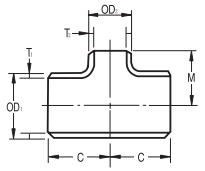
(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		STD		Sch40		X-S		Sch80		Sch160		XX-S	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
38 X 38 X 34	965.0	864.0	711	698	9.53	9.53		17.48	12.70	12.70						
38 X 38 X 30	965.0	762.0	711	673	9.53	9.53			12.70	12.70						
38 X 38 X 26	965.0	660.0	711	648	9.53	9.53			12.70	12.70						
40 X 40 X 36	1016.0	914.0	749	737	9.53	9.53		19.05	12.70	12.70						
40 X 40 X 32	1016.0	813.0	749	711	9.53	9.53		17.48	12.70	12.70						
40 X 40 X 28	1016.0	711.0	749	673	9.53	9.53			12.70	12.70						
42 X 42 X 38	1067.0	965.0	762	711	9.53	9.53			12.70	12.70						
42 X 42 X 34	1067.0	864.0	762	711	9.53	9.53		17.48	12.70	12.70						
42 X 42 X 30	1067.0	762.0	762	711	9.53	9.53			12.70	12.70						
44 X 44 X 40	1118.0	1016.0	813	749	9.53	9.53			12.70	12.70						
44 X 44 X 36	1118.0	914.0	813	724	9.53	9.53		19.05	12.70	12.70						
44 X 44 X 32	1118.0	813.0	813	711	9.53	9.53		17.48	12.70	12.70						
46 X 46 X 42	1168.0	1067.0	851	787	9.53	9.53			12.70	12.70						
46 X 46 X 38	1168.0	965.0	851	762	9.53	9.53			12.70	12.70						
46 X 46 X 34	1168.0	864.0	851	749	9.53	9.53		17.48	12.70	12.70						
48 X 48 X 44	1219.0	1118.0	889	838	9.53	9.53			12.70	12.70						
48 X 48 X 40	1219.0	1016.0	889	813	9.53	9.53			12.70	12.70						
48 X 48 X 36	1219.0	914.0	889	787	9.53	9.53		19.05	12.70	12.70						

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee (Reducing)

Sch20, Sch60, Sch100, Sch120, Sch140



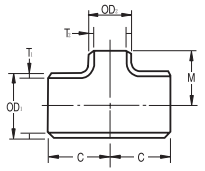
ASME B16.9

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
5 x 5 x 4	141.3	114.3	124	117							12.70	11.13		
6 x 6 x 5	168.3	141.3	143	137							14.27	12.70		
6 x 6 x 4	168.3	114.3	143	130							14.27	11.13		
8 x 8 x 6	219.1	168.3	178	168	6.35		10.31		15.09		18.26	14.27	20.62	
8 x 8 x 5	219.1	141.3	178	162	6.35		10.31		15.09		18.26	12.70	20.62	
8 x 8 x 4	219.1	114.3	178	156	6.35		10.31		15.09		18.26	11.13	20.62	
10 x 10 x 8	273.0	219.1	216	203	6.35	6.35	12.70	10.31	18.26	15.09	21.44	18.26	25.40	20.62
10 x 10 x 6	273.0	168.3	216	194	6.35		12.70		18.26		21.44	14.27	25.40	
10 x 10 x 5	273.0	141.3	216	191	6.35		12.70		18.26		21.44	12.70	25.40	
12 x 12 x 10	323.8	273.0	254	241	6.35	6.35	14.27	12.70	21.44	18.26	25.40	21.44	28.58	25.40
12 x 12 x 8	323.8	219.1	254	229	6.35	6.35	14.27	10.31	21.44	15.09	25.40	18.26	28.58	20.62
12 x 12 x 6	323.8	168.3	254	219	6.35		14.27		21.44		25.40	14.27	28.58	
14 x 14 x 12	355.6	323.8	279	270	7.92	6.35	15.09	14.27	23.83	21.44	27.79	25.40	31.75	28.58
14 x 14 x 10	355.6	273.0	279	257	7.92	6.35	15.09	12.70	23.83	18.26	27.79	21.44	31.75	25.40
14 x 14 x 8	355.6	219.1	279	248	7.92	6.35	15.09	10.31	23.83	15.09	27.79	18.26	31.75	20.62
16 x 16 x 14	406.4	355.6	305	305	7.92	7.92	16.66	15.09	26.19	23.83	30.96	27.79	36.53	31.75
16 x 16 x 12	406.4	323.8	305	295	7.92	6.35	16.66	14.27	26.19	21.44	30.96	25.40	36.53	28.58
16 x 16 x 10	406.4	273.0	305	283	7.92	6.35	16.66	12.70	26.19	18.26	30.96	21.44	36.53	25.40
18 x 18 x 16	457.0	406.4	343	330	7.92	7.92	19.05	16.66	29.36	26.19	34.93	30.96	39.67	36.53
18 x 18 x 14	457.0	355.6	343	330	7.92	7.92	19.05	15.09	29.36	23.83	34.93	27.79	39.67	31.75
18 x 18 x 12	457.0	323.8	343	321	7.92	6.35	19.05	14.27	29.36	21.44	34.93	25.40	39.67	28.58
20 x 20 x 18	508.0	457.0	381	368	9.53	7.92	20.62	19.05	32.54	29.36	38.10	34.93	44.45	39.67
20 x 20 x 16	508.0	406.4	381	356	9.53	7.92	20.62	16.66	32.54	26.19	38.10	30.96	44.45	36.53
20 x 20 x 14	508.0	355.6	381	356	9.53	7.92	20.62	15.09	32.54	23.83	38.10	27.79	44.45	31.75
22 x 22 x 20	559.0	508.0	419	406	9.53	9.53	22.23	20.62	34.93	32.54	41.28	38.10	47.63	44.45
22 x 22 x 18	559.0	457.0	419	394	9.53	7.92	22.23	19.05	34.93	29.36	41.28	34.93	47.63	39.67

Tee (Reducing)

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9

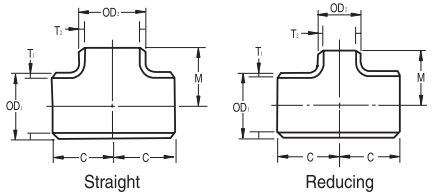
(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	Run C	Outlet M	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
22 x 22 x 16	559.0	406.4	419	381	9.53	7.92	22.23	16.66	34.93	26.19	41.28	30.96	47.63	36.53
24 x 24 x 22	610.0	559.0	432	432	9.53	9.53	24.61	22.23	38.89	34.93	46.02	41.28	52.37	47.63
24 x 24 x 20	610.0	508.0	432	432	9.53	9.53	24.61	20.62	38.89	32.54	46.02	38.10	52.37	44.45
24 x 24 x 18	610.0	457.0	432	419	9.53	7.92	24.61	19.05	38.89	29.36	46.02	34.93	52.37	39.67

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Tee

Special Fittings



(Unit : mm)

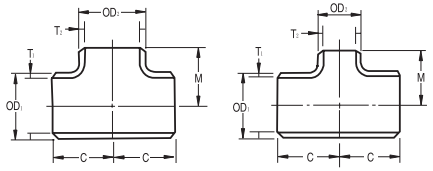
Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
50x50x50	1270.0	1270.0	927.1	876.3
50x50x48	1270.0	1219.2	927.1	838.2
50x50x46	1270.0	1168.4	927.1	812.8
50x50x44	1270.0	1117.6	927.1	787.4
50x50x42	1270.0	1066.8	927.1	762.0
50x50x40	1270.0	1016.0	927.1	736.6
50x50x38	1270.0	965.2	927.1	736.6
52x52x52	1320.8	1320.8	965.2	914.4
52x52x50	1320.8	1270.0	965.2	889.0
52x52x48	1320.8	1219.2	965.2	863.6
52x52x46	1320.8	1168.4	965.2	838.2
52x52x44	1320.8	1117.6	965.2	812.8
52x52x42	1320.8	1066.8	965.2	787.4
52x52x40	1320.8	1016.0	965.2	762.0
52x52x38	1320.8	965.2	965.2	762.0
54x54x54	1371.6	1371.6	1003.3	952.5
54x54x52	1371.6	1320.8	1003.3	914.4
54x54x50	1371.6	1270.0	1003.3	889.0
54x54x48	1371.6	1219.2	1003.3	863.6
54x54x46	1371.6	1168.4	1003.3	838.2
54x54x44	1371.6	1117.6	1003.3	812.8
54x54x40	1371.6	1016.0	1003.3	787.4
54x54x28	1371.6	711.2	1003.3	787.4
54x54x20	1371.6	508.0	1003.3	787.4
56x56x56	1422.4	1422.4	1041.4	965.2
56x56x54	1422.4	1371.6	1041.4	939.8

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
56x56x52	1422.4	1320.8	1041.4	914.4
56x56x50	1422.4	1270.0	1041.4	889.0
56x56x48	1422.4	1219.2	1041.4	863.6
56x56x46	1422.4	1168.4	1041.4	838.2
56x56x44	1422.4	1117.6	1041.4	812.8
56x56x40	1422.4	1016.0	1041.4	812.8
56x56x28	1422.4	711.2	1041.4	812.8
56x56x20	1422.4	508.0	1041.4	812.8
58x58x58	1473.2	1473.2	1079.5	990.6
58x58x56	1473.2	1422.4	1079.5	965.2
58x58x54	1473.2	1371.6	1079.5	939.8
58x58x52	1473.2	1320.8	1079.5	914.4
58x58x50	1473.2	1270.0	1079.5	889.0
58x58x48	1473.2	1219.2	1079.5	863.6
58x58x46	1473.2	1168.4	1079.5	838.2
58x58x44	1473.2	1117.6	1079.5	838.2
60x60x60	1524.0	1524.0	1117.6	1016.0
60x60x58	1524.0	1473.2	1117.6	990.6
60x60x56	1524.0	1422.4	1117.6	965.2
60x60x54	1524.0	1371.6	1117.6	939.8
60x60x52	1524.0	1320.8	1117.6	914.4
60x60x50	1524.0	1270.0	1117.6	889.0
60x60x48	1524.0	1219.2	1117.6	863.6
60x60x46	1524.0	1168.4	1117.6	863.6
60x60x40	1524.0	1016.0	1117.6	863.6
60x60x28	1524.0	711.2	1117.6	863.6

Tee

Special Fittings



(Unit : mm)

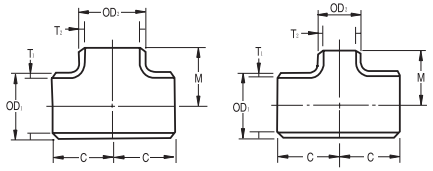
Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
60x60x20	1524.0	508.0	1117.6	863.6
62x62x62	1574.8	1574.8	1143.0	1028.7
62x62x60	1574.8	1524.0	1143.0	990.6
62x62x58	1574.8	1473.2	1143.0	965.2
62x62x56	1574.8	1422.4	1143.0	939.8
62x62x54	1574.8	1371.6	1143.0	914.4
62x62x52	1574.8	1320.8	1143.0	889.0
62x62x50	1574.8	1270.0	1143.0	889.0
64x64x64	1625.6	1625.6	1168.4	1041.4
64x64x62	1625.6	1574.8	1168.4	1016.0
64x64x60	1625.6	1524.0	1168.4	990.6
64x64x58	1625.6	1473.2	1168.4	965.2
64x64x56	1625.6	1422.4	1168.4	939.8
64x64x54	1625.6	1371.6	1168.4	914.4
64x64x52	1625.6	1320.8	1168.4	914.4
66x66x66	1676.4	1676.4	1219.2	1066.8
66x66x64	1676.4	1625.6	1219.2	1041.4
66x66x62	1676.4	1574.8	1219.2	1016.0
66x66x60	1676.4	1524.0	1219.2	990.6
66x66x58	1676.4	1473.2	1219.2	965.2
66x66x56	1676.4	1422.4	1219.2	939.8
66x66x54	1676.4	1371.6	1219.2	939.8
68x68x68	1727.2	1727.2	1244.6	1092.2
68x68x66	1727.2	1676.4	1244.6	1066.8
68x68x64	1727.2	1625.6	1244.6	1041.4
68x68x62	1727.2	1574.8	1244.6	1016.0

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
68x68x60	1727.2	1524.0	1244.6	990.6
68x68x58	1727.2	1473.2	1244.6	965.2
68x68x56	1727.2	1422.4	1244.6	965.2
70x70x70	1778.0	1778.0	1270.0	1117.6
70x70x68	1778.0	1727.2	1270.0	1092.2
70x70x66	1778.0	1676.4	1270.0	1066.8
70x70x64	1778.0	1625.6	1270.0	1041.4
70x70x62	1778.0	1574.8	1270.0	1016.0
70x70x60	1778.0	1524.0	1270.0	990.6
70x70x58	1778.0	1473.2	1270.0	990.6
72x72x72	1828.8	1828.8	1320.8	1143.0
72x72x70	1828.8	1778.0	1320.8	1117.6
72x72x68	1828.8	1727.2	1320.8	1092.2
72x72x66	1828.8	1676.4	1320.8	1066.8
72x72x64	1828.8	1625.6	1320.8	1041.4
72x72x62	1828.8	1574.8	1320.8	1016.0
72x72x60	1828.8	1524.0	1320.8	1016.0
74x74x74	1879.6	1879.6	1346.2	1168.4
74x74x72	1879.6	1828.8	1346.2	1143.0
74x74x70	1879.6	1778.0	1346.2	1117.6
74x74x68	1879.6	1727.2	1346.2	1092.2
74x74x66	1879.6	1676.4	1346.2	1066.8
74x74x64	1879.6	1625.6	1346.2	1041.4
74x74x62	1879.6	1574.8	1346.2	1041.4
76x76x76	1930.4	1930.4	1371.6	1193.8
76x76x74	1930.4	1879.6	1371.6	1168.4

Tee

Special Fittings



(Unit : mm)

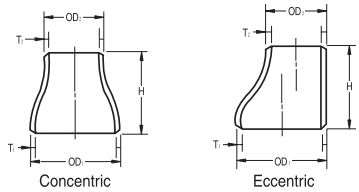
Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
76x76x72	1930.4	1828.8	1371.6	1143.0
76x76x70	1930.4	1778.0	1371.6	1117.6
76x76x68	1930.4	1727.2	1371.6	1092.2
76x76x66	1930.4	1676.4	1371.6	1066.8
76x76x64	1930.4	1625.6	1371.6	1066.8
78x78x78	1981.2	1981.2	1397.0	1219.2
78x78x76	1981.2	1930.4	1397.0	1193.8
78x78x74	1981.2	1879.6	1397.0	1168.4
78x78x72	1981.2	1828.8	1397.0	1143.0
78x78x70	1981.2	1778.0	1397.0	1117.6
78x78x68	1981.2	1727.2	1397.0	1092.2
78x78x66	1981.2	1676.4	1397.0	1092.2
80x80x80	2032.0	2032.0	1422.4	1244.6
80x80x78	2032.0	1981.2	1422.4	1219.2

(Unit : mm)

Nominal Pipe Size	Outside Diameter		Denter to End	
	OD1	OD2	Run C	Outlet M
80x80x76	2032.0	1930.4	1422.4	1193.8
80x80x74	2032.0	1879.6	1422.4	1168.4
80x80x72	2032.0	1828.8	1422.4	1143.0
80x80x70	2032.0	1778.0	1422.4	1117.6
80x80x68	2032.0	1727.2	1422.4	1117.6
82x82x82	2082.8	2082.8	1447.8	1270.0
82x82x80	2082.8	2032.0	1447.8	1244.6
82x82x78	2082.8	1981.2	1447.8	1219.2
82x82x76	2082.8	1930.4	1447.8	1193.8
82x82x74	2082.8	1879.6	1447.8	1168.4
82x82x72	2082.8	1828.8	1447.8	1143.0
82x82x70	2082.8	1778.0	1447.8	1143.0
84x84x84	2133.6	2133.6	1473.2	1295.4

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



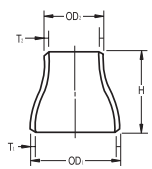
ASME B16.9

(Unit : mm)

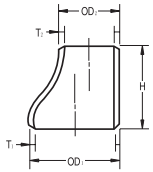
Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
3/4 X 1/2	26.7	21.3	38	2.87	2.77	2.87	2.77	3.91	3.73	3.91	3.73	5.56	4.78	7.82	7.47	3/4 X 1/2
1 X 3/4	33.4	26.7	51	3.38	2.87	3.38	2.87	4.55	3.91	4.55	3.91	6.35	5.56	9.09	7.82	1 X 3/4
1 X 1/2	33.4	21.3	51	3.38	2.77	3.38	2.77	4.55	3.73	4.55	3.73	6.35	4.78	9.09	7.47	1 X 1/2
1-1/4 X 1	42.2	33.4	51	3.56	3.38	3.56	3.38	4.85	4.55	4.85	4.55	6.35	6.35	9.70	9.09	1-1/4 X 1
1-1/4 X 3/4	42.2	26.7	51	3.56	2.87	3.56	2.87	4.85	3.91	4.85	3.91	6.35	5.56	9.70	7.82	1-1/4 X 3/4
1-1/4 X 1/2	42.2	21.3	51	3.56	2.77	3.56	2.77	4.85	3.73	4.85	3.73	6.35	4.78	9.70	7.47	1-1/4 X 1/2
1-1/2 X 1-1/4	48.3	42.2	64	3.68	3.56	3.68	3.56	5.08	4.85	5.08	4.85	7.14	6.35	10.15	9.70	1-1/2 X 1-1/4
1-1/2 X 1	48.3	33.4	64	3.68	3.38	3.68	3.38	5.08	4.55	5.08	4.55	7.14	6.35	10.15	9.09	1-1/2 X 1
1-1/2 X 3/4	48.3	26.7	64	3.68	2.87	3.68	2.87	5.08	3.91	5.08	3.91	7.14	5.56	10.15	7.82	1-1/2 X 3/4
2 X 1-1/2	60.3	48.3	76	3.91	3.68	3.91	3.68	5.54	5.08	5.54	5.08	8.74	7.14	11.07	10.15	2 X 1-1/2
2 X 1-1/4	60.3	42.2	76	3.91	3.56	3.91	3.56	5.54	4.85	5.54	4.85	8.74	6.35	11.07	9.70	2 X 1-1/4
2 X 1	60.3	33.4	76	3.91	3.38	3.91	3.38	5.54	4.55	5.54	4.55	8.74	6.35	11.07	9.09	2 X 1
2 X 3/4	60.3	26.7	76	3.91	2.87	3.91	2.87	5.54	3.91	5.54	3.91	8.74	5.56	11.07	7.82	2 X 3/4
2-1/2 X 2	73.0	60.3	89	5.16	3.91	5.16	3.91	7.01	5.54	7.01	5.54	9.53	8.74	14.02	11.07	2-1/2 X 2
2-1/2 X 1-1/2	73.0	48.3	89	5.16	3.68	5.16	3.68	7.01	5.08	7.01	5.08	9.53	7.14	14.02	10.15	2-1/2 X 1-1/2
2-1/2 X 1-1/4	73.0	42.2	89	5.16	3.56	5.16	3.56	7.01	4.85	7.01	4.85	9.53	6.35	14.02	9.70	2-1/2 X 1-1/4
2-1/2 X 1	73.0	33.4	89	5.16	3.38	5.16	3.38	7.01	4.55	7.01	4.55	9.53	6.35	14.02	9.09	2-1/2 X 1
3 X 2-1/2	88.9	73.0	89	5.49	5.16	5.49	5.16	7.62	7.01	7.62	7.01	11.13	9.53	15.24	14.02	3 X 2-1/2
3 X 2	88.9	60.3	89	5.49	3.91	5.49	3.91	7.62	5.54	7.62	5.54	11.13	8.74	15.24	11.07	3 X 2
3 X 1-1/2	88.9	48.3	89	5.49	3.68	5.49	3.68	7.62	5.08	7.62	5.08	11.13	7.14	15.24	10.15	3 X 1-1/2
3 X 1-1/4	88.9	42.2	89	5.49	3.56	5.49	3.56	7.62	4.85	7.62	4.85	11.13	6.35	15.24	9.70	3 X 1-1/4
3-1/2 X 3	101.6	88.9	102	5.74	5.49	5.74	5.49	8.08	7.62	8.08	7.62		11.13		15.24	3-1/2 X 3
3-1/2 X 2-1/2	101.6	73.0	102	5.74	5.16	5.74	5.16	8.08	7.01	8.08	7.01		9.53		14.02	3-1/2 X 2-1/2
3-1/2 X 2	101.6	60.3	102	5.74	3.91	5.74	3.91	8.08	5.54	8.08	5.54		8.74		11.07	3-1/2 X 2
3-1/2 X 1-1/2	101.6	48.3	102	5.74	3.68	5.74	3.68	8.08	5.08	8.08	5.08		7.14		10.15	3-1/2 X 1-1/2
4 X 3-1/2	114.3	101.6	102	6.02	5.74	6.02	5.74	8.56	8.08	8.56	8.08	13.49		17.12		4 X 3-1/2

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



Concentric



Eccentric

ASME B16.9

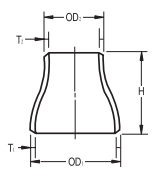
(Unit : mm)

Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40	
	OD1	OD2	H	T1	T2	T1	T2
4 X 3	114.3	88.9	102	6.02	5.49	6.02	5.49
4 X 2-1/2	114.3	73.0	102	6.02	5.16	6.02	5.16
4 X 2	114.3	60.3	102	6.02	3.91	6.02	3.91
5 X 4	141.3	114.3	127	6.55	6.02	6.55	6.02
5 X 3-1/2	141.3	101.6	127	6.55	5.74	6.55	5.74
5 X 3	141.3	88.9	127	6.55	5.49	6.55	5.49
5 X 2-1/2	141.3	73.0	127	6.55	5.16	6.55	5.16
6 X 5	168.3	141.3	140	7.11	6.55	7.11	6.55
6 X 4	168.3	114.3	140	7.11	6.02	7.11	6.02
6 X 3-1/2	168.3	101.6	140	7.11	5.74	7.11	5.74
6 X 3	168.3	88.9	140	7.11	5.49	7.11	5.49
6 X 2-1/2	168.3	73.0	140	7.11	5.16	7.11	5.16
8 X 6	219.1	168.3	152	8.18	7.11	8.18	7.11
8 X 5	219.1	141.3	152	8.18	6.55	8.18	6.55
8 X 4	219.1	114.3	152	8.18	6.02	8.18	6.02
8 X 3-1/2	219.1	101.6	152	8.18	5.74	8.18	5.74
10 X 8	273.0	219.1	178	9.27	8.18	9.27	8.18
10 X 6	273.0	168.3	178	9.27	7.11	9.27	7.11
10 X 5	273.0	141.3	178	9.27	6.55	9.27	6.55
10 X 4	273.0	114.3	178	9.27	6.02	9.27	6.02
12 X 10	323.8	273.0	203	9.53	9.27	10.31	9.27
12 X 8	323.8	219.1	203	9.53	8.18	10.31	8.18
12 X 6	323.8	168.3	203	9.53	7.11	10.31	7.11
12 X 5	323.8	141.3	203	9.53	6.55	10.31	6.55
14 X 12	355.6	323.8	330	9.53	9.53	11.13	10.31
14 X 10	355.6	273.0	330	9.53	9.27	11.13	9.27

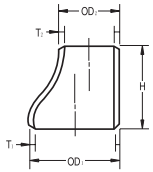
X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
T1	T2	T1	T2	T1	T2	T1	T2	
8.56	7.62	8.56	7.62	13.49	11.13	17.12	15.24	4X3
8.56	7.01	8.56	7.01	13.49	9.53	17.12	14.02	4X2-1/2
8.56	5.54	8.56	5.54	13.49	8.74	17.12	11.07	4X2
9.53	8.56	9.53	8.56	15.88	13.49	19.05	17.12	5X4
9.53	8.08	9.53	8.08	15.88		19.05		5X3-1/2
9.53	7.62	9.53	7.62	15.88	11.13	19.05	15.24	5X3
9.53	7.01	9.53	7.01	15.88	9.53	19.05	14.02	5X2-1/2
10.97	9.53	10.97	9.53	18.26	15.88	21.95	19.05	6X5
10.97	8.56	10.97	8.56	18.26	13.49	21.95	17.12	6X4
10.97	8.08	10.97	8.08	18.26		21.95		6X3-1/2
10.97	7.62	10.97	7.62	18.26	11.13	21.95	15.24	6X3
10.97	7.01	10.97	7.01	18.26	9.53	21.95	14.02	6X2-1/2
12.70	10.97	12.70	10.97	23.01	18.26	22.23	21.95	8X6
12.70	9.53	12.70	9.53	23.01	15.88	22.23	19.05	8X5
12.70	8.56	12.70	8.56	23.01	13.49	22.23	17.12	8X4
12.70	8.08	12.70	8.08	23.01		22.23		8X3-1/2
12.70	12.70	15.09	12.70	28.58	23.01	25.40	22.23	10X8
12.70	10.97	15.09	10.97	28.58	18.26	25.40	21.95	10X6
12.70	9.53	15.09	9.53	28.58	15.88	25.40	19.05	10X5
12.70	8.56	15.09	8.56	28.58	13.49	25.40	17.12	10X4
12.70	12.70	17.48	15.09	33.32	28.58	25.40	25.40	12X10
12.70	12.70	17.48	12.70	33.32	23.01	25.40	22.23	12X 8
12.70	10.97	17.48	10.97	33.32	18.26	25.40	21.95	12X 6
12.70	9.53	17.48	9.53	33.32	15.88	25.40	19.05	12X 5
12.70	12.70	19.05	17.48	35.71	33.32		25.40	14X12
12.70	12.70	19.05	15.09	35.71	28.58		25.40	14X10

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



Concentric



Eccentric

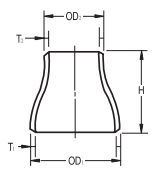
ASME B16.9

(Unit : mm)

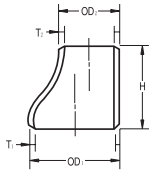
Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
14 X 8	355.6	219.1	330	9.53	8.18	11.13	8.18	12.70	12.70	19.05	12.70	35.71	23.01		22.23	14 X 8
16 X 14	406.4	355.6	356	9.53	9.53	12.70	11.13	12.70	12.70	21.44	19.05	40.49	35.71			16 X 14
16 X 12	406.4	323.8	356	9.53	9.53	12.70	10.31	12.70	12.70	21.44	17.48	40.49	33.32		25.40	16 X 12
16 X 10	406.4	273.0	356	9.53	9.27	12.70	9.27	12.70	12.70	21.44	15.09	40.49	28.58		25.40	16 X 10
18 X 16	457.0	406.4	381	9.53	9.53	14.27	12.70	12.70	12.70	23.83	21.44	45.24	40.49			18 X 16
18 X 14	457.0	355.6	381	9.53	9.53	14.27	11.13	12.70	12.70	23.83	19.05	45.24	35.71			18 X 14
18 X 12	457.0	323.8	381	9.53	9.53	14.27	10.31	12.70	12.70	23.83	17.48	45.24	33.32		25.40	18 X 12
20 X 18	508.0	457.0	508	9.53	9.53	15.09	14.27	12.70	12.70	26.19	23.83	50.01	45.24			20 X 18
20 X 16	508.0	406.4	508	9.53	9.53	15.09	12.70	12.70	12.70	26.19	21.44	50.01	40.49			20 X 16
20 X 14	508.0	355.6	508	9.53	9.53	15.09	11.13	12.70	12.70	26.19	19.05	50.01	35.71			20 X 14
22 X 20	559.0	508.0	508	9.53	9.53		15.09	12.70	12.70	28.58	26.19	53.98	50.01			22 X 20
22 X 18	559.0	457.0	508	9.53	9.53		14.27	12.70	12.70	28.58	23.83	53.98	45.24			22 X 18
22 X 16	559.0	406.4	508	9.53	9.53		12.70	12.70	12.70	28.58	21.44	53.98	40.49			22 X 16
24 X 22	610.0	559.0	508	9.53	9.53	17.48		12.70	12.70	30.96	28.58	59.54	53.98			24 X 22
24 X 20	610.0	508.0	508	9.53	9.53	17.48	15.09	12.70	12.70	30.96	26.19	59.54	50.01			24 X 20
24 X 18	610.0	457.0	508	9.53	9.53	17.48	14.27	12.70	12.70	30.96	23.83	59.54	45.24			24 X 18
26 X 22	660.0	559.0	610	9.53	9.53			12.70	12.70		28.58		53.98			26 X 22
26 X 18	660.0	457.0	610	9.53	9.53		14.27	12.70	12.70		23.83		45.24			26 X 18
26 X 16	660.0	406.4		9.53	9.53		12.70	12.70	12.70		21.44		40.49			26 X 16
28 X 24	711.0	610.0	610	9.53	9.53		17.48	12.70	12.70		30.96		59.54			28 X 24
28 X 20	711.0	508.0	610	9.53	9.53		15.09	12.70	12.70		26.19		50.01			28 X 20
28 X 18	711.0	457.0	610	9.53	9.53		14.27	12.70	12.70		23.83		45.24			28 X 18
30 X 26	762.0	660.0	610	9.53	9.53			12.70	12.70							30 X 26
30 X 22	762.0	559.0		9.53	9.53			12.70	12.70		28.58		53.98			30 X 22
30 X 20	762.0	508.0	610	9.53	9.53		15.09	12.70	12.70		26.19		50.01			30 X 20
32 X 28	813.0	711.0	610	9.53	9.53	17.48		12.70	12.70							32 X 28

Reducer

STD, Sch40, X-S, Sch80, Sch160, XX-S



Concentric



Eccentric

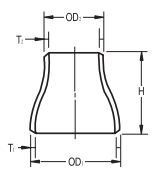
ASME B16.9

(Unit : mm)

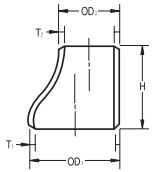
Nominal Pipe Size	Outside Diameter		End to End	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	
32 X 24	813.0	610.0	610	9.53	9.53	17.48	17.48	12.70	12.70		30.96		59.54			32 X 24
32 X 22	813.0	559.0		9.53	9.53	17.48		12.70	12.70		28.58		53.98			32 X 22
34 X 30	864.0	762.0	610	9.53	9.53	17.48		12.70	12.70							34 X 30
34 X 26	864.0	660.0	610	9.53	9.53	17.48		12.70	12.70							34 X 26
34 X 22	864.0	559.0		9.53	9.53	17.48		12.70	12.70		28.58		53.98			34 X 22
36 X 32	914.0	813.0	610	9.53	9.53	19.05	17.48	12.70	12.70							36 X 32
36 X 28	914.0	711.0		9.53	9.53	19.05		12.70	12.70							36 X 28
36 X 24	914.0	610.0	610	9.53	9.53	19.05	17.48	12.70	12.70		30.96		59.54			36 X 24
38 X 34	965.0	864.0	610	9.53	9.53		17.48	12.70	12.70							38 X 34
38 X 30	965.0	762.0	610	9.53	9.53			12.70	12.70							38 X 30
38 X 26	965.0	660.0	610	9.53	9.53			12.70	12.70							38 X 26
40 X 36	1016.0	914.0	610	9.53	9.53		19.05	12.70	12.70							40 X 36
40 X 32	1016.0	813.0	610	9.53	9.53		17.48	12.70	12.70							40 X 32
40 X 28	1016.0	711.0		9.53	9.53			12.70	12.70							40 X 28
42 X 38	1067.0	965.0	610	9.53	9.53			12.70	12.70							42 X 38
42 X 34	1067.0	864.0	610	9.53	9.53		17.48	12.70	12.70							42 X 34
42 X 30	1067.0	762.0	610	9.53	9.53			12.70	12.70							42 X 30
44 X 40	1118.0	1016.0	610	9.53	9.53			12.70	12.70							44 X 40
44 X 36	1118.0	914.0	610	9.53	9.53		19.05	12.70	12.70							44 X 36
44 X 32	1118.0	813.0		9.53	9.53		17.48	12.70	12.70							44 X 32
46 X 42	1168.0	1067.0	711	9.53	9.53			12.70	12.70							46 X 42
46 X 38	1168.0	965.0	711	9.53	9.53			12.70	12.70							46 X 38
46 X 34	1168.0	864.0		9.53	9.53		17.48	12.70	12.70							46 X 34
48 X 44	1219.0	1118.0	711	9.53	9.53			12.70	12.70							48 X 44
48 X 40	1219.0	1016.0	711	9.53	9.53			12.70	12.70							48 X 40
48 X 36	1219.0	914.0		9.53	9.53		19.05	12.70	12.70							48 X 36

Reducer

Sch20, Sch60, Sch100, Sch120, Sch140



Concentric



Eccentric

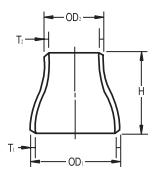
ASME B16.9

(Unit : mm)

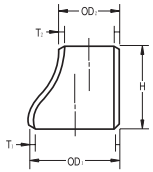
Nominal Pipe Size	Outside Diameter		End to End	Sch20		Sch60		Sch100		Sch120		Sch140	
	OD1	OD2	H	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
5 X 4	141.3	114.3	127							12.70	11.13		
6 X 5	168.3	141.3	140							14.27	12.70		
6 X 4	168.3	114.3	140							14.27	11.13		
8 X 6	219.1	168.3	152	6.35		10.31		15.09		18.26	14.27	20.62	
8 X 5	219.1	141.3	152	6.35		10.31		15.09		18.26	12.70	20.62	
8 X 4	219.1	114.3	152	6.35		10.31		15.09		18.26	11.13	20.62	
10 X 8	273.0	219.1	178	6.35	6.35	12.70	10.31	18.26	15.09	21.44	18.26	25.40	20.62
10 X 6	273.0	168.3	178	6.35		12.70		18.26		21.44	14.27	25.40	
10 X 5	273.0	141.3	178	6.35		12.70		18.26		21.44	12.70	25.40	
10 X 4	273.0	114.3	178	6.35		12.70		18.26		21.44	11.13	25.40	
12 X 10	323.8	273.0	203	6.35	6.35	14.27	12.70	21.44	18.26	25.40	21.44	28.58	25.40
12 X 8	323.8	219.1	203	6.35	6.35	14.27	10.31	21.44	15.09	25.40	18.26	28.58	20.62
12 X 6	323.8	168.3	203	6.35		14.27		21.44		25.40	14.27	28.58	
14 X 12	355.6	323.8	330	7.92	6.35	15.09	14.27	23.83	21.44	27.79	25.40	31.75	28.58
14 X 10	355.6	273.0	330	7.92	6.35	15.09	12.70	23.83	18.26	27.79	21.44	31.75	25.40
14 X 8	355.6	219.1	330	7.92	6.35	15.09	10.31	23.83	15.09	27.79	18.26	31.75	20.62
16 X 14	406.4	355.6	356	7.92	7.92	16.66	15.09	26.19	23.83	30.96	27.79	36.53	31.75
16 X 12	406.4	323.8	356	7.92	6.35	16.66	14.27	26.19	21.44	30.96	25.40	36.53	28.58
16 X 10	406.4	273.0	356	7.92	6.35	16.66	12.70	26.19	18.26	30.96	21.44	36.53	25.40
18 X 16	457.0	406.4	381	7.92	7.92	19.05	16.66	29.36	26.19	34.93	30.96	39.67	36.53
18 X 14	457.0	355.6	381	7.92	7.92	19.05	15.09	29.36	23.83	34.93	27.79	39.67	31.75
18 X 12	457.0	323.8	381	7.92	6.35	19.05	14.27	29.36	21.44	34.93	25.40	39.67	28.58
20 X 18	508.0	457.0	508	9.53	7.92	20.62	19.05	32.54	29.36	38.10	34.93	44.45	39.67
20 X 16	508.0	406.4	508	9.53	7.92	20.62	16.66	32.54	26.19	38.10	30.96	44.45	36.53
20 X 14	508.0	355.6	508	9.53	7.92	20.62	15.09	32.54	23.83	38.10	27.79	44.45	31.75
22 X 20	559.0	508.0	508	9.53	9.53	22.23	20.62	34.93	32.54	41.28	38.10	47.63	44.45

Reducer

Sch20, Sch60, Sch100, Sch120, Sch140



Concentric



Eccentric

ASME B16.9

(Unit : mm)

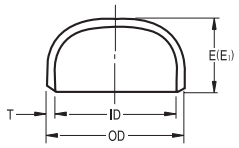
Nominal Pipe Size	Outside Diameter		End to End	Sch20	
	OD1	OD2	H	T1	T2
22 X 18	559.0	457.0	508	9.53	7.92
22 X 16	559.0	406.4	508	9.53	7.92
24 X 22	610.0	559.0	508	9.53	9.53
24 X 20	610.0	508.0	508	9.53	9.53
24 X 18	610.0	457.0	508	9.53	7.92

Sch60		Sch100		Sch120		Sch140	
T1	T2	T1	T2	T1	T2	T1	T2
22.23	19.05	34.93	29.36	41.28	34.93	47.63	39.67
22.23	16.66	34.93	26.19	41.28	30.96	47.63	36.53
24.61	22.23	38.89	34.93	46.02	41.28	52.37	47.63
24.61	20.62	38.89	32.54	46.02	38.10	52.37	44.45
24.61	19.05	38.89	29.36	46.02	34.93	52.37	39.67

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Cap

STD, Sch40, X-S, Sch80, Sch160, XX-S



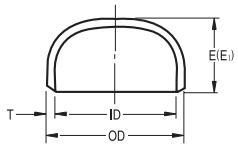
ASME B16.9

(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Length E	Limiting Wall Thickness for Length E	Length E1	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
					T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
1/2	21.3	25	4.57	25	2.77	15.8	2.77	15.8	3.73	13.8	3.73	13.8	4.78	11.7	7.47	6.4	1/2
3/4	26.7	25	3.81	25	2.87	21.0	2.87	21.0	3.91	18.9	3.91	18.9	5.56	15.6	7.82	11.1	3/4
1	33.4	38	4.57	38	3.38	26.6	3.38	26.6	4.55	24.3	4.55	24.3	6.35	20.7	9.09	15.2	1
1-1/4	42.2	38	4.83	38	3.56	35.1	3.56	35.1	4.85	32.5	4.85	32.5	6.35	29.5	9.70	22.8	1-1/4
1-1/2	48.3	38	5.08	38	3.68	40.9	3.68	40.9	5.08	38.1	5.08	38.1	7.14	34.0	10.15	28.0	1-1/2
2	60.3	38	5.59	44	3.91	52.5	3.91	52.5	5.54	49.2	5.54	49.2	8.74	42.8	11.07	38.2	2
2-1/2	73.0	38	7.11	51	5.16	62.7	5.16	62.7	7.01	59.0	7.01	59.0	9.53	53.9	14.02	45.0	2-1/2
3	88.9	51	7.62	64	5.49	77.9	5.49	77.9	7.62	73.7	7.62	73.7	11.13	66.6	15.24	58.4	3
3-1/2	101.6	64	8.13	76	5.74	90.1	5.74	90.1	8.08	85.4	8.08	85.4					3-1/2
4	114.3	64	8.64	76	6.02	102.3	6.02	102.3	8.56	97.2	8.56	97.2	13.49	87.3	17.12	80.1	4
5	141.3	76	9.65	89	6.55	128.2	6.55	128.2	9.53	122.2	9.53	122.2	15.88	109.5	19.05	103.2	5
6	168.3	89	10.92	102	7.11	154.1	7.11	154.1	10.97	146.4	10.97	146.4	18.26	131.8	21.95	124.4	6
8	219.1	102	12.70	127	8.18	202.7	8.18	202.7	12.70	193.7	12.70	193.7	23.01	173.1	22.23	174.6	8
10	273.0	127	12.70	152	9.27	254.5	9.27	254.5	12.70	247.6	15.09	242.8	28.58	215.8	25.40	222.2	10
12	323.8	152	12.70	178	9.53	304.7	10.31	303.2	12.70	298.4	17.48	288.8	33.32	257.2	25.40	273.0	12
14	355.6	165	12.70	191	9.53	336.5	11.13	333.3	12.70	330.2	19.05	317.5	35.71	284.2			14
16	406.4	178	12.70	203	9.53	387.3	12.70	381.0	12.70	381.0	21.44	363.5	40.49	325.4			16
18	457.0	203	12.70	229	9.53	437.9	14.27	428.5	12.70	431.6	23.83	409.3	45.24	366.5			18
20	508.0	229	12.70	254	9.53	488.9	15.09	477.8	12.70	482.6	26.19	455.6	50.01	408.0			20
22	559.0	254	12.70	254	9.53	539.9			12.70	533.6	28.58	501.8	53.98	451.0			22
24	610.0	267	12.70	305	9.53	590.9	17.48	575.0	12.70	584.6	30.96	548.1	59.54	490.9			24
26	660.0	267			9.53	640.9			12.70	634.6							26
28	711.0	267			9.53	691.9			12.70	685.6							28
30	762.0	267			9.53	742.9			12.70	736.6							30
32	813.0	267			9.53	793.9	17.48	778.0	12.70	787.6							32
34	864.0	267			9.53	844.9	17.48	829.0	12.70	838.6							34

Cap

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9

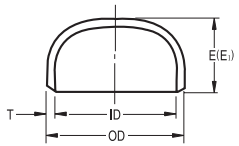
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Length E	Limiting Wall Thickness for Length E	Length E1	STD		Sch40		X-S		Sch80		Sch160		XX-S		Nominal Pipe Size
					T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	T	I.D	
36	914.0	267			9.53	894.9	19.05	875.9	12.70	888.6							36
38	965.0	305			9.53	945.9			12.70	939.6							38
40	1016.0	305			9.53	996.9			12.70	990.6							40
42	1067.0	305			9.53	1047.9			12.70	1041.6							42
44	1118.0	343			9.53	1098.9			12.70	1092.6							44
46	1168.0	343			9.53	1148.9			12.70	1142.6							46
48	1219.0	343			9.53	1199.9			12.70	1193.6							48

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Cap

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9

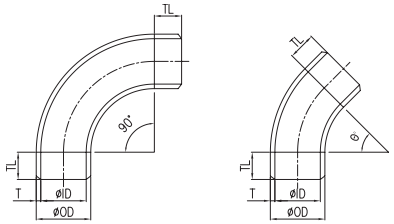
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Length E	Limiting Wall Thickness for Length E	Length E1	Sch20		Sch60		Sch100		Sch120		Sch140	
					T	I.D	T	I.D	T	I.D	T	I.D	T	I.D
4	114.3	64	8.64	76							11.13	92.0		
5	141.3	76	9.65	89							12.70	115.9		
6	168.3	89	10.92	102							14.27	139.8		
8	219.1	102	12.70	127	6.35	206.4	10.31	198.5	15.09	188.9	18.26	182.6	20.62	177.9
10	273.0	127	12.70	152	6.35	260.3	12.70	247.6	18.26	236.5	21.44	230.1	25.40	222.2
12	323.8	152	12.70	178	6.35	311.1	14.27	295.3	21.44	280.9	25.40	273.0	28.58	266.6
14	355.6	165	12.70	191	7.92	339.8	15.09	325.4	23.83	307.9	27.79	300.0	31.75	292.1
16	406.4	178	12.70	203	7.92	390.6	16.66	373.1	26.19	354.0	30.96	344.5	36.53	333.3
18	457.0	203	12.70	229	7.92	441.2	19.05	418.9	29.36	398.3	34.93	387.1	39.67	377.7
20	508.0	229	12.70	254	9.53	488.9	20.62	466.8	32.54	442.9	38.10	431.8	44.45	419.1
22	559.0	254	12.70	254	9.53	539.9	22.23	514.5	34.93	489.1	41.28	476.4	47.63	463.7
24	610.0	267	12.70	305	9.53	590.9	24.61	560.8	38.89	532.2	46.02	518.0	52.37	505.3

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.10M Specifications

Pipe Bend

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9 / PFI STD ES-24

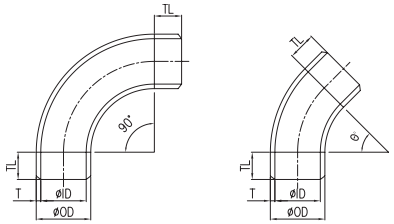
(Unit : mm)

Nominal Pipe Size	Outside Diameter OD	STD		Sch40	
		T	ID	T	ID
1/2	21.3	2.77	15.8	2.77	15.8
3/4	26.7	2.87	21.0	2.87	21.0
1	33.4	3.38	26.6	3.38	26.6
1 1/4	42.2	3.56	35.1	3.56	35.1
1 1/2	48.3	3.68	40.9	3.68	40.9
2	60.3	3.91	52.5	3.91	52.5
2 1/2	73.0	5.16	62.7	5.16	62.7
3	88.9	5.49	77.9	5.49	77.9
3 1/2	101.6	5.74	90.1	5.74	90.1
4	114.3	6.02	102.3	6.02	102.3
5	141.3	6.55	128.2	6.55	128.2
6	168.3	7.11	154.1	7.11	154.1
8	219.1	8.18	202.7	8.18	202.7
10	273.0	9.27	254.5	9.27	254.5
12	323.8	9.53	304.7	10.31	303.2
14	355.6	9.53	336.5	11.13	333.3
16	406.4	9.53	387.3	12.70	381.0
18	457.0	9.53	437.9	14.27	428.5
20	508.0	9.53	488.9	15.09	477.8
22	559.0	9.53	539.9		
24	610.0	9.53	590.9	17.48	575.0
26	660.0	9.53	640.9		
28	711.0	9.53	691.9		

X-S		Sch80		Sch160		XX-S	
T	ID	T	ID	T	ID	T	ID
3.73	13.8	3.73	13.8	4.78	11.7	7.47	6.4
3.91	18.9	3.91	18.9	5.56	15.6	7.82	11.1
4.55	24.3	4.55	24.3	6.35	20.7	9.09	15.2
4.85	32.5	4.85	32.5	6.35	29.5	9.70	22.8
5.08	38.1	5.08	38.1	7.14	34.0	10.15	28.0
5.54	49.2	5.54	49.2	8.74	42.8	11.07	38.2
7.01	59.0	7.01	59.0	9.53	53.9	14.02	45.0
7.62	73.7	7.62	73.7	11.13	66.6	15.24	58.4
8.08	85.4	8.08	85.4				
8.56	97.2	8.56	97.2	13.49	87.3	17.12	80.1
9.53	122.2	9.53	122.2	15.88	109.5	19.05	103.2
10.97	146.4	10.97	146.4	18.26	131.8	21.95	124.4
12.70	193.7	12.70	193.7	23.01	173.1	22.23	174.6
12.70	247.6	15.09	242.8	28.58	215.8	25.40	222.2
12.70	298.4	17.48	288.8	33.32	257.2	25.40	273.0
12.70	330.2	19.05	317.5	35.71	284.2		
12.70	381.0	21.44	363.5	40.49	325.4		
12.70	431.6	23.83	409.3	45.24	366.5		
12.70	482.6	26.19	455.6	50.01	408.0		
12.70	533.6	28.58	501.8	53.98	451.0		
12.70	584.6	30.96	548.1	59.54	490.9		
12.70	634.6						
12.70	685.6						

Pipe Bend

STD, Sch40, X-S, Sch80, Sch160, XX-S



ASME B16.9 / PFI STD ES-24

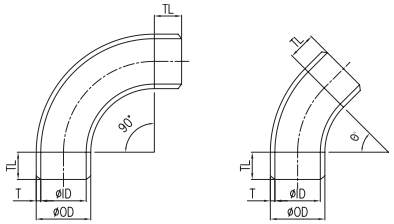
(Unit : mm)

Nominal Pipe Size	Outside Diameter OD	STD		Sch40		X-S		Sch80		Sch160		XX-S	
		T	ID	T	ID	T	ID	T	ID	T	ID	T	ID
30	762.0	9.53	742.9			12.70	736.6						
32	813.0	9.53	793.9	17.48	778.0	12.70	787.6						
34	864.0	9.53	844.9	17.48	829.0	12.70	838.6						
36	914.0	9.53	894.9	19.05	875.9	12.70	888.6						
38	965.0	9.53	945.9			12.70	939.6						
40	1016.0	9.53	996.9			12.70	990.6						
42	1067.0	9.53	1047.9			12.70	1041.6						
44	1118.0	9.53	1098.9			12.70	1092.6						
46	1168.0	9.53	1148.9			12.70	1142.6						
48	1219.0	9.53	1199.9			12.70	1193.6						

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- TL, R, Ø : Specified in Purchaser order
- For General Bending Range See Page 168

Pipe Bend

Sch20, Sch60, Sch100, Sch120, Sch140



ASME B16.9 / PFI STD ES-24

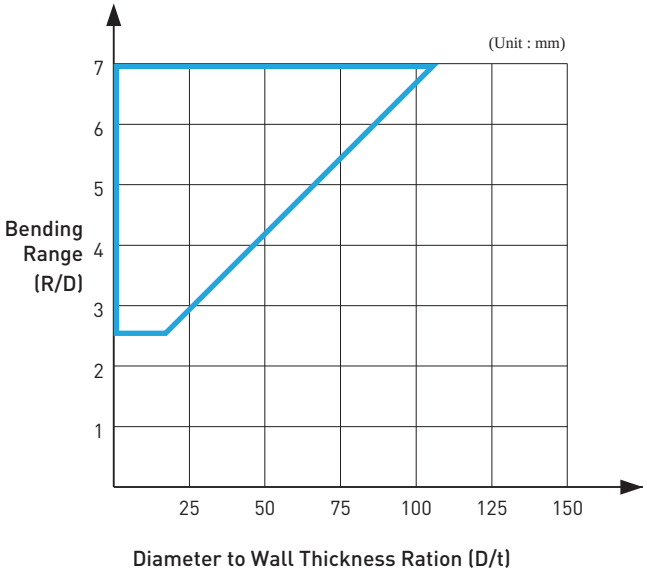
(Unit : mm)

Nominal Pipe Size	Outside Diameter OD	Sch20		Sch60		Sch100		Sch120		Sch140	
		T	ID	T	ID	T	ID	T	ID	T	ID
4	114.3							11.13	92.0		
5	141.3							12.70	115.9		
6	168.3							14.27	139.8		
8	219.1	6.35	206.4	10.31	198.5	15.09	188.9	18.26	182.6	20.62	177.9
10	273.0	6.35	260.3	12.70	247.6	18.26	236.5	21.44	230.1	25.40	222.2
12	323.8	6.35	311.1	14.27	295.3	21.44	280.9	25.40	273.0	28.58	266.6
14	355.6	7.92	339.8	15.09	325.4	23.83	307.9	27.79	300.0	31.75	292.1
16	406.4	7.92	390.6	16.66	373.1	26.19	354.0	30.96	344.5	36.53	333.3
18	457.0	7.92	441.2	19.05	418.9	29.36	398.3	34.93	387.1	39.67	377.7
20	508.0	9.53	488.9	20.62	466.8	32.54	442.9	38.10	431.8	44.45	419.1
22	559.0	9.53	539.9	22.23	514.5	34.93	489.1	41.28	476.4	47.63	463.7
24	610.0	9.53	590.9	24.61	560.8	38.89	532.2	46.02	518.0	52.37	505.3

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- TL, R, Ø : Specified in Purchaser order
- For General Bending Range See Page 168

TK corporation

General Bending Range



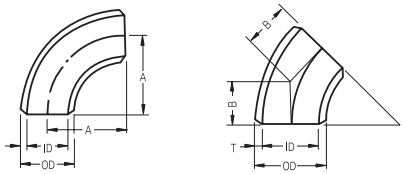
Where :
D = Pipe Outside Diameter in mm
t = Pipe Wall Thickness in mm
R = Bending Radius in mm

※ Bending Capacity (Carbon Steel)
- Min. OD = 320mm, Max. OD = 2,500mm
- Max. Wall Thickness : 200mm at Min. OD of 500mm

WROUGHT STAINLESS STEEL BUTT WELD PIPE FITTINGS

90° Elbow (Long, Short)
45° Elbow (Long)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9

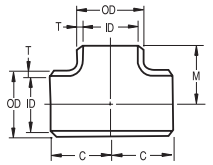
(Unit : mm)

Nominal Pipe Size	Outside Diameter O.D	Center to End			5S		10S		40S		80S		Nominal Pipe Size
		Long		Short	T	I.D	T	I.D	T	I.D	T	I.D	
		A	B	A									
1/2	21.3	38	16		1.65	18.0	2.11	17.1	2.77	15.8	3.73	13.8	1/2
3/4	26.7	38	19		1.65	23.4	2.11	22.5	2.87	21.0	3.91	18.9	3/4
1	33.4	38	22	25	1.65	30.1	2.77	27.9	3.38	26.6	4.55	24.3	1
1-1/4	42.2	48	25	32	1.65	38.9	2.77	36.7	3.56	35.1	4.85	32.5	1-1/4
1-1/2	48.3	57	29	38	1.65	45.0	2.77	42.8	3.68	40.9	5.08	38.1	1-1/2
2	60.3	76	35	51	1.65	57.0	2.77	54.8	3.91	52.5	5.54	49.2	2
2-1/2	73.0	95	44	64	2.11	68.8	3.05	66.9	5.16	62.7	7.01	59.0	2-1/2
3	88.9	114	51	76	2.11	84.7	3.05	82.8	5.49	77.9	7.62	73.7	3
3-1/2	101.6	133	57	89	2.11	97.4	3.05	95.5	5.74	90.1	8.08	85.4	3-1/2
4	114.3	152	64	102	2.11	110.1	3.05	108.2	6.02	102.3	8.56	97.2	4
5	141.3	190	79	127	2.77	135.8	3.40	134.5	6.55	128.2	9.53	122.2	5
6	168.3	229	95	152	2.77	162.8	3.40	161.5	7.11	154.1	10.97	146.4	6
8	219.1	305	127	203	2.77	213.6	3.76	211.6	8.18	202.7	12.70	193.7	8
10	273.0	381	159	254	3.40	266.2	4.19	264.6	9.27	254.5	12.70	247.6	10
12	323.8	457	190	305	3.96	315.9	4.57	314.7	9.53	304.7	12.70	298.4	12
14	355.6	533	222	356	3.96	347.7	4.78	346.0	9.53	336.5	12.70	330.2	14
16	406.4	610	254	406	4.19	398.0	4.78	396.8	9.53	387.3	12.70	381.0	16
18	457.0	686	286	457	4.19	448.6	4.78	447.4	9.53	437.9	12.70	431.6	18
20	508.0	762	318	508	4.78	498.4	5.54	496.9	9.53	488.9	12.70	482.6	20
22	559.0	838	343	559	4.78	549.4	5.54	547.9					22
24	610.0	914	381	610	5.54	598.9	6.35	597.3	9.53	590.9	12.70	584.6	24
30	762.0	1143	470		6.35	749.3	7.92	746.2					30

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Tee (Straight)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : mm)

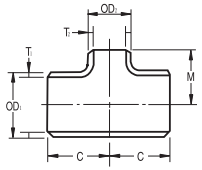
Nominal Pipe Size	Outside Diameter O.D	Center to End		5S	
		Run C	Outlet M	T	I.D
1/2	21.3	25	25	1.65	18.0
3/4	26.7	29	29	1.65	23.4
1	33.4	38	38	1.65	30.1
1-1/4	42.2	48	48	1.65	38.9
1-1/2	48.3	57	57	1.65	45.0
2	60.3	64	64	1.65	57.0
2-1/2	73.0	76	76	2.11	68.8
3	88.9	86	86	2.11	84.7
3-1/2	101.6	95	95	2.11	97.4
4	114.3	105	105	2.11	110.1
5	141.3	124	124	2.77	135.8
6	168.3	143	143	2.77	162.8
8	219.1	178	178	2.77	213.6
10	273.0	216	216	3.40	266.2
12	323.8	254	254	3.96	315.9
14	355.6	279	279	3.96	347.7
16	406.4	305	305	4.19	398.0
18	457.0	343	343	4.19	448.6
20	508.0	381	381	4.78	498.4
22	559.0	419	419	4.78	549.4
24	610.0	432	432	5.54	598.9
30	762.0	559	559	6.35	749.3

Nominal Pipe Size	10S		40S		80S	
	T	I.D	T	I.D	T	I.D
1/2	2.11	17.1	2.77	15.8	3.73	13.8
3/4	2.11	22.5	2.87	21.0	3.91	18.9
1	2.77	27.9	3.38	26.6	4.55	24.3
1-1/4	2.77	36.7	3.56	35.1	4.85	32.5
1-1/2	2.77	42.8	3.68	40.9	5.08	38.1
2	2.77	54.8	3.91	52.5	5.54	49.2
2-1/2	3.05	66.9	5.16	62.7	7.01	59.0
3	3.05	82.8	5.49	77.9	7.62	73.7
3-1/2	3.05	95.5	5.74	90.1	8.08	85.4
4	3.05	108.2	6.02	102.3	8.56	97.2
5	3.40	134.5	6.55	128.2	9.53	122.2
6	3.40	161.5	7.11	154.1	10.97	146.4
8	3.76	211.6	8.18	202.7	12.70	193.7
10	4.19	264.6	9.27	254.5	12.70	247.6
12	4.57	314.7	9.53	304.7	12.70	298.4
14	4.78	346.0	9.53	336.5	12.70	330.2
16	4.78	396.8	9.53	387.3	12.70	381.0
18	4.78	447.4	9.53	437.9	12.70	431.6
20	5.54	496.9	9.53	488.9	12.70	482.6
22	5.54	547.9				
24	6.35	597.3	9.53	590.9	12.70	584.6
30	7.92	746.2				

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Tee (Reducing)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

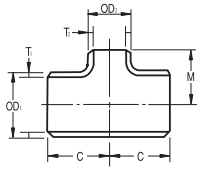
(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		5S	
	OD1	OD2	Run C	Outlet M	T1	T2
3/4 X 3/4 X 1/2	26.7	21.3	29	25	1.65	1.65
1 X 1 X 3/4	33.4	26.7	38	29	1.65	1.65
1 X 1 X 1/2	33.4	21.3	38	25	1.65	1.65
1-1/4 X 1-1/4 X 1	42.2	33.4	48	38	1.65	1.65
1-1/4 X 1-1/4 X 3/4	42.2	26.7	48	29	1.65	1.65
1-1/2 X 1-1/2 X 1-1/4	48.3	42.2	57	48	1.65	1.65
1-1/2 X 1-1/2 X 1	48.3	33.4	57	38	1.65	1.65
1-1/2 X 1-1/2 X 3/4	48.3	26.7	57	29	1.65	1.65
2 X 2 X 1-1/2	60.3	48.3	64	57	1.65	1.65
2 X 2 X 1-1/4	60.3	42.2	64	48	1.65	1.65
2 X 2 X 1	60.3	33.4	64	38	1.65	1.65
2-1/2 X 2-1/2 X 2	73.0	60.3	76	64	2.11	1.65
2-1/2 X 2-1/2 X 1-1/2	73.0	48.3	76	57	2.11	1.65
2-1/2 X 2-1/2 X 1-1/4	73.0	42.2	76	48	2.11	1.65
3 X 3 X 2-1/2	88.9	73.0	86	76	2.11	2.11
3 X 3 X 2	88.9	60.3	86	64	2.11	1.65
3 X 3 X 1-1/2	88.9	48.3	86	57	2.11	1.65
3-1/2 X 3-1/2 X 3	101.6	88.9	95	86	2.11	2.11
3-1/2 X 3-1/2 X 2-1/2	101.6	73.0	95	76	2.11	2.11
3-1/2 X 3-1/2 X 2	101.6	60.3	95	64	2.11	1.65
3-1/2 X 3-1/2 X 1-1/2	101.6	48.3	95	57	2.11	1.65
4 X 4 X 3-1/2	114.3	101.6	105	95	2.11	2.11
4 X 4 X 3	114.3	88.9	105	86	2.11	2.11
4 X 4 X 2-1/2	114.3	73.0	105	76	2.11	2.11
4 X 4 X 2	114.3	60.3	105	64	2.11	1.65

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
3/4 X 3/4 X 1/2	2.11	2.11	2.87	2.77	3.91	3.73
1 X 1 X 3/4	2.77	2.11	3.38	2.87	4.55	3.91
1 X 1 X 1/2	2.77	2.11	3.38	2.77	4.55	3.73
1-1/4 X 1-1/4 X 1	2.77	2.77	3.56	3.38	4.85	4.55
1-1/4 X 1-1/4 X 3/4	2.77	2.11	3.56	2.87	4.85	3.91
1-1/2 X 1-1/2 X 1-1/4	2.77	2.77	3.68	3.56	5.08	4.85
1-1/2 X 1-1/2 X 1	2.77	2.77	3.68	3.38	5.08	4.55
1-1/2 X 1-1/2 X 3/4	2.77	2.11	3.68	2.87	5.08	3.91
2 X 2 X 1-1/2	2.77	2.77	3.91	3.68	5.54	5.08
2 X 2 X 1-1/4	2.77	2.77	3.91	3.56	5.54	4.85
2 X 2 X 1	2.77	2.77	3.91	3.38	5.54	4.55
2-1/2 X 2-1/2 X 2	3.05	2.77	5.16	3.91	7.01	5.54
2-1/2 X 2-1/2 X 1-1/2	3.05	2.77	5.16	3.68	7.01	5.08
2-1/2 X 2-1/2 X 1-1/4	3.05	2.77	5.16	3.56	7.01	4.85
3 X 3 X 2-1/2	3.05	3.05	5.49	5.16	7.62	7.01
3 X 3 X 2	3.05	2.77	5.49	3.91	7.62	5.54
3 X 3 X 1-1/2	3.05	2.77	5.49	3.68	7.62	5.08
3-1/2 X 3-1/2 X 3	3.05	3.05	5.74	5.49	8.08	7.62
3-1/2 X 3-1/2 X 2-1/2	3.05	3.05	5.74	5.16	8.08	7.01
3-1/2 X 3-1/2 X 2	3.05	2.77	5.74	3.91	8.08	5.54
3-1/2 X 3-1/2 X 1-1/2	3.05	2.77	5.74	3.68	8.08	5.08
4 X 4 X 3-1/2	3.05	3.05	6.02	5.74	8.56	8.08
4 X 4 X 3	3.05	3.05	6.02	5.49	8.56	7.62
4 X 4 X 2-1/2	3.05	3.05	6.02	5.16	8.56	7.01
4 X 4 X 2	3.05	2.77	6.02	3.91	8.56	5.54

Tee (Reducing)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

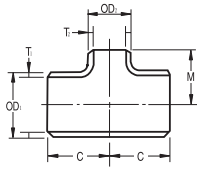
(Unit : mm)

Nominal Pipe Size	Outside Diameter		Center to End		5S	
	OD1	OD2	Run C	Outlet M	T1	T2
5X5X4	141.3	114.3	124	105	2.77	2.11
5X5X3-1/2	141.3	101.6	124	95	2.77	2.11
5X5X3	141.3	88.9	124	86	2.77	2.11
5X5X2-1/2	141.3	73.0	124	76	2.77	2.11
6X6X5	168.3	141.3	143	124	2.77	2.77
6X6X4	168.3	114.3	143	105	2.77	2.11
6X6X3-1/2	168.3	101.6	143	95	2.77	2.11
6X6X3	168.3	88.9	143	86	2.77	2.11
8X8X6	219.1	168.3	178	143	2.77	2.77
8X8X5	219.1	141.3	178	124	2.77	2.77
8X8X4	219.1	114.3	178	105	2.77	2.11
10X10X8	273.0	219.1	216	178	3.40	2.77
10X10X6	273.0	168.3	216	143	3.40	2.77
10X10X5	273.0	141.3	216	124	3.40	2.77
12X12X10	323.8	273.0	254	216	3.96	3.40
12X12X8	323.8	219.1	254	178	3.96	2.77
12X12X6	323.8	168.3	254	143	3.96	2.77
14X14X12	355.6	323.8	279	254	3.96	3.96
14X14X10	355.6	273.0	279	216	3.96	3.40
14X14X8	355.6	219.1	279	178	3.96	2.77
16X16X14	406.4	355.6	305	279	4.19	3.96
16X16X12	406.4	323.8	305	254	4.19	3.96
16X16X10	406.4	273.0	305	216	4.19	3.40
18X18X16	457.0	406.4	343	305	4.19	4.19
18X18X14	457.0	355.6	343	279	4.19	3.96

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
5X5X4	3.40	3.05	6.55	6.02	9.53	8.56
5X5X3-1/2	3.40	3.05	6.55	5.74	9.53	8.08
5X5X3	3.40	3.05	6.55	5.49	9.53	7.62
5X5X2-1/2	3.40	3.05	6.55	5.16	9.53	7.01
6X6X5	3.40	3.40	7.11	6.55	10.97	9.53
6X6X4	3.40	3.05	7.11	6.02	10.97	8.56
6X6X3-1/2	3.40	3.05	7.11	5.74	10.97	8.08
6X6X3	3.40	3.05	7.11	5.49	10.97	7.62
8X8X6	3.76	3.40	8.18	7.11	12.70	10.97
8X8X5	3.76	3.40	8.18	6.55	12.70	9.53
8X8X4	3.76	3.05	8.18	6.02	12.70	8.56
10X10X8	4.19	3.76	9.27	8.18	12.70	12.70
10X10X6	4.19	3.40	9.27	7.11	12.70	10.97
10X10X5	4.19	3.40	9.27	6.55	12.70	9.53
12X12X10	4.57	4.19	9.53	9.27	12.70	12.70
12X12X8	4.57	3.76	9.53	8.18	12.70	12.70
12X12X6	4.57	3.40	9.53	7.11	12.70	10.97
14X14X12	4.78	4.57	9.53	9.53	12.70	12.70
14X14X10	4.78	4.19	9.53	9.27	12.70	12.70
14X14X8	4.78	3.76	9.53	8.18	12.70	12.70
16X16X14	4.78	4.78	9.53	9.53	12.70	12.70
16X16X12	4.78	4.57	9.53	9.53	12.70	12.70
16X16X10	4.78	4.19	9.53	9.27	12.70	12.70
18X18X16	4.78	4.78	9.53	9.53	12.70	12.70
18X18X14	4.78	4.78	9.53	9.53	12.70	12.70

Tee (Reducing)

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : mm)

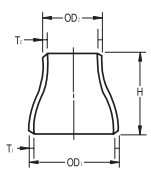
Nominal Pipe Size	Outside Diameter		Center to End		5S	
	OD1	OD2	Run C	Outlet M	T1	T2
18 X 18 X 12	457.0	323.8	343	254	4.19	3.96
20 X 20 X 18	508.0	457.0	381	343	4.78	4.19
20 X 20 X 16	508.0	406.4	381	305	4.78	4.19
20 X 20 X 14	508.0	355.6	381	279	4.78	3.96
22 X 22 X 20	559.0	508.0	419	381	4.78	4.78
22 X 22 X 18	559.0	457.0	419	343	4.78	4.19
22 X 22 X 16	559.0	406.4	419	305	4.78	4.19
24 X 24 X 22	610.0	559.0	432	419	5.54	4.78
24 X 24 X 20	610.0	508.0	432	381	5.54	4.78
24 X 24 X 18	610.0	457.0	432	343	5.54	4.19
30 X 30 X 24	762.0	610.0	559	432	6.35	5.54
30 X 30 X 22	762.0	559.0	559	419	6.35	4.78
30 X 30 X 20	762.0	508.0	559	381	6.35	4.78

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
18 X 18 X 12	4.78	4.57	9.53	9.53	12.70	12.70
20 X 20 X 18	5.54	4.78	9.53	9.53	12.70	12.70
20 X 20 X 16	5.54	4.78	9.53	9.53	12.70	12.70
20 X 20 X 14	5.54	4.78	9.53	9.53	12.70	12.70
22 X 22 X 20	5.54	5.54		9.53		12.70
22 X 22 X 18	5.54	4.78		9.53		12.70
22 X 22 X 16	5.54	4.78		9.53		12.70
24 X 24 X 22	6.35	5.54	9.53		12.70	
24 X 24 X 20	6.35	5.54	9.53	9.53	12.70	12.70
24 X 24 X 18	6.35	4.78	9.53	9.53	12.70	12.70
30 X 30 X 24	7.92	6.35		9.53		12.70
30 X 30 X 22	7.92	5.54				
30 X 30 X 20	7.92	5.54		9.53		12.70

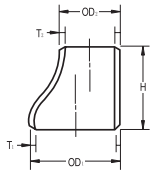
- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Reducer

Sch5s, Sch10s, Sch40s, Sch80s



Concentric



Eccentric

ASME B16.9, MSS SP-43

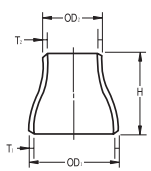
(Unit : mm)

Nominal Pipe Size	Outside Diameter		End to End	5S	
	OD1	OD2	H	T1	T2
3/4 X 1/2	26.7	21.3	38	1.65	1.65
1 X 3/4	33.4	26.7	51	1.65	1.65
1 X 1/2	33.4	21.3	51	1.65	1.65
1-1/4 X 1	42.2	33.4	51	1.65	1.65
1/4 X 3/4	42.2	26.7	51	1.65	1.65
1-1/4 X 1/2	42.2	21.3	51	1.65	1.65
1-1/2 X 1-1/4	48.3	42.2	64	1.65	1.65
1-1/2 X 1	48.3	33.4	64	1.65	1.65
1-1/2 X 3/4	48.3	26.7	64	1.65	1.65
1-1/2 X 1/2	48.3	21.3	64	1.65	1.65
2 X 1-1/2	60.3	48.3	76	1.65	1.65
2 X 1-1/4	60.3	42.2	76	1.65	1.65
2 X 1	60.3	33.4	76	1.65	1.65
2 X 3/4	60.3	26.7	76	1.65	1.65
2-1/2 X 2	73.0	60.3	89	2.11	1.65
2-1/2 X 1-1/2	73.0	48.3	89	2.11	1.65
2-1/2 X 1-1/4	73.0	42.2	89	2.11	1.65
3 X 2-1/2	88.9	73.0	89	2.11	2.11
3 X 2	88.9	60.3	89	2.11	1.65
3 X 1-1/2	88.9	48.3	89	2.11	1.65
3 X 1-1/4	88.9	42.2	89	2.11	1.65
3-1/2 X 3	101.6	88.9	102	2.11	2.11
3-1/2 X 2-1/2	101.6	73.0	102	2.11	2.11
3-1/2 X 2	101.6	60.3	102	2.11	1.65
4 X 3-1/2	114.3	101.6	102	2.11	2.11
4 X 3	114.3	88.9	102	2.11	2.11

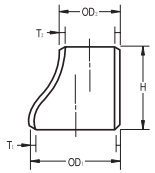
Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
3/4 X 1/2	2.11	2.11	2.87	2.77	3.91	3.73
1 X 3/4	2.77	2.11	3.38	2.87	4.55	3.91
1 X 1/2	2.77	2.11	3.38	2.77	4.55	3.73
1-1/4 X 1	2.77	2.77	3.56	3.38	4.85	4.55
1/4 X 3/4	2.77	2.11	3.56	2.87	4.85	3.91
1-1/4 X 1/2	2.77	2.11	3.56	2.77	4.85	3.73
1-1/2 X 1-1/4	2.77	2.77	3.68	3.56	5.08	4.85
1-1/2 X 1	2.77	2.77	3.68	3.38	5.08	4.55
1-1/2 X 3/4	2.77	2.11	3.68	2.87	5.08	3.91
1-1/2 X 1/2	2.77	2.11	3.68	2.77	5.08	3.73
2 X 1-1/2	2.77	2.77	3.91	3.68	5.54	5.08
2 X 1-1/4	2.77	2.77	3.91	3.56	5.54	4.85
2 X 1	2.77	2.77	3.91	3.38	5.54	4.55
2 X 3/4	2.77	2.11	3.91	2.87	5.54	3.91
2-1/2 X 2	3.05	2.77	5.16	3.91	7.01	5.54
2-1/2 X 1-1/2	3.05	2.77	5.16	3.68	7.01	5.08
2-1/2 X 1-1/4	3.05	2.77	5.16	3.56	7.01	4.85
3 X 2-1/2	3.05	3.05	5.49	5.16	7.62	7.01
3 X 2	3.05	2.77	5.49	3.91	7.62	5.54
3 X 1-1/2	3.05	2.77	5.49	3.68	7.62	5.08
3 X 1-1/4	3.05	2.77	5.49	3.56	7.62	4.85
3-1/2 X 3	3.05	3.05	5.74	5.49	8.08	7.62
3-1/2 X 2-1/2	3.05	3.05	5.74	5.16	8.08	7.01
3-1/2 X 2	3.05	2.77	5.74	3.91	8.08	5.54
4 X 3-1/2	3.05	3.05	6.02	5.74	8.56	8.08
4 X 3	3.05	3.05	6.02	5.49	8.56	7.62

Reducer

Sch5s, Sch10s, Sch40s, Sch80s



Concentric



Eccentric

ASME B16.9, MSS SP-43

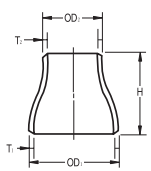
(Unit : mm)

Nominal Pipe Size	Outside Diameter		End to End	5S	
	OD1	OD2	H	T1	T2
4 X 2-1/2	114.3	73.0	102	2.11	2.11
4 X 2	114.3	60.3	102	2.11	1.65
5 X 4	141.3	114.3	127	2.77	2.11
5 X 3-1/2	141.3	101.6	127	2.77	2.11
5 X 3	141.3	88.9	127	2.77	2.11
5 X 2-1/2	141.3	73.0	127	2.77	2.11
6 X 5	168.3	141.3	140	2.77	2.77
6 X 4	168.3	114.3	140	2.77	2.11
6 X 3-1/2	168.3	101.6	140	2.77	2.11
6 X 3	168.3	88.9	140	2.77	2.11
8 X 6	219.1	168.3	152	2.77	2.77
8 X 5	219.1	141.3	152	2.77	2.77
8 X 4	219.1	114.3	152	2.77	2.11
10 X 8	273.0	219.1	178	3.40	2.77
10 X 6	273.0	168.3	178	3.40	2.77
10 X 5	273.0	141.3	178	3.40	2.77
12 X 10	323.8	273.0	203	3.96	3.40
12 X 8	323.8	219.1	203	3.96	2.77
12 X 6	323.8	168.3	203	3.96	2.77
14 X 12	355.6	323.8	330	3.96	3.96
14 X 10	355.6	273.0	330	3.96	3.40
14 X 8	355.6	219.1	330	3.96	2.77
16 X 14	406.4	355.6	356	4.19	3.96
16 X 12	406.4	323.8	356	4.19	3.96
16 X 10	406.4	273.0	356	4.19	3.40
18 X 16	457.0	406.4	381	4.19	4.19

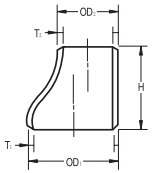
Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
4 X 2-1/2	3.05	3.05	6.02	5.16	8.56	7.01
4 X 2	3.05	2.77	6.02	3.91	8.56	5.54
5 X 4	3.40	3.05	6.55	6.02	9.53	8.56
5 X 3-1/2	3.40	3.05	6.55	5.74	9.53	8.08
5 X 3	3.40	3.05	6.55	5.49	9.53	7.62
5 X 2-1/2	3.40	3.05	6.55	5.16	9.53	7.01
6 X 5	3.40	3.40	7.11	6.55	10.97	9.53
6 X 4	3.40	3.05	7.11	6.02	10.97	8.56
6 X 3-1/2	3.40	3.05	7.11	5.74	10.97	8.08
6 X 3	3.40	3.05	7.11	5.49	10.97	7.62
8 X 6	3.76	3.40	8.18	7.11	12.70	10.97
8 X 5	3.76	3.40	8.18	6.55	12.70	9.53
8 X 4	3.76	3.05	8.18	6.02	12.70	8.56
10 X 8	4.19	3.76	9.27	8.18	12.70	12.70
10 X 6	4.19	3.40	9.27	7.11	12.70	10.97
10 X 5	4.19	3.40	9.27	6.55	12.70	9.53
12 X 10	4.57	4.19	9.53	9.27	12.70	12.70
12 X 8	4.57	3.76	9.53	8.18	12.70	12.70
12 X 6	4.57	3.40	9.53	7.11	12.70	10.97
14 X 12	4.78	4.57	9.53	9.53	12.70	12.70
14 X 10	4.78	4.19	9.53	9.27	12.70	12.70
14 X 8	4.78	3.76	9.53	8.18	12.70	12.70
16 X 14	4.78	4.78	9.53	9.53	12.70	12.70
16 X 12	4.78	4.57	9.53	9.53	12.70	12.70
16 X 10	4.78	4.19	9.53	9.27	12.70	12.70
18 X 16	4.78	4.78	9.53	9.53	12.70	12.70

Reducer

Sch5s, Sch10s, Sch40s, Sch80s



Concentric



Eccentric

ASME B16.9, MSS SP-43

(Unit : mm)

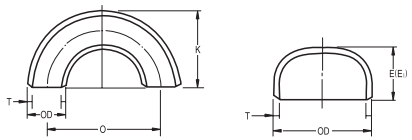
Nominal Pipe Size	Outside Diameter		End to End	5S	
	OD1	OD2	H	T1	T2
18 X 14	457.0	355.6	381	4.19	3.96
18 X 12	457.0	323.8	381	4.19	3.96
20 X 18	508.0	457.0	508	4.78	4.19
20 X 16	508.0	406.4	508	4.78	4.19
20 X 14	508.0	355.6	508	4.78	3.96
22 X 20	559.0	508.0	508	4.78	4.78
22 X 18	559.0	457.0	508	4.78	4.19
22 X 16	559.0	406.4	508	4.78	4.19
24 X 22	610.0	559.0	508	5.54	4.78
24 X 20	610.0	508.0	508	5.54	4.78
24 X 18	610.0	457.0	508	5.54	4.19
30 X 24	762.0	610.0	610	6.35	5.54
30 X 22	762.0	559.0		6.35	4.78
30 X 20	762.0	508.0	610	6.35	4.78

Nominal Pipe Size	10S		40S		80S	
	T1	T2	T1	T2	T1	T2
18 X 14	4.78	4.78	9.53	9.53	12.70	12.70
18 X 12	4.78	4.57	9.53	9.53	12.70	12.70
20 X 18	5.54	4.78	9.53	9.53	12.70	12.70
20 X 16	5.54	4.78	9.53	9.53	12.70	12.70
20 X 14	5.54	4.78	9.53	9.53	12.70	12.70
22 X 20	5.54	5.54		9.53		12.70
22 X 18	5.54	4.78		9.53		12.70
22 X 16	5.54	4.78		9.53		12.70
24 X 22	6.35	5.54	9.53		12.70	
24 X 20	6.35	5.54	9.53	9.53	12.70	12.70
24 X 18	6.35	4.78	9.53	9.53	12.70	12.70
30 X 24	7.92	6.35		9.53		12.70
30 X 22	7.92	5.54				
30 X 20	7.92	5.54		9.53		12.70

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

180° Elbow (Long, Short) Cap

Sch5s, Sch10s, Sch40s, Sch80s



ASME B16.9, MSS SP-43

(Unit : mm)

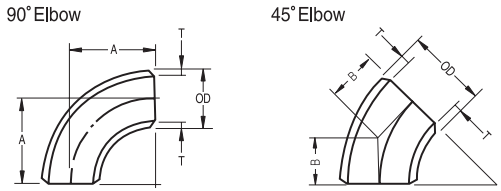
Nominal Pipe Size	Outside Diameter O.D	Wall Thickness				Length
		5S	10S	40S	80S	E
1/2	21.3	1.65	2.11	2.77	3.73	25
3/4	26.7	1.65	2.11	2.87	3.91	25
1	33.4	1.65	2.77	3.38	4.55	38
1-1/4	42.2	1.65	2.77	3.56	4.85	38
1-1/2	48.3	1.65	2.77	3.68	5.08	38
2	60.3	1.65	2.77	3.91	5.54	38
2-1/2	73.0	2.11	3.05	5.16	7.01	38
3	88.9	2.11	3.05	5.49	7.62	51
3-1/2	101.6	2.11	3.05	5.74	8.08	64
4	114.3	2.11	3.05	6.02	8.56	64
5	141.3	2.77	3.40	6.55	9.53	76
6	168.3	2.77	3.40	7.11	10.97	89
8	219.1	2.77	3.76	8.18	12.70	102
10	273.0	3.40	4.19	9.27	12.70	127
12	323.8	3.96	4.57	9.53	12.70	152
14	355.6	3.96	4.78	9.53	12.70	165
16	406.4	4.19	4.78	9.53	12.70	178
18	457.0	4.19	4.78	9.53	12.70	203
20	508.0	4.78	5.54	9.53	12.70	229
22	559.0	4.78	5.54			254
24	610.0	5.54	6.35	9.53	12.70	267
30	762.0	6.35	7.92			267

- Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."
- Length E_1 applies for thickness greater than that given in column 'Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

Nominal Pipe Size	Limiting Wall Thickness for Length E	Length	180° Elbow			
		E1	Long		Short	
			O	K	O	K
1/2	4.57	25		48		
3/4	3.81	25		51		
1	4.57	38		56	51	41
1-1/4	4.83	38	95	70	64	52
1-1/2	5.08	38	114	83	76	62
2	5.59	44	152	106	102	81
2-1/2	7.11	51	190	132	127	100
3	7.62	64	229	159	152	121
3-1/2	8.13	76	267	184	178	140
4	8.64	76	305	210	203	159
5	9.65	89	381	262	254	197
6	10.92	102	457	313	305	237
8	12.70	127	610	414	406	313
10	12.70	152	762	518	508	391
12	12.70	178	914	619	610	467
14	12.70	191	1067	711	711	533
16	12.70	203	1219	813	813	610
18	12.70	229	1372	914	914	686
20	12.70	254	1524	1016	1016	762
22	12.70	254	1676	1118	1118	838
24	12.70	305	1829	1219	1219	914
30						

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- Wall Thickness Conform to ASME B 36.19M Specifications

Special Fittings
Elbow (90°,45°)

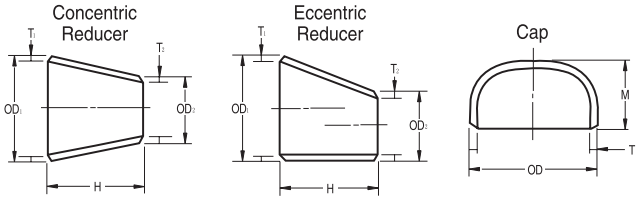


(Unit : mm)

Nominal Pipe Size	ELBOW					
	OD	Wall Thickness		LONG		SHORT
		STD	X-S	A	B	A
50	1270.0	9.53	12.70	1905.0	789.1	1270.0
52	1320.8	9.53	12.70	1981.2	820.6	1320.8
54	1371.6	9.53	12.70	2057.4	852.2	1371.6
56	1422.4	9.53	12.70	2133.6	883.8	1422.4
58	1473.2	9.53	12.70	2209.8	915.3	1473.2
60	1524.0	9.53	12.70	2286.0	946.9	1524.0
62	1574.8	9.53	12.70	2362.2	978.5	1574.8
64	1625.6	9.53	12.70	2438.4	1010.0	1625.6
66	1676.4	9.53	12.70	2514.6	1041.6	1676.4
68	1727.2	9.53	12.70	2590.8	1073.2	1727.2
70	1778.0	9.53	12.70	2667.0	1104.7	1778.0
72	1828.8	9.53	12.70	2743.2	1136.3	1828.8
74	1879.6	9.53	12.70	2819.4	1167.8	1879.6
76	1930.4	9.53	12.70	2895.6	1199.4	1930.4
78	1981.2	9.53	12.70	2971.8	1231.0	1981.2
80	2032.0	9.53	12.70	3048.0	1211.7	2032.0
82	2082.8	9.53	12.70	3124.2	1294.1	2082.8

- For Bevel Details See Page 356
- For Dimensional Tolerances See Page 362
- For Approx Weight See Page 394~421
- Wall Thickness Conform to ASME B 36.19M Specifications

Special Fittings
Reducer, Cap



(Unit : mm)

Nominal Pipe Size	REDUCER / CAP		
	OD	Wall Thickness	
		STD	X-S
50	1270.0	9.53	12.70
52	1320.8	9.53	12.70
54	1371.6	9.53	12.70
56	1422.4	9.53	12.70
58	1473.2	9.53	12.70
60	1524.0	9.53	12.70
62	1574.8	9.53	12.70
64	1625.6	9.53	12.70
66	1676.4	9.53	12.70
68	1727.2	9.53	12.70
70	1778.0	9.53	12.70
72	1828.8	9.53	12.70
74	1879.6	9.53	12.70
76	1930.4	9.53	12.70
78	1981.2	9.53	12.70
80	2032.0	9.53	12.70
82	2082.8	9.53	12.70

- Reducer for 50" and above shall be Conical shape.
- Dimension 'H' to be provided by customer or agreed.
- Dimension 'M' for caps for 50" and above o be provided by customer or agreed.

TK corporation

KS/JIS

Wrought Carbon Steel Butt Weld Pipe Fittings 192

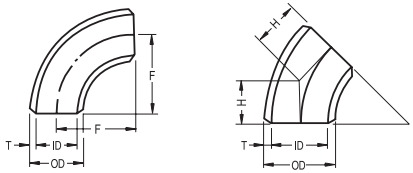
- 90° Elbow, 45° Elbow (SPP/SGP, 7.9T, STD, X-S) 192
- 180° Elbow, Cap (SPP/SGP) 194
- Tee (SPP, SGP / 7.9T, STD, X-S) 196
- Reducer (SPP, SGP / 7.9T, STD, X-S) 208
- 90° Elbow, 45° Elbow (Sch40, Sch80, Sch120, Sch160) 220
- 180° Elbow, Cap (Sch40, Sch80, Sch120, Sch160) 222
- Tee (Sch40, Sch80, Sch120, Sch160) 224
- Reducer (Sch40, Sch80, Sch120, Sch160) 230

Wrought Stainless Steel Butt Weld Pipe Fittings 239

- 90° Elbow, 45° Elbow (Sch5s, Sch10s, Sch20s) 240
- Tee (Sch5s, Sch10s, Sch20s) 242
- Reducer(Sch5s, Sch10s, Sch20s) 248
- 180° Elbow, Cap (Sch5s, Sch10s, Sch20s) 254
- Lap Joint (Stub End) 256

90° Elbow (Long, Short)
45° Elbow (Long, Short)

SPP/SGP, 7.9T, STD, X-S



KS B1522, JIS B2311

(Unit : mm)

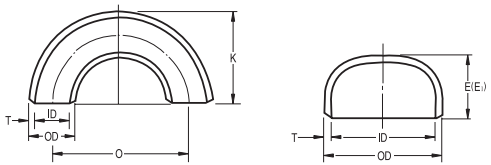
Nominal Pipe Size	Outside Diameter O.D	SPP/SGP		Center to Center			
		Inside Diameter I.D	Wall Thickness T	Long		Short	
				F (90°)	H (45°)	F (90°)	
15	21.7	16.1	2.8	38.1	15.8	-	
20	27.2	21.6	2.8	38.1	15.8	-	
25	34.0	27.6	3.2	38.1	15.8	25.4	
32	42.7	35.7	3.5	47.6	19.7	31.8	
40	48.6	41.6	3.5	57.2	23.7	38.1	
50	60.5	52.9	3.8	76.2	31.6	50.8	
65	76.3	67.9	4.2	95.3	39.5	63.5	
80	89.1	80.7	4.2	114.3	47.3	76.2	
90	101.6	93.2	4.2	133.4	55.3	88.9	
100	114.3	105.3	4.5	152.4	63.1	101.6	
125	139.8	130.8	4.5	190.5	78.9	127.0	
150	165.2	155.2	5.0	228.6	94.7	152.4	
200	216.3	204.7	5.8	304.8	126.3	203.2	
250	267.4	254.2	6.6	381.0	157.8	254.0	
300	318.5	304.7	6.9	457.2	189.4	304.8	
350	355.6	339.8	7.9	533.4	220.9	355.6	
400	406.4	390.6	7.9	609.6	252.5	406.4	
450	457.2	441.4	7.9	685.8	284.1	457.2	
500	508.0	492.2	7.9	762.0	315.6	508.0	

Wall Thickness T						Center to Center			
7.9T		STD		X-S		Long		Short	
I.D	T	I.D	T	I.D	T	F (90°)	H (45°)	F (90°)	
16.1	2.8	16.1	2.8	16.1	2.8	38.1	15.8	-	
21.6	2.8	21.6	2.8	21.6	2.8	38.1	15.8	-	
27.6	3.2	27.6	3.2	27.6	3.2	38.1	15.8	25.4	
35.7	3.5	35.7	3.5	35.7	3.5	47.6	19.7	31.8	
41.6	3.5	41.6	3.5	41.6	3.5	57.2	23.7	38.1	
52.9	3.8	52.9	3.8	52.9	3.8	76.2	31.6	50.8	
67.9	4.2	67.9	4.2	67.9	4.2	95.3	39.5	63.5	
80.7	4.2	80.7	4.2	80.7	4.2	114.3	47.3	76.2	
93.2	4.2	93.2	4.2	93.2	4.2	133.4	55.3	88.9	
105.3	4.5	105.3	4.5	105.3	4.5	152.4	63.1	101.6	
130.8	4.5	130.8	4.5	130.8	4.5	190.5	78.9	127.0	
155.2	5.0	155.2	5.0	155.2	5.0	228.6	94.7	152.4	
204.7	5.8	204.7	5.8	204.7	5.8	304.8	126.3	203.2	
254.2	6.6	254.2	6.6	254.2	6.6	381.0	157.8	254.0	
304.7	6.9	304.7	6.9	304.7	6.9	457.2	189.4	304.8	
339.8	7.9	339.8	9.5	339.8	12.7	533.4	220.9	355.6	
390.6	7.9	390.6	9.5	390.6	12.7	609.6	252.5	406.4	
441.4	7.9	441.4	9.5	441.4	12.7	685.8	284.1	457.2	
492.2	7.9	492.2	9.5	492.2	12.7	762.0	315.6	508.0	

- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

180° Elbow (Long, Short) Cap

SPP/SGP



KS B1522, JIS B2311

(Unit : mm)

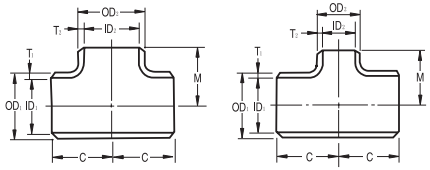
Nominal Pipe Size (Unit : A)	Outside Diameter O.D	Inside Diameter I.D	Wall Thickness T
15	21.7	16.1	2.8
20	27.2	21.6	2.8
25	34.0	27.6	3.2
32	42.7	35.7	3.5
40	48.6	41.6	3.5
50	60.5	52.9	3.8
65	76.3	67.9	4.2
80	89.1	80.7	4.2
90	101.6	93.2	4.2
100	114.3	105.3	4.5
125	139.8	130.8	4.5
150	165.2	155.2	5.0
200	216.3	204.7	5.8
250	267.4	254.2	6.6
300	318.5	304.7	6.9
350	355.6	339.8	7.9
400	406.4	390.6	7.9
450	457.2	441.4	7.9
500	508.0	492.2	7.9

Cap E	180° Elbow			
	Long		Short	
	O	K	O	K
-	76.2	49.0	-	-
-	76.2	51.7	-	-
38.1	76.2	55.1	50.8	42.4
38.1	95.2	69.0	63.6	53.2
38.1	114.4	81.5	76.2	62.4
38.1	152.4	106.5	101.6	81.1
38.1	190.6	133.5	127.0	101.7
50.8	228.6	158.9	152.4	120.8
63.5	266.8	184.2	177.8	139.7
63.5	304.8	209.6	203.2	158.8
76.2	381.0	260.4	254.0	196.9
88.9	457.2	311.2	304.8	235.0
101.6	609.6	413.0	406.4	311.4
127.0	762.0	514.7	508.0	387.7
152.4	914.4	616.5	609.6	464.1
165.1	1066.8	711.2	711.2	533.4
177.8	1219.2	812.8	812.8	609.6
203.2	-	-	-	-
228.6	-	-	-	-

- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

Tee

SPP, SGP



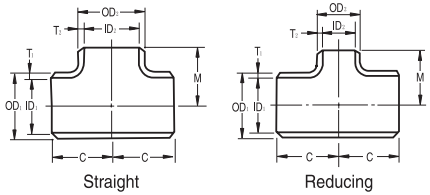
KS B1522, JIS B2311

(Unit : mm)

Nominal Pipe Size (Unit : A)	Run			Outlet			Center to End	
	Outside Dia. O.D1	Inside Dia. I.D1	Wall Thick. T1	Outside Dia. O.D2	Inside Dia. I.D2	Wall Thick. T2	C	M
15	21.7	16.1	2.8	21.7	16.1	2.8	25.4	25.4
20	27.2	21.6	2.8	27.2	21.6	2.8	28.6	28.6
20 x 20 x 15	27.2	21.6	2.8	21.7	16.1	2.8	28.6	28.6
25	34.0	27.6	3.2	34.0	27.6	3.2	38.1	38.1
25 x 25 x 20	34.0	27.6	3.2	27.2	21.6	2.8	38.1	38.1
25 x 25 x 15	34.0	35.7	3.2	21.7	16.1	2.8	38.1	38.1
32	42.7	35.7	3.5	42.7	35.7	3.5	47.6	47.6
32 x 32 x 25	42.7	35.7	3.5	34.0	27.6	3.2	47.6	47.6
32 x 32 x 20	42.7	35.7	3.5	27.2	21.6	2.8	47.6	47.6
40	48.6	41.6	3.5	48.6	41.6	3.5	57.2	57.2
40 x 40 x 32	48.6	41.6	3.5	42.7	35.7	3.5	57.2	57.2
40 x 40 x 25	48.6	41.6	3.5	34.0	27.6	3.2	57.2	57.2
40 x 40 x 20	48.6	41.6	3.5	27.2	21.6	2.8	57.2	57.2
50	60.5	52.9	3.8	60.5	52.9	3.8	63.5	63.5
50 x 50 x 40	60.5	52.9	3.8	48.6	41.6	3.5	63.5	60.3
50 x 50 x 32	60.5	52.9	3.8	42.7	35.7	3.5	63.5	57.2
50 x 50 x 25	60.5	52.9	3.8	34.0	27.6	3.2	63.5	50.8
65	76.3	67.9	4.2	76.3	67.9	4.2	76.2	76.2
65 x 65 x 50	76.3	67.9	4.2	60.5	52.9	3.8	76.2	69.9
65 x 65 x 40	76.3	67.9	4.2	48.6	41.6	3.5	76.2	66.7
65 x 65 x 32	76.3	67.9	4.2	42.7	35.7	3.5	76.2	63.5
80	89.1	80.7	4.2	89.1	80.7	4.2	85.7	85.7
80 x 80 x 65	89.1	80.7	4.2	76.3	67.9	4.2	85.7	82.6
80 x 80 x 50	89.1	80.7	4.2	60.5	52.9	3.8	85.7	76.2
80 x 80 x 40	89.1	80.7	4.2	48.6	41.6	3.5	85.7	73.0

Tee

SPP, SGP



KS B1522, JIS B2311

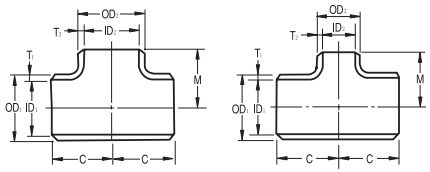
(Unit : mm)

Nominal Pipe Size (Unit : A)	Run			Outlet			Center to End	
	Outside Dia. O.D1	Inside Dia. I.D1	Wall Thick. T1	Outside Dia. O.D2	Inside Dia. I.D2	Wall Thick. T2	C	M
90	101.6	93.2	4.2	101.6	93.2	4.2	95.3	95.3
90 x 90 x 80	101.6	93.2	4.2	89.1	80.7	4.2	95.3	92.1
90 x 90 x 65	101.6	93.2	4.2	76.3	67.9	4.2	95.3	88.9
90 x 90 x 50	101.6	93.2	4.2	60.5	52.9	3.8	95.3	82.6
90 x 90 x 40	101.6	93.2	4.2	48.6	41.6	3.5	95.3	79.4
100	114.3	105.3	4.5	114.3	105.3	4.5	104.8	104.8
100 x 100 x 90	114.3	105.3	4.5	101.6	93.2	4.2	104.8	101.6
100 x 100 x 80	114.3	105.3	4.5	89.1	80.7	4.2	104.8	98.4
100 x 100 x 65	114.3	105.3	4.5	76.3	67.9	4.2	104.8	95.3
100 x 100 x 50	114.3	105.3	4.5	60.5	52.9	3.8	104.8	88.9
125	139.8	130.8	4.5	139.8	130.8	4.5	123.8	123.8
125 x 125 x 100	139.8	130.8	4.5	114.3	105.3	4.5	123.8	117.5
125 x 125 x 90	139.8	130.8	4.5	101.6	93.2	4.2	123.8	114.3
125 x 125 x 80	139.8	130.8	4.5	89.1	80.7	4.2	123.8	111.1
125 x 125 x 65	139.8	130.8	4.5	76.3	67.9	4.2	123.8	108.0
125 x 125 x 50	139.8	130.8	4.5	60.5	52.9	3.8	123.8	104.8
150	165.2	155.2	5.0	165.2	155.2	5.0	142.9	142.9
150 x 150 x 125	165.2	155.2	5.0	139.8	130.8	4.5	142.9	136.5
150 x 150 x 100	165.2	155.2	5.0	114.3	105.3	4.5	142.9	130.2
150 x 150 x 90	165.2	155.2	5.0	101.6	93.2	4.2	142.9	127.0
150 x 150 x 80	165.2	155.2	5.0	89.1	80.7	4.2	142.9	123.8
150 x 150 x 65	165.2	155.2	5.0	76.3	67.9	4.2	142.9	120.7
200	216.3	204.7	5.8	216.3	204.7	5.8	177.8	177.8
200 x 200 x 150	216.3	204.7	5.8	165.2	155.2	5.0	177.8	168.3
200 x 200 x 125	216.3	204.7	5.8	139.8	130.8	4.5	177.8	161.9

Tee

SPP, SGP

KS B1522, JIS B2311



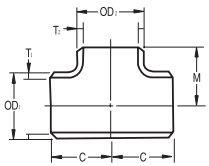
(Unit : mm)

Nominal Pipe Size (Unit : A)	Run			Outlet			Center to End	
	Outside Dia. O.D1	Inside Dia. I.D1	Wall Thick. T1	Outside Dia. O.D2	Inside Dia. I.D2	Wall Thick. T2	C	M
200 x 200 x 100	216.3	204.7	5.8	114.3	105.3	4.5	177.8	155.6
250	267.4	254.2	6.6	267.2	254.2	6.6	215.9	215.9
250 x 250 x 200	267.4	254.2	6.6	216.3	204.7	5.8	215.9	203.2
250 x 250 x 150	267.4	254.2	6.6	165.2	155.2	5.0	215.9	193.7
250 x 250 x 125	267.4	254.2	6.6	139.8	130.8	4.5	215.9	190.5
300	318.5	304.7	6.9	318.5	304.7	6.9	254.0	254.0
300 x 300 x 250	318.5	304.7	6.9	267.4	254.2	6.6	254.0	241.3
300 x 300 x 200	318.5	304.7	6.9	216.3	204.7	5.8	254.0	228.6
300 x 300 x 150	318.5	304.7	6.9	165.2	155.2	5.0	254.0	219.1
350	355.6	339.8	7.9	355.6	339.8	7.9	279.4	279.4
350 x 350 x 300	355.6	339.8	7.9	318.5	304.7	6.9	279.4	269.9
350 x 350 x 250	355.6	339.8	7.9	267.4	254.2	6.6	279.4	257.2
350 x 350 x 200	355.6	339.8	7.9	216.3	204.7	5.8	279.4	247.7
400	406.4	390.6	7.9	406.4	390.6	7.9	304.8	304.8
400 x 400 x 350	406.4	390.6	7.9	355.6	339.8	7.9	304.8	304.8
400 x 400 x 300	406.4	390.6	7.9	318.5	304.7	6.9	304.8	295.3
400 x 400 x 250	406.4	390.6	7.9	267.4	254.2	6.9	304.8	282.6
450	457.2	441.4	7.9	457.2	441.4	7.9	342.9	342.9
450 x 450 x 400	457.2	441.4	7.9	406.4	390.6	7.9	342.9	330.2
450 x 450 x 350	457.2	441.4	7.9	355.6	339.8	7.9	342.9	330.2
450 x 450 x 300	457.2	441.4	7.9	318.5	304.7	6.9	342.9	320.7
500	508.0	492.2	7.9	508.0	492.2	7.9	381.0	381.0
500 x 500 x 450	508.0	492.2	7.9	457.2	441.4	7.9	381.0	368.3
500 x 500 x 400	508.0	492.2	7.9	406.4	390.6	7.9	381.0	355.6
500 x 500 x 350	508.0	492.2	7.9	355.6	339.8	7.9	381.0	355.6

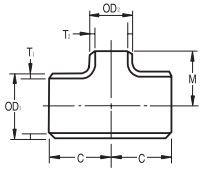
For Bevel Details See Page 358
For Dimensional Tolerances See Page 370
For Approx Weight See Page 394~421

Tee

7.9T, STD, X-S



Straight



Reducing

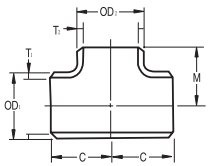
KS B1522/43, JIS B2311/3

(Unit : mm)

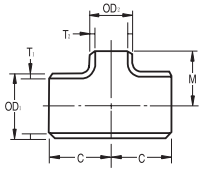
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness			Center to End	
	O.D1	O.D2	7.9T T1, T2	STD T1, T2	X-S T1, T2	C	M
400	406.4	406.4	7.9	9.5	12.7	304.8	304.8
400 x 400 x 350	406.4	355.6	7.9	9.5	12.7	304.8	304.8
400 x 400 x 300	406.4	318.5	7.9	9.5	12.7	304.8	295.3
400 x 400 x 250	406.4	267.4	7.9	9.5	12.7	304.8	282.6
450	457.2	457.2	7.9	9.5	12.7	342.9	342.9
450 x 450 x 400	457.2	406.4	7.9	9.5	12.7	342.9	330.2
450 x 450 x 350	457.2	355.6	7.9	9.5	12.7	342.9	330.2
450 x 450 x 300	457.2	318.5	7.9	9.5	12.7	342.9	330.2
500	508.0	508.0	7.9	9.5	12.7	381.0	381.0
500 x 500 x 450	508.0	457.2	7.9	9.5	12.7	381.0	368.3
500 x 500 x 400	508.0	406.4	7.9	9.5	12.7	381.0	355.6
500 x 500 x 350	508.0	355.6	7.9	9.5	12.7	381.0	355.6
550	558.8	558.8	7.9	9.5	12.7	419.1	419.1
550 x 550 x 500	558.8	508.0	7.9	9.5	12.7	419.1	406.4
550 x 550 x 450	558.8	457.2	7.9	9.5	12.7	419.1	393.7
550 x 550 x 400	558.8	406.4	7.9	9.5	12.7	419.1	381.0
600	609.6	609.6	7.9	9.5	12.7	431.8	431.8
600 x 600 x 550	609.6	558.8	7.9	9.5	12.7	431.8	431.8
600 x 600 x 500	609.6	508.0	7.9	9.5	12.7	431.8	431.8
600 x 600 x 450	609.6	457.2	7.9	9.5	12.7	431.8	419.1
650	660.4	660.4	7.9	9.5	12.7	495.3	495.3
650 x 650 x 600	660.4	609.6	7.9	9.5	12.7	495.3	482.6
650 x 650 x 550	660.4	558.8	7.9	9.5	12.7	495.3	469.9
650 x 650 x 500	660.4	508.0	7.9	9.5	12.7	495.3	457.2
700	711.2	711.2	7.9	9.5	12.7	520.7	520.7

Tee

7.9T, STD, X-S



Straight



Reducing

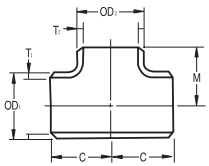
KS B1522/43, JIS B2311/3

(Unit : mm)

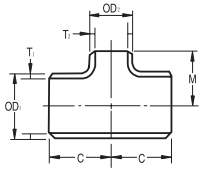
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness			Center to End	
	O.D1	O.D2	7.9T T1, T2	STD T1, T2	X-S T1, T2	C	M
700 x 700 x 650	711.2	660.4	7.9	9.5	12.7	520.7	520.7
700 x 700 x 600	711.2	609.6	7.9	9.5	12.7	520.7	508.0
700 x 700 x 550	711.2	558.8	7.9	9.5	12.7	520.7	495.3
750	762.0	762.0	7.9	9.5	12.7	558.8	558.8
750 x 750 x 700	762.0	711.2	7.9	9.5	12.7	558.8	546.1
750 x 750 x 650	762.0	660.4	7.9	9.5	12.7	558.8	546.1
750 x 750 x 600	762.0	609.6	7.9	9.5	12.7	558.8	533.4
800	812.8	812.8	7.9	9.5	12.7	569.9	596.9
800 x 800 x 750	812.8	762.0	7.9	9.5	12.7	569.9	584.2
800 x 800 x 700	812.8	711.2	7.9	9.5	12.7	569.9	571.5
800 x 800 x 650	812.8	660.4	7.9	9.5	12.7	569.9	571.5
850	863.6	863.6	7.9	9.5	12.7	635.0	635.0
850 x 850 x 800	863.6	812.8	7.9	9.5	12.7	635.0	622.3
850 x 850 x 750	863.6	762.0	7.9	9.5	12.7	635.0	609.6
850 x 850 x 700	863.6	711.2	7.9	9.5	12.7	635.0	596.9
900	914.4	914.4	7.9	9.5	12.7	673.1	673.1
900 x 900 x 850	914.4	863.6	7.9	9.5	12.7	673.1	660.4
900 x 900 x 800	914.4	812.8	7.9	9.5	12.7	673.1	647.7
900 x 900 x 750	914.4	762.0	7.9	9.5	12.7	673.1	635.0
950	965.2	965.2	7.9	9.5	12.7	711.2	711.2
950 x 950 x 900	965.2	914.4	7.9	9.5	12.7	711.2	711.2
950 x 950 x 850	965.2	863.6	7.9	9.5	12.7	711.2	698.5
950 x 950 x 800	965.2	812.8	7.9	9.5	12.7	711.2	685.8
1000	1016.0	1016.0	7.9	9.5	12.7	749.3	749.3
1000 x 1000 x 950	1016.0	965.2	7.9	9.5	12.7	749.3	749.3

Tee

7.9T, STD, X-S



Straight



Reducing

KS B1522/43, JIS B2311/3

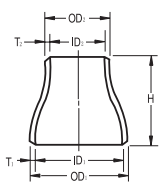
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness			Center to End	
	O.D1	O.D2	7.9T T1, T2	STD T1, T2	X-S T1, T2	C	M
1000 x 1000 x 900	1016.0	914.4	7.9	9.5	12.7	749.3	736.6
1000 x 1000 x 850	1016.0	863.6	7.9	9.5	12.7	749.3	723.9
1050	1066.8	1066.8	7.9	9.5	12.7	762.0	711.2
1050 x 1050 x 1000	1066.8	1016.0	7.9	9.5	12.7	762.0	711.2
1050 x 1050 x 950	1066.8	965.2	7.9	9.5	12.7	762.0	711.2
1050 x 1050 x 900	1066.8	914.4	7.9	9.5	12.7	762.0	711.2
1100	1117.6	1117.6	7.9	9.5	12.7	812.8	762.0
1100 x 1100 x 1050	1117.6	1066.8	7.9	9.5	12.7	812.8	762.0
1100 x 1100 x 1000	1117.6	1016.0	7.9	9.5	12.7	812.8	749.3
1100 x 1100 x 950	1117.6	965.2	7.9	9.5	12.7	812.8	736.6
1150	1168.4	1168.4	7.9	9.5	12.7	850.9	800.1
1150 x 1150 x 1100	1168.4	1117.6	7.9	9.5	12.7	850.9	800.1
1150 x 1150 x 1050	1168.4	1066.8	7.9	9.5	12.7	850.9	787.4
1150 x 1150 x 1000	1168.4	1016.0	7.9	9.5	12.7	850.9	774.7
1200	1219.2	1219.2	7.9	9.5	12.7	889.0	838.2
1200 x 1200 x 1150	1219.2	1168.4	7.9	9.5	12.7	889.0	838.2
1200 x 1200 x 1100	1219.2	1117.6	7.9	9.5	12.7	889.0	838.2
1200 x 1200 x 1050	1219.2	1066.8	7.9	9.5	12.7	889.0	812.8

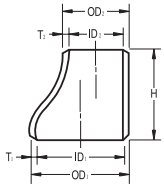
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

Reducer

SPP, SGP



Concentric



Eccentric

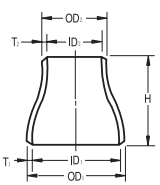
KS B1522, JIS B2311

(Unit : mm)

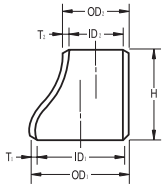
Nominal Pipe Size (Unit : A)	Large End			Small End			End to End
	Outside Dia. O.D1	Inside Dia. I.D1	Wall Thick. T1	Outside Dia. O.D2	Inside Dia. I.D2	Wall Thick. T2	H
20 x 15	27.2	21.6	2.8	21.7	16.1	2.8	38.1
25 x 20	34.0	27.6	3.2	27.2	21.6	2.8	50.8
25 x 15	34.0	35.7	3.2	21.7	16.1	2.8	50.8
32 x 25	42.7	35.7	3.5	34.0	27.6	3.2	50.8
32 x 20	42.7	35.7	3.5	27.2	21.6	2.8	50.8
32 x 15	42.7	35.7	3.5	21.7	16.1	2.8	50.8
40 x 32	48.6	41.6	3.5	42.7	35.7	3.5	63.5
40 x 25	48.6	41.6	3.5	34.0	27.6	3.2	63.5
40 x 20	48.6	41.6	3.5	27.2	21.6	2.8	63.5
50 x 40	60.5	52.9	3.8	48.6	41.6	3.5	76.2
50 x 32	60.5	52.9	3.8	42.7	35.7	3.5	76.2
50 x 25	60.5	52.9	3.8	34.0	27.6	3.2	76.2
50 x 15	60.5	52.9	3.8	27.2	21.6	2.8	76.2
65 x 50	76.3	67.9	4.2	60.5	52.9	3.8	88.9
65 x 40	76.3	67.9	4.2	48.6	41.6	3.5	88.9
65 x 32	76.3	67.9	4.2	42.7	35.7	3.5	88.9
65 x 32	76.3	67.9	4.2	34.0	27.6	3.2	88.9
80 x 65	89.1	80.7	4.2	76.3	67.9	4.2	88.9
80 x 50	89.1	80.7	4.2	60.5	52.9	3.8	88.9
80 x 40	89.1	80.7	4.2	48.6	41.6	3.5	88.9
80 x 32	89.1	80.7	4.2	42.7	35.7	3.5	88.9
90 x 80	101.6	93.2	4.2	89.1	80.7	4.2	101.6
90 x 65	101.6	93.2	4.2	76.3	67.9	4.2	101.6
90 x 50	101.6	93.2	4.2	60.5	52.9	3.8	101.6
90 x 40	101.6	93.2	4.2	48.6	41.6	3.5	101.6

Reducer

SPP, SGP



Concentric



Eccentric

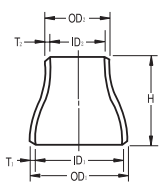
KS B1522, JIS B2311

(Unit : mm)

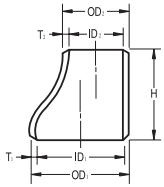
Nominal Pipe Size (Unit : A)	Large End			Small End			End to End
	Outside Dia. O.D1	Inside Dia. I.D1	Wall Thick. T1	Outside Dia. O.D2	Inside Dia. I.D2	Wall Thick. T2	H
100 x 90	114.3	105.3	4.5	101.6	93.2	4.2	101.6
100 x 80	114.3	105.3	4.5	89.1	80.7	4.2	101.6
100 x 65	114.3	105.3	4.5	76.3	67.9	4.2	101.6
100 x 50	114.3	105.3	4.5	60.5	52.9	3.8	101.6
125 x 100	139.8	130.8	4.5	114.3	105.3	4.5	127.0
125 x 90	139.8	130.8	4.5	101.6	93.2	4.2	127.0
125 x 80	139.8	130.8	4.5	89.1	80.7	4.2	127.0
125 x 65	139.8	130.8	4.5	76.3	67.9	4.2	127.0
150 x 125	165.2	155.2	5.0	139.8	130.8	4.5	139.7
150 x 100	165.2	155.2	5.0	114.3	105.3	4.5	139.7
150 x 90	165.2	155.2	5.0	101.6	93.2	4.2	139.7
150 x 80	165.2	155.2	5.0	89.1	80.7	4.2	139.7
150 x 65	165.2	155.2	5.0	76.3	67.9	4.2	139.7
200 x 150	216.3	204.7	5.8	165.2	155.2	5.0	152.4
200 x 125	216.3	204.7	5.8	139.8	130.8	4.5	152.4
200 x 100	216.3	204.7	5.8	114.3	105.3	4.5	152.4
200 x 90	216.3	204.7	5.8	101.6	93.2	4.2	152.4
250 x 200	267.4	254.2	6.6	216.3	204.7	5.8	177.8
250 x 150	267.4	254.2	6.6	165.2	155.2	5.0	177.8
250 x 125	267.4	254.2	6.6	139.8	130.8	4.5	177.8
300 x 250	318.5	304.7	6.9	267.4	254.2	6.6	203.2
300 x 200	318.5	304.7	6.9	216.3	204.7	5.8	203.2
300 x 150	318.5	304.7	6.9	165.2	155.2	5.0	203.2
300 x 125	318.5	304.7	6.9	139.8	130.8	4.5	203.2
350 x 300	355.6	339.8	7.9	318.5	304.7	6.9	330.2

Reducer

SPP, SGP



Concentric



Eccentric

KS B1522, JIS B2311

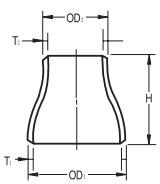
(Unit : mm)

Nominal Pipe Size (Unit : A)	Large End			Small End			End to End
	Outside Dia. O.D1	Inside Dia. I.D1	Wall Thick. T1	Outside Dia. O.D2	Inside Dia. I.D2	Wall Thick. T2	H
350 x 250	355.6	339.8	7.9	267.4	254.2	6.6	330.2
350 x 200	355.6	339.8	7.9	216.3	204.7	5.8	330.2
400 x 350	406.4	390.6	7.9	355.6	339.8	7.9	355.6
400 x 300	406.4	390.6	7.9	318.5	304.7	6.9	355.6
400 x 250	406.4	390.6	7.9	267.4	254.2	6.6	355.6
450 x 400	457.2	441.4	7.9	406.4	390.6	7.9	381.0
450 x 350	457.2	441.4	7.9	355.6	339.8	7.9	381.0
450 x 300	457.2	441.4	7.9	318.5	304.7	6.9	381.0
500 x 450	508.0	492.2	7.9	457.2	441.4	7.9	508.0
500 x 400	508.0	492.2	7.9	406.4	390.6	7.9	508.0
500 x 350	508.0	492.2	7.9	355.6	339.8	7.9	508.0

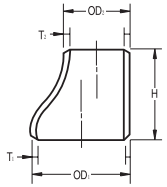
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

Reducer

7.9T, STD, X-S



Concentric



Eccentric

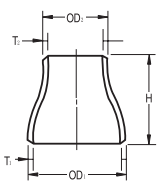
KS B1522/43, JIS B2311/3

(Unit : mm)

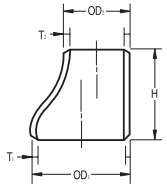
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness			End to End
	OD1	OD2	7.9T T1, T2	STD T1, T2	X-S T1, T2	H
400 x 350	406.4	355.6	7.9	9.5	12.7	355.6
400 x 300	406.4	318.5	7.9	9.5	12.7	355.6
400 x 250	406.4	267.4	7.9	9.5	12.7	355.6
400 x 200	406.4	216.3	7.9	9.5	12.7	355.6
450 x 400	457.2	406.4	7.9	9.5	12.7	381.0
450 x 350	457.2	355.6	7.9	9.5	12.7	381.0
450 x 300	457.2	318.5	7.9	9.5	12.7	381.0
450 x 250	457.2	267.4	7.9	9.5	12.7	381.0
500 x 450	508.0	457.2	7.9	9.5	12.7	508.0
500 x 400	508.0	406.4	7.9	9.5	12.7	508.0
500 x 350	508.0	355.6	7.9	9.5	12.7	508.0
500 x 300	508.0	318.5	7.9	9.5	12.7	508.0
550 x 500	558.8	508.0	7.9	9.5	12.7	508.0
550 x 450	558.8	457.2	7.9	9.5	12.7	508.0
550 x 400	558.8	406.4	7.9	9.5	12.7	508.0
550 x 350	558.8	355.6	7.9	9.5	12.7	508.0
600 x 550	609.6	558.8	7.9	9.5	12.7	508.0
600 x 500	609.6	508.0	7.9	9.5	12.7	508.0
600 x 450	609.6	457.2	7.9	9.5	12.7	508.0
600 x 400	609.6	406.4	7.9	9.5	12.7	508.0
650 x 600	660.4	609.6	7.9	9.5	12.7	609.6
650 x 550	660.4	558.8	7.9	9.5	12.7	609.6
650 x 500	660.4	508.0	7.9	9.5	12.7	609.6
650 x 450	660.4	457.2	7.9	9.5	12.7	609.6
700 x 650	711.2	660.4	7.9	9.5	12.7	609.6

Reducer

7.9T, STD, X-S



Concentric



Eccentric

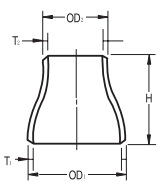
KS B1522/43, JIS B2311/3

(Unit : mm)

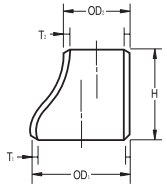
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness			End to End
	OD1	OD2	7.9T T1, T2	STD T1, T2	X-S T1, T2	H
700 x 600	711.2	609.6	7.9	9.5	12.7	609.6
700 x 550	711.2	558.8	7.9	9.5	12.7	609.6
700 x 500	711.2	508.0	7.9	9.5	12.7	609.6
750 x 700	762.0	711.2	7.9	9.5	12.7	609.6
750 x 650	762.0	660.4	7.9	9.5	12.7	609.6
750 x 600	762.0	609.6	7.9	9.5	12.7	609.6
750 x 550	762.0	558.8	7.9	9.5	12.7	609.6
800 x 750	812.8	762.0	7.9	9.5	12.7	609.6
800 x 700	812.8	711.2	7.9	9.5	12.7	609.6
800 x 650	812.8	660.4	7.9	9.5	12.7	609.6
800 x 600	812.8	609.6	7.9	9.5	12.7	609.6
850 x 800	863.6	812.8	7.9	9.5	12.7	609.6
850 x 750	863.6	762.0	7.9	9.5	12.7	609.6
850 x 700	863.6	711.2	7.9	9.5	12.7	609.6
850 x 650	863.6	660.4	7.9	9.5	12.7	609.6
900 x 850	914.4	863.6	7.9	9.5	12.7	609.6
900 x 800	914.4	812.8	7.9	9.5	12.7	609.6
900 x 750	914.4	762.0	7.9	9.5	12.7	609.6
900 x 700	914.4	711.2	7.9	9.5	12.7	609.6
950 x 900	965.2	914.4	7.9	9.5	12.7	609.6
950 x 850	965.2	863.6	7.9	9.5	12.7	609.6
950 x 800	965.2	812.8	7.9	9.5	12.7	609.6
950 x 750	965.2	762.0	7.9	9.5	12.7	609.6
1000 x 950	1016.0	965.2	7.9	9.5	12.7	609.6
1000 x 900	1016.0	914.4	7.9	9.5	12.7	609.6

Reducer

7.9T, STD, X-S



Concentric



Eccentric

KS B1522/43, JIS B2311/3

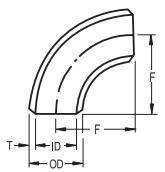
(Unit : mm)

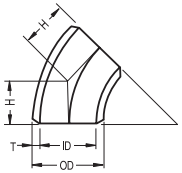
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness			End to End
	OD1	OD2	7.9T T1, T2	STD T1, T2	X-S T1, T2	H
1000 x 850	1016.0	863.6	7.9	9.5	12.7	609.6
1000 x 800	1016.0	812.8	7.9	9.5	12.7	609.6
1050 x 1000	1066.8	1016.0	7.9	9.5	12.7	609.6
1050 x 950	1066.8	965.2	7.9	9.5	12.7	609.6
1050 x 900	1066.8	914.4	7.9	9.5	12.7	609.6
1050 x 850	1066.8	863.6	7.9	9.5	12.7	609.6
1100 x 1050	1117.6	1066.8	7.9	9.5	12.7	609.6
1100 x 1000	1117.6	1016.0	7.9	9.5	12.7	609.6
1100 x 950	1117.6	965.2	7.9	9.5	12.7	609.6
1100 x 900	1117.6	914.4	7.9	9.5	12.7	609.6
1150 x 1100	1168.4	1117.6	7.9	9.5	12.7	711.2
1150 x 1050	1168.4	1066.8	7.9	9.5	12.7	711.2
1150 x 1000	1168.4	1016.0	7.9	9.5	12.7	711.2
1150 x 950	1168.4	965.2	7.9	9.5	12.7	711.2
1200 x 1150	1219.2	1168.4	7.9	9.5	12.7	711.2
1200 x 1100	1219.2	1117.6	7.9	9.5	12.7	711.2
1200 x 1050	1219.2	1066.8	7.9	9.5	12.7	711.2
1200 x 1000	1219.2	1016.0	7.9	9.5	12.7	711.2

- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

90° Elbow (Long, Short)
45° Elbow (Long, Short)

Sch40, Sch80, Sch120, Sch160





KS B1541, JIS B2312

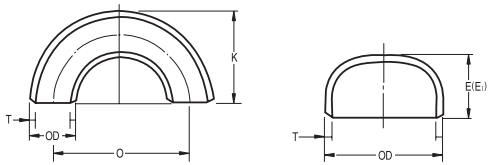
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter O.D	Wall Thickness T				Wall Thickness T				Center to Center			
		Sch 40		Sch 80		Sch 120		Sch 160		Long		Short	
		I.D	T	I.D	T	I.D	T	I.D	T	F (90°)	H (45°)	F (90°)	
15	21.7	16.1	2.8	14.3	3.7	-	-	12.3	4.7	38.1	15.8	-	
20	27.2	21.4	2.9	19.4	3.9	-	-	16.2	5.5	38.1	15.8	-	
25	34.0	27.2	3.4	25.0	4.5	-	-	21.2	6.4	38.1	15.8	25.4	
32	42.7	35.5	3.6	32.9	4.9	-	-	29.9	6.4	47.6	19.7	31.8	
40	48.6	41.2	3.7	38.4	5.1	-	-	34.4	7.1	57.2	23.7	38.1	
50	60.5	52.7	3.9	49.5	5.5	-	-	43.1	8.7	76.2	31.6	50.8	
65	76.3	65.9	5.2	62.3	7.0	-	-	57.3	9.5	95.3	39.5	63.5	
80	89.1	78.1	5.5	73.9	7.6	-	-	66.9	11.1	114.3	47.3	76.2	
90	101.6	90.2	5.7	85.4	8.1	-	-	76.2	12.7	133.4	55.3	88.9	
100	114.3	102.3	6.0	97.1	8.6	92.1	11.1	87.3	13.5	152.4	63.1	101.6	
125	139.8	126.6	6.6	120.8	9.5	114.4	12.7	108	15.9	190.5	78.9	127.0	
150	165.2	151	7.1	143.2	11.0	136.6	14.3	128.8	18.2	228.6	94.7	152.4	
200	216.3	199.9	8.2	190.9	12.7	179.9	18.2	170.3	23.0	304.8	126.3	203.2	
250	267.4	248.8	9.3	237.2	15.1	224.6	21.4	210.2	28.6	381.0	157.8	254.0	
300	318.5	297.9	10.3	283.7	17.4	267.7	25.4	251.9	33.3	457.2	189.4	304.8	
350	355.6	333.4	11.1	317.6	19.0	300.0	27.8	284.2	35.7	533.4	220.9	355.6	
400	406.4	381	12.7	363.6	21.4	344.6	30.9	325.4	40.5	609.6	252.5	406.4	
450	457.2	428.6	14.3	409.6	23.8	387.4	34.9	366.8	45.2	685.8	284.1	457.2	
500	508.0	477.8	15.1	455.6	26.2	431.8	38.1	408.0	50.0	762.0	315.6	508.0	

- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

180° Elbow (Long, Short) Cap

Sch40, Sch80, Sch120, Sch160



KS B1541, JIS B2312

(Unit : mm)

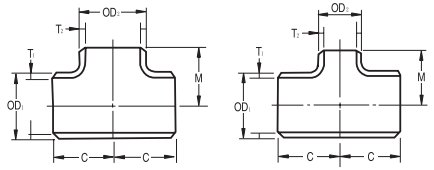
Nominal Pipe Size (Unit : A)	Outside Diameter O.D	Wall Thickness T			
		Sch 40	Sch 80	Sch 120	Sch 160
15	21.7	2.8	3.7	-	4.7
20	27.2	2.9	3.9	-	5.5
25	34.0	3.4	4.5	-	6.4
32	42.7	3.6	4.9	-	6.4
40	48.6	3.7	5.1	-	7.1
50	60.5	3.9	5.5	-	8.7
65	76.3	5.2	7.0	-	9.5
80	89.1	5.5	7.6	-	11.1
90	101.6	5.7	8.1	-	12.7
100	114.3	6.0	8.6	11.1	13.5
125	139.8	6.6	9.5	12.7	15.9
150	165.2	7.1	11.0	14.3	18.2
200	216.3	8.2	12.7	18.2	23.0
250	267.4	9.3	15.1	21.4	28.6
300	318.5	10.3	17.4	25.4	33.3
350	355.6	11.1	19.0	27.8	35.7
400	406.4	12.7	21.4	30.9	40.5
450	457.2	14.3	23.8	34.9	45.2
500	508.0	15.1	26.2	38.1	50.0

CAP			180° Elbow			
E	E1	Limited Wall Thickness for E	Long		Short	
			O	K	O	K
25.4	-	-	76.2	49.0	-	-
25.4	-	-	76.2	51.7	-	-
38.1	-	-	76.2	55.1	50.8	42.4
38.1	-	-	95.2	69.0	63.6	53.2
38.1	-	-	114.4	81.5	76.2	62.4
38.1	44.5	5.5	152.4	106.5	101.6	81.1
38.1	50.8	7.0	190.6	133.5	127.0	101.7
50.8	63.5	7.6	228.6	158.9	152.4	120.8
63.5	76.2	8.1	266.8	184.2	177.8	139.7
63.5	76.2	8.6	304.8	209.6	203.2	158.8
76.2	88.9	9.5	381.0	260.4	254.0	196.9
88.9	101.6	11.0	457.2	311.2	304.8	235.0
101.6	127.0	12.7	609.6	413.0	406.4	311.4
127.0	152.4	12.7	762.0	514.7	508.0	387.7
152.4	177.8	12.7	914.4	616.5	609.6	464.1
165.1	190.5	12.7	1066.8	711.2	711.2	533.4
177.8	203.2	12.7	1219.2	812.8	812.8	609.6
203.2	228.6	12.7	1371.6	914.4	914.4	685.8
228.6	254.0	12.7	1524.0	1016.0	1016.0	762.0

- The Back-To-Face Dimension of Cap Shall Be E, If The Basic Wall Thickness is Not More Than The "Limited Wall Thickness" And E_1 If It Exceeds The "Limited Wall Thickness"
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

Tee

Sch40, Sch80, Sch120, Sch160



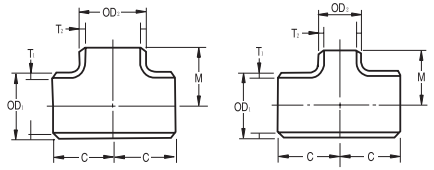
KS B1541, JIS B2312

(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T						Center to Center	
	OD1	OD2	Sch 40		Sch 80		Sch 120		Sch160		C	M
			T1	T2	T1	T2	T1	T2	T1	T2		
15	21.7	21.7	2.8	2.8	3.7	3.7	-	-	-	-	25.4	25.4
20	27.2	27.2	2.9	2.9	3.9	3.9	-	-	-	-	28.6	28.6
20 x 20 x 15	27.2	21.7	2.9	2.8	3.9	3.7	-	-	-	-	28.6	28.6
25	34.0	34.0	3.4	3.4	4.5	4.5	-	-	-	-	38.1	38.1
25 x 25 x 20	34.0	27.2	3.4	2.9	4.5	3.9	-	-	-	-	38.1	38.1
25 x 25 x 15	34.0	21.7	3.4	2.8	4.5	3.7	-	-	-	-	38.1	38.1
32	42.7	42.7	3.6	3.6	4.9	4.9	-	-	-	-	47.6	47.6
32 x 32 x 25	42.7	34.0	3.6	3.4	4.9	4.5	-	-	-	-	47.6	47.6
32 x 32 x 20	42.7	27.2	3.6	2.9	4.9	3.9	-	-	-	-	47.6	47.6
40	48.6	48.6	3.7	3.7	5.1	5.1	-	-	7.1	7.1	57.2	57.2
40 x 40 x 32	48.6	42.7	3.7	3.6	5.1	4.9	-	-	-	-	57.2	57.2
40 x 40 x 25	48.6	34.0	3.7	3.4	5.1	4.5	-	-	-	-	57.2	57.2
40 x 40 x 20	48.6	27.2	3.7	2.9	5.1	3.9	-	-	-	-	57.2	57.2
50	60.5	60.5	3.9	3.9	5.5	5.5	-	-	8.7	8.7	63.5	63.5
50 x 50 x 40	60.5	48.6	3.9	3.7	5.5	5.1	-	-	8.7	7.1	63.5	60.3
50 x 50 x 32	60.5	42.7	3.9	3.6	5.5	4.9	-	-	-	-	63.5	57.2
50 x 50 x 25	60.5	34.0	3.9	3.4	5.5	4.5	-	-	-	-	63.5	50.8
65	76.3	76.3	5.2	5.2	7.0	7.0	-	-	9.5	9.5	76.2	76.2
65 x 65 x 50	76.3	60.5	5.2	3.9	7.0	5.5	-	-	9.5	8.7	76.2	69.9
65 x 65 x 40	76.3	48.6	5.2	3.7	7.0	5.1	-	-	9.5	7.1	76.2	66.7
65 x 65 x 32	76.3	42.7	5.2	3.6	7.0	4.9	-	-	-	-	76.2	63.5
80	89.1	89.1	5.5	5.5	7.6	7.6	-	-	11.1	11.1	85.7	85.7
80 x 80 x 65	89.1	76.3	5.5	5.2	7.6	7.0	-	-	11.1	9.5	85.7	82.6
80 x 80 x 50	89.1	60.5	5.5	3.9	7.6	5.5	-	-	11.1	8.7	85.7	76.2
80 x 80 x 40	89.1	48.6	5.5	3.7	7.6	5.1	-	-	11.1	7.1	85.7	73.0

Tee

Sch40, Sch80, Sch120, Sch160



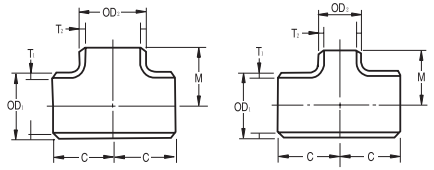
KS B1541, JIS B2312

(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T						Center to Center	
	OD1	OD2	Sch 40		Sch 80		Sch 120		Sch160		C	M
			T1	T2	T1	T2	T1	T2	T1	T2		
90	101.6	101.6	5.7	5.7	8.1	8.1	-	-	12.7	12.7	95.3	95.3
90 x 90 x 80	101.6	89.1	5.7	5.5	8.1	7.6	-	-	12.7	11.1	95.3	92.1
90 x 90 x 65	101.6	76.3	5.7	5.2	8.1	7.0	-	-	12.7	9.5	95.3	88.9
90 x 90 x 50	101.6	60.5	5.7	3.9	8.1	5.5	-	-	12.7	8.7	95.3	82.6
90 x 90 x 40	101.6	48.6	5.7	3.7	8.1	5.1	-	-	12.7	7.1	95.3	79.4
100	114.3	114.3	6.0	6.0	8.6	8.6	-	-	13.5	13.5	104.8	104.8
100 x 100 x 90	114.3	101.6	6.0	5.7	8.6	8.1	-	-	13.5	12.7	104.8	101.6
100 x 100 x 80	114.3	89.1	6.0	5.5	8.6	7.6	-	-	13.5	11.1	104.8	98.4
100 x 100 x 65	114.3	76.3	6.0	5.2	8.6	7.0	-	-	13.5	9.5	104.8	95.3
100 x 100 x 50	114.3	60.5	6.0	3.9	8.6	5.5	-	-	13.5	8.7	104.8	88.9
125	139.8	139.8	6.6	6.6	9.5	9.5	12.7	12.7	15.9	15.9	123.8	123.8
125 x 125 x 100	139.8	114.3	6.6	6.0	9.5	8.6	12.7	11.1	15.9	13.5	123.8	117.5
125 x 125 x 90	139.8	101.6	6.6	5.7	9.5	8.1	-	-	15.9	12.7	123.8	114.3
125 x 125 x 80	139.8	89.1	6.6	5.5	9.5	7.6	-	-	15.9	11.1	123.8	111.1
125 x 125 x 65	139.8	76.3	6.6	5.2	9.5	7.0	-	-	15.9	9.5	123.8	108.0
150	165.2	165.2	7.1	7.1	11.0	11.0	14.3	14.3	18.2	18.2	142.9	142.9
150 x 150 x 125	165.2	139.8	7.1	6.6	11.0	9.5	14.3	12.7	18.2	15.9	142.9	136.5
150 x 150 x 100	165.2	114.3	7.1	6.0	11.0	8.6	14.3	11.1	18.2	13.5	142.9	130.2
150 x 150 x 90	165.2	101.6	7.1	5.7	11.0	8.1	-	-	18.2	12.7	142.9	127.0
150 x 150 x 80	165.2	89.1	7.1	5.5	11.0	7.6	-	-	18.2	11.1	142.9	123.8
200	216.3	216.3	8.2	8.2	12.7	12.7	18.2	18.2	23.0	23.0	177.8	177.8
200 x 200 x 150	216.3	165.2	8.2	7.1	12.7	11.0	18.2	14.3	23.0	18.2	177.8	168.3
200 x 200 x 125	216.3	139.8	8.2	6.6	12.7	9.5	18.2	12.7	23.0	15.9	177.8	161.9
200 x 200 x 100	216.3	114.3	8.2	6.0	12.7	8.6	18.2	11.1	23.0	13.5	177.8	155.6
250	267.4	267.4	9.3	9.3	15.1	15.1	21.4	21.4	28.6	28.6	215.9	215.9

Tee

Sch40, Sch80, Sch120, Sch160



KS B1541, JIS B2312

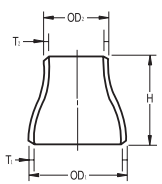
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T						Center to Center	
	OD1	OD2	Sch 40		Sch 80		Sch 120		Sch160		C	M
			T1	T2	T1	T2	T1	T2	T1	T2		
250 x 250 x 200	267.4	216.3	9.3	8.2	15.1	12.7	21.4	18.2	28.6	23.0	215.9	203.2
250 x 250 x 150	267.4	165.2	9.3	7.1	15.1	11.0	21.4	14.3	28.6	18.2	215.9	193.7
250 x 250 x 125	267.4	139.8	9.3	6.6	15.1	9.5	21.4	12.7	28.6	15.9	215.9	190.5
300	318.5	318.5	10.3	10.3	17.4	17.4	25.4	25.4	33.3	33.3	254.0	254.0
300 x 300 x 250	318.5	267.4	10.3	9.3	17.4	15.1	25.4	21.4	33.3	28.6	254.0	241.3
300 x 300 x 200	318.5	216.3	10.3	8.2	17.4	12.7	25.4	18.2	33.3	23.0	254.0	228.6
300 x 300 x 150	318.5	165.2	10.3	7.1	17.4	11.0	25.4	14.3	33.3	18.2	254.0	219.1
350	355.6	355.6	11.1	11.1	19.0	19.0	27.8	27.8	35.7	35.7	279.4	279.4
350 x 350 x 300	355.6	318.5	11.1	10.3	19.0	17.4	27.8	25.4	35.7	33.3	279.4	269.9
350 x 350 x 250	355.6	267.4	11.1	9.3	19.0	15.1	27.8	21.4	35.7	28.6	279.4	257.2
350 x 350 x 200	355.6	216.3	11.1	8.2	19.0	12.7	27.8	18.2	35.7	23.0	279.4	247.7
400	406.4	406.4	12.7	12.7	21.4	21.4	30.9	30.9	40.5	40.5	304.8	304.8
400 x 400 x 350	406.4	355.6	12.7	11.1	21.4	19.0	30.9	27.8	40.5	35.7	304.8	304.8
400 x 400 x 300	406.4	318.5	12.7	10.3	21.4	17.4	30.9	25.4	40.5	33.3	304.8	295.3
400 x 400 x 250	406.4	267.4	12.7	9.3	21.4	15.1	30.9	21.4	40.5	28.6	304.8	282.6
450	457.2	457.2	14.3	14.3	23.8	23.8	34.9	34.9	-	-	342.9	342.9
450 x 450 x 400	457.2	406.4	14.3	12.7	23.8	21.4	34.9	30.9	-	-	342.9	330.2
450 x 450 x 350	457.2	355.6	14.3	11.1	23.8	19.0	34.9	27.8	-	-	342.9	330.2
450 x 450 x 300	457.2	318.5	14.3	10.3	23.8	17.4	34.9	25.4	-	-	342.9	320.7
500	508.0	508.0	15.1	15.1	26.2	26.2	38.1	38.1	-	-	381.0	381.0
500 x 500 x 450	508.0	457.2	15.1	14.3	26.2	23.8	38.1	34.9	-	-	381.0	368.0
500 x 500 x 400	508.0	406.4	15.1	12.7	26.2	21.4	38.1	30.9	-	-	381.0	355.6
500 x 500 x 350	508.0	355.6	15.1	11.1	26.2	19.0	38.1	27.8	-	-	381.0	355.6

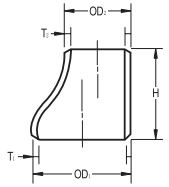
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

Reducer

Sch40, Sch80, Sch160



Concentric



Eccentric

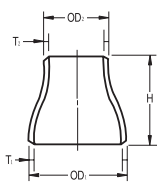
KS B1541, JIS B2312

(Unit : mm)

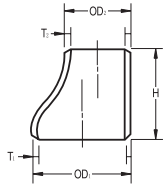
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T				End to End
	OD1	OD2	Sch 40		Sch 80		Sch 160		H
			T1	T2	T1	T2	T1	T2	
20 x 15	27.2	21.7	2.9	2.8	3.9	3.7	-	-	38.1
25 x 20	34.0	27.2	3.4	2.9	4.5	3.9	-	-	50.8
25 x 15	34.0	21.7	3.4	2.8	4.5	3.7	-	-	50.8
32 x 25	42.7	34.0	3.6	3.4	4.9	4.5	-	-	50.8
32 x 20	42.7	27.2	3.6	2.9	4.9	3.9	-	-	50.8
32 x 15	42.7	21.7	3.6	2.8	4.9	3.7	-	-	50.8
40 x 32	48.6	42.7	3.7	3.6	5.1	4.9	-	-	63.5
40 x 25	48.6	34.0	3.7	3.4	5.1	4.5	-	-	63.5
40 x 20	48.6	27.2	3.7	2.9	5.1	3.9	-	-	63.5
50 x 40	60.5	48.6	3.9	3.7	5.5	5.1	8.7	7.1	76.2
50 x 32	60.5	42.7	3.9	3.6	5.5	4.9	-	-	76.2
50 x 25	60.5	34.0	3.9	3.4	5.5	4.5	-	-	76.2
50 x 20	60.5	27.2	3.9	2.9	5.5	3.9	-	-	76.2
65 x 50	76.3	60.5	5.2	3.9	7.0	5.5	9.5	8.7	88.9
65 x 40	76.3	48.6	5.2	3.7	7.0	5.1	9.5	7.1	88.9
65 x 32	76.3	42.7	5.2	3.6	7.0	4.9	-	-	88.9
65 x 25	76.3	34.0	5.2	3.4	7.0	4.5	-	-	88.9
80 x 65	89.1	76.3	5.5	5.2	7.6	7.0	11.1	9.5	88.9
80 x 50	89.1	60.5	5.5	3.9	7.6	5.5	11.1	8.7	88.9
80 x 40	89.1	48.6	5.5	3.7	7.6	5.1	11.1	7.1	88.9
80 x 32	89.1	42.7	5.5	3.6	7.6	4.9	-	-	88.9
90 x 80	101.6	89.1	5.7	5.5	8.1	7.6	12.7	11.1	101.6
90 x 65	101.6	76.3	5.7	5.2	8.1	7.0	12.7	9.5	101.6
90 x 50	101.6	60.5	5.7	3.9	8.1	5.5	12.7	8.7	101.6
90 x 40	101.6	48.6	5.7	3.7	8.1	5.1	12.7	7.1	101.6

Reducer

Sch40, Sch80, Sch160



Concentric



Eccentric

KS B1541, JIS B2312

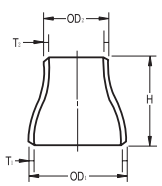
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T				End to End
	OD1	OD2	Sch 40		Sch 80		Sch 160		H
			T1	T2	T1	T2	T1	T2	
100 x 90	114.3	101.6	6.0	5.7	8.6	8.1	13.5	12.7	101.6
100 x 80	114.3	89.1	6.0	5.5	8.6	7.6	13.5	11.1	101.6
100 x 65	114.3	76.3	6.0	5.2	8.6	7.0	13.5	9.5	101.6
100 x 50	114.3	60.5	6.0	3.9	8.6	5.5	13.5	8.7	101.6
100 x 40	114.3	48.6	6.0	3.7	8.6	5.1	13.5	7.1	101.6

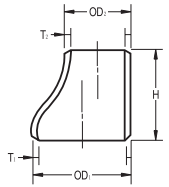
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

Reducer

Sch40, Sch80, Sch120, Sch160



Concentric



Eccentric

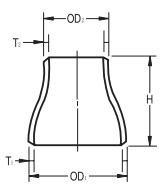
KS B1541, JIS B2312

(Unit : mm)

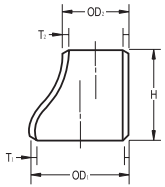
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T								End to End
	OD1	OD2	Sch 40		Sch 80		Sch 120		Sch 160		H
			T1	T2	T1	T2	T1	T2	T1	T2	
125 x 100	139.8	114.3	6.6	6.0	9.5	8.6	12.7	11.1	15.9	13.5	127.0
125 x 90	139.8	101.6	6.6	5.7	9.5	8.1	-	-	15.9	12.7	127.0
125 x 80	139.8	89.1	6.6	5.5	9.5	7.6	-	-	15.9	11.1	127.0
125 x 65	139.8	76.3	6.6	5.2	9.5	7.0	-	-	15.9	9.5	127.0
150 x 125	165.2	139.8	7.1	6.6	11.0	9.5	14.3	12.7	18.2	15.9	139.7
150 x 100	165.2	114.3	7.1	6.0	11.0	8.6	14.3	11.1	18.2	13.5	139.7
150 x 90	165.2	101.6	7.1	5.7	11.0	8.1	-	-	18.2	12.7	139.7
150 x 80	165.2	89.1	7.1	5.5	11.0	7.6	-	-	18.2	11.1	139.7
150 x 65	165.2	76.3	7.1	5.2	11.0	7.0	-	-	18.2	9.5	139.7
200 x 150	216.3	165.2	8.2	7.1	12.7	11.0	18.2	14.3	23.0	18.2	152.4
200 x 125	216.3	139.8	8.2	6.6	12.7	9.5	18.2	12.7	23.0	15.9	152.4
200 x 100	216.3	114.3	8.2	6.0	12.7	8.6	18.2	11.1	23.0	13.5	152.4
200 x 90	216.3	101.6	8.2	5.7	12.7	8.1	-	-	23.0	12.7	152.4
250 x 200	267.4	216.3	9.3	8.2	15.1	12.7	21.4	18.2	28.6	23.0	177.8
250 x 150	267.4	165.2	9.3	7.1	15.1	11.0	21.4	14.3	28.6	18.2	177.8
250 x 125	267.4	139.8	9.3	6.6	15.1	9.5	21.4	12.7	28.6	15.9	177.8
250 x 100	267.4	114.3	9.3	6.0	15.1	8.6	-	-	28.6	13.5	177.8
300 x 250	318.5	267.4	10.3	9.3	17.4	15.1	25.4	21.4	33.3	28.6	203.2
300 x 200	318.5	216.3	10.3	8.2	17.4	12.7	25.4	18.2	33.3	23.0	203.2
300 x 150	318.5	165.2	10.3	7.1	17.4	11.0	25.4	14.3	33.3	18.2	203.2
300 x 125	318.5	139.8	10.3	6.6	17.4	9.5	25.4	12.7	33.3	15.9	203.2
350 x 300	355.6	318.5	11.1	10.3	19.0	17.4	27.8	25.4	35.7	33.3	330.2
350 x 250	355.6	267.4	11.1	9.3	19.0	15.1	27.8	21.4	35.7	28.6	330.2
350 x 200	355.6	216.3	11.1	8.2	19.0	12.7	27.8	18.2	35.7	23.0	330.2
400 x 350	406.4	355.6	12.7	11.1	21.4	19.0	30.9	27.8	40.5	35.7	355.6

Reducer

Sch40, Sch80, Sch120, Sch160



Concentric



Eccentric

KS B1541, JIS B2312

(Unit : mm)

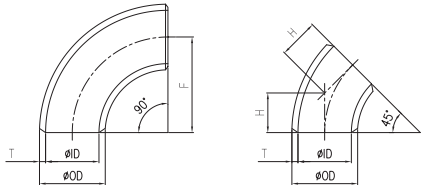
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T						End to End
	OD1	OD2	Sch 40		Sch 80		Sch 120		Sch 160		H
			T1	T2	T1	T2	T1	T2	T1	T2	
400 x 300	406.4	318.5	12.7	10.3	21.4	17.4	30.9	25.4	40.5	33.3	355.6
400 x 250	406.4	267.4	12.7	9.3	21.4	15.1	30.9	21.4	40.5	28.6	355.6
450 x 400	457.2	406.4	14.3	12.7	23.8	21.4	34.9	30.9	45.2	40.5	381.0
450 x 350	457.2	355.6	14.3	11.1	23.8	19.0	34.9	27.8	45.2	35.7	381.0
450 x 300	457.2	318.5	14.3	10.3	23.8	17.4	34.9	25.4	45.2	33.3	381.0
500 x 450	508.0	457.2	15.1	14.3	26.2	23.8	38.1	34.9	50.0	45.2	508.0
500 x 400	508.0	406.4	15.1	12.7	26.2	21.4	38.1	30.9	50.0	40.5	508.0
500 x 350	508.0	355.6	15.1	11.1	26.2	19.0	38.1	27.8	50.0	35.7	508.0

- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370
- For Approx Weight See Page 394~421

WROUGHT STAINLESS STEEL BUTT WELD PIPE FITTINGS

90° Elbow (Long, Short)
45° Elbow (Long, Short)

Sch5s, Sch10s, Sch20s



KS B1541/3, JIS B2312/3

(Unit : mm)

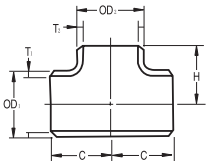
Nominal Pipe Size (Unit : A)	outside Diameter O.D	Wall Thickness T			
		Sch 5s		Sch10s	
		I.D	T	I.D	T
15	21.7	18.40	1.65	17.5	2.1
20	27.2	23.90	1.65	23.0	2.1
25	34.0	30.70	1.65	28.4	2.8
32	42.7	39.40	1.65	37.1	2.8
40	48.6	45.30	1.65	43.0	2.8
50	60.5	57.20	1.65	54.9	2.8
65	76.3	72.10	2.10	70.3	3.0
80	89.1	84.90	2.10	83.1	3.0
90	101.6	97.40	2.10	95.6	3.0
100	114.3	110.10	2.10	108.3	3.0
125	139.8	134.20	2.80	133.0	3.4
150	165.2	159.60	2.80	158.4	3.4
200	216.3	210.70	2.80	208.3	4.0
250	267.4	260.60	3.40	259.4	4.0
300	318.5	310.50	4.00	309.5	4.5
350	355.6	-	-	-	-
400	406.4	-	-	-	-
450	457.2	-	-	-	-
500	508.0	-	-	-	-
550	558.8	-	-	-	-
600	609.6	-	-	-	-
750	762.0	-	-	-	-

Wall Thickness T		Center to Center			
Sch20s		Long		Short	
I.D	T	F (90°)	H (45°)	F (90°)	
16.7	2.5	38.1	15.8	-	
22.2	2.5	38.1	15.8	-	
28.0	3.0	38.1	15.8	25.4	
36.7	3.0	47.6	19.7	31.8	
42.6	3.0	57.2	23.7	38.1	
53.5	3.5	76.2	31.6	50.8	
69.3	3.5	95.3	39.5	63.5	
81.1	4.0	114.3	47.3	76.2	
93.6	4.0	133.4	55.3	88.9	
106.3	4.0	152.4	63.1	101.6	
129.8	5.0	190.5	78.9	127.0	
155.2	5.0	228.6	94.7	152.4	
203.3	6.5	304.8	126.3	203.2	
254.4	6.5	381.0	157.8	254.0	
305.5	6.5	457.2	189.4	304.8	
-	-	533.4	220.9	355.6	
-	-	609.6	252.5	406.4	
-	-	685.8	284.1	457.2	
-	-	762.0	315.6	508.0	
-	-	838.2	347.2	558.8	
-	-	914.4	378.7	609.6	
-	-	1143.0	473.4	762.0	

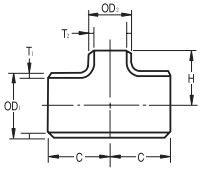
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370

Tee

Sch5s, Sch10s, Sch20s



Straight



Reducing

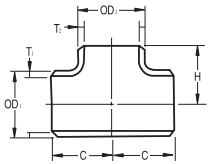
KS B1541/3, JIS B2312/3

(Unit : mm)

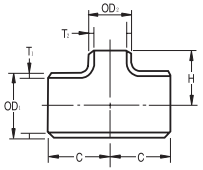
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T				Center to Center	
	OD1	OD2	Sch 5s		Sch 10s		Sch 20s		C	M
			T1	T2	T1	T2	T1	T2		
15	21.7	21.7	1.65	1.65	2.1	2.1	2.5	2.5	25.4	25.4
20	27.2	27.2	1.65	1.65	2.1	2.1	2.5	2.5	28.6	28.6
25	34.0	34.0	1.65	1.65	2.8	2.8	3.0	3.0	38.1	38.1
32	42.7	42.7	1.65	1.65	2.8	2.8	3.0	3.0	47.6	47.6
32 x 32 x 25	42.7	34.0	1.65	1.65	2.8	2.8	3.0	3.0	47.6	47.6
40	48.6	48.6	1.65	1.65	2.8	2.8	3.0	3.0	57.2	57.2
40 x 40 x 32	48.6	42.7	1.65	1.65	2.8	2.8	3.0	3.0	57.2	57.2
40 x 40 x 25	48.6	34.0	1.65	1.65	2.8	2.8	3.0	3.0	57.2	57.2
50	60.5	60.5	1.65	1.65	2.8	2.8	3.5	3.5	63.5	63.5
50 x 50 x 40	60.5	48.6	1.65	1.65	2.8	2.8	3.5	3.0	63.5	60.3
50 x 50 x 32	60.5	42.7	1.65	1.65	2.8	2.8	3.5	3.0	63.5	57.2
65	76.3	76.3	2.10	2.10	3.0	3.0	3.5	3.5	76.2	76.2
65 x 65 x 50	76.3	60.5	2.10	1.65	3.0	2.8	3.5	3.5	76.2	69.9
65 x 65 x 40	76.3	48.6	2.10	1.65	3.0	2.8	3.5	3.0	76.2	66.7
80	89.1	89.1	2.10	2.10	3.0	3.0	4.0	4.0	85.7	85.7
80 x 80 x 65	89.1	76.3	2.10	2.10	3.0	3.0	4.0	3.5	85.7	82.6
80 x 80 x 50	89.1	60.5	2.10	1.65	3.0	2.8	4.0	3.5	85.7	76.2
90	101.6	101.6	2.10	2.10	3.0	3.0	4.0	4.0	95.3	95.3
90 x 90 x 80	101.6	89.1	2.10	2.10	3.0	3.0	4.0	4.0	95.3	92.1
90 x 90 x 65	101.6	76.3	2.10	2.10	3.0	3.0	4.0	3.5	95.3	88.9
100	114.3	114.3	2.10	2.10	3.0	3.0	4.0	4.0	104.8	104.8
100 x 100 x 90	114.3	101.6	2.10	2.10	3.0	3.0	4.0	4.0	104.8	101.6
100 x 100 x 80	114.3	89.1	2.10	2.10	3.0	3.0	4.0	4.0	104.8	98.4
100 x 100 x 65	114.3	76.3	2.10	2.10	3.0	3.0	4.0	3.5	104.8	95.3
125	139.8	139.8	2.80	2.80	3.4	3.4	5.0	5.0	123.8	123.8

Tee

Sch5s, Sch10s, Sch20s



Straight



Reducing

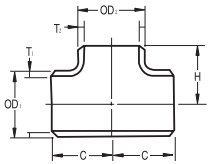
KS B1541/3, JIS B2312/3

(Unit : mm)

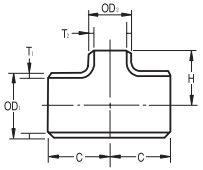
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T				Center to Center	
	OD1	OD2	Sch 5s		Sch 10s		Sch 20s		C	M
			T1	T2	T1	T2	T1	T2		
125 x 125 x 100	139.8	114.3	2.80	2.10	3.4	3.0	5.0	4.0	123.8	117.5
125 x 125 x 90	139.8	101.6	2.80	2.10	3.4	3.0	5.0	4.0	123.8	114.3
125 x 125 x 80	139.8	89.1	2.80	2.10	3.4	3.0	5.0	4.0	123.8	111.1
150	165.2	165.2	2.80	2.80	3.4	3.4	5.0	5.0	142.9	142.9
150 x 150 x 125	165.2	139.8	2.80	2.80	3.4	3.4	5.0	5.0	142.9	136.5
150 x 150 x 100	165.2	114.3	2.80	2.10	3.4	3.0	5.0	4.0	142.9	130.2
200	216.3	216.3	2.80	2.80	4.0	4.0	6.5	6.5	177.8	177.8
200 x 200 x 150	216.3	165.2	2.80	2.80	4.0	3.4	6.5	5.0	177.8	168.3
200 x 200 x 125	216.3	139.8	2.80	2.80	4.0	3.4	6.5	5.0	177.8	161.9
250	267.4	267.4	3.40	3.40	4.0	4.0	6.5	6.5	215.9	215.9
250 x 250 x 200	267.4	216.3	3.40	2.80	4.0	4.0	6.5	6.5	215.9	203.2
250 x 250 x 150	267.4	165.2	3.40	2.80	4.0	3.4	6.5	5.0	215.9	193.7
300	318.5	318.5	4.00	4.00	4.5	4.5	6.5	6.5	254.0	254.0
300 x 300 x 250	318.5	267.4	4.00	3.40	4.5	4.0	6.5	6.5	254.0	241.3
300 x 300 x 200	318.5	216.3	4.00	2.80	4.5	4.0	6.5	6.5	254.0	228.6
350	355.6	355.6	-	-	-	-	-	-	279.4	279.4
350 x 350 x 300	355.6	318.5	-	-	-	-	-	-	279.4	269.9
350 x 350 x 250	355.6	267.4	-	-	-	-	-	-	279.4	257.2
350 x 350 x 200	355.6	216.3	-	-	-	-	-	-	279.4	247.7
400	406.4	406.4	-	-	-	-	-	-	304.8	304.8
400 x 400 x 350	406.4	355.6	-	-	-	-	-	-	304.8	304.8
400 x 400 x 300	406.4	318.5	-	-	-	-	-	-	304.8	295.3
400 x 400 x 250	406.4	267.4	-	-	-	-	-	-	304.8	282.6
450	457.2	457.2	-	-	-	-	-	-	342.9	342.9
450 x 450 x 400	457.2	406.4	-	-	-	-	-	-	342.9	330.2

Tee

Sch5s, Sch10s, Sch20s



Straight



Reducing

KS B1541/3, JIS B2312/3

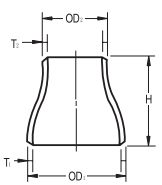
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T				Center to Center	
	OD1	OD2	Sch 5s		Sch 10s		Sch 20s		C	M
			T1	T2	T1	T2	T1	T2		
450 x 450 x 350	457.2	355.6	-	-	-	-	-	-	342.9	330.2
450 x 450 x 300	457.2	318.5	-	-	-	-	-	-	342.9	320.7
500	508.0	508.0	-	-	-	-	-	-	381.0	381.0
500 x 500 x 450	508.0	457.2	-	-	-	-	-	-	381.0	368.3
500 x 500 x 400	508.0	406.4	-	-	-	-	-	-	381.0	355.6
500 x 500 x 350	508.0	355.6	-	-	-	-	-	-	381.0	355.6
550	558.8	558.8	-	-	-	-	-	-	419.1	419.1
550 x 550 x 500	558.8	508.0	-	-	-	-	-	-	419.1	406.4
550 x 550 x 450	558.8	457.2	-	-	-	-	-	-	419.1	393.7
550 x 550 x 400	558.8	406.4	-	-	-	-	-	-	419.1	381.0
600	609.6	609.6	-	-	-	-	-	-	431.8	431.8
600 x 600 x 550	609.6	558.8	-	-	-	-	-	-	431.8	431.8
600 x 600 x 500	609.6	508.0	-	-	-	-	-	-	431.8	431.8
600 x 600 x 450	609.6	457.2	-	-	-	-	-	-	431.8	419.1
750	762.0	762.0	-	-	-	-	-	-	558.8	558.8
750 x 750 x 600	762.0	609.6	-	-	-	-	-	-	558.8	533.4

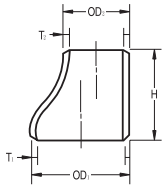
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370

Reducer

Sch5s, Sch10s, Sch20s



Concentric



Eccentric

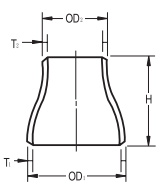
KS B1541/3, JIS B2312/3

(Unit : mm)

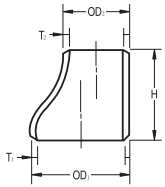
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T					
	OD1	OD2	Sch 5s		Sch 10s		Sch 20s		End to End
			T1	T2	T1	T2	T1	T2	H
25 x 20	34.0	27.2	1.65	1.65	2.8	2.1	3.0	2.5	50.8
25 x 15	34.0	21.7	1.65	1.65	2.8	2.1	3.0	2.5	50.8
32 x 25	42.7	34.0	1.65	1.65	2.8	2.8	3.0	3.0	50.8
32 x 20	42.7	27.2	1.65	1.65	2.8	2.1	3.0	2.5	50.8
40 x 32	48.6	42.7	1.65	1.65	2.8	2.8	3.0	3.0	63.5
40 x 25	48.6	34.0	1.65	1.65	2.8	2.8	3.0	3.0	63.5
40 x 20	48.6	27.2	1.65	1.65	2.8	2.1	3.0	2.5	63.5
50 x 40	60.5	48.6	1.65	1.65	2.8	2.8	3.5	3.0	76.2
50 x 32	60.5	42.7	1.65	1.65	2.8	2.8	3.5	3.0	76.2
50 x 25	60.5	34.0	1.65	1.65	2.8	2.8	3.5	3.0	76.2
65 x 50	76.3	60.5	2.10	1.65	3.0	2.8	3.5	3.5	88.9
65 x 40	76.3	48.6	2.10	1.65	3.0	2.8	3.5	3.0	88.9
65 x 32	76.3	42.7	2.10	1.65	3.0	2.8	3.5	3.0	88.9
80 x 65	89.1	76.3	2.10	2.10	3.0	3.0	4.0	3.5	88.9
80 x 50	89.1	60.5	2.10	1.65	3.0	2.8	4.0	3.5	88.9
80 x 40	89.1	48.6	2.10	1.65	3.0	2.8	4.0	3.0	88.9
90 x 80	101.6	89.1	2.10	2.10	3.0	3.0	4.0	4.0	101.6
90 x 65	101.6	76.3	2.10	2.10	3.0	3.0	4.0	3.5	101.6
90 x 50	101.6	60.5	2.10	1.65	3.0	2.8	4.0	3.5	101.6
100 x 90	114.3	101.6	2.10	2.10	3.0	3.0	4.0	4.0	101.6
100 x 80	114.3	89.1	2.10	2.10	3.0	3.0	4.0	4.0	101.6
100 x 65	114.3	76.3	2.10	2.10	3.0	3.0	4.0	3.5	101.6
100 x 50	114.3	60.5	2.10	1.65	3.0	2.8	4.0	3.5	101.6

Reducer

Sch5s, Sch10s, Sch20s



Concentric



Eccentric

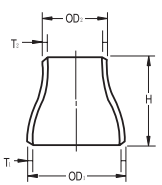
KS B1541/3, JIS B2312/3

(Unit : mm)

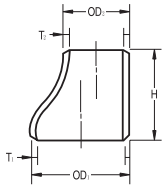
Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T						End to End
	OD1	OD2	Sch 5s		Sch 10s		Sch 20s		H
			T1	T2	T1	T2	T1	T2	
125 x 100	139.8	114.3	2.80	2.10	3.4	3.0	5.0	4.0	127.0
125 x 90	139.8	101.6	2.80	2.10	3.4	3.0	5.0	4.0	127.0
125 x 80	139.8	89.1	2.80	2.10	3.4	3.0	5.0	4.0	127.0
125 x 65	139.8	76.3	2.80	2.10	3.4	3.0	5.0	3.5	127.0
150 x 125	165.2	139.8	2.80	2.80	3.4	3.4	5.0	5.0	139.7
150 x 100	165.2	114.3	2.80	2.10	3.4	3.0	5.0	4.0	139.7
150 x 90	165.2	101.6	2.80	2.10	3.4	3.0	5.0	4.0	139.7
150 x 80	165.2	89.1	2.80	2.10	3.4	3.0	5.0	4.0	139.7
200 x 150	216.3	165.2	2.80	2.80	4.0	3.4	6.5	5.0	152.4
200 x 125	216.3	139.8	2.80	2.80	4.0	3.4	6.5	5.0	152.4
200 x 100	216.3	114.3	2.80	2.10	4.0	3.0	6.5	4.0	152.4
250 x 200	267.4	216.3	3.40	2.80	4.0	4.0	6.5	6.5	177.8
250 x 150	267.4	165.2	3.40	2.80	4.0	3.4	6.5	5.0	177.8
300 x 250	318.5	267.4	4.00	3.40	4.5	4.0	6.5	6.5	203.2
300 x 200	318.5	216.3	4.00	2.80	4.5	4.0	6.5	6.5	203.2
300 x 150	318.5	165.2	4.00	2.80	4.5	3.4	6.5	5.0	203.2
350 x 300	355.6	318.5	4.00	4.00	4.8	4.5	8.0	6.5	330.2
350 x 250	355.6	267.4	4.00	3.40	4.8	4.0	8.0	6.5	330.2
350 x 200	355.6	216.3	4.00	2.80	4.8	4.0	8.0	6.5	330.2
400 x 350	406.4	355.6	4.50	4.00	4.8	4.8	8.0	8.0	355.6
400 x 300	406.4	318.5	4.50	4.00	4.8	4.5	8.0	6.5	355.6
400 x 250	406.4	267.4	4.50	3.40	4.8	4.0	8.0	6.5	355.6

Reducer

Sch5s, Sch10s, Sch20s



Concentric



Eccentric

KS B1541/3, JIS B2312/3

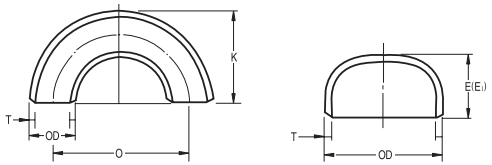
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter		Wall Thickness T					
	OD1	OD2	Sch 5s		Sch 10s		Sch 20s		End to End
			T1	T2	T1	T2	T1	T2	H
450 x 400	457.2	406.4	4.50	4.50	4.8	5.0	8.0	8.0	381.0
450 x 350	457.2	355.6	4.50	4.00	4.8	5.0	8.0	8.0	381.0
450 x 300	457.2	318.5	5.00	4.00	4.8	4.5	8.0	6.5	381.0
500 x 300	508.0	457.2	5.00	4.00	5.5	4.5	9.5	6.5	508.0
550 x 500	558.8	508.0	5.00	5.00	5.5	5.5	-	-	508.0
550 x 450	558.8	457.2	5.00	4.50	5.5	5.0	-	-	508.0
550 x 400	558.8	406.4	5.00	4.50	5.5	5.0	-	-	508.0
600 x 400	609.6	406.4	5.50	4.50	6.5	5.0	9.5	8.0	508.0

- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370

180° Elbow (Long, Short)
Cap

Sch5s, Sch10s, Sch20s



KS B1541, JIS B2312

(Unit : mm)

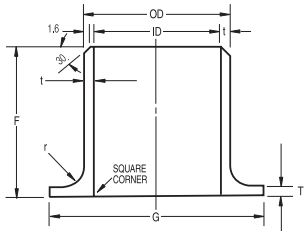
Nominal Pipe Size (Unit : A)	Outside Diameter O.D	Wall Thickness T		
		Sch 5s	Sch 10s	Sch 20s
15	21.7	1.65	2.1	2.5
20	27.2	1.65	2.1	2.5
25	34.0	1.65	2.8	3.0
32	42.7	1.65	2.8	3.0
40	48.6	1.65	2.8	3.0
50	60.5	1.65	2.8	3.5
65	76.3	2.10	3.0	3.5
80	89.1	2.10	3.0	4.0
90	101.6	2.10	3.0	4.0
100	114.3	2.10	3.0	4.0
125	139.8	2.80	3.4	5.0
150	165.2	2.80	3.4	5.0
200	216.3	2.80	4.0	6.5
250	267.4	3.40	4.0	6.5
300	318.5	4.00	4.5	6.5
350	355.6	4.00	5.0	8.0
400	406.4	4.50	5.0	8.0
450	457.2	4.50	5.0	8.0
500	508.0	5.00	5.5	9.5

CAP			180° Elbow			
E	E1	Limite Wall Thickness for E	Long		Short	
			O	K	O	K
25.4	-	-	76.2	49.0	-	-
25.4	-	-	76.2	51.7	-	-
38.1	-	-	76.2	55.1	50.8	42.4
38.1	-	-	95.2	69.0	63.6	53.2
38.1	-	-	114.4	81.5	76.2	62.4
38.1	44.5	5.5	152.4	106.5	101.6	81.1
38.1	50.8	7.0	190.6	133.5	127.0	101.7
50.8	63.5	7.6	228.6	158.9	152.4	120.8
63.5	76.2	8.1	266.8	184.2	177.8	139.7
63.5	76.2	8.6	304.8	209.6	203.2	158.8
76.2	88.9	9.5	381.0	260.4	254.0	196.9
88.9	101.6	11.0	457.2	311.2	304.8	235.0
101.6	127.0	12.7	609.6	413.0	406.4	311.4
127.0	152.4	12.7	762.0	514.7	508.0	387.7
152.4	177.8	12.7	914.4	616.5	609.6	464.1
165.1	190.5	12.7	1066.8	711.2	711.2	533.4
177.8	203.2	12.7	1219.2	812.8	812.8	609.6
203.2	228.6	12.7	1371.6	914.4	914.4	685.8
228.6	254.0	12.7	1524.0	1016.0	1016.0	762.0

- The Back-To-Face Dimension of Cap Shall Be E, If The Basic Wall Thickness is Not More Than The "Limited Wall Thickness" And E_1 If It Exceeds The "Limited Wall Thickness"
- For Bevel Details See Page 358
- For Dimensional Tolerances See Page 370

Lap Joint (Stub End)

Sch5s, Sch10s, Sch20s, Sch40s



JPI-75-15-70

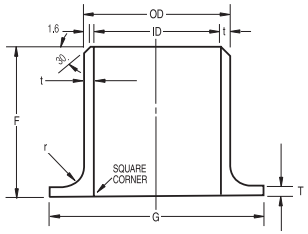
(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter O.D	Sch 5s		Sch10s		Sch 20s		Sch 40s		F	G	r
		I.D	t	I.D	t	I.D	t	I.D	t			
15	21.7	18.4	1.65	17.5	2.1	16.7	2.5	16.1	2.8	50	35	3.2
20	27.2	23.9	1.65	23.0	2.1	22.2	2.5	21.4	2.9	50	43	3.2
25	34.0	30.7	1.65	28.4	2.8	28.0	3.0	27.2	3.4	50	51	3.2
32	42.7	39.4	1.65	37.1	2.8	36.7	3.0	35.5	3.6	50	64	4.8
40	48.6	45.3	1.65	43.0	2.8	42.6	3.0	41.2	3.7	50	73	6.4
50	60.5	57.2	1.65	54.9	2.8	53.5	3.5	52.7	3.9	65	92	7.9
65	76.3	72.1	2.10	70.3	3.0	69.3	3.5	65.9	5.2	65	105	7.9
80	89.1	84.9	2.10	83.1	3.0	81.1	4.0	78.1	5.5	65	127	9.5
90	101.6	97.4	2.10	95.6	3.0	93.6	4.0	90.2	5.7	75	140	9.5
100	114.3	110.1	2.10	108.3	3.0	106.3	4.0	102.3	6.0	75	157	11.1
125	139.8	134.2	2.80	133.0	3.4	129.8	5.0	126.6	6.6	75	186	11.1
150	165.2	159.6	2.80	158.4	3.4	155.2	5.0	151.0	7.1	90	216	12.7
200	216.3	210.7	2.80	208.3	4.0	203.3	6.5	199.9	8.2	100	270	12.7
250	267.4	260.6	3.40	259.4	4.0	254.4	6.5	248.8	9.3	125	324	12.7
300	318.5	310.5	4.00	309.5	4.5	305.5	6.5	297.9	10.3	150	381	12.7

- Minimum Lap Thickness "T" Shall not be less than Wall Thickness "t"

Lap Joint (Stub End)

Sch5s, Sch10s, Sch20s, Sch40s



KS/JIS 10K

(Unit : mm)

Nominal Pipe Size (Unit : A)	Outside Diameter O.D	Sch 5s		Sch 10s		Sch 20s		Sch 40s		F	G	r	Approx Weight			
		I.D	t	I.D	t	I.D	t	I.D	t				Sch 5s	Sch 10s	Sch 20s	Sch 40s
15	21.7	18.4	1.65	17.5	2.1	16.7	2.5	16.1	2.8	50	35	3.2	-	0.059	0.070	0.078
20	27.2	23.9	1.65	23.0	2.1	22.2	2.5	21.4	2.9	50	43	3.2	-	0.073	0.086	0.099
25	34.0	30.7	1.65	28.4	2.8	28.0	3.0	27.2	3.4	50	51	3.2	-	0.172	0.184	0.207
32	42.7	39.4	1.65	37.1	2.8	36.7	3.0	35.5	3.6	50	64	4.8	-	0.217	0.231	0.275
40	48.6	45.3	1.65	43.0	2.8	42.6	3.0	41.2	3.7	50	73	8.4	-	0.242	0.258	0.316
50	60.5	57.2	1.65	54.9	2.8	53.5	3.5	52.7	3.9	65	92	7.9	-	0.308	0.383	0.424
65	76.3	72.1	2.10	70.3	3.0	69.3	3.5	65.9	5.2	65	105	7.9	-	0.430	0.499	0.731
80	89.1	84.9	2.10	83.1	3.0	81.1	4.0	78.1	5.5	65	127	9.5	-	0.484	0.640	0.870
90	101.6	97.4	2.10	95.6	3.0	93.6	4.0	90.2	5.7	75	140	9.5	-	0.536	0.710	1.000
100	114.3	110.1	2.10	108.3	3.0	106.3	4.0	102.3	6.0	75	157	11.1	-	0.614	0.814	1.210
125	139.8	134.2	2.80	133.0	3.4	129.8	5.0	126.6	6.6	75	186	11.1	-	0.879	1.280	1.680
150	165.2	159.6	2.80	158.4	3.4	155.2	5.0	151.0	7.1	90	216	12.7	-	1.070	1.570	2.210
200	216.3	210.7	2.80	208.3	4.0	203.3	6.5	199.9	8.2	100	270	12.7	-	1.940	3.120	3.920
250	267.4	260.6	3.40	259.4	4.0	254.4	6.5	248.8	9.3	125	324	12.7	-	2.530	4.080	5.800
300	318.5	310.5	4.00	309.5	4.5	305.5	6.5	297.9	10.3	150	381	12.7	-	3.250	4.670	7.340

- Dimensions Conform to TK Standards.
- This specification used for JIS 10K Flanges.

TK corporation

HIGH PRESSURE FITTINGS

High Pressure Manifold Fittings 262

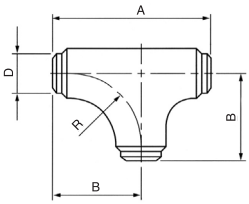
Api Flange Studded Croasses & Tees 266

Api Flange - Type 6bx Integral Flanges 270

Api Flange - Type 6bx Weld Neck Flanges 274

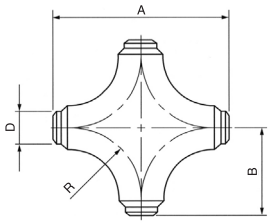
Api Flange - Type 6bx Blind and Test Flanges 278

LONG SWEEP TEE



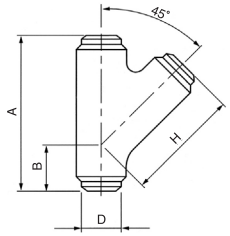
Size	ALL DIMENSIONS IN mm			
	D	A	B	R
2″	60.3	330	203	150
3″	88.9	330	203	150
4″	114.3	406	280	210
5″	141.3	483	305	240
6″	168.3	686	381	305

FULL FLOW CROSS



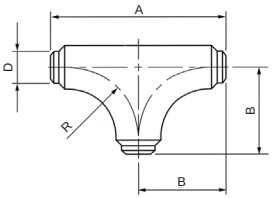
Size	ALL DIMENSIONS IN mm			
	D	A	B	R
2″	60.3	406	203	150
3″	88.9	406	203	150
4″	114.3	560	280	210
5″	141.3	610	305	240
6″	168.3	762	381	305

45° LATERAL TEE



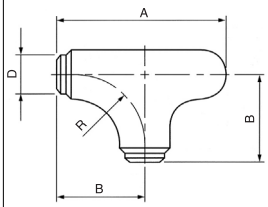
Size	ALL DIMENSIONS IN mm			
	D	A	B	R
2″	60.3	365	115	265
3″	88.9	365	115	265
4″	114.3	510	155	365
5″	141.3	550	165	405
6″	168.3	670	195	505

FULL FLOW TEE



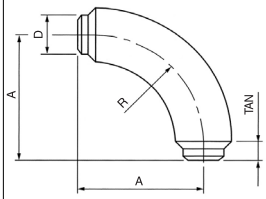
Size	ALL DIMENSIONS IN mm			
	D	A	B	R
2″	60.3	406	203	150
3″	88.9	406	203	150
4″	114.3	560	280	210
5″	141.3	610	305	240
6″	168.3	762	381	305

LONG SWEEP TEE WITH INTEGRAL BULL PLUG



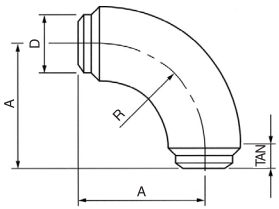
Size	ALL DIMENSIONS IN mm				
	D	T	A	B	R
2″	60.3	11.1	385	203	150
3″	88.9	15.2	385	203	150
4″	114.3	17.1	496	280	210
5″	141.3	19.0	582	305	240
6″	168.3	21.9	805	381	304

90° 3D DOUBLE BACKED BEND



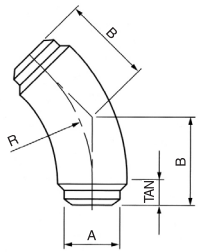
Size	ALL DIMENSIONS IN mm			
	D	A	R	TAN
2″	60.3	178	152	26
3″	88.9	305	229	76
4″	114.3	356	305	51
5″	141.3	432	381	51
6″	168.3	533	457	76

90° LONG SWEEP ELBOW



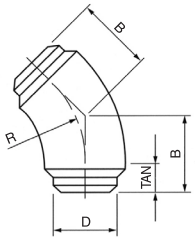
Size	ALL DIMENSIONS IN mm			
	D	A	R	TAN
2″	60.3	203	150	53
3″	88.9	203	150	53
4″	114.3	280	210	70
5″	141.3	305	240	65
6″	168.3	381	305	76

45° 3D DOUBLE BACKED BEND



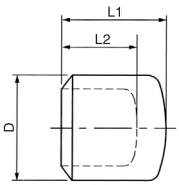
Size	ALL DIMENSIONS IN mm			
	D	B	R	TAN
2″	60.3	121	152	58
3″	88.9	171	229	76
4″	114.3	178	305	51
5″	141.3	209	381	51
6″	168.3	266	457	76

45° LONG SWEEP ELBOW



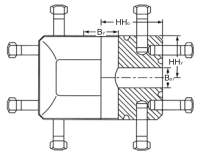
Size	ALL DIMENSIONS IN mm			
	D	B	R	TAN
2″	60.3	119	150	56
3″	88.9	119	150	56
4″	114.3	162	210	75
5″	141.3	172	240	71
6″	168.3	203	305	77

BULL PLUG

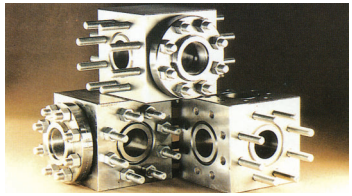


Size	ALL DIMENSIONS IN mm		
	D	L1	L2
2″	60.3	70	48
3″	88.9	90	60
4″	114.3	115	81
5″	141.3	140	102
6″	168.3	170	126

Api Flange Studded Croasses & Tees



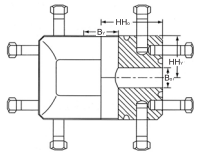
API Flange studded Cross & Tee



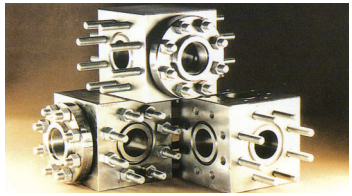
Rated Working Pressure (psi)	Vertical Bv +1, -0mm	Outlet Bo +1, -0mm	Center to Face Vertical Run, HHv ±0.8mm	Center to Face Horizontal Run, HH0 ±0.8mm
2000	52	52	89.0	89.0
2000	65	52	89.0	101.5
2000	65	65	114.5	114.5
2000	78	52	114.5	114.5
2000	78	65	114.5	114.5
2000	78	78	114.5	114.5
2000	103	52	114.5	139.5
2000	103	65	114.5	139.5
2000	103	78	114.5	139.5
2000	103	103	139.5	139.5
3000	78	52	114.5	127.0
3000	78	65	127.0	127.0
3000	78	78	127.0	127.0
3000	103	52	114.5	156.0
3000	103	65	127.0	156.0
3000	103	78	127.0	156.0
3000	103	103	156.0	156.0
5000	52	52	114.5	114.5
5000	65	52	114.5	127.0
5000	65	65	127.0	127.0
5000	78	52	114.5	139.5
5000	78	65	139.5	139.5

Rated Working Pressure (psi)	Vertical Bv +1, -0mm	Outlet Bo +1, -0mm	Center to Face Vertical Run, HHv ±0.8mm	Center to Face Horizontal Run, HH0 ±0.8mm
5000	78	78	139.5	139.5
5000	103	52	114.5	165.0
5000	103	65	127.0	165.0
5000	103	78	139.5	165.0
5000	103	103	165.0	165.0
10000	46	46	111.0	111.0
10000	52	46	111.0	111.0
10000	52	52	111.0	111.0
10000	65	46	114.5	130.0
10000	65	52	114.5	130.0
10000	65	65	130.0	130.0
10000	78	46	114.5	149.0
10000	78	52	114.5	149.0
10000	78	65	130.0	149.0
10000	78	78	149.0	149.0
10000	103	46	114.5	174.5
10000	103	52	114.5	174.5
10000	103	65	130.0	174.5
10000	103	78	149.0	174.5
10000	103	103	174.5	174.5

Api Flange Studded Croasses & Tees



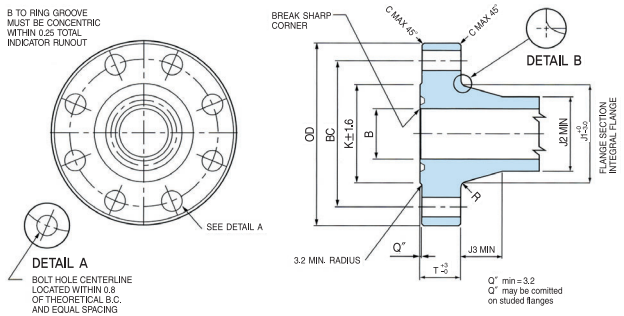
API Flange studded Cross & Tee



Rated Working Pressure (psi)	Vertical Bv +1, -0mm	Outlet Bo +1, -0mm	Center to Face Vertical Run, HHv ±0.8mm	Center to Face Horizontal Run, HH0 ±0.8mm
15000	46	46	127.0	127.0
15000	52	46	127.0	127.0
15000	52	52	127.0	127.0
15000	65	46	139.5	139.5
15000	65	52	139.5	139.5
15000	65	65	139.5	139.5
15000	78	46	160.5	160.5
15000	78	52	160.5	160.5
15000	78	65	160.5	160.5
15000	78	78	160.5	160.5
15000	103	46	194.0	194.0
15000	103	52	194.0	194.0
15000	103	65	194.0	194.0
15000	103	78	194.0	194.0
15000	103	103	194.0	194.0

Rated Working Pressure (psi)	Vertical Bv +1, -0mm	Outlet Bo +1, -0mm	Center to Face Vertical Run, HHv ±0.8mm	Center to Face Horizontal Run, HH0 ±0.8mm
20000	46	46	164.5	164.5
20000	52	46	164.5	164.5
20000	52	52	164.5	164.5
20000	65	46	185.0	185.0
20000	65	52	185.0	185.0
20000	65	65	185.0	185.0
20000	78	46	202.5	202.5
20000	78	52	202.5	202.5
20000	78	65	202.5	202.5
20000	78	78	202.5	202.5
20000	103	46	251.5	251.5
20000	103	52	251.5	251.5
20000	103	65	251.5	251.5
20000	103	78	251.5	251.5
20000	103	103	251.5	251.5

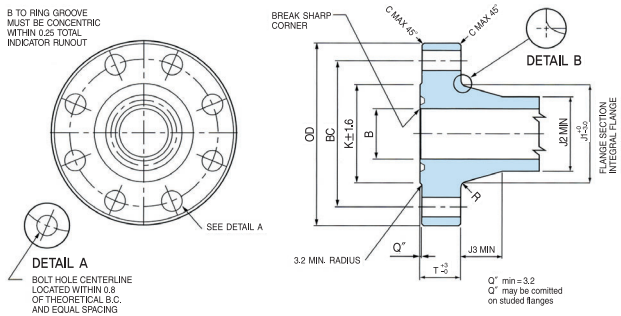
Api Flange - Type 6bx Integral Flanges



Basic Flange Dimensions									
Nominal Size of Flange		Maxi -mum Bore	Outside Diameter of Flange	Tole -rance	Maxi -mum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub
in	in	B	OD	OD	C	K	T	J1	J2
10000 psi									
1-13/16	46	46.8	190	2	3	105	42.1	88.9	65.1
2-1/16	52	53.2	200	2	3	111	44.1	100.0	74.6
2-9/16	65	65.9	230	2	3	132	51.2	120.7	92.1
3-1/16	78	78.6	270	2	3	152	58.4	142.1	110.4
4-1/16	103	104.0	315	2	3	185	70.3	182.6	146.1
5-1/8	130	131.0	360	2	3	221	79.4	223.8	182.6
7-1/16	179	180.2	479	3	6	302	103.2	301.6	254.0
9	228	229.4	555	3	6	359	123.8	374.7	327.1
11	279	280.2	655	3	6	429	141.3	450.9	400.1
13-5/8	346	346.9	770	3	6	518	168.3	552.5	495.3
16-3/4	425	426.2	870	3	6	576	168.3	655.6	601.7

Basic Flange Dimensions				Bolting Dimensions				
Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Lenght of Stud Bolts	Ring Number
J3	R	BC		in.	mm		Lssb	BX
10000 psi								
48.4	10	146.0	8	3/4	23	+2 / -0.5	130	151
51.6	10	158.8	8	3/4	23	+2 / -0.5	130	152
57.2	10	184.2	8	7/8	25	+2 / -0.5	150	153
63.5	10	215.9	8	1	29	+2 / -0.5	170	154
73.1	10	258.8	8	1-1/8	32	+2 / -0.5	200	155
81.0	10	300.0	12	1-1/8	32	+2 / -0.5	220	169
95.3	16	403.2	12	1-1/2	42	+2 / -0.5	285	156
93.7	16	476.2	16	1-1/2	42	+2 / -0.5	330	157
103.2	16	565.2	16	1-3/4	48	+3 / -0.5	380	158
114.3	16	673.1	20	1-7/8	51	+3 / -0.5	440	159
76.2	19	776.3	24	1-7/8	51	+3 / -0.5	440	162

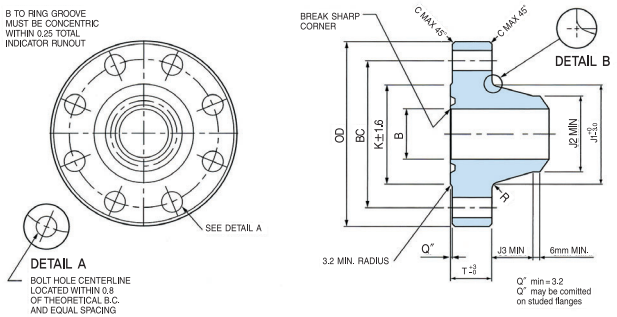
Api Flange - Type 6bx Integral Flanges



Basic Flange Dimensions									
Nominal Size of Flange		Maxi -mum Bore	Outside Diameter of Flange	Tole -rance	Maxi -mum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub
in	mm	B	OD	OD	C	K	T	J1	J2
15000 psi									
1-13/16	46	46.8	210	2	3	106	45.2	97.6	71.4
2-1/16	52	53.2	220	2	3	114	50.8	111.1	82.6
2-9/16	65	65.9	250	2	3	133	57.1	128.6	100.0
3-1/16	78	78.6	290	2	3	154	64.3	154.0	122.2
4-1/16	103	104.0	360	2	3	194	78.6	195.3	158.8
7-1/16	179	180.2	505	3	6	305	119.1	325.4	276.2
20000 psi									
1-13/16	46	46.8	255	2	3	117	63.5	133.3	109.5
2-1/16	52	53.2	285	2	3	132	71.5	154.0	127.0
2-9/16	65	65.9	325	2	3	151	79.4	173.0	144.4
3-1/16	78	78.6	355	2	3	171	85.7	192.1	160.3
4-1/16	103	104.0	445	2	3	219	106.4	242.9	206.4
7-1/16	179	180.2	655	3	6	352	165.1	385.7	338.1

Basic Flange Dimensions				Bolting Dimensions				
Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Lenght of Stud Bolts	Ring Number
J3	R	BC		in.	mm		Lssb	BX
15000 psi								
47.6	10	160.3	8	7/8	26	+2 / -0.5	140	151
54.0	10	174.6	8	7/8	26	+2 / -0.5	150	152
57.1	10	200.0	8	1	30	+2 / -0.5	170	153
63.5	10	230.2	8	1-1/8	32	+2 / -0.5	190	154
73.0	10	290.5	8	1-3/8	40	+2 / -0.5	235	155
66.7	16	428.6	16	1-1/2	42	+2 / -0.5	325	156
20000 psi								
49.2	10	203.2	8	1	30	+2 / -0.5	190	151
52.4	10	230.2	8	1-1/8	32	+2 / -0.5	210	152
58.7	10	261.9	8	1-1/4	36	+2 / -0.5	235	153
63.5	10	287.3	8	1-3/8	40	+2 / -0.5	255	154
73.0	10	357.2	8	1-3/4	48	+3 / -0.5	310	155
96.8	16	554.0	16	2	54	+3 / -0.5	445	156

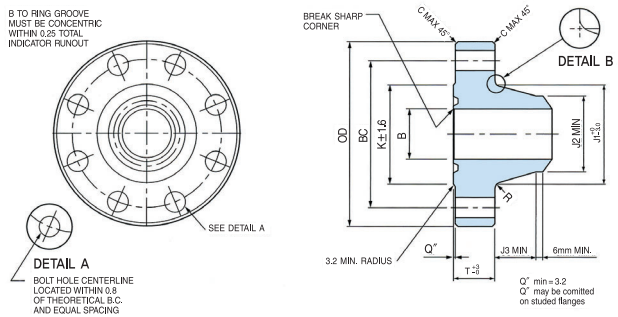
Api Flange - Type 6bx Weld Neck Flanges



Basic Flange Dimensions									
Nominal Size of Flange		Maxi -mum Bore	Outside Diameter of Flange	Tole -rance	Maxi -mum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub
in	mm	B	OD	OD	C	K	T	J1	J2
10000 psi									
1-13/16	46	46.8	190	2	3	105	42.1	88.9	65.1
2-1/16	52	53.2	200	2	3	111	44.1	100.0	74.6
2-9/16	65	65.9	230	2	3	132	51.2	120.7	92.1
3-1/16	78	78.6	270	2	3	152	58.4	142.1	110.4
4-1/16	103	104.0	315	2	3	185	70.3	182.6	146.1
5-1/8	130	131.0	360	2	3	221	79.4	223.8	182.6
7-1/16	179	180.2	479	3	6	302	103.2	301.6	254.0
9	228	229.4	555	3	6	359	123.8	374.7	327.1
11	279	280.2	655	3	6	429	141.3	450.9	400.1
13-5/8	346	346.9	770	3	6	518	168.3	552.5	495.3
16-3/4	425	426.2	870	3	6	576	168.3	655.6	601.7

Basic Flange Dimensions				Bolting Dimensions				
Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Lenght of Stud Bolts	Ring Number
J3	R	BC		in.	mm		Lssb	BX
10000 psi								
48.4	10	146.0	8	3/4	23	+2 / -0.5	130	151
51.6	10	158.8	8	3/4	23	+2 / -0.5	130	152
57.2	10	184.2	8	7/8	25	+2 / -0.5	150	153
63.5	10	215.9	8	1	29	+2 / -0.5	170	154
73.1	10	258.8	8	1-1/8	32	+2 / -0.5	200	155
81.0	10	300.0	12	1-1/8	32	+2 / -0.5	220	169
95.3	16	403.2	12	1-1/2	42	+2 / -0.5	285	156
93.7	16	476.2	16	1-1/2	42	+2 / -0.5	330	157
103.2	16	565.2	16	1-3/4	48	+3 / -0.5	380	158
114.3	16	673.1	20	1-7/8	51	+3 / -0.5	440	159
76.2	19	776.3	24	1-7/8	51	+3 / -0.5	440	162

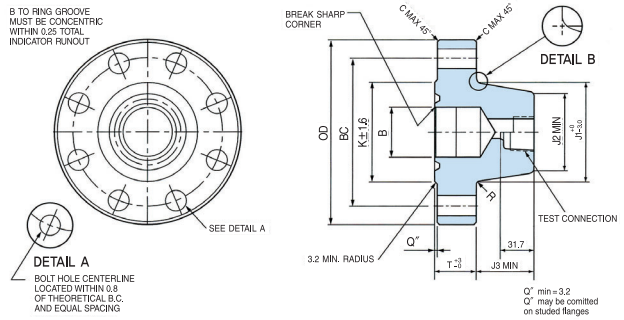
Api Flange - Type 6bx Weld Neck Flanges



Basic Flange Dimensions									
Nominal Size of Flange		Maxi -mum Bore	Outside Diameter of Flange	Tole -rance	Maxi -mum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub
in	mm	B	OD	OD	C	K	T	J1	J2
15000 psi									
1-13/16	46	46.8	210	2	3	106	45.2	97.6	71.4
2-1/16	52	53.2	220	2	3	114	50.8	111.1	82.6
2-9/16	65	65.9	250	2	3	133	57.1	128.6	100.0
3-1/16	78	78.6	290	2	3	154	64.3	154.0	122.2
4-1/16	103	104.0	360	2	3	194	78.6	195.3	158.8
7-1/16	179	180.2	505	3	6	305	119.1	325.4	276.2
20000 psi									
1-13/16	46	46.8	255	2	3	117	63.5	133.3	109.5
2-1/16	52	53.2	285	2	3	132	71.5	154.0	127.0
2-9/16	65	65.9	325	2	3	151	79.4	173.0	144.4
3-1/16	78	78.6	355	2	3	171	85.7	192.1	160.3
4-1/16	103	104.0	445	2	3	219	106.4	242.9	206.4
7-1/16	179	180.2	655	3	6	352	165.1	385.7	338.1

Basic Flange Dimensions				Bolting Dimensions				
Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Lenght of Stud Bolts	Ring Number
J3	R	BC		in.	mm		Lssb	BX
15000 psi								
47.6	10	160.3	8	7/8	26	+2 / -0.5	140	151
54.0	10	174.6	8	7/8	26	+2 / -0.5	150	152
57.1	10	200.0	8	1	30	+2 / -0.5	170	153
63.5	10	230.2	8	1-1/8	32	+2 / -0.5	190	154
73.0	10	290.5	8	1-3/8	40	+2 / -0.5	235	155
66.7	16	428.6	16	1-1/2	42	+2 / -0.5	325	156
20000 psi								
49.2	10	203.2	8	1	30	+2 / -0.5	190	151
52.4	10	230.2	8	1-1/8	32	+2 / -0.5	210	152
58.7	10	261.9	8	1-1/4	36	+2 / -0.5	235	153
63.5	10	287.3	8	1-3/8	40	+2 / -0.5	255	154
73.0	10	357.2	8	1-3/4	48	+3 / -0.5	310	155
96.8	16	554.0	16	2	54	+3 / -0.5	445	156

Api Flange - Type 6bx Blind and Test Flanges



Basic Flange Dimensions									
Nominal Size of Flange		Maxi -mum Bore	Outside Diameter of Flange	Tole -rance	Maxi -mum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub
in	in	B	OD	OD	C	K	T	J1	J2
10000 psi									
1-13/16	46	46.8	190	2	3	105	42.1	88.9	65.1
2-1/16	52	53.2	200	2	3	111	44.1	100.0	74.6
2-9/16	65	65.9	230	2	3	132	51.2	120.7	92.1
3-1/16	78	78.6	270	2	3	152	58.4	142.1	110.4
4-1/16	103	104.0	315	2	3	185	70.3	182.6	146.1
15000 psi									
1-13/16	46	46.8	210	2	3	106	45.2	97.6	71.4
2-1/16	52	53.2	220	2	3	114	50.8	111.1	82.6
2-9/16	65	65.9	250	2	3	133	57.1	128.6	100.0
3-1/16	78	78.6	290	2	3	154	64.3	154.0	122.2
4-1/16	103	104.0	360	2	3	194	78.6	195.3	158.8
20000 psi									
1-13/16	46	46.8	255	2	3	117	63.5	133.3	109.5
2-1/16	52	53.2	285	2	3	132	71.5	154.0	127.0
2-9/16	65	65.9	325	2	3	151	79.4	173.0	144.4
3-1/16	78	78.6	355	2	3	171	85.7	192.1	160.3
4-1/16	103	104.0	445	2	3	219	106.4	242.9	206.4

Basic Flange Dimensions				Bolting Dimensions				
Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Lenght of Stud Bolts	Ring Number
J3	R	BC		in.	mm		Lssb	BX
10000 psi								
48.4	10	146.0	8	3/4	23	+2 / -0.5	130	151
51.6	10	158.8	8	3/4	23	+2 / -0.5	130	152
57.2	10	184.2	8	7/8	25	+2 / -0.5	150	153
63.5	10	215.9	8	1	29	+2 / -0.5	170	154
73.0	10	258.8	8	1-1/8	32	+2 / -0.5	200	155
15000 psi								
47.6	10	160.3	8	7/8	26	+2 / -0.5	140	151
54.0	10	174.6	8	7/8	26	+2 / -0.5	150	152
57.1	10	200.0	8	1	30	+2 / -0.5	170	153
63.5	10	230.2	8	1-1/8	32	+2 / -0.5	190	154
73.0	10	290.5	8	1-3/8	40	+2 / -0.5	235	155
20000 psi								
49.2	10	203.2	8	1	30	+2 / -0.5	190	151
52.4	10	230.2	8	1-1/8	32	+2 / -0.5	210	152
58.7	10	261.9	8	1-1/4	36	+2 / -0.5	235	153
63.5	10	287.3	8	1-3/8	40	+2 / -0.5	255	154
73.0	10	357.2	8	1-3/4	48	+3 / -0.5	310	155

TK corporation

FORGED STEEL FITTINGS

Forged Steel Socket-Welding & Threaded Fittings 282

Socket-Welding Type (ASME)

- 90°, 45° Elbow, Tee, Cross 288
- Full Coupling, Half Coupling, Reducer, Cap, Boss 292
- Reducer Insert 302
- Union 306

Threaded Type

- 90°, 45° Elbow, Tee, Cross 310
- Full Coupling, Half Coupling, Cap, Reducer 314
- Union 318
- Boss & Plug, Bushing, Nipple & Swaged 321

Outlet

- Weld-outlet, Socket-outlet, Thread-outlet 328
- Nipple-outlet, Flanged End Outlet 334

Socket-Welding Type (KS/JIS)

- 90°, 45° Elbow, Tee, Cross 336
- Full Coupling, Half Coupling, 340
- Reducer, Cap 342
- Approx Weight Lis t(Socket / Threaded) 346

1. Pressure Ratings

These fittings shall be designated as pressure class 2000, 3000 and 6000 fittings for threading and pressure class 3000, 6000 and 9000 for socket-welding. This designation identifies the fittings with their ratings as shown as follows, Table 1.

Table1 : Correlation of Fittings Class With Schedule Number of Wall Designation of Pipe for Calculation of Ratings

Class Designation of Fitting	Type of Fitting	Pipe Used For Rating Basic	
		Schedule No.	Wall Designation
2000	Threaded	80	X-S
3000	Threaded	160	-
6000	Threaded	-	XX-S
3000	Socket-Welding	80	X-S
6000	Socket-Welding	160	-
9000	Socket-Welding	-	XX-S

- This table is not intended to restrict the use of pipe of thinner or thicker wall with fittings. Pipe actually used may be thinner or thicker in nominal wall than that shown in Table 1. When thinner pipe is used, its strength may govern the rating. When thicker pipe is used (e. g., for mechanical strength), the strength of the fitting governs the rating.

Table2 : Nomianl Wall Thickness of Schedule 160 and Double Extra Strong Pipe

NPS.	Schedule 160		XX-S	
	in	mm	in	mm
1/8	0.124	3.15	0.190	4.83
1/4	0.145	3.68	0.238	6.05
3/8	0.158	4.01	0.252	6.40

Table3 : Pressure / Temperature Ratings

Non-shock Working Pressure in Pounds per Square Inch

Service Temperature Degree °F	2000lb Threaded Fittings				
	Carbon Steel	F304	F316	F22	F5
100	2000	1715	2000	2000	2000
150	1970	1615	1970	1970	1970
200	1940	1520	1940	1940	1940
250	1915	1445	1915	1915	1915
300	1895	1370	1896	1895	1895
350	1875	1310	1875	1875	1875
400	1850	1245	1850	1850	1850
450	1810	1195	1810	1810	1810
500	1735	1140	1735	1735	1735
550	1640	1100	1640	1640	1640
600	1540	1060	1540	1540	1540
650	1430	1020	1430	1430	1430
700	1305	985	1370	1340	1340
750	1180	950	1305	1245	1245
800	1015	915	1240	1155	1155
850	830	880	1180	1060	1060
900	615	860	1115	970	970
950	425	845	1055	880	880
1000	235	830	990	740	695

Table3 : Pressure / Temperature Ratings

Non-shock Working Pressure in Pounds per Square Inch

Service Temperature Degree °F	3000lb Socket Welding and Threaded Fittings				
	Carbon Steel	F304	F316	F22	F5
100	3000	2570	3000	3000	3000
150	2950	2425	2950	2950	2950
200	2915	2280	2915	2915	2915
250	2875	2170	2875	2875	2875
300	2845	2055	2845	2845	2845
350	2810	1965	2810	2810	2810
400	2775	1870	2775	2775	2775
450	2715	1790	2715	2715	2715
500	2605	1715	2605	2605	2605
550	2460	1650	2460	2460	2460
600	2310	1590	2310	2310	2310
650	2150	1535	2150	2150	2150
700	1960	1480	2055	2010	2010
750	1775	1425	1960	1870	1870
800	1525	1370	1865	1735	1735
850	1250	1330	1770	1595	1595
900	925	1290	1675	1455	1455
950	640	1270	1580	1320	1320
1000	350	1250	1485	1115	1040

Service Temperature Degree °F	6000lb Socket Welding and Threaded Fittings				
	Carbon Steel	F304	F316	F22	F5
100	6000	5145	6000	6000	6000
150	5915	4855	5915	5915	5915
200	5830	4565	5830	5830	5830
250	5750	4340	5750	5750	5750
300	5690	4115	5690	5690	5690
350	5625	3930	5690	5625	5625
400	5550	3745	5550	5550	5550
450	5430	3585	5430	5430	5430
500	5210	3430	5210	5210	5210
550	4925	3305	4925	4925	4925
600	4620	3180	4620	4620	4620
650	4300	3070	4300	4300	4300
700	3920	2960	4110	4025	4025
750	3550	2580	3920	3745	3745
800	3050	2745	3730	3470	3470
850	2500	2660	3540	3190	3190
900	1885	2580	3350	2915	2915
950	1295	2540	3165	2640	2640
1000	715	2500	2975	2230	2085

2. Size Identification

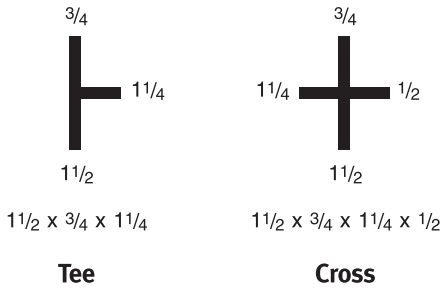


Fig.1 Method of Designating Outlets of Reducing Tees and Crosses

In the case of reducing tees and crosses, the size of the largest run opening shall be given first, followed by the size of the opening at the opposite end of the run.
Where the fitting is a tee, the size of the branch is given last.
Where the fitting is a cross, the largest side-outlet is the third dimension given, followed by the opening.
The line sketches, Fig.1, illustrate how the reducing fittings are read.

3. Threaded

Unless otherwise specified in inquiry, all threaded fittings are supplied with NPT threads(ASME B1.20.1 American National Standard Taper Pipe Threads) for reference, other available threads are:

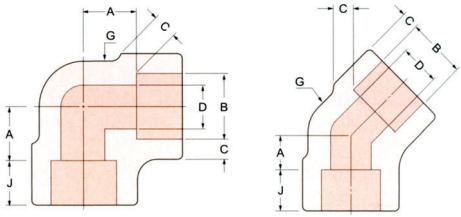
- ISO/R7, Pipe Threads for Gas List Tubes and Screwed Fittings where Pressure-Tight Joints are made on the threads(BS 2.1&JIS B0203 PT Thread).
- API 5B, Line Pipe Threads.
- KS B0222 Taper Pipe Threads.

4. Bore Diameter of Fittings

Bore diameter of fitting(B), (S) are manufactured for conforming with JIS. ASME or MSS dimension.

90° Elbow, 45° Elbow,

3000# 6000# 9000#



90° Elbow 45° Elbow

ANSI B16.11

(Unit : mm)

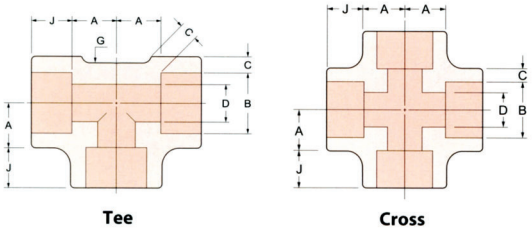
Nom Pipe Size	Socket Bore Dia	Bore Diameter of Fitting-D		
	B	3000	6000	9000
1/8	10.8 11.2	6.1~7.6	3.2~4.8	-
1/4	14.2 14.6	8.5~10.0	5.6~7.1	-
3/8	17.6 18.0	11.8~13.3	8.4~9.9	-
1/2	21.8 22.2	15.0~16.6	11.0~12.5	5.6~7.2
3/4	27.2 27.6	20.2~21.7	14.8~16.3	10.3~11.8
1	33.9 34.3	25.9~27.4	19.9~21.5	14.4~16.0
1 1/4	42.7 43.1	34.3~35.8	28.7~30.2	22.0~23.5
1 1/2	48.8 49.2	40.1~41.6	33.2~34.7	27.2~28.7
2	61.2 61.7	51.7~53.3	42.1~43.6	37.4~38.9
2 1/2	73.9 74.4	61.2~64.2	-	-
3	89.8 90.3	76.4~79.4	-	-
4	115.2 115.7	100.7~103.8	-	-

Socket Wall Thickness C(Ave/Min)			Depth of Socket Min-J
3000	6000	9000	
3.18 / 3.18	3.96 / 3.43	-	9.5
3.78 / 3.30	4.60 / 4.01	-	9.5
4.01 / 3.50	5.03 / 4.37	-	9.5
4.67 / 4.09	5.97 / 5.18	9.35 / 8.18	9.5
4.90 / 4.27	6.96 / 6.04	9.78 / 8.56	12.5
5.69 / 4.98	7.92 / 6.93	11.38 / 9.96	12.5
6.07 / 5.28	7.92 / 6.93	12.14 / 10.62	12.5
6.35 / 5.54	8.92 / 7.80	12.70 / 11.12	12.5
6.93 / 6.04	10.92 / 9.50	13.84 / 12.12	16.0
8.76 / 7.67	-	-	16.0
9.52 / 8.30	-	-	16.0
10.69 / 9.35	-	-	19.0

- Dimensions are in millimeters.
- Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

Tee, Cross

3000# 6000# 9000#



ANSI B16.11

(Unit : mm)

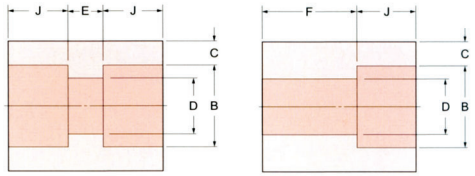
Nom Pipe Size	Body Wall Thickness Min-G		
	3000	6000	9000
1/8	2.41	3.15	-
1/4	3.02	3.68	-
3/8	3.20	4.01	-
1/2	3.73	4.78	7.47
3/4	3.91	556	7.82
1	4.55	6.35	9.09
1 1/4	4.85	6.35	9.70
1 1/2	5.08	7.14	10.15
2	5.54	8.74	11.07
2 1/2	7.01	-	-
3	7.62	-	-
4	8.56	-	-

Center to Bottom of Socket-A					
90° Elbow, Tees and Crosses			45° Elbow		
3000	6000	9000	3000	6000	9000
11.0	11.0	-	8.0	8.0	-
11.0	13.5	-	8.0	8.0	-
13.5	15.5	-	8.0	11.0	-
15.5	19.0	25.5	11.0	12.5	15.5
19.0	22.5	28.5	13.0	14.0	19.0
22.5	27.0	32.0	14.0	17.5	20.5
27.0	32.0	35.0	17.5	20.5	22.5
32.0	38.0	38.0	20.5	25.5	25.5
38.0	41.0	54.0	25.5	28.5	28.5
41.0	-	-	28.5	-	-
57.0	-	-	32.0	-	-
66.5	-	-	41.0	-	-

- Dimensions are in millimeters.
- Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

Full Coupling
Half Coupling

3000# 6000# 9000#



Full Coupling Half Coupling

ANSI B16.11

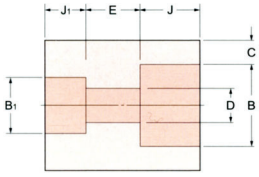
(Unit : mm)

Nom Pipe Size	Socket Bore Dia	Bore Diameter of Fitting-D			Socket Wall Thickness C(Ave/Min)			Depth Min J	Laying Lengths	
									F/C	H/C
	B	3000	6000	9000	3000	6000	9000		E	F
1/8	10.8 11.2	6.1~7.6	3.2~4.8	-	3.18/3.18	3.96/3.43	-	9.5	6.5	16.0
1/4	14.2 14.6	8.5~10.0	5.6~7.1	-	3.78/3.30	4.60/4.01	-	9.5	6.5	16.0
3/8	17.6 18.0	11.8~13.3	8.4~9.9	-	4.01/3.50	5.03/4.37	-	9.5	6.5	17.5
1/2	21.8 22.2	15.0~16.6	11.0~12.5	5.6~7.2	4.67/4.09	5.97/5.18	9.35/8.18	9.5	9.5	22.5
3/4	27.2 27.6	20.2~21.7	14.8~16.3	10.3~11.8	4.90/4.27	6.96/6.04	9.78/8.56	12.5	9.5	24.0
1	33.9 34.3	25.9~27.4	19.9~21.5	14.4~16.0	5.69/4.98	7.92/6.93	11.38/9.96	12.5	12.5	28.5
1 1/4	42.7 43.1	34.3~35.8	28.7~30.2	22.0~23.5	6.07/5.28	7.92/6.93	12.14/10.62	12.5	12.5	30.0
1 1/2	48.8 79.2	40.1~41.6	33.2~34.7	27.2~28.7	6.35/5.54	8.92/7.80	12.70/11.12	12.5	12.5	32.0
2	61.2 61.7	51.7~53.3	42.1~43.6	37.4~38.9	6.93/6.04	10.92/9.50	13.84/12.12	16.0	19.0	41.0
2 1/2	73.9 74.4	61.2~64.2	-	-	8.76/7.67	-	-	16.0	19.0	43.0
3	89.8 90.3	76.4~79.4	-	-	9.52/8.30	-	-	16.0	19.0	44.5
4	115.2 115.7	100.7~103.8	-	-	10.69/9.35	-	-	19.0	19.0	48.0

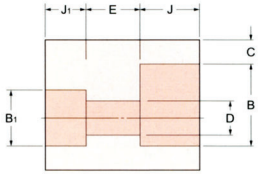
- Dimensions are in millimeters.
- Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

Concentric Reducer
Eccentric Reducer

3000# 6000# 9000#



Concentric Reducer



Eccentric Reducer

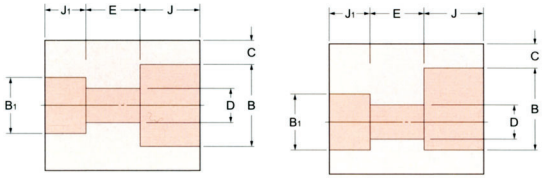
ANSI B16.11

(Unit : mm)

Nom Pipe Size	Socket Bore Dia Min		Bore Diameter of Fitting-D			Socket Wall Thickness C(Ave/Min)			Depth Min		Laying Lengths (Min/Max)
	B	B_1	3000	6000	9000	3000	6000	9000	J	J_1	E
1/4 x 1/8	14.2/14.6	10.8/11.2	6.1/7.6	3.2/4.8	-	3.78/3.30	4.60/4.01	-	9.5	9.5	5.0/8.0
3/8 x 1/4	17.6/18.0	14.2/14.6	8.5/10.0	5.6/7.1	-	4.01/3.50	5.03/4.37	-	9.5	9.5	3.5/9.5
1/2 x 1/4	21.8/22.2	14.2/14.6	8.5/10.0	5.6/7.1	-	4.67/4.09	5.97/5.18	9.35/8.18	9.5	9.5	6.5/12.5
x 3/8	-	17.6/18.0	11.8/13.3	8.4/9.9	-	-	-	-	9.5	9.5	-
3/4 x 1/4	27.2/27.6	14.2/14.6	8.5/10.0	5.6/7.1	-	4.90/4.27	6.96/6.04	9.78/8.56	12.5	9.5	6.5/12.5
x 3/8	-	17.6/18.0	11.8/13.3	8.4/9.9	-	-	-	-	12.5	9.5	-
x 1/2	-	21.8/22.2	15.0/16.6	11.0/12.5	5.6/7.2	-	-	-	12.5	9.5	-
1 x 3/8	33.9/34.3	17.6/18.0	11.8/13.3	8.4/9.9	-	5.69/4.98	7.92/6.93	11.38/9.96	12.5	9.5	8.5/16.5
x 1/2	-	21.8/22.2	15.0/16.6	11.0/12.5	5.6/7.2	-	-	-	12.5	9.5	-
x 3/4	-	27.2/27.6	20.2/21.7	14.8/16.3	10.3/11.8	-	-	-	12.5	12.5	-
1 1/4 x 1/2	42.7/43.1	21.8/22.2	15.0/16.6	10.2/12.5	5.6/7.2	6.07/5.28	7.92/6.93	12.14/10.62	12.5	12.5	8.5/16.5
x 3/4	-	27.2/27.6	20.2/21.7	14.8/16.3	10.3/11.8	-	-	-	12.5	12.5	-
x 1	-	33.9/34.3	25.9/27.4	19.9/21.5	14.5/16.0	-	-	-	12.5	12.5	-
1 1/2 x 3/4	48.8/49.2	27.2/27.6	20.2/21.7	14.8/16.3	14.8/16.3	6.35/5.54	8.92/7.80	12.70/11.12	12.5	12.5	8.5/16.5
x 1	-	33.9/34.3	25.9/27.4	19.9/21.5	14.5/16.0	-	-	-	12.5	12.5	-
x 1 1/4	-	42.7/43.1	34.3/35.8	28.7/30.2	22.0/23.5	-	-	-	12.5	12.5	-
2 x 1	61.2/61.7	33.9/34.3	25.9/27.4	19.9/21.5	14.5/16.0	6.93/6.04	10.92/9.50	13.84/12.12	16.0	12.5	15.0/23.0
x 1/4	-	42.7/43.1	34.3/35.8	28.7/30.2	22.0/23.5	-	-	-	16.0	12.5	-
x 1/2	-	48.8/49.2	40.1/41.6	33.2/34.7	27.2/28.7	-	-	-	16.0	12.5	-
2 1/2 x 1 1/4	73.9/74.4	42.7/43.1	34.3/35.8	28.7/30.2	22.0/23.5	8.76/7.67	-	-	16.0	12.5	14.0/24.0
x 1 1/2	-	48.8/49.2	40.1/41.6	33.2/34.7	27.2/28.7	-	-	-	16.0	12.5	-
x 2	-	61.2/61.7	51.7/53.3	42.1/43.6	27.4/38.9	-	-	-	16.0	16.0	-

Concentric Reducer
Eccentric Reducer

3000# 6000# 9000#



Concentric Reducer Eccentric Reducer

ANSI B16.11

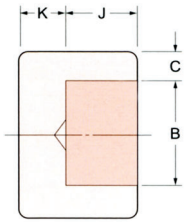
(Unit : mm)

Nom Pipe Size	Socket Bore Dia Min		Bore Diameter of Fitting-D			Socket Wall Thickness C(Ave/Min)			Depth Min		Laying Lengths (Min/Max)
	B	B_1	3000	6000	9000	3000	6000	9000	J	J_1	E
3 x $1^1/_2$	89.8/90.3	48.8/49.2	40.1/41.6	33.2/34.7	-	9.52/8.30	-	-	16.0	12.5	14.0/24.0
x 2	-	61.2/61.7	51.7/53.3	42.1/43.6	-	-	-	-	16.0	16.0	-
x $2^1/_2$	-	73.9/74.4	61.2/64.2	-	-	-	-	-	16.0	16.0	-
4 x 2	115.2/115.7	61.2/61.7	51.7/53.3	-	-	10.69/9.35	-	-	19.0	16.0	14.0/24.0
x $2^1/_2$	-	73.9/74.4	61.2/64.2	-	-	-	-	-	19.0	16.0	-
x 3	-	89.8/90.3	76.4/79.4	-	-	-	-	-	19.0	16.0	-

- Dimensions are in millimeters.
- Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

Cap

3000# 6000# 9000#



ANSI B16.11

(Unit : mm)

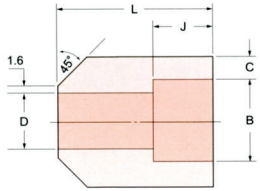
Nom Pipe Size	Socket Bore Dia	Socket Wall Thickness C(Ave/Min)		
	B	3000	6000	9000
1/8	10.8 11.2	3.18/3.18	3.96/3.43	-
1/4	14.2 14.6	3.78/3.30	4.60/4.01	-
3/8	17.6 18.0	4.01/3.50	5.03/4.37	-
1/2	21.8 22.2	4.67/4.09	5.97/5.18	9.35/8.18
3/4	27.2 27.6	4.90/4.27	6.96/6.04	9.78/8.56
1	33.9 34.3	5.69/4.98	7.92/6.93	11.38/9.96
1 1/4	42.7 43.1	6.07/5.28	7.92/6.96	12.14/10.62
1 1/2	48.8 49.2	6.35/5.54	8.92/7.80	12.70/11.12
2	61.2 61.7	6.93/6.04	10.92/9.50	13.84/12.12
2 1/2	73.9 74.4	8.67/7.67	-	-
3	89.8 90.3	9.52/8.30	-	-
4	115.2 115.7	10.69/9.35	-	-

Depth Min J	Socket Wall Thickness K(Min)		
	3000	6000	9000
9.5	4.8	6.4	-
9.5	4.8	6.4	-
9.5	4.8	6.4	-
9.5	6.4	7.9	11.2
12.5	6.4	7.9	12.7
12.5	9.6	11.2	14.2
12.5	9.6	11.2	14.2
12.5	11.2	12.7	15.7
16.0	12.7	15.7	19.0
16.0	15.7	19.0	-
16.0	19.0	22.4	-
19.0	22.4	28.4	-

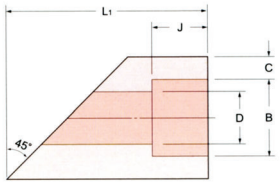
- Dimensions are in millimeters.
- Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

Boss

3000# 6000# 9000#



Type. 1



Type. 2

ANSI B16.11

(Unit : mm)

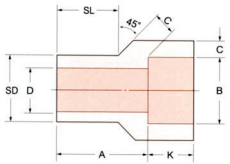
Nom Pipe Size	Socket Bore Dia	Bore Diameter of Fitting-D		
	B	3000	6000	9000
1/4	14.2 14.6	8.5~10.0	5.6~7.1	-
3/8	17.6 18.0	11.8~13.3	8.4~9.9	-
1/2	21.8 22.2	15.0~16.6	11.0~12.5	5.6~7.2
3/4	27.2 27.6	20.2~21.7	14.8~16.3	10.3~11.8
1	33.9 34.3	25.9~27.4	19.9~21.5	14.4~16.0
1 1/4	42.7 43.1	34.3~35.8	28.7~30.2	22.0~23.5
1 1/2	48.8 49.2	40.1~41.6	33.2~34.7	27.2~28.7
2	61.2 61.7	51.7~53.3	42.1~43.6	37.4~38.9

Socket Wall Thickness C(Ave/Min)			Depth Min J	End to End	
3000	6000	9000		L	L_1
3.78/3.30	4.60/4.01	-	9.5	25.7	62
4.01/3.50	5.03/4.37	-	9.5	27.5	66
4.67/4.09	5.97/5.18	9.35/818	9.5	32.4	82
4.90/4.27	6.96/6.04	9.78/8.56	12.5	36.9	88
5.69/4.98	7.92/6.93	11.38/9.96	12.5	41.4	96
6.07/5.28	7.92/6.93	12.14/10.62	12.5	43.2	105
6.35/5.54	8.92/7.80	12.70/11.12	12.5	44.8	112
6.93/6.04	10.92/9.50	13.84/12.12	16.0	57.1	125

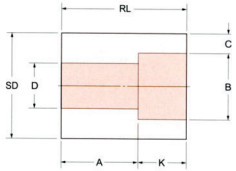
- Dimensions are in millimeters.
- Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.

Reducer Insert

3000# 6000#



Type. 1



Type. 2(1)

MSS SP-79

(Unit : mm)

Nominal Pipe Size	Type(2)		Socket Min		Shank Dia SD	Laying Length A	
	3M	6M	Dia B	Depth k		3M	6M
3/8 X 1/4	1	1	14.35	9.65	17.15	19	21
1/2 X 3/8	1	1	17.78	9.65	21.34	21	23
X 1/4	1	1	14.35	9.65	21.34	21	21
3/4 X 1/2	1	1	21.97	9.65	26.67	22	25
X 3/8	2	1	17.78	9.65	26.67	16	22
X 1/4	2	2	14.35	9.65	26.67	18	22
1 X 3/4	1	1	27.31	12.70	33.40	24	28
X 1/2	2	1	21.97	9.65	33.40	16	28
X 3/8	2	2	17.78	9.65	33.40	18	22
X 1/4	2	2	14.35	9.65	33.40	19	24
1 1/4 X 1	1	1	34.04	12.70	42.16	25	30
X 3/4	2	2	27.31	12.70	42.16	18	21
X 1/2	2	2	21.97	9.65	42.16	19	22
X 3/8	2	2	17.78	9.65	42.16	21	24
X 1/4	2	2	14.35	9.65	42.16	22	25
1 1/2 X 1 1/4	1	1	42.80	12.70	48.26	28	35
X 1	2	2	34.04	12.70	48.26	18	29
X 3/4	2	2	27.31	12.70	48.26	19	25
X 1/2	2	2	21.97	9.65	48.26	21	27
X 3/8	2	2	17.78	9.65	48.26	22	28

- At the option of the manufacturer Type 2 Reducers may be furnished in Type 1 configuration.
- 3M and 6M symbols denote 3000 and 6000 classes.

Bore D		Wall Thickness Min C		Length Min.			
				SL		RL	
3M	6M	3M	6M	3M	6M	3M	6M
9.0	6.5	3.78	4.60	14	16	-	-
12.5	9.0	4.01	5.03	16	16	-	-
9.0	6.0	3.78	4.60	16	16	-	-
16.0	11.5	4.67	5.93	17	19	-	-
12.5	9.0	4.01	5.03	-	19	27	-
9.0	6.5	3.78	4.60	-	-	27	32
21.0	15.5	4.90	6.96	19	21	-	-
16.0	11.5	4.67	5.97	-	21	28.5	-
12.5	9.0	4.01	5.03	-	-	28.5	33
9.0	6.0	3.78	4.60	-	-	28.5	33
26.5	20.5	5.69	7.92	21	22	-	-
21.0	15.5	4.90	6.96	-	-	32	35
16.0	11.5	4.67	5.97	-	-	32	35
12.5	9.0	4.01	5.03	-	-	32	35
9.0	6.0	3.78	4.60	-	-	32	35
35.0	29.5	6.07	7.92	22	25	-	-
26.5	20.5	5.69	7.92	-	25	33	-
21.0	15.5	4.90	6.96	-	-	33	40
16.0	11.5	4.67	5.97	-	-	33	40
12.5	9.0	4.01	5.03	-	-	33	40

※Laying Length A- Sizes 3/8* thru 3/4* ±1.50mm
Sizes 1* thru 2* ±2.00mm
Sizes 2 1/2* thru 4* ±2.50mm

※Laying Length B- Sizes 3/8* thru 2* ±0.13mm
Sizes 2 1/2* thru 4* ±2.50mm

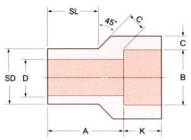
TORELANCES

※Bore D - Sizes 3/8* thru 3/4* ±0.8mm
※Socket Dia SD - Sizes 2 1/2* thru 4* ±0.25mm
Sizes 1/4* thru 1 1/2* ±0.25mm
Sizes 2* thru 3* ±0.75mm
Sizes 4* ±0.25mm

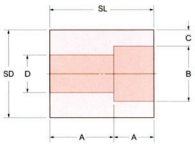
※Shank Length SL- Sizes 3/8* thru 3/4* –1.5mm
Sizes 1* thru 2* –2.0mm
Sizes 2 1/2* thru 4* –2.5mm

Reducer Insert

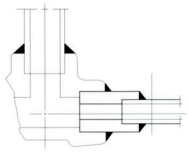
3000# 6000#



Type. 1



Type. 2(1)


Application of Reducer Insert

MSS SP-79

(Unit : mm)

Nominal Pipe Size	Type(2)		Socket Min		Shank Dia SD	Laying Length A	
	3M	6M	Dia B	Depth k		3M	6M
2 X 1 1/2	1	1	48.90	12.70	60.33	32	39
X 1 1/4	2	2	42.80	12.70	60.33	21	24
X 1	2	2	34.04	12.70	60.33	22	25
X 3/4	2	2	27.31	12.70	60.33	24	27
X 1/2	2	2	21.97	9.65	60.33	25	28
2 1/2 X 2	1	1	61.37	15.75	73.03	46	43
X 1 1/2	2	2	48.90	12.70	73.03	35	35
X 1 1/4	2	2	42.80	12.70	73.03	37	37
X 1	2	2	34.04	12.70	73.03	38	38
X 3/4	2	2	27.31	12.70	73.03	40	38
3 X 2 1/2	1	1	74.07	15.75	88.90	38	57
X 2	2	2	61.37	15.75	88.90	25	32
X 1 1/2	2	2	48.90	12.70	88.90	29	32
X 1 1/4	2	2	42.80	12.70	88.90	30	32
X 1	2	2	34.04	12.70	88.90	32	32
4 X 3	2	1	90.04	15.75	114.30	33	-
X 2 1/2	2	2	74.07	15.75	114.30	38	-
X 2	2	2	61.37	15.75	114.30	38	-
X 1 1/2	2	2	48.90	12.70	114.30	42	-
X 1 1/4	2	2	42.80	12.70	114.30	43	-

Bore D		Wall Thickness Min C		Length Min.			
				SL		RL	
3M	6M	3M	6M	3M	6M	3M	6M
41.0	34.0	6.35	8.92	25	28	-	-
35.0	29.5	6.07	7.92	-	-	38	41
26.5	20.5	5.69	7.92	-	-	38	41
21.0	15.5	4.90	6.96	-	-	38	41
16.0	11.5	4.67	5.97	-	-	38	41
52.5	43.0	6.93	10.92	38	32	-	-
41.0	34.0	6.35	8.92	-	-	54	54
35.0	29.5	6.07	7.92	-	-	54	54
26.5	20.5	5.69	7.92	-	-	54	54
21.0	15.5	4.90	6.96	-	-	54	54
62.5	54.0	8.76	11.91	32	-	-	-
52.5	43.0	6.93	10.92	-	-	48	54
41.0	34.0	6.35	8.92	-	-	48	54
35.0	29.5	6.07	7.92	-	-	48	54
26.5	20.5	5.69	7.92	-	-	48	54
78.0	-	9.53	-	-	-	60	-
62.5	-	8.76	-	-	-	60	-
52.5	-	6.93	-	-	-	60	-
41.0	-	6.35	-	-	-	60	-
35.0	-	6.07	-	-	-	60	-

- At the option of the manufacturer Type 2 Reducers may be furnished in Type 1 configuration.
- 3M and 6M symbols denote 3000 and 6000 classes.

※Laying Length A- Sizes 3/8* thru 3/4* ±1.50mm
Sizes 1* thru 2* ±2.00mm
Sizes 2 1/2* thru 4* ±2.50mm

※Laying Length B- Sizes 3/8* thru 2* ±0.13mm
Sizes 2 1/2* thru 4* ±2.50mm

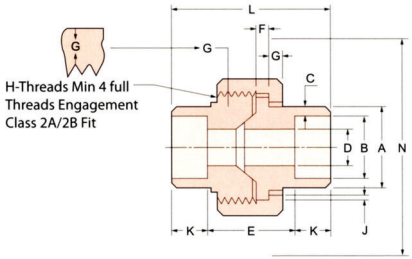
TORELANCES

※Bore D - Sizes 3/8* thru 3/4* ±0.8mm
※Socket Dia SD - Sizes 2 1/2* thru 4* ±0.25mm
Sizes 1/4* thru 1 1/2* ±0.25mm
Sizes 2* thru 3* ±0.75mm
Sizes 4* ±0.25mm

※Shank Length SL- Sizes 3/8* thru 3/4* –1.5mm
Sizes 1* thru 2* –2.0mm
Sizes 2 1/2* thru 4* –2.5mm

Union

3000#



MSS SP-83

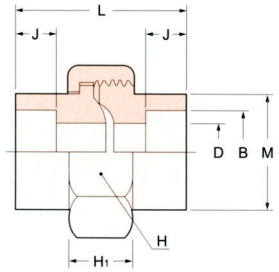
(Unit : mm)

Nom Pipe Size	Pipe End Min	Socket Bore Dia	Socket Wall Min	Water Way Bore	Laying Lwngth	Male Flange Min
	A	B	C	D	E	F
1/4	21.8	14.22 13.97	3.30	9.85 9.45	22,4 19,0	3.17
3/8	25.9	17.78 17.53	3.48	13.92 13.51	26,9 20,6	3.43
1/2	31.2	21.84 21.59	4.06	17.47 17.07	26,9 20,6	3.68
3/4	37.1	27.18 26.92	4.27	21.79 21.39	31,8 25,4	4.06
1	45.5	34.04 33.78	4.95	28.14 27.74	34,3 26,2	4.57
1 1/4	54.9	42.67 42.42	5.28	35.76 35.36	40,6 32,5	5.33
1 1/2	61.5	48.77 48.51	5.54	41.61 41.20	42,2 34,0	5.84
2	75.2	61.47 61.21	6.05	52.53 52.12	45,5 37,3	6.60
2 1/2	91.7	74.17 73.66	7.65	64.72 64.31	61,7 52,1	7.49
3	109.2	90.17 89.66	8.31	77.67 77.27	63,8 53,6	8.25

Nut Min	Thrds. Per 25.4 Max.	Bearing Min.	Depth Of Socket Min.	Length Ass'y Nominal	Clear Ass'y Nut
G	H	J	K	L	M
3.17	16	1.24	9.6	41.4	49.0
3.43	14	1.37	9.6	46.0	55.0
3.68	14	14	9.6	49.0	57.0
4.06	11	1.68	12.7	56.9	67.0
4.44	11	1.85	12.7	62.0	79.0
5.21	11	2.13	12.7	71.1	94.0
5.59	10	2.31	12.7	76.5	111.0
6.35	10	2.69	15.8	86.1	132.0
7.11	8	3.07	15.8	102.4	148.0
8.00	8	3.53	15.8	109.0	175.0

Union

3000# 6000#



(Unit : mm)

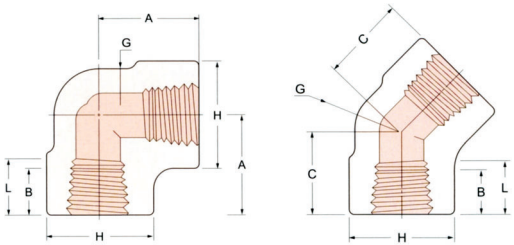
Nom Pipe Size	Socket Borer Dia Min-B	Bore-D		Pipe End-M		Depth Min J
		3000	6000	3000	6000	
1/4	14.10	9.0	6.5	23.0	25	10
3/8	17.55	12.5	9.0	25.9	32	10
1/2	21.70	16.0	11.5	31.5	38	10
3/4	27.05	21.0	15.5	38.0	42	13
1	33.80	26.5	20.5	46.0	49	13
1 1/4	42.55	35.0	29.5	55.0	59	13
1 1/2	48.65	41.0	34.0	61.5	69	13
2	61.10	52.5	43.0	75.5	90	16
2 1/2	73.80	62.5	54.0	92.0	105	16
3	89.80	78.0	66.8	109.2	125	24
4	115.45	102.3	-	140.0	-	24

Length Ass'y Nomi-L		Nut-H *		Nut-H1	
3000	6000	3000	6000	3000	6000
45	51	38	38	20	20
51	54	42	48	20	20
54	57	46	55	20	26
57	64	55	60	26	26
64	72	63	72	26	28
72	80	74	82	30	30
78	89	82	91	36	36
89	110	101	120	38	40
110	120	120	150	40	45
110	140	142	176	42	50
128	-	180	-	45	-

*Nut-H : 3000# Size 1/8~1″Hexagon, 1 1/4~4″ : Octagon
6000# Size 1/8~3/4″Hexagon, 1~3″ : Octagon

90° Elbow, 45° Elbow

2000# 3000# 6000#



90° Elbow 45° Elbow

ANSI B16.11

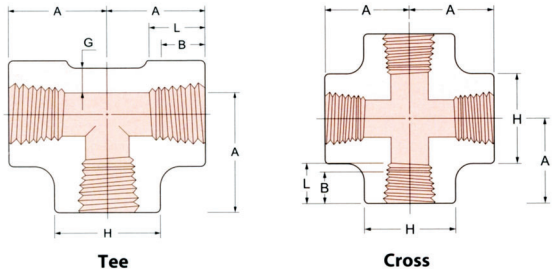
(Unit : mm)

Nom Pipe Size	Center to End Elbow, Tees, Crosses A			Center to End 45°Elbow C			Outside Diameter of Bend H			Minimum Wall Thickness G			Length of thread Min(1)	
	2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L
1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
1/4	21	25	28	17	19	22	22	25	33	3.18	3.30	6.60	8.1	10.2
3/8	25	28	33	19	22	25	25	33	38	3.18	3.51	6.98	9.1	10.4
1/2	289	33	38	22	25	28	33	38	46	3.18	4.09	8.15	10.9	13.6
3/4	33	38	44	25	28	33	38	46	56	3.18	4.32	8.53	12.7	13.9
1	38	44	51	28	33	35	46	56	62	3.68	4.98	9.93	14.7	17.3
1 1/4	44	51	60	33	35	43	56	62	75	3.89	5.28	10.59	17.0	18.0
1 1/2	51	60	64	35	43	44	62	75	84	4.01	5.56	11.07	17.8	18.4
2	60	64	83	43	44	52	75	84	102	4.27	7.14	12.09	19.0	19.2
2 1/2	76	83	95	52	52	64	92	102	121	5.61	7.65	15.29	23.6	28.9
3	86	95	106	64	64	79	110	121	146	5.99	8.84	16.64	25.9	30.5
4	106	114	114	79	79	79	146	152	152	6.55	11.18	18.67	27.7	33.0

- Dimensions B is minimum length of perfect thread. The length of useful thread(L plus threads with fully formed roots and crests) shall not be less thn L(effective length of external thread) required by American National Standard fot Pipe Threads(ASME B1.20.1)

Tee, Cross

2000# 3000# 6000#



ANSI B16.11

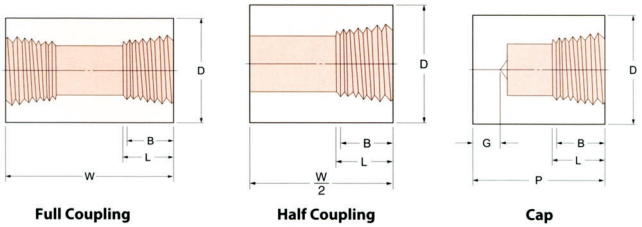
(Unit : mm)

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

- Dimensions B is minimum length of perfect thread. The length of useful thread(L plus threads with fully formed roots and crests) shall not be less thn L(effective length of external thread) required by American National Standard fot Pipe Threads(ASME B1.20.1)

Full Coupling
Half Coupling, Cap

3000# 6000#



ANSI B16.11

(Unit : mm)

Nom Pipe Size	Outside Diameter D		Full Coupling End to End W
	3000	6000	
1/8	16	22	32
1/4	19	25	35
3/8	22	32	38
1/2	28	38	48
3/4	35	44	51
1	44	57	60
1 1/4	57	64	67
1 1/2	64	76	79
2	76	92	86
2 1/2	92	108	92
3	108	127	108
4	140	159	121

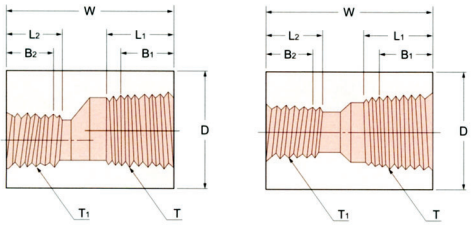
Cap				Length of thread Min(1)	
Ent to End P		Thickness Min G			
3000	6000	3000	6000	B	L
19	-	4.8	-	6.4	6.7
25	27	4.8	6.4	8.1	10.2
25	27	4.8	6.4	9.1	10.4
32	33	6.4	7.9	10.9	13.6
37	38	6.4	7.9	12.7	13.9
41	43	9.7	11.2	14.7	17.3
44	46	9.7	11.2	17.0	18.0
44	48	11.2	12.7	17.8	18.4
48	51	12.7	15.7	19.0	19.2
60	64	15.7	19.0	23.6	28.9
65	68	19.0	22.4	25.9	30.5
68	75	22.4	28.4	27.7	33.0

- Dimensions B is minimum length of perfect thread. The length of useful thread(L plus threads with fully formed roots and crests) shall not be less thn L(effective length of external thread) required by American National Standard fot Pipe Threads(ASME B1.20.1)

*Class 2000 and NPS 1/8 class 6000 couplings, half couplings, and caps are not included in this standard

Concentric Reducer
Eccentric Reducer

3000# 6000#



Concentric Reducer Eccentric Reducer

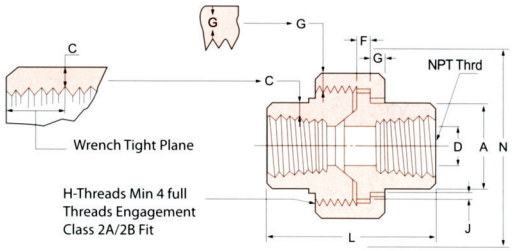
(Unit : mm)

Nom Pipe Size	Min Outside Diameter D		End to End W	Length of thread Min(1)			
T X T	3000	6000	6000	B_1	B_2	L_1	L_2
1/4 X 1/8	19.0	25.4	35	8.12	6.35	10.20	6.70
3/8 X 1/4	22.0	31.8	38	9.14	8.12	10.35	10.20
1/2 X 1/4	28.5	38.1	48	10.92	8.12	13.55	10.20
X 3/8	28.5	38.1	48	10.92	9.14	13.55	10.35
3/4 X 1/4	35.0	44.5	51	12.70	8.12	13.86	10.20
X 3/8	35.0	44.5	51	12.70	9.14	13.86	10.35
X 1/2	35.0	44.5	51	12.70	10.92	13.86	13.55
1 X 3/8	44.5	57.0	60	14.73	9.14	17.34	10.35
X 1/2	44.5	57.0	60	14.73	10.92	17.34	13.55
X 3/4	44.5	57.0	60	14.73	12.70	17.34	13.86
1 1/4 X 1/2	57.0	63.5	67	17.01	10.92	17.95	13.55
X 3/4	57.0	63.5	67	17.01	12.70	17.95	13.86
X 1	57.0	63.5	67	17.01	14.73	17.95	17.34
1 1/2 X 3/4	63.1	76.0	80	17.78	12.70	18.37	13.86
X 1	63.5	76.0	80	17.78	14.73	18.37	17.34
X 1 1/4	63.5	76.0	80	17.78	17.01	18.37	17.95

Nom Pipe Size	Min Outside Diameter D		End to End W	Length of thread Min(1)			
T X T	3000	6000	6000	B_1	B_2	L_1	L_2
2 X 1	76.0	92.0	86	19.05	14.73	19.21	17.34
X 1 1/4	76.0	92.0	86	19.05	17.01	19.21	17.95
X 1 1/2	76.0	92.0	86	19.05	17.78	19.21	18.37
2 1/2 X 1 1/4	92.0	108.0	92	23.62	17.01	28.90	17.95
X 1 1/2	92.0	108.0	92	23.62	17.78	28.90	18.37
X 2	92.0	108.0	92	23.62	19.05	28.90	19.21
3 X 1 1/4	108.0	127.0	108	25.90	17.78	30.48	18.37
X 2	108.0	127.0	108	25.90	19.05	30.48	19.21
X 2 1/2	108.0	127.0	108	25.90	23.62	30.48	28.90
4 X 2	140.0	160.0	121	27.68	19.06	33.02	19.21
X 2 1/2	140.0	160.0	121	27.68	23.62	33.02	28.90
X 3	140.0	160.0	121	27.68	25.90	33.02	30.48

Union

3000#



MSS SP-83

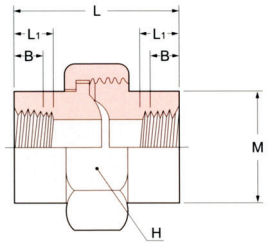
(Unit : mm)

Nom. Pipe Size	Pipe End Min	Stock Wall Min	Water Way Bore	Male Flange Min
	A	C	D	F
1/8	14.7	2.41	6.83 6.43	3.17
1/4	19.0	3.02	9.85 9.45	3.17
3/8	22.9	3.20	13.92 13.51	3.43
1/2	27.7	3.73	17.47 17.07	3.68
3/4	33.5	3.91	21.79 21.39	4.06
1	41.4	4.55	28.14 27.74	4.57
1 1/4	50.5	4.85	35.76 35.36	5.33
1 1/2	57.2	5.08	41.61 41.20	5.84
2	70.1	5.54	52.53 52.12	6.60
2 1/2	85.3	7.01	61.72 64.31	7.49
3	102.4	7.62	77.67 77.27	8.25

Nut Min	Thrds. Per 25.4 Max	Bearing Min.	Length Ass`y Nominal	Clear Ass`y Nut
G	H	J	L	N
3.2	16	1.24	41.4	49.0
3.2	16	1.24	41.4	49.0
3.4	14	1.37	46.0	55.0
3.7	14	14	49.0	57.0
4.1	11	1.68	56.9	67.0
4.4	11	1.85	62.0	79.0
5.2	11	2.13	71.1	94.0
5.6	10	2.31	76.5	111.0
6.4	10	2.67	86.1	132.0
7.1	8	3.07	102.4	148.0
8.0	8	3.53	109.0	175.0

Union

3000# 6000#



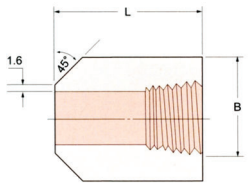
(Unit : mm)

Nom Pipe Size	Pipe End M		Length Ass'y Nomi L		Nut H		Length of Thread Min	
	3000	6000	3000	6000	3000	6000	L1	B
1/4	23.0	30	45	54	38	46	10.20	8.12
3/8	25.9	36	51	57	42	54	10.35	9.14
1/2	31.5	42	54	64	46	60	13.55	10.92
3/4	38.0	49	57	72	55	72	13.86	12.70
1	46.0	56	69	80	63	80	17.34	14.73
1 1/4	55.0	64	72	89	74	94	17.95	17.01
1 1/2	61.5	76	78	108	82	100	18.37	17.78
2	75.5	90	89	114	101	120	19.21	19.05
2 1/2	92.0	105	110	120	120	150	28.90	23.62
3	109.2	125	110	140	142	180	30.48	25.90
4	140.0	-	128	-	180	-	33.02	27.68

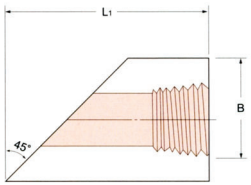
*Nut-H : 3000# Size 1/8~1" Hexagon, 1 1/4~4" : Octagon
6000# Size 1/8~3/4" Hexagon, 1~3" : Octagon

Boss

3000# 6000#



Type. 1

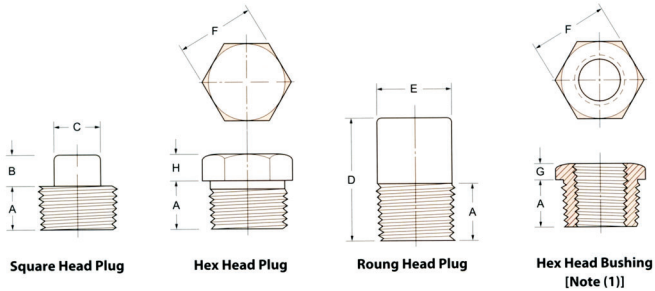


Type. 2

(Unit : mm)

Nom Pipe Size		Outside Diameter D		End to End	
B	A	3000	6000	L	L1
1/4	8	19.0	25.4	17.5	62
3/8	10	22.3	31.8	19.0	66
1/2	15	28.4	38.1	24.0	82
3/4	20	35.0	44.5	25.5	88
1	25	44.5	57.0	30.0	96
1 1/4	32	57.0	63.5	33.5	105
1 1/2	40	63.5	76.2	39.5	112
2	50	76.2	92.0	43.0	125

Plug
Bushing



Square Head Plug | Hex Head Plug | Roung Head Plug | Hex Head Bushing [Note (1)]

ANSI B16.11

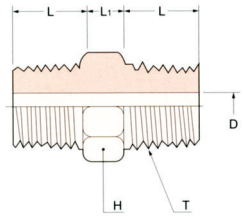
(Unit : mm)

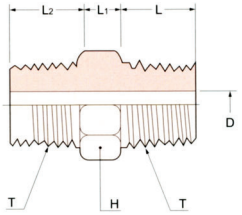
Nom Pipe Size	Length (Min) A	Plugs Square Head		Plugs Round Head		Hex Plugs & Bushing		
		Height of Square(min) B	Width Flats(Min) C	Length (Min) D	Nominal Diameter of Head E	Width Flats (Nom) F	Hex Height Min	
							Bushing G	Plug H
1/8	10	6	7	35	10	11	-	6
1/4	11	6	10	41	14	16	3	6
3/8	13	8	11	41	18	18	4	8
1/2	14	10	14	44	21	22	5	8
3/4	16	11	16	44	27	27	6	10
1	19	13	21	51	33	36	6	10
1 1/4	21	14	24	51	43	46	7	14
1 1/2	21	16	28	51	48	50	8	16
2	22	18	32	64	60	65	9	18
2 1/2	27	19	36	70	73	75	10	19
3	28	21	41	70	89	90	10	21
4	32	25	65	76	114	115	13	25

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

Nipple

3000# 6000#





Reducing Nipple

IHARA STD (Unit : mm)

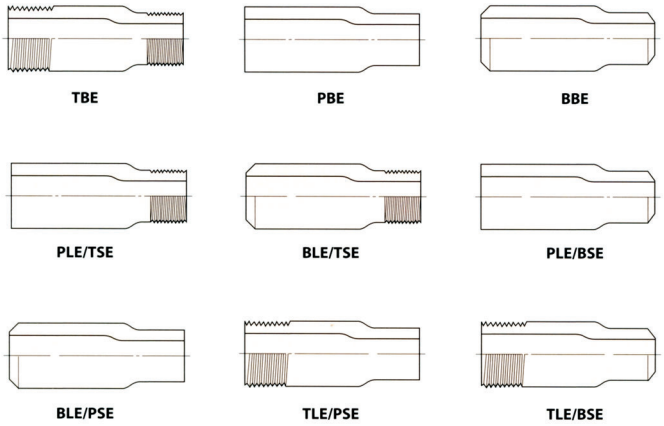
Nom PIpe Size	D	H *	L	L1
1/8	5.5	11.0	10	6
1/4	7	16.0	14	8
3/8	9	18.0	14	8
1/2	12	22.0	19	9
3/4	15	27.0	19	10
1	20	35.0	24	11
1 1/4	28	44.0	24	12
1 1/2	32	51.0	25	14
2	40	63.5	26	16
2 1/2	60	76.2	38	18
3	74	95.0	40	20

H * : Size 2˝ and smaller are Hexagonal Bodles 3˝ is Octagonal body

IHARA STD (Unit : mm)

Nom Pipe Size T X T1	D	H *	L	L1	L2
3/8 X 1/4	7	18	14	8	14
1/2 X 1/4	7	22	19	9	14
X 3/8	9	22	19	9	14
3/4 X 1/4	7	27	19	10	14
X 3/8	9	27	19	10	14
X 1/2	12	27	19	10	19
1 X 3/8	9	35	24	11	14
X 1/2	12	35	24	11	19
X 3/4	15	35	24	11	19
1 1/4 X 1/2	12	44	24	12	19
X 3/4	15	44	24	12	19
X 1	20	44	24	12	24
1 1/2 X 3/4	15	51	25	14	19
X 1	20	51	25	14	24
X 1 1/4	28	51	25	14	24
2 X 1	20	63.5	26	16	24
X 1 1/4	28	63.5	26	16	24
X 1 1/2	32	63.5	26	16	25
2 1/2 X 1 1/4	28	76.2	38	18	24
X 1 1/2	32	76.2	38	18	25
X 2	40	76.2	38	18	26
3 X 1 1/2	32	95	40	20	25
X 2	40	95	40	20	26
X 2 1/2	60	95	40	20	38

Swaged Nipple



MSS SP-95

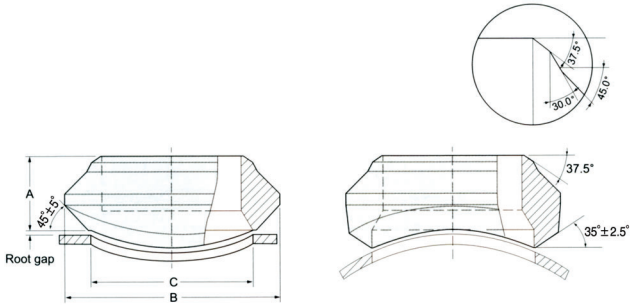
Large end Size	Small end Size	Length (mm)
1/2	3/8 ~ 1/8	70
3/4	1/2 ~ 1/8	76
1	3/4 ~ 1/8	89
1 1/4	1 ~ 1/8	102
1 1/2	1 1/4 ~ 1/8	114
2	1 1/2 ~ 1/8	165
2 1/2	2 ~ 1/8	178
3	2 1/2 ~ 1/8	203
3 1/2	3 ~ 1/8	203
4	3 1/2 ~ 1/8	229
5	4 ~ 1/4	279
6	5 ~ 1/2	304

- BBE : Beveled both end
- TBE : Threaded both end
- PBE : Plane both end
- PLE / TSE : Plane large end - Threaded small end
- BLE / TSE : Beveled large end - Threaded small end
- TLE / PSE : Threaded large end - Plane small end
- BLE / PSE : Beveled large end - Plane small end
- PLE / BSE : Plane large end - Beveled small end
- TLE / BSE : Threaded large end - Beveled small end

*Pipe schedule numbers and weight designations accordance woth ASME B36.10
*Swaged Nipples are from Forged Steel or Pipe

Weld-outlet

STD(Sch 40) X-S(Sch 80) Sch 160 XX-S



STD, X-S

(Unit : mm)

Outlet Size	A		B		C	
	STD	X-S	STD	X-S	STD	X-S
1/2	19.1	19.1	34.9	34.9	23.8	23.8
3/4	22.2	22.2	44.5	44.5	30.2	30.2
1	27.0	27.0	54.0	54.0	36.5	36.5
1 1/4	31.8	31.8	65.1	65.1	44.5	44.5
1 1/2	33.3	33.3	73.0	73.0	50.8	50.8
2	38.1	38.1	88.9	88.9	65.1	65.1
2 1/2	41.3	41.3	103.2	103.2	76.2	76.2
3	44.5	44.5	122.2	122.2	93.7	93.7
4	50.8	50.8	152.4	152.4	120.7	120.7
5	57.2	57.2	179.4	179.4	141.3	141.3
6	60.3	77.8	215.9	225.4	169.9	169.9
8	69.9	98.5	263.5	292.1	220.7	220.7
10	77.8	93.7	322.3	323.9	274.7	265.1
12	85.7	103.2	377.8	397.4	325.4	317.5
14	88.9	100.0	409.6	431.8	357.2	350.8
16	93.7	106.4	463.6	466.7	408.0	403.2
18	96.8	111.1	520.7	523.9	458.0	455.6
20	101.6	119.1	571.5	582.6	508.0	509.6
24	115.9	139.7	689.0	708.0	614.4	638.2

- Dimensions are in millimeters.
- Applicable Run Pipe Sizes are from Out-Let size to 36 inch

SCH 160, XX-S

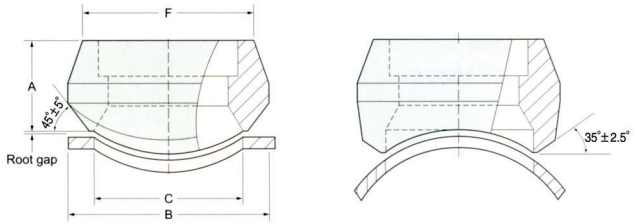
(Unit : mm)

Outlet Size	A		B		C	
	SCH 160	XX-S	SCH 160	XX-S	SCH 160	XX-S
1/2	28.6	28.6	34.9	34.9	14.3	14.3
3/4	31.8	31.8	44.5	44.5	19.1	19.1
1	38.1	38.1	50.8	50.8	25.4	25.4
1 1/4	44.5	44.5	61.9	61.9	33.3	33.3
1 1/2	50.8	50.8	69.9	69.9	38.1	38.1
2	55.6	55.6	81.0	81.0	42.9	42.9
2 1/2	61.9	61.9	96.8	96.8	54.0	54.0
3	73.0	73.0	120.7	120.7	73.0	73.0
4	84.1	84.1	152.4	152.4	98.4	98.4
5	93.7	93.7	187.3	187.3	122.2	122.2
6	104.8	104.8	220.7	220.7	146.1	146.1
8	111.1	111.1	284.2	284.2	173.0	173.0
10	125.4	125.4	312.7	312.7	215.9	215.9

- Dimensions are in millimeters.
- Applicable Run Pipe Sizes are from Out-Let size to 36 inch

Socket-outlet

3000# 6000#



(Unit : mm)

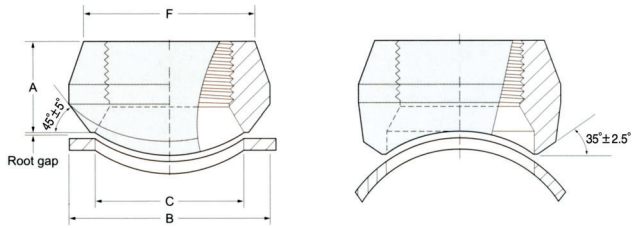
Outlet Size	A		B	
	3000#	6000#	3000#	6000#
1/2	25.4	31.8	34.9	44.5
3/4	27.0	36.5	44.5	50.8
1	33.3	39.7	54.0	61.9
1 1/4	33.3	41.3	65.1	69.9
1 1/2	34.9	42.9	73.0	82.6
2	38.1	58.7	88.9	103.2
2 1/2	46.0	-	103.2	-
3	50.8	-	122.2	-
4	57.2	-	152.4	-

C		F	
3000#	6000#	3000#	6000#
23.8	19.1	31.8	39.7
30.2	25.4	36.5	45.2
36.5	33.3	46.0	57.2
44.5	38.1	55.6	65.1
50.8	49.2	61.9	76.2
65.1	69.9	74.6	92.1
76.2	-	87.3	-
93.7	-	104.8	-
120.7	-	130.2	-

- Dimensions are in millimeters.
- Applicable Run Pipe Sizes are from Out-Let size to 36 inch
- For the 3000# and 6000# Socket-outlets and Thread-outlets, Inside Bore, Thread, Socket Bore and Socket Depth Dimentions are According to ASME B16.11

Thread-outlet

3000lb 6000lb



(Unit : mm)

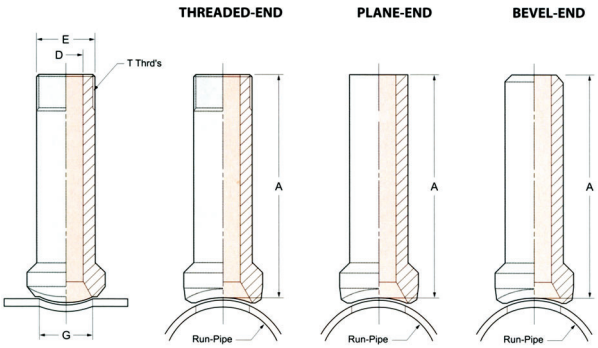
Outlet Size	A		B	
	3000#	6000#	3000#	6000#
1/2	25.4	31.8	34.9	44.5
3/4	27.0	36.5	44.5	50.8
1	33.3	39.7	54.0	61.9
1 1/4	33.3	41.3	65.1	69.9
1 1/2	34.9	42.9	73.0	82.6
2	38.1	52.4	88.9	103.2
2 1/2	46.0	-	103.2	-
3	50.8	-	122.2	-
4	57.2	-	152.4	-

C		F	
3000#	6000#	3000#	6000#
23.8	19.1	31.8	39.7
30.2	25.4	36.5	45.2
36.5	33.3	46.0	57.2
44.5	38.1	55.6	65.1
50.8	49.2	61.9	76.2
65.1	69.9	74.6	92.1
76.2	-	87.3	-
93.7	-	104.8	-
120.7	-	130.2	-

- Dimensions are in millimeters.
- Applicable Run Pipe Sizes are from Out-Let size to 36 inch
- For the 3000# and 6000# Socket-outlets and Thread-outlets, Inside Bore, Thread, Socket Bore and Socket Depth Dimentions are According to ASME B16.11

Nipple-outlet

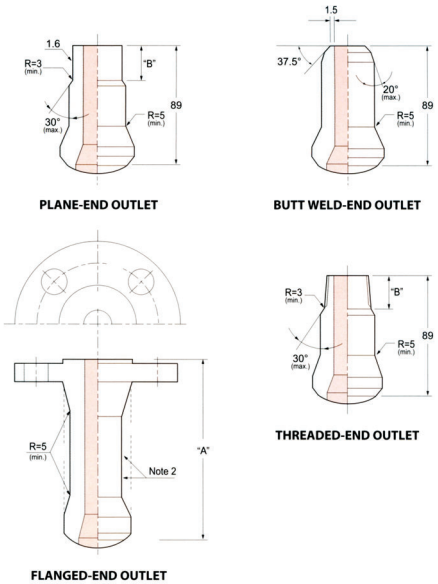
3000#



STD, X-S

Run Pipe Size	Outlet Size T	A	G	D	E	Unit Weight (kg)
36- 3/4	1/2	88.9	23.9	14.0	21.3	0.36
36-1	3/4	88.9	30.2	18.8	26.7	0.56
36-1 1/4	1	88.9	36.6	24.4	33.3	0.84
36-1 1/2	1 1/4	88.9	44.5	32.5	42.2	1.22
36-2	1 1/2	88.9	50.8	38.1	48.3	2.00
36-2 1/2	2	88.9	65.0	49.3	60.5	3.12

Flanged End Outlet

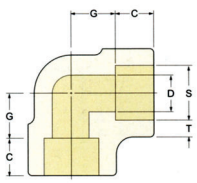


Nominal Size DN	"A" (Face flanges to crotch) Cross					"B" Min (mm)
	150#	300#	600#	1500#	2500#	
15	150	150	150	150	150	25
20						
25						30
40						
50					165	

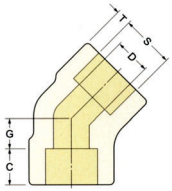
- Dimensions are in millimeters.
- Shape only indicative, other shape are also acceptable.

90° Elbow, 45° Elbow

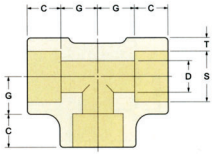
Sch40, Sch80, Sch160



90° Elbow



45° Elbow



Tee

JIS B2316

(Unit : mm)

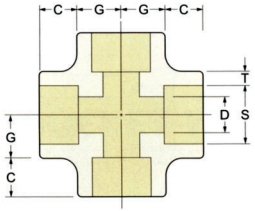
Nom Pipe Size		Socket Bore Dia		Bore Diameter of Fitting-D	
A	B	S	TOL	Sch40	Sch80
6	1/8	11.0	+ 0.3 − 0	7.1	5.7
8	1/4	14.3		9.4	7.8
10	3/8	17.8		12.7	10.9
15	1/2	22.2		16.1	14.3
20	3/4	27.7		21.4	19.4
25	1	34.5		27.2	25.0
32	1 1/4	43.2		36.5	32.9
40	1 1/2	49.1		41.2	38.4
50	2	61.1		52.7	49.5
65	2 1/2	77.1	+ 0.4 − 0	65.9	62.3
80	3	90.0		78.1	73.9
100	4	115.5		102.3	97.1

TOL : Tolerances

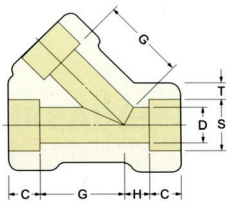
Bore Diameter of Fitting-D		Socket Wall Thickness Min-T		Depth of Socket Min-C
Sch160	TOL	Sch40, 80	Sch160	
4.0	± 0.4	3.2	3.5	9.6
6.5		3.3	4.0	9.6
9.0		3.5	4.4	9.6
12.3		4.1	5.2	9.6
16.2		4.3	6.1	12.7
21.2		5.0	7.0	12.7
29.9		5.4	7.0	12.7
34.4		5.6	7.8	12.7
43.1		6.1	9.6	15.9
57.3	± 0.8	7.7	10.4	15.9
66.9		8.4	12.2	15.9
87.3		9.4	18.0	19.0

Tee, Cross

Sch40, Sch80, Sch160



Cross



45° Y

JIS B2316

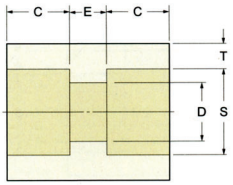
(Unit : mm)

Nom Pipe Size		Center to Bottom of Socket-C			
		90°E, Tee, Cross-G		45°Elbow-G	
A	B	Sch40, 80	Sch160	Sch40, 80	Sch160
6	1/8	11.1	-	7.9	-
8	1/4	11.1	-	7.9	-
10	3/8	13.5	-	7.9	-
15	1/2	15.9	19.1	11.1	12.7
20	3/4	19.1	22.2	12.7	14.3
25	1	22.2	27.0	14.3	17.5
32	1 1/4	27.0	31.8	17.5	20.6
40	1 1/2	31.8	38.1	20.6	25.4
50	2	38.1	41.3	25.4	28.6
65	2 1/2	41.3	57.2	28.6	31.8
80	3	57.2	63.5	31.8	34.9
100	4	66.5	-	41.5	-

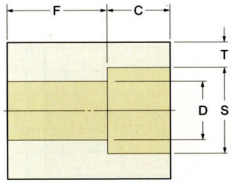
Center to Bottom of Socket-C				TOL
45° Y-G		45°Y-H		
Sch40, 80	Sch160	Sch40, 80	Sch160	
-	-	-	-	± 0.8
31.8	-	7.9	-	
36.5	-	7.9	-	± 1.5
41.3	50.8	11.1	12.7	
50.8	60.3	12.7	14.3	
60.3	71.4	14.3	17.5	± 2.0
71.4	81.0	17.5	20.6	
81.0	98.4	20.6	25.4	
98.4	120.0	25.4	28.6	
-	-	-	-	± 2.5
-	-	-	-	
-	-	-	-	

Full Coupling
Half Coupling

Sch40, Sch80, Sch160



Full Coupling



Half Coupling

JIS B2316

(Unit : mm)

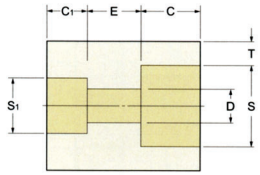
Nom Pipe Size		Socket Bore Dia		Bore Diameter of Fitting-D			
A	B	S	TOL	Sch40	Sch80	Sch160	TOL
6	1/8	11.0	± 0.3 −0	7.1	5.7	4.0	± 0.4
8	1/4	14.3		9.4	7.8	6.5	
10	3/8	17.8		12.7	10.9	9.0	
15	1/2	22.2		16.1	14.3	12.3	
20	3/4	27.7		21.4	19.4	16.2	
25	1	34.5		27.2	25.0	21.2	
32	1 1/4	43.2		36.5	32.9	29.9	
40	1 1/2	49.1		41.2	38.4	34.4	
50	2	61.1		52.7	49.5	43.1	
65	2 1/2	77.1	± 0.4 −0	65.9	62.3	57.3	± 0.8
80	3	90.0		78.1	73.9	66.9	
100	4	115.5		102.3	97.1	87.3	

Socket Wall Thickness Min-T		Depth of Min-C	Laying Lengths			
			F/C		H/C	
Sch40,80	Sch160		E	TOL	F	TOL
3.2	3.5	9.6	6.4	±1.5	15.9	±0.8
3.3	4.0	9.6	6.4		15.9	
3.5	4.4	9.6	6.4	±3.0	17.5	±1.5
4.1	5.2	9.6	9.5		22.2	
4.3	6.1	12.7	9.5		23.8	
5.0	7.0	12.7	12.7	±4.0	28.6	±2.0
5.4	7.0	12.7	12.7		30.2	
5.6	7.8	12.7	12.7		31.8	
6.1	9.6	15.9	19.1		41.3	
7.7	10.4	15.9	19.1	±5.0	42.9	±2.5
8.4	12.2	15.9	19.1		44.5	
9.4	18.0				47.7	

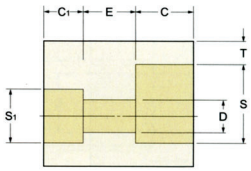
TOL : Tolerances
F/C : Full Coupling
H/C : Half Coupling

Concentric Reducer
Eccentric Reducer

Sch40, Sch80, Sch160



Concentric Reducer



Eccentric Reducer

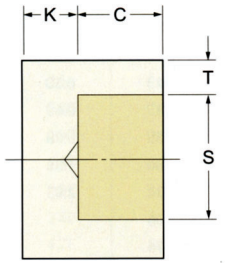
JIS B2316

(Unit : mm)

Nom Pipe Size(A)	Socket Bore Dia		Bore Diameter of Fitting-D			Socket Wall Thickness Min-T		Depth Min		Laying Lengths E
	BS	S_1	Sch40	Sch40,80	Sch160	Sch80	Sch160	C	C_1	
8 × 6	14.3	11.0	7.1	5.7	4.0	3.3	4.0	9.6	9.6	6.4
10 × 8	17.8	14.3	9.4	7.8	6.5	3.5	4.4	9.6	9.6	6.4
15 × 8	22.2	14.3	9.4	7.8	6.5	4.1	5.2	9.6	9.6	9.5
×10	-	17.8	12.7	10.9	9.0	4.1	5.2	9.6	9.6	9.5
20 × 8	27.7	14.3	9.4	7.8	6.5	4.3	6.1	12.7	9.6	9.5
× 10	-	17.8	12.7	10.9	9.0	4.3	6.1	12.7	9.6	9.5
× 10	-	22.2	16.1	14.3	12.3	4.3	6.1	12.7	9.6	9.5
25 ×10	34.5	17.8	12.7	10.9	9.0	5.0	7.0	12.7	9.6	12.7
×15	-	22.2	16.1	14.3	12.3	5.0	7.0	12.7	9.6	12.7
×20	-	27.7	21.4	19.4	16.2	5.0	7.0	12.7	12.7	12.7
32 ×15	43.2	22.2	16.1	14.3	12.3	5.4	7.0	12.7	12.7	12.7
×20	-	27.7	21.4	19.4	16.2	5.4	7.0	12.7	12.7	12.7
×25	-	34.5	27.2	25.0	21.2	5.4	7.0	12.7	12.7	12.7
40 ×20	49.1	27.7	21.4	19.4	16.2	5.6	7.8	12.7	12.7	12.7
×25	-	34.5	27.2	25.0	21.2	5.6	7.8	12.7	12.7	12.7
×32	-	43.2	35.5	32.9	29.9	5.6	7.8	12.7	12.7	12.7
50 ×25	61.1	34.5	27.2	25.0	21.2	6.1	9.6	15.9	12.7	19.1
×32	-	43.2	35.5	32.9	29.9	6.1	9.6	15.9	12.7	19.1
×40	-	49.1	41.2	38.4	34.4	6.1	9.6	15.9	12.7	19.1
65 ×32	77.1	43.2	35.5	32.9	29.9	7.7	10.4	15.9	12.7	19.1
×40	-	49.1	41.2	38.4	34.4	7.7	10.4	15.9	12.7	19.1
×50	-	61.1	52.7	49.5	43.1	7.7	10.4	15.9	15.9	19.1
80 ×40	90.0	49.1	41.2	38.4	34.4	8.4	12.2	15.9	12.7	19.1
×50	-	61.1	52.7	49.5	43.1	8.4	12.2	15.9	15.9	19.1
×65	-	77.1	65.9	62.3	57.3	8.4	12.2	15.9	15.9	19.1
100 ×50	115.5	61.1	52.7	49.5	43.1	9.4	18.0	19.0	15.9	19.1
×65	-	77.1	65.9	62.3	57.3	9.4	18.0	19.0	15.9	19.1
×80	-	90.0	78.1	73.9	66.9	9.4	18.0	19.0	15.9	19.1

Cap

Sch40, Sch80, Sch160



JIS B2316

(Unit : mm)

Nom Pipe Size		Socket Bore Dia		Socket Wall Thickness Min-T		Depth Min-C	End Thickness Min-K	
A	B	S	TOL	Sch40, 80	Sch160		Sch40, 80	Sch160
6	1/8	11.0	+ 0.3 – 0	3.2	3.5	9.6	5	-
8	1/4	14.3		3.3	4.0	9.6	5	-
10	3/8	17.8		3.5	4.4	9.6	5	-
15	1/2	22.2		4.1	5.2	9.6	6.5	8.0
20	3/4	27.7		4.3	6.1	12.7	6.5	8.0
25	1	34.5		5.0	7.0	12.7	9.5	11.0
32	1 1/4	43.2		5.4	7.0	12.7	9.5	14.0
40	1 1/2	49.1		5.6	7.8	12.7	11.0	16.0
50	2	61.1		6.1	9.6	15.9	12.5	19.0
65	2 1/2	77.1	+ 0.4 – 0	7.7	10.4	15.9	16.0	19.2
80	3	90.0		8.4	12.2	15.9	19.0	22.5

TOL : Tolerances

Socket Welding Fittings Approx Weight List

(Unit : kg)

NPS	90° Elbow		45° Elbow	
	3000	6000	3000	6000
1/4	0.11	0.12	0.09	0.18
3/8	0.12	0.20	0.17	0.19
1/2	0.20	0.30	0.18	0.23
3/4	0.28	0.60	0.23	0.50
1	0.46	1.05	0.35	0.69
1 1/4	0.65	1.40	0.65	0.88
1 1/2	0.96	2.40	0.80	1.85
2	1.50	3.65	1.20	2.93
2 1/2	2.25	-	3.06	-
3	4.00	-	4.76	-
4	9.40	-	8.25	-

Tee		Cross	
3000	6000	3000	6000
0.10	0.17	0.17	0.23
0.16	0.19	0.18	0.40
0.28	0.31	0.36	0.66
0.37	0.86	0.51	1.12
0.57	1.45	0.68	1.73
0.87	1.70	1.02	2.38
1.28	3.04	1.38	3.75
1.80	4.44	2.32	7.86
2.85	-	7.48	-
5.50	-	10.43	-
12.24		18.14	-

(Unit : kg)

NPS	F/Coupling		H/Coupling	
	3000	6000	3000	6000
1/4	0.06	0.06	0.06	0.07
3/8	0.06	0.07	0.08	0.08
1/2	0.11	0.14	0.14	0.30
3/4	0.17	0.25	0.20	0.43
1	0.27	0.36	0.34	0.69
1 1/4	0.35	0.46	0.48	0.96
1 1/2	0.43	0.58	0.51	1.20
2	0.72	1.20	1.00	2.05
2 1/2	1.13	1.60	1.55	3.25
3	1.50	2.18	2.13	4.33
4	2.50	3.95	3.65	6.45

Cap		Boss		Union	
3000	6000	3000	6000	3000	6000
0.04	0.04	0.09	0.09	0.23	0.25
0.05	0.06	0.14	0.15	0.35	0.42
0.07	0.22	0.24	0.45	0.40	0.85
0.13	0.35	0.28	0.52	0.50	1.00
0.21	0.55	0.41	0.73	0.70	1.30
0.37	0.89	0.44	0.77	1.20	2.00
0.60	1.15	0.63	1.12	1.50	3.80
0.99	2.05	1.09	1.82	2.58	6.40
1.50	3.75	-	-	5.14	6.87
2.30	5.10	-	-	7.12	10.85
4.00	8.20	-	-	12.40	-

Socket Welding Fittings Approx Weight List

(Unit : kg)

NPS	Weld-outlet				Socket-outlet		Thread-outlet	
	S.T.D	XS	Sch160	XXS	3000	6000	3000	6000
1/2	0.08	0.09	0.11	0.11	0.14	0.23	0.11	0.20
3/4	0.11	0.14	0.32	0.32	0.15	0.36	0.16	0.34
1	0.23	0.21	0.38	0.38	0.27	0.59	0.28	0.56
1 1/4	0.36	0.41	0.57	0.57	0.39	0.73	0.41	0.71
1 1/2	0.45	0.50	0.80	0.80	0.47	0.91	0.45	0.89
2	0.80	0.80	1.00	1.00	0.73	2.33	0.80	2.30
2 1/2	1.14	1.20	1.54	1.54	1.25	-	1.36	-
3	1.82	1.90	2.90	2.90	1.73	-	1.98	-
4	2.86	2.90	4.80	4.80	3.30	-	3.22	-
5	4.66	4.70	6.50	6.50	-	-	-	-
6	6.45	10.50	12.70	12.70	-	-	-	-
8	10.68	16.80	20.50	20.50	-	-	-	-
10	17.73	20.90	38.60	38.60	-	-	-	-

Threaded Welding Fittings Approx Weight List

(Unit : kg)

NPS	90° Elbow		45° Elbow	
	2000	3000	2000	3000
1/4	0.11	0.17	0.06	0.11
3/8	0.14	0.29	0.11	0.23
1/2	0.25	0.59	0.20	0.34
3/4	0.31	0.63	2.09	0.54
1	0.51	1.02	0.43	0.85
1 1/4	0.77	1.25	0.63	0.97
1 1/2	1.02	1.59	0.74	1.36
2	1.59	2.47	1.22	1.93
2 1/2	2.95	4.85	3.35	6.52
3	4.76	6.55	5.13	4.76
4	10.30	13.80	8.65	8.68

Tee		Cross	
2000	3000	2000	3000
0.11	0.13	0.23	0.17
0.14	0.37	0.23	0.45
0.25	0.54	0.40	0.68
0.43	0.85	0.51	1.13
0.65	1.13	0.77	1.61
0.91	1.42	1.13	1.87
1.25	2.27	1.45	2.95
2.10	3.06	2.38	3.69
3.94	5.96	7.46	7.60
5.98	9.24	8.85	8.96
12.40	17.90	14.50	14.80

(Unit : kg)

NPS	F/Coupling		H/Coupling	
	3000	6000	3000	6000
1/4	0.05	0.12	0.02	0.06
3/8	0.06	0.18	0.03	0.09
1/2	0.14	0.28	0.07	0.14
3/4	0.21	0.45	0.10	0.23
1	0.41	0.80	0.21	0.37
1 1/4	0.72	1.40	0.36	0.70
1 1/2	1.06	1.95	0.52	0.90
2	1.40	2.80	0.69	1.22
2 1/2	2.55	3.80	1.25	1.85
3	3.83	6.00	1.84	2.95
4	6.35	10.70	3.51	5.40

Cap		Boss	
3000	6000	3000	6000
0.05	0.09	0.09	0.13
0.08	0.14	0.11	0.24
0.12	0.25	0.24	0.44
0.20	0.36	0.29	0.55
0.31	0.70	0.42	0.74
0.60	0.80	0.61	0.75
0.73	1.28	0.65	1.17
1.05	2.16	1.13	1.90
2.27	2.72	-	-
3.83	4.95	-	-
6.35	9.21	-	-

Threaded Welding Fittings Approx Weight List

(Unit : kg)

NPS	Union		Nipple
	3000	6000	
1/4	0.14	0.45	0.04
3/8	0.20	0.60	0.05
1/2	0.35	0.85	0.09
3/4	0.43	1.40	0.15
1	0.65	1.75	0.27
1 1/4	0.98	3.00	0.45
1 1/2	1.26	4.00	0.62
2	2.01	5.50	1.03
2 1/2	5.14	6.87	1.51
3	7.12	10.85	2.22
4	12.40	-	-

S/H Plug	H/H Plug	R/H Plug	H/H Bushing	Flush Bushing
0.01	0.03	0.05	0.03	0.03
0.03	0.06	0.08	0.03	0.03
0.06	0.09	0.17	0.03	0.03
0.09	0.14	0.17	0.09	0.06
0.14	0.23	0.34	0.09	0.06
0.25	0.51	0.34	0.17	0.06
0.40	0.63	0.71	0.31	0.09
0.68	1.02	1.36	0.74	0.17
1.02	1.76	2.15	1.08	0.29
1.31	2.67	3.45	1.59	0.45
3.26	5.90	5.83	3.77	0.91

REFERENCES

Welding End Preparations for ASME B16.9 356

Welding End Preparations for KS/JIS 358

- Steel Butt-Welding Pipe Fittings For Ordinaty Use 358
- Steel Butt-Welding Pipe Fittings For Special Use 358
- Steel Plate Butt-Welding Pipe Fittings 361

Dimensional Tolerances for ASME B16.9 362

- Wrought Steel Butt Welding Fittings 362
- Forged Socket Welding Fittings 365

Dimensional Tolerances for MSS SP-43 366

Dimensional Tolerances for KS/JIS 370

- Steel Butt-Welding Pipe Fittings for Ordinary Use 370
- Steel Butt-Welding Pipe Fittings for Special Use and Steel Plate Butt-Welding Pipe Fittings 372
- Steel Socket-Welding Pipe Fittings for Special 374
- Right Angle for Shaft-Center of Pipe Fittings 376

Standard Threads Specification 378

- KS B0222 & JIS B0203 Pipe Threads 378
- ASME B2.1 Taper Pipe Threads. (Except Dryseal) 382
- BS21-1973 British Standard Taper Pipe Threads. (Except Dryseal) 388

Approx Weight Equation 394

- Elbow, Tee, Reducer, Cap 394

Butt-Welding Fittings Approx Weight 396

- 90° Elbows, 45° Elbows, Cap, Tee, Reducer 396
- Stainless Steel Fittings, Lap Joint Stub-end 418

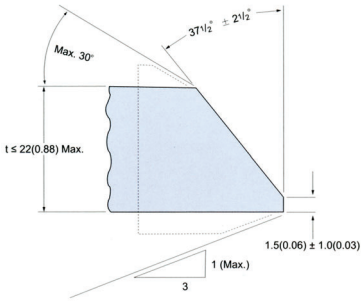
Comparison ASTM Specifications and Similar Standards 422

Materials Specifications for Butt-Welding Fittings ASTM Materials (A234, A403 and A420) 426

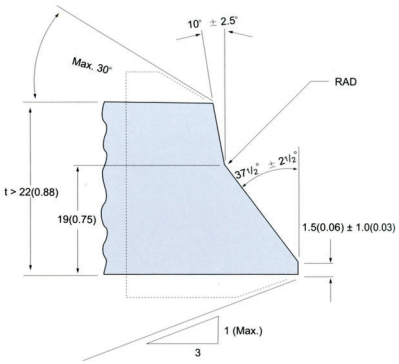
Materials Specifications for Fittings JIS Materials 440

Wall Thickness of Welded and Seamless Pipe Carbon, Alloy & Stainless Steel 448

ASME B16.9



(a) Plain Bevel



(b) Compound Bevel

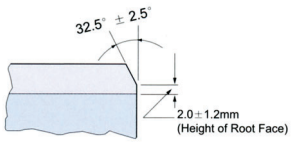
Nominal Pipe Wall Thickness(t)	End Preparation
Less than x*	Cut Square of slightly chamfer, at Mfr's option
x*to 22(0.88), inclusive	Plain bevel as in sketch "a" above
more than 22(0.88)	Compound bevel as in sketch "b" above
*x=5(0.19) for carbon steel, ferritic alloy steel or wrought iron; 3(0.12) for 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

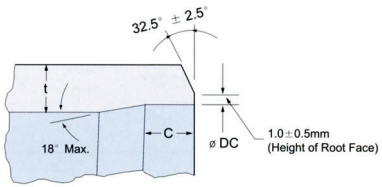
{ KS B1522
JIS B2311 }



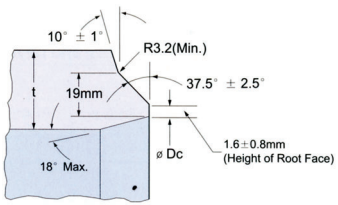
2. Steel Butt-Welding Pipe Fittings For Special Use

{ KS B1541
JIS B2312 }

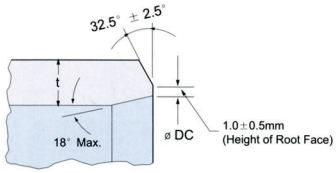
C: In the Case Where t is 22.4mm or Less



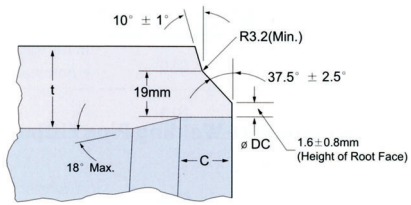
B: In the Case Where t is Over 22.4mm



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



D: In the Case Where t is Over 22.4mm



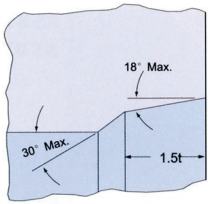
Where t : nominal wall thickness
DC : diameter of machining bore
C : length of machining bore

Remarks

1. Dimeter(Dc) and length(C) of machining bore and dimensional toleraneces shall be as agreed between parties concerned.
2. Relieving of machining bore may be performed by poviding 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.

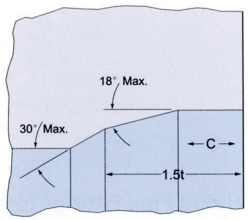
KS / JIS

For Types A and B of Bevel Shape



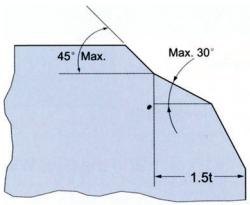
In the figure,
t: nominal wall thickness

For Types C and D of Bevel Shape



In the figure,
t: nominal wall thickness
c: length of maching bore

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 beyound that portion machining with an inclination 45° or less

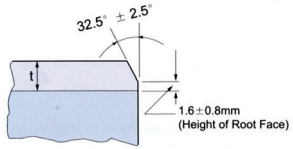


In the figure,
t: nominal wall thickness

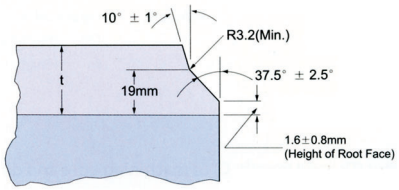
3. Steel Plate Butt-Welding Pipe Fittings

{ KS B1543
JIS B2313 }

Where. t ≦ 22.4mm



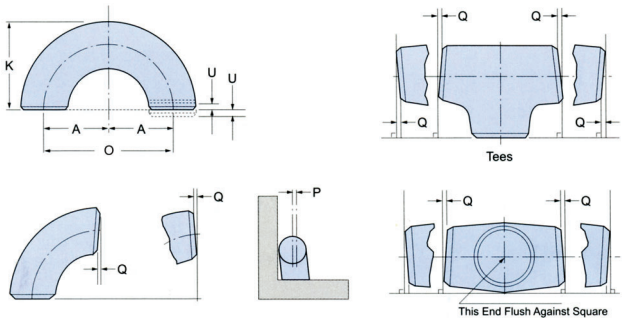
Where. t > 22.4mm



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



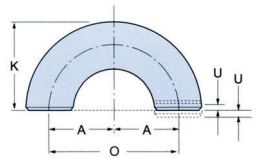
1. Wrought Steel Butt Welding Fittings

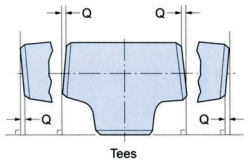
All Fittings				90° and 45° Elbows
Nominal Pipe Size	Outside Diameter at Bevel OD	Inside Diameter at End ID	Wall Thickness T	Center-to-End Dimension A, B
$^1/_2$ ~ 2 $^1/_2$	+ 0.06 − 0.03	± 0.03	Not less than $87^1/_2$% of nominal thickness	± 0.06
3~4	± 0.06	± 0.06		
5~8	+ 0.09 − 0.06			
10~18	+ 0.16 − 0.12	± 0.12		± 0.09
20~24	+ 0.25 − 0.19	± 0.19		
26~30				± 0.12
32~48				± 0.19

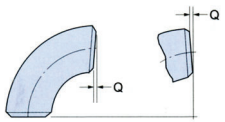
Tees	Reducers	Caps	180° Returns		
Center-to-End Dimension C, M	End to End H	Back to Face E	Center-to-Center Dimension O	Back-to-Face Dimension K	Alignment of Ends U
± 0.06	± 0.06	± 0.12	± 0.25	± 0.25	± 0.03
± 0.09	± 0.09	± 0.25	± 0.38		± 0.06
± 0.12	± 0.19	± 0.38	–	–	–
± 0.19					

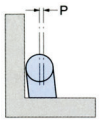
• Dimensions are in inches.

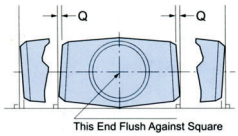
ASME B16.9











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	
32 ~ 42		0.5
44 ~ 48		0.75

- 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.

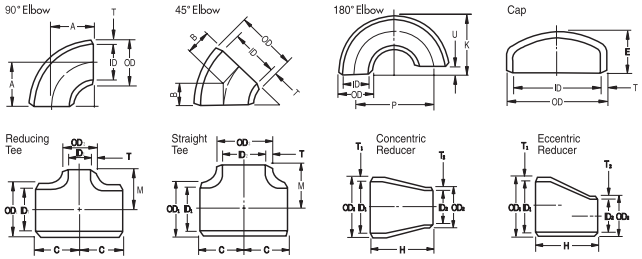
MSS SP-43

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



1. Steel Butt-Welding Pipe Fittings for Ordinary Use

{ KS B1522 / JIS B2311 }

Item		Type of Pipe Fittings	Nominal Diameter				
			1/2 ~ 2 1/2	3 ~ 4	5 ~ 8	10 ~ 18	20
			Tolerance				
Outside Dia, at end face	(OD)	All pipe Fitting	± 2	± 2.5	± 3.5	± 5 − 4.5	± 6.4 − 4.8
Inside Dia, at end face	(ID)		± 2	± 2.5	± 3.5	± 4.5	± 4.8
Wall thickness	(T)		+ Not specified − 15%				
Center-to-end dimension	(A, B)	90° Elbow, 45° Elbow	± 2.0		± 3.2		± 4.8
Center-to-Center dimension	(P)	180° Elbow	± 6.4		± 9.5		–
Back-to face dimension	(K)		± 6.4				–
Alignment of ends (Max.)	(U)		1.6		3.2		–
End-to-end dimension	(H)	Reducer	± 2.0		± 3.2		
Center-to-end dimension	(C, M)	Tee	± 2.0		± 3.2		
Back-to-face dimension	(E)	Cap	± 3.2		± 6.4		

• Dimensions are in millimeters.

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	Nominal Diameter						
			1/2 ~ 2 1/2	3 ~ 4	5 ~ 8	10 ~ 18	20 ~ 24	26 ~ 30	32 ~ 36
			Tolerance						
Outside Dia, at end face	(OD)	All pipe Fitting	± 1.6 − 0.8	± 1.6	± 2.4 − 1.6	± 4 − 3.2	± 6.4 − 4.8		
Inside Dia, at end face	(ID)		± 0.8			± 3.2	± 4.8		
Wall thickness	(T)		+ Not specified − 12.5%						
Center-to-end dimension	(A, B)	90° Elbow, 45° Elbow	± 1.6			± 2.4		± 3.2	± 4.8
Center-to-Center dimension	(P)	180° Elbow	± 6.4			± 9.5			
Back-to face dimension	(K)		± 6.4						
Alignment of ends (Max.)	(U)		* ± 0.8 ** ± 1.6			* ± 1.6 ** ± 3.2		–	
End-to-end dimension	(H)	Reducer	± 1.6			± 2.4		± 4.8	
Center-to-end dimension	(C, M)	Tee	± 1.6			± 2.4		± 3.2	± 4.8
Back-to-face dimension	(E)	Cap	± 3.2			± 6.4			
Outside of end Peripheral length		All pipe Fitting	–					± 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	Nominal Diameter			
		1/8 and 1/4	3/8 to 3/4	1 to 2	2 1/2 and 3
		Tolerance			
Inside Diameter of Socket	All pipe Fitting	± 0.3 0			± 0.4 0
Bore diameter		± 0.4			± 0.8
Eccentricity of inside Diameter of socket to bore diameter		± 0.8			
Inclination of socket hole to fitting bore axis		1.5 / 300 Max.			
Distance from center to bottom of socket	90° Elbow 45° Elbow	± 0.8	± 1.5	± 2	± 2.5
Laying Length	Full coupling	± 1.5	± 3	± 4	± 5
Laying Length	Full coupling	± 0.8	± 1.5	± 2	± 2.5

• Dimensions are in millimeters.

KS / JIS

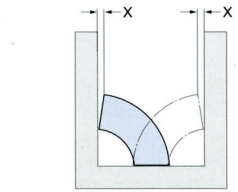
KS B1522, JIS B2311
KS B1541, JIS B2312
KS B1543, JIS B2313

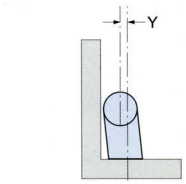
4. Right Angle for Shaft-Center of Pipe Fittings

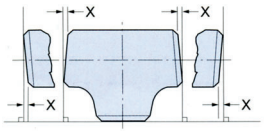
Item	Type of Pipe Fittings	Nominal Diameter	
		1/2 ~ 4	5 ~ 8
		Tolerance	
Off Angle (X)	All pipe Fitting	0.8	1.6
Off Plane (Y)		1.6	3.2

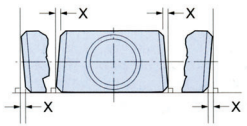
Nominal Diameter					
10 ~ 12	14 ~ 16	18 ~ 24	26 ~ 30	32 ~ 42	44 ~ 48
Tolerance					
2.4		3.2	4.8		
4.8	6.4	9.5		12.7	19.1

• Dimensions are in millimeters.

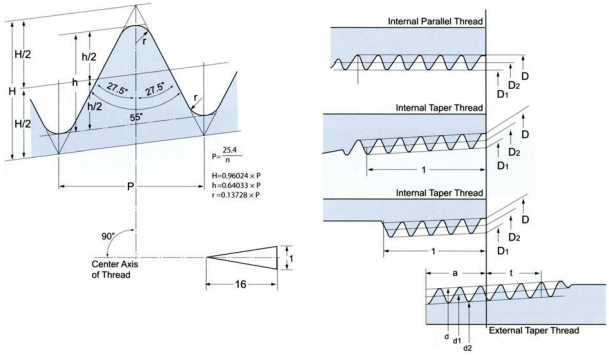








KS B0222 & JIS B0203 Pipe Threads

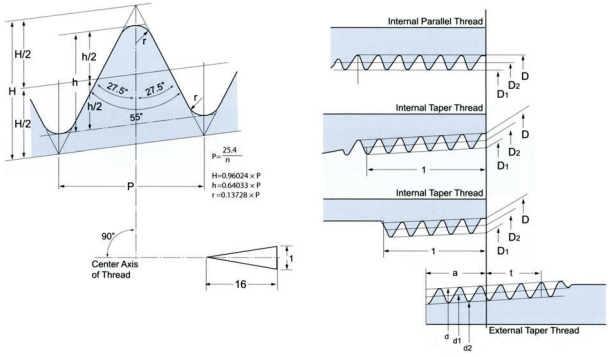


Basic Thread Data

Nominal Size	Number of Threads per Inch	Screw Thread			Basic Diameter		
					External Thread		
					Major Diameter d	Pitch Diameter d_2	Major Diameter d_1
					Internal Thread		
					Major Diameter	Pitch Diameter	Major Diameter
	n	p	h	r	D	D_2	D_1
PT 15 (1/2)	14	1.8143	1.162	0.25	20.955	19.793	18.631
PT 20 (3/4)	14	1.8143	1.162	0.25	26.441	25.279	24.117
PT 25 (1)	11	2.3091	1.479	0.32	33.249	31.770	30.291
PT 32 (1 1/4)	11	2.3091	1.479	0.32	41.910	40.431	38.952
PT 40 (1 1/2)	11	2.3091	1.479	0.32	47.803	46.324	44.845
PT 50 (2)	11	2.3091	1.479	0.32	59.614	58.135	56.656
PT 65 (2 1/2)	11	2.3091	1.479	0.32	75.184	73.705	72.226
PT 80 (3)	11	2.3091	1.479	0.32	87.884	86.405	84.926
PT 90 (3 1/2)	11	2.3091	1.479	0.32	100.330	98.851	97.372
PT 100 (4)	11	2.3091	1.479	0.32	113.030	111.551	110.072
PT 125 (5)	11	2.3091	1.479	0.32	138.430	136.952	135.472
PT 150 (6)	11	2.3091	1.479	0.32	163.830	162.351	160.872

- Dimensions are in millimeters.

KS B0222 & JIS B0203 Pipe Threads



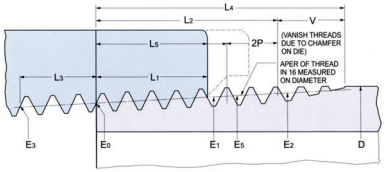
Basic Thread Data

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

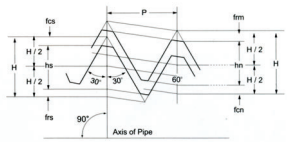
Effective Thread Length (Min.)				Nominal Pipe Size (For Referance)	
External Thread	Internal Thread				
External Thread	When there is an Incomplete thread or More		When there is no Incomplete thread		
	Internal Taper Thread	Internal Parallel Thread	Internal Taper & Parallel Thread	Outside Diameter	Wall Thickness
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

• Dimensions are in millimeters.

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



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

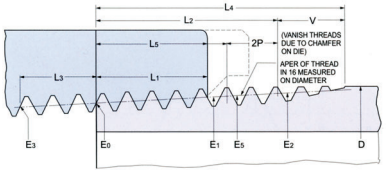


Thread Height Dimensions

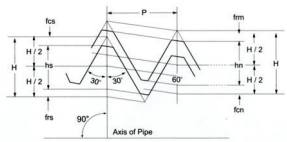
Thread Element	27 Threads per inch P=0.03704	18 Threads per inch P=0.05556	14 Threads per inch P=0.07143	11 1/2 Threads per inch P=0.08696	8 Threads per inch P=0.12500
H = 0.866p	0.0321	0.4810	0.0619	0.0753	0.1082
hs = hn = 0.760p	0.0281	0.0422	0.0543	0.0661	0.0950
frs = frn = 0.033p	0.0012	0.0088	0.0024	0.0029	0.0041
fcs = fcn = 0.073p	0.0027	0.0041	0.0052	0.0063	0.0091

- Dimensions are in Inches.

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



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



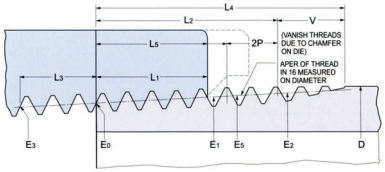
Basic Thread Data

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

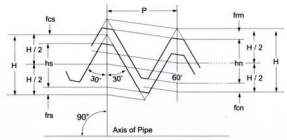
Handtight Engagement			Effective Thread, External		
Lenght L_1		Dia	Lenght L_2		Dia
Ins.	Thds.	D_1	Ins.	Thds.	D_2
6	7	8	9	10	11
0.1615	4.36	0.37360	0.2369	7.12	0.38000
0.2278	4.10	0.79160	0.4018	7.23	0.50250
0.2400	4.32	0.62701	0.4078	7.34	0.63750
0.3200	4.48	0.77843	0.5337	7.47	0.79179
0.3390	4.75	0.98887	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

- Dimensions are in Inches.

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 forInternal 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

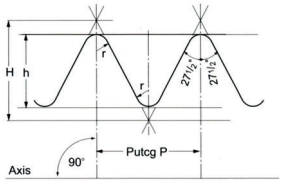
Ovaerall Length External Thread L_4	Nominal, Complete External Threads[5]		Height of Thred h	Increade in Dia per Thread, 0.0625/n	Basic Minor Dia at Small End of Pipe, Ko
	Length L_5	Dia, E_5			
19	20	21	22	23	24
0.3924	0.1898	0.37537	0.2963	0.00231	0.3339
0.5946	0.2907	0.49556	0.4444	0.00347	0.4329
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

• Dimensions are in Inches.

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

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

H = 0.960237 × P
h = 0.460327 × P
r = 0.137278 × P



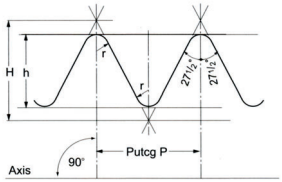
BSP Size (Nominal Bore of Pipe)	No. of Threads per inch	Pitch		Depth of Thread	
in.		in.	mm	in.	mm
1/2	14	0.07143	1.814	0.0457	1.162
3/4	14	0.07143	1.814	0.0457	1.162
1	11	0.09091	2.039	0.0582	1.479
1 1/4	11	0.09091	2.039	0.0582	1.479
1 1/2	11	0.09091	2.039	0.0582	1.479
2	11	0.09091	2.039	0.0582	1.479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

H = 0.960237 × P
h = 0.460327 × P
r = 0.137278 × P



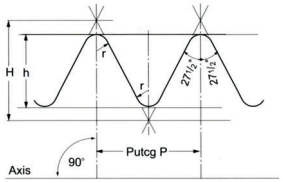
BSP Size (Nominal Bore of Pipe)	No. of Threads per inch	Gauge Length			
		Basic		Tolerance Plus and Minus	
in.		in.	mm	in.	mm
1/2	14	0.3214	9.2	0.0714	1.8
3/4	14	0.3750	9.5	0.0714	1.8
1	11	0.4091	10.4	0.0909	2.3
1 1/4	11	0.5000	12.7	0.0909	2.3
1 1/2	11	0.5000	12.7	0.0909	2.3
2	11	0.6250	15.9	0.0909	2.3
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 × P
h = 0.460327 × P
r = 0.137278 × P

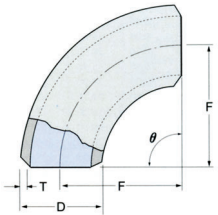


BSP Size (Nominal Bore of Pipe)	No. of Threads per inch	Length of Useful Thread on Pipe End Not Less Than.					
		For Basic Gauge Length		For Max. Gauge Length		For Min. Gauge Length	
in.		in.	mm	in.	mm	in.	mm
1/2	14	0.5178	13.2	0.5892	15.0	0.4464	11.4
3/4	14	0.5714	14.5	0.6428	16.3	0.5000	12.7
1	11	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		Wrenhing 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

ELBOW, TEE

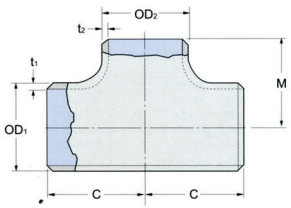
1. ELBOW



$W = 15.4864 \times \theta / 360 \times F \times T \times (D - T) \times 10^{-5}$

W = Weight (kg)
F = Center to End (mm)
D = Outside Diameter (mm)
T = Wall Thickness (mm)
θ = Angle

2. TEE

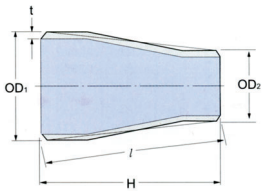


$W = [0.02466\{2Ct_1(OD_1 -) + (OD_2 - t_2) \times (M - OD_1/2)\} \times 10^{-3} \times K]$

W = Weight (kg)
OD_1 = Outside Diameter (mm)
OD_2 = Outside Diameter (mm)
M = Center to End (mm)
K = 1 (PLATE)
C = Center to End (mm)
t_1 = Wall Thickness (mm)
t_2 = Wall Thickness (mm)
K = 1.363 (PIPE)

REDUCER, CAP

3. REDUCER

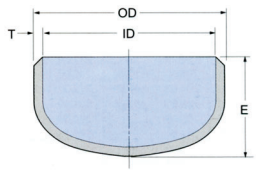


$W = 1.3232t_1(OD_1 + OD_2 - 2t_1)l \times 10^{-5}$

$l = \sqrt{H^2 + \frac{(OD_1 + OD_2)^2}{2}}$

W = Weight (kg)
OD_1 = Large Size Outside Diameter (mm)
t_1 = Wall Thickness (mm)
H = End to End (mm)
OD_2 = Small Size

4. CAP



$W = 7.85 \times \frac{\pi}{4}(OD + E)^2 \times T \times 10^{-6}$

W = Weight (kg)
OD = Outside Diameter (mm)
T = Wall Thickness (mm)
E = End to End (mm)

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)

Size \ Type / Thick	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-X Grade	API 5L-X Grade	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 1/4% 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)% CSteel	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)% CSteel	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)								
		Grage	Thick		C	Si	Mn	P	S	Ni	Cr	Mo	Ti	Other Elements
A234	WPB	A106 Gr. B		P	-	0.10min	0.29-1.06	0.035	0.035	0.40	0.40	0.15	-	-
		A515 Gr. 65	0~25mm	PL	0.28	0.025	0.90	0.025	0.025	-	-	-	-	-
			25~50		0.31					-	-	-	-	-
			50~100		0.33					-	-	-	-	-
		A515 Gr. 70	0~25mm	PL	0.31	0.15-0.40	1.20	0.025	0.025	-	-	-	-	-
			25~50		33					-	-	-	-	-
			50~100		0.35					-	-	-	-	-
	WPC	A106 Gr. C		P	0.35	0.10min	0.29-1.06	0.035	0.035	0.40	0.40	0.15	-	-
	WP1	A335 Gr. P1		P	0.10-0.20	0.10-0.50	0.30-0.80	0.025	0.025	-	-	0.44-0.65	-	-
		A204 Gr. B		PL	0.20-0.27	0.15-0.40	0.90	0.025	0.025	-	-	0.45-0.60	-	-
	WP12	A335 Gr. P12		P	0.05-0.15	0.50	0.30-0.61	0.025	0.025	-	0.80-1.25	0.44-0.65	-	-
		A387 Gr. 12		PL	0.05-0.17	0.15-0.40	0.40-0.65	0.025	0.025	-	0.80-1.15	0.45-0.60	-	-
	WP11	A335 Gr. P11		P	0.05-0.15	0.50-1.00	0.30-0.60	0.025	0.025	-	1.00-1.50	0.44-0.65	-	-
		A387 Gr. 11		PL	0.05-0.17	0.50-0.80	0.40-0.65	0.025	0.025	-	1.00-1.50	0.45-0.65	-	-
	WP22	A335 Gr. P22		P	0.05-0.15	0.50	0.30-0.60	0.025	0.025	-	1.90-2.60	0.87-1.13	-	-
		A387 Gr. 22		PL	0.05-0.15	0.50	0.30-0.60	0.025	0.025	-	2.00-2.50	0.90-1.10	-	-
	WP23	A335 P23		P	0.04-0.10	0.50	0.10-0.60	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
	WP5	A335 Gr. P5		P	0.15	0.50	0.30-0.60	0.025	0.025	-	4.00-6.00	0.45-0.65	-	-
		A387 Gr. 5		PL	0.15	0.50	0.30-0.60	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)								
		Grage	Thick		C	Si	Mn	P	S	Ni	Cr	Mo	Ti	Other Elements
A234	WP9	A335 P9		P	0.15	0.25-1.00	0.30-0.60	0.025	0.025	-	8.00-10.00	0.90-1.10	-	-
		A387 Gr. 9		PL	0.15	1.00	0.30-0.60	0.025	0.025	-				
	WP91	A335 P91		P	0.08-0.12	0.20-0.50	0.30-0.60	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 T i: 0.01max Zr : 0.01max
		A387 Gr. 91		PL										
	WP92	A335 P92		P	0.07-0.13	0.50	0.30-0.60	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
A403	WP304	A312 Gr. TP304		P	0.08	1.00	2.00	0.045	0.030	8.00-11.00	18.00-20.00	-	-	-
		A240 Type 304		PL	0.07	1.00	2.00	0.045	0.030	8.00-10.50	17.50-19.50	-	-	-
	WP304H	A312 Gr. TP304H		P	0.04-0.10	1.00	2.00	0.045	0.030	8.00-11.00	18.00-20.00	-	-	-
		A240 Type 304H*		PL	0.04-0.10	0.75	2.00	0.045	0.030	8.00-10.50	18.00-20.00	-	-	-
	WP304L	A312 Gr. TP304L†		P	0.035	1.00	2.00	0.045	0.030	8.00-13.00	18.00-20.00	-	-	-
		A240 Type 304L †		PL	0.030	0.75	2.00	0.045	0.030	8.00-12.00	17.50-19.50	-	-	-
	WP309	A312 Gr. TP309		P	0.08	1.00	2.00	0.045	0.030	12.00-15.00	22.00-24.00	0.75	-	-
		A240 Type 309S		PL	0.08	0.75	2.00	0.045	0.030	12.00-15.00	22.00-24.00	-	-	-
	WP310	A312 Gr. TP310		P	0.08	1.00	2.00	0.045	0.030	19.00-22.00	24.00-26.00	0.75	-	-
		A240 Type 310S		PL	0.08	1.50	2.00	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)									Other Elements
		Grage	Thick		C	Si	Mn	P	S	Ni	Cr	Mo	Ti	
A403	WP347	A312 Gr. TP347		P	0.08	1.00	2.00	0.045	0.030	9.00-13.00	17.00-19.00	-	-	Ca+Ta10XC-1.00
		A240 Type 347		PL	0.08	0.75	2.00	0.045	0.030	9.00-13.00	17.00-19.00	-	-	Ca+Ta10XC-1.10
	WP316	A312 Gr. TP316		P	0.08	1.00	2.00	0.045	0.030	11.00-14.00	16.00-18.00	2.00-3.00	-	-
		A240 Type 316		PL	0.08	0.75	2.00	0.045	0.030	10.00-14.00	16.00-18.00	2.00-3.00	-	-
	WP316H	A312 Gr. TP316H		P	0.04-0.10	1.00	2.00	0.045	0.030	11.00-14.00	16.00-18.00	2.00-3.00	-	-
		A240 Type 316H*		PL	0.40-1.10	1.00	2.00	0.045	0.030	10.00-14.00	16.00-18.00	2.00-3.00	-	-
	WP316L	A312 Gr. TP316L		P	0.035	1.00	2.00	0.040	0.030	10.00-14.00	16.00-18.00	2.00-3.00	-	-
		A240 Type 316L †		PL	0.030	1.00	2.00	0.045	0.030	10.00-14.00	16.00-18.00	2.00-3.00	-	-
	WP321	A312 Gr. TP321		P	0.08	0.75	2.00	0.045	0.030	9.00-12.00	17.00-19.00	-	-	-
		A240 Type 321		PL	0.08	1.00	2.00	0.045	0.030	9.00-12.00	17.00-19.00	-	5XC-0.70	-
	WP321H	A312 Gr. TP321H		P	0.04-0.10	1.00	2.00	0.045	0.030	9.00-12.00	17.00-19.00	-	-	-
		A240 Type 321H*		PL	0.04-0.10	1.00	2.00	0.045	0.030	9.00-13.00	17.00-19.00	-	4XC-0.70	-
	WP347H	A312 Gr. TP347H		P	0.04-0.10	1.00	2.00	0.045	0.030	9.00-13.00	17.00-19.00	-	-	-
		A240 Type 347H*		PL	0.04-0.10	1.00	2.00	0.045	0.030	9.00-13.00	17.00-19.00	-	-	Ca+Ta8XC-1.0
	WP S31254	A312 S31254		P	0.020	0.80	1.00	0.030	0.010	17.5-18.5	19.5-20.5	6.00-6.50	-	N:0.18-0.22
		A240 S31254		PL										-
A420	WPL6	A333 and A334 Gr. 6		P	0.30	0.10min	0.29-1.06	0.025	0.025	0.40 Max	-	0.12	-	-
			0~25mm		0.21									
		A516 Gr. 60	26~50	PL	0.23	0.15-0.40	0.60-1.30	0.025	0.025	-	-	-	-	-
			50~100		0.25									
	WPL3	A333 and A334 Gr. 3		P	0.19	0.18-0.37	0.31-0.64	0.025	0.025	3.25-3.75	-	-	-	-
			0~50mm		0.17									
		A203 Gr. D	50~100	PL	0.20	0.13-0.45	0.70-0.80	0.025	0.025	3.25-3.75	-	-	-	-
	WPL9	A333 and A334 Gr. 8		P	0.13	-	0.90 Max	0.025	0.025	8.40-9.60	-	-	-	-
		A203 Gr. A		PL	0.17	0.15-0.40	0.70	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)								
		Grage	Thick		C	Si	Mn	P	S	Ni	Cr	Mo	Ti	Other Elements
A815	S31803	A790 S31803 A240 S31803		P PL	0.030	1.0	2.0	0.030	0.020	4.50-6.50	21.0-23.0	2.50-3.50	- -	N:0.08-0.20
	S32750	A790 S32750 A240 S32750		P PL	0.030	0.8	1.2	0.035	0.020	6.0-8.0	24.0-26.0	3.0-5.0	- -	N:0.24-0.43
	S32760	A790 S32760 A240 S32760		P PL	0.05 0.030	1.00	1.00	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.	
A860	WPHY42	API 5L Gr. X42		P PL	0.14	0.40	1.35	0.020	0.010	- -	- -	- -	- 0.04	- -
	WPHY60	API 5L Gr. X60		P PL	0.16	0.45	1.65	0.020	0.010	- -	- -	- -	- -	
	WPHY65	API 5L Gr. X65		P PL	0.16	0.45	1.65	0.020	0.010	- -	- -	- -	-	

- 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.**

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol		Materials		Form	Tensile Requirements			
		Grage	Thick		Tensile Strength Min. or Range Ksi (Mpa)		Yied Strength Min. Ksi(Mpa)	Longitudinal Elongation in 2 in (50mm) Min. %
A234	WPB	A106 Gr. B		P	60	(415)	35 (240)	30
		A515 Gr. 65	0~25mm 56~50 50~100	PL	65-85	(450-585)	35 (240)	23
		A515 Gr. 70	0~25mm 26~50 50~100	PL	70-90	(485-620)	38 (260)	21
	WPC	A106 Gr. C		P	70	(485)	40 (275)	30
	WP1	A335 Gr. P1		P	55	(380)	30 (205)	30
		A204 Gr. B		PL	70-90	(485-620)	40 (275)	21
	WP12	A335 Gr. P12		P	60	(415)	30 (205)	30
		A387 Gr. 12		PL	65-80	(450-585)	40 (275)	22
	WP11	A335 Gr. P11		P	60	(415)	30 (205)	30
		A387 Gr. 11		PL	70-100	(515-690)	45 (310)	22
	WP22	A335 Gr. P22		P	60	(415)	30 (205)	30
		A387 Gr. 22		PL	75-100	(515-690)	45 (310)	18
	WP23	A335 P23		P	74	(510)	58 (400)	20
	WP5	A335 Gr. P5		P	60	(415)	30 (205)	30
		A387 Gr. 5		PL	75-100	(515-690)	45 (310)	18
	WP9	A335 P9		P	60	(415)	30 (205)	30
		A387 Gr. 9		PL	75-100		45 (310)	18
	WP91	A335 P91		P	85	(585)	60 (415)	20
		A387 Gr. 91		PL	85-100		60 (415)	18
	WP92	A335 P92		P	90	(620)	64 (440)	20

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol		Materials		Form	Tensile Requirements			
		Grage	Thick		Tensile Strength Min. or Range Ksi (Mpa)		Yied Strength Min. Ksi(Mpa)	Longitudinal Elongation in 2 in (50mm) Min. %
A403	WP304	A312 Gr. TP304		P	75	(515)	30 (205)	35
		A240 Type 304		PL	75	(515)	30 (205)	40
	WP304H	A312 Gr. TP304H		P	75	(515)	30 (205)	35
		A240 Type 304H*		PL	75	(515)	30 (205)	40
	WP304L	A312 Gr. TP304L †		P	70	(485)	25 (170)	35
		A240 Type 304L †		PL	70	(485)	25 (170)	40
	WP309	A312 Gr. TP309		P	75	(515)	30 (205)	35
		A240 Type 309S		PL	75	(515)	30 (205)	40
	WP310	A312 Gr. TP310		P	75	(515)	30 (205)	35
		A240 Type 310S		PL	75	(515)	30 (205)	40
	WP347	A312 Gr. TP347		P	75	(515)	30 (205)	35
		A240 Type 347		PL	75	(515)	30 (205)	40
	WP316	A312 Gr. TP316		P	75	(515)	30 (205)	35
		A240 Type 316		PL	75	(515)	30 (205)	40
	WP316H	A312 Gr. TP316H		P	75	(515)	30 (205)	35
		A240 Type 316H*		PL	75	(515)	30 (205)	40
	WP316L	A312 Gr. TP316L		P	70	(485)	25 (170)	35
		A240 Type 316L †		PL	70	(485)	25 (170)	40
	WP321	A312 Gr. TP321		P	75	(515)	30 (205)	35
		A240 Type 321		PL	75	(515)	30 (205)	40
	WP321H	A312 Gr. TP321H		P	75	(515)	30 (205)	35
		A240 Type 321H*		PL	75	(515)	30 (205)	40
	WP347H	A312 Gr. TP347H		P	75	(515)	30 (205)	35
		A240 Type 347H*		PL	75	(515)	30 (205)	40
	WP S31254	A312 S31254		P	94	(650)	44(300)	35
		A240 S31254		PL	119	(820)		

Materials Specifications for Butt-Welding Fittings ASTM Materials

Marking Symbol		Materials		Form
		Grage	Thick	
A420	WPL6	A333 and A334 Gr. 6		P
		A516 Gr. 60	0~25mm 26~50 50~100	PL
	WPL3	A333 and A334 Gr. 3		P
		A203 Gr. D	0~50mm 50~100	PL
	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

Tensile Requirements			
Tensile Strength Min. or Range Ksi (Mpa)		Yied 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)		
109	(750)	80 (550)	25
108	(750)		
60	(415)	42 (290)	24
75	(520)	60 (415)	18
77	(535)	65 (450)	17
80	(550)		

- 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.**

Materials Specifications for Fittings JIS Materials

Marking Symbol		Chemical Composition (percent)							
		C	Si	Mn	P	S	Ni	Cr	Mo
G3452	SGP	-	-	-	0.040 Max.	0.040 Max.	-	-	-
G3454	STPG370	0.25 Max	0.35 Max.	0.30-0.90	0.040 Max.	0.040 Max.	-	-	-
	STPG410	0.30 Max.	0.35 Max.	0.30-1.00	0.040 Max.	0.040 Max.	-	-	-
G3456	STPT370	0.25 Max.	0.10-0.35	0.30-0.90	0.035 Max.	0.035 Max.	-	-	-
	STPT410	0.30 Max.	0.10-0.35	0.30-1.00	0.035 Max.	0.035 Max.	-	-	-
	STPT480	0.33 Max.	0.10-0.35	0.30-1.00	0.035 Max.	0.035 Max.	-	-	-
G3455	STS370	0.25 Max.	0.10-0.35	0.30-1.10	0.035 Max.	0.035 Max.	-	-	-
	STS410	0.30 Max.	0.10-0.35	0.30-1.40	0.035 Max.	0.035 Max.	-	-	-
	STS480	0.33 Max.	0.10-0.35	0.30-1.50	0.035 Max.	0.035 Max.	-	-	-
G3457	STPY400	0.25 Max.	-	-	0.040 Max.	0.040 Max.	-	-	-
G3459	SUS304TP	0.08 Max.	1.00 Max.	2.00 Max.	0.045 Max.	0.030 Max.	8.00-11.00	18.00-20.00	-
	SUS304HTP	0.04-1.00	0.75 Max.	2.00 Max.	0.040 Max.	0.030 Max.	8.00-11.00	18.00-20.00	-
	SUS304LTP	0.03 Max.	1.00 Max.	2.00 Max.	0.045 Max.	0.030 Max.	9.00-13.00	18.00-20.00	-
	SUS316TP	0.08 Max.	1.00 Max.	2.00 Max.	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	P	S	Ni	Cr	Mo
G3459	SUS316HTP	0.04-0.10	0.75 Max.	2.00 Max.	0.030 Max.	0.030 Max.	11.00-14.00	16.00-18.00	2.00-3.00
	SUS316LTP	0.03 Max.	1.00 Max.	2.00 Max.	0.045 Max.	0.030 Max.	12.00-16.00	16.00-18.00	2.00-3.00
G3460	STPL380	0.25 Max.	0.35 Max.	1.35 Max.	0.035 Max.	0.035 Max.	-	-	-
	STPL450	0.18 Max.	0.10-0.35	0.30-0.60	0.030 Max.	0.030 Max.	3.20-3.80	-	-
G3101	SS400	-	-	-	0.050 Max.	0.050 Max.	-	-	-
G3106	SM400B	0.20 Max.	0.35 Max.	0.60-1.50	0.035 Max.	0.035 Max.	-	-	-
	SM490B	0.18 Max.	0.55 Max.	1.65 Max.	0.035 Max.	0.035 Max.	-	-	-
G3103	SB410	0.24 Max.	0.15-0.40	0.90 Max.	0.020 Max.	0.020 Max.	-	-	-
	SB450	0.28 Max.	0.15-0.40	0.90 Max.	0.020 Max.	0.020 Max.	-	-	-
G4051	S20C	0.18-0.23	0.15-0.35	0.30-0.60	0.030 Max.	0.035 Max.	-	-	-
	S25C	0.22-0.28	0.15-0.35	0.30-0.60	0.030 Max.	0.035 Max.	-	-	-
	S45C	0.42-0.48	0.15-0.35	0.60-0.90	0.030 Max.	0.035 Max.	-	-	-
G3201	SF45	0.60 Max.	0.15-0.50	0.30-1.20	0.030 Max.	0.035 Max.	-	-	-
	SF50	0.60 Max.	0.15-0.50	0.30-1.20	0.030 Max.	0.035 Max.	-	-	-

Materials Specifications for Fittings JIS Materials

Marking Symbol		Mechanical Requirements		Mechanical Requirements	Reduction of Area	Hardness (HB)
		Tensile Strength kgf/mm² (N/mm²)	Yield Strength kgf/mm² (N/mm²)	Elongation (%) Test Piece No.		
G3452	SGP	30 Min. (290) Min.	-	(11.12) 30 Min. (5) 25 Min.	-	-
G3454	STPG370	38 Min. (370) Min.	22 Min. (215) Min.	(11.12) 30 Min. (5) 25 Min.	-	-
	STPG410	42 Min. (410) Min.	25 Min. (245) Min.	(11.12) 25 Min. (5) 20 Min.	-	-
G3456	STPT370	38 Min. (370) Min.	22 Min. (215) Min.	(11.12) 30 Min. (5) 25 Min.	-	-
	STPT410	42 Min. (410) Min.	25 Min. (245) Min.	(11.12) 25 Min. (5) 20 Min.	-	-
	STPT480	49 Min. (480) Min.	28 Min. (275) Min.	(11.12) 25 Min. (5) 20 Min.	-	-
G3455	STS370	38 Min. (370) Min.	22 Min. (215) Min.	(11.12) 30 Min. (5) 25 Min.	-	-
	STS410	42 Min. (410) Min.	25 Min. (245) Min.	(11.12) 25 Min. (5) 20 Min.	-	-
	STS480	49 Min. (480) Min.	28 Min. (275) Min.	(11.12) 25 Min. (5) 20 Min.	-	-
G3457	STPY400	41 Min. (400) Min.	23 Min. (225) Min.	(5) 18 Min.	-	-
G3459	SUS304TP	53 Min. (520) Min.	21 Min. (205) Min.	(11.12) 35 Min. (5) 25 Min.	-	-
	SUS304HTP	53 Min. (520) Min.	21 Min. (205) Min.	(11.12) 35 Min. (5) 25 Min.	-	-
	SUS304LTP	49 Min. (480) Min.	18 Min. (175) Min.	(11.12) 35 Min. (5) 25 Min.	-	-
	SUS316TP	53 Min. (520) Min.	21 Min. (205) Min.	(11.12) 35 Min. (5) 25 Min.	-	-

Materials Specifications for Fittings JIS Materials

Marking Symbol		Mechanical Requirements		Mechanical Requirements	Reduction of Area	Hardness (HB)
		Tensile Strength kgf/mm² (N/mm²)	Yield Strength kgf/mm² (N/mm²)	Elongation (%) Test Piece No.		
G3459	SUS316HTP	53 Min.	21 Min.	(11.12) 35 Min.	-	-
		(520) Min.	(205) Min.	(5) 25 Min.		
	SUS316LTP	49 Min.	18 Min.	(11.12) 35 Min.	-	-
		(481) Min.	(175) Min.	(5) 25 Min.		
G3460	STPL380	39 Min.	21 Min.	(11.12) 35 Min.	-	-
		(380) Min.	(205) Min.	(5) 25 Min.		
	STPL450	46 Min.	25 Min.	(11.12) 30 Min.	-	-
		(450) Min.	(245) Min.	(5) 20 Min.		
G3101	SS400	41-52	16tMax.25 Min.	(5) 21 Min.	-	-
		(400-510)	(245)	(14) 17 Min.		
G3106	SM400B	41-52	16tMax.25 Min.	(5) 23 Min.	-	-
		(400-510)	(245)	(1A) 18 Min.		
	SM490B	50-62	16tMax.33 Min.	(5) 22 Min.	-	-
		(490-610)	(325)	(1A) 17 Min.		
G3103	SB410	42-56	23 Min.	(1A) 21 Min.	-	-
		(410-550)	(225) Min.	(10) 25 Min.		
	SB450	46-60 Min.	25 Min.	(1A) 19 Min.	-	-
		(450-590)	(245) Min.	(10) 23 Min.		
G4051	S20C	41 Min.	(N)25 Min.	-	-	-
		(402) Min.	(245) Min.			
	S25C	45 Min.	(N)27 Min.	-	-	-
		(441) Min.	(265) Min.			
	S45C	58 Min.	(N)35 Min.	-	-	-
		(569) Min.	(343) Min.			
G3201	SF45	45-55	(N)23 Min.	(14A)(A) 24 Min.	(A) 45	121 Min.
		(440-540)	(225) Min.	(T) 19 Min.	(T) 35	
	SF50	50-60	(N)25 Min.	(14A)(A) 22 Min.	(A) 40	134 Min.
		(490-590)	(245) Min.	(T) 17 Min.	(T) 30	

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

(Unit : mm)

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

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

(Unit : mm)

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness		Nominal Wall Thickness						
Inch	A	ASME	KJ/JIS	SPP SGP	Sch 5S	Sch 10S	Sch 10	Sch 20S	Sch 20	Sch 30	Sch 40S	STD
26	650	660.40	660.40	-	-	*7.92	7.92	-	12.70	-	*9.52	9.52
28	700	711.20	711.20	-	-	*7.92	7.92	-	12.70	15.88	*9.52	9.52
30	750	762.00	762.00	-	6.35	*7.92	7.92	-	12.70	15.88	*9.52	9.52
32	800	812.80	812.80	-	-	*7.92	7.92	-	12.70	15.88	*9.52	9.52
34	850	863.60	863.60	-	-	*7.92	7.92	-	12.70	15.88	*9.52	9.52
36	900	914.40	914.40	-	-	*7.92	7.92	-	12.70	15.88	*9.52	9.52
38	950	965.20	965.20	-	-	*7.92	-	-	-	-	*9.52	9.52
40	1000	1016.00	1016.00	-	-	*7.92	-	-	-	-	*9.52	9.52
42	1050	1066.80	1066.80	-	-	*7.92	-	-	-	-	*9.52	9.52
44	1100	1117.60	1117.60	-	-	*7.92	-	-	-	-	*9.52	9.52
46	1150	1168.40	1168.40	-	-	*7.92	-	-	-	-	*9.52	9.52
48	1200	1219.20	1219.20	-	-	*7.92	-	-	-	-	*9.52	9.52

- Asterisks(*) denote TK Corporation Standrd as no internationally Recognized Standards for these wall thickness have been established.

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

(Unit : mm)

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

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

(Unit : mm)

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

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	-	-	-	-	-	-

- Asterisks(*) denote TK Corporation Standrd as no internationally Recognized Standards for these wall thickness have been established.

APPENDIX

About Weld Fittings and Flanges 458

Useful Formulas 466

Conversion Factors 470

Fittings 474

- Bevel detail - welding fittings 474
- Flow Resistance equivalent length of weldbend elbows and tees 475

Weld Ends 476

- Joining Buttwelding Fittings to Pipe 476
- Bevel for weldneck flanges 477

Welding Guide 478

- Pipe Alignment 478
- JIG for Small Diameter Piping 480

About Weld Fittings and Flanges

Even with all the advances in technology today, the wholly welded piping system has for decades remained the best choice for use in high pressure and high temperature applications.

Many piping jobs in schools, industrial plants, and factories have benefitted from the inherent advantages of a completely welded system. For instance, they become a closed container joining sections of pipe, valves, fittings and flanges, Also, a welded joint actually becomes part of the section, minimizing leak potential and extending service life. This provides greater margins of safety, especially under conditions of internal pressure. Additionally, welding fittings form a continuous metal structure with the pipe, adding forged-in strength to any piping system.
Furthemore, smoother joints simplify insulation and take up less space.

By taking a detailed look at the type of fittings and flanges specifically designed for use in welded systems, one notes immediately their gain in both recognition and preference. Here is a quick rundown on the many fittings available.

What are Fittings?

A fitting is any part used in a piping system to change direction or function and joined to that system by some mechanical means or by welding.

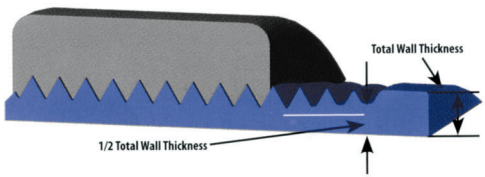
The simplest way to change the direction of a pipe would be to bend it. However, besides restricting the flow, this method often distorts the shape of the pipe and reduces the wall strength.

Another method of altering direction is with mitered joints, I.e. straight pieces of pipe cut for the required turn and welded together. This type lowers flow efficiency considerably by creating greater turbulence. A single mitered bend has about six times the resistance of a smooth elbow. Fittings are preferable for most piping systems where rate of flow, internal pressure and protection against a corrosive environment are primary design considerations.

Fittings fall into these main categories:

Screwed

These fittings are joined to a system by means of threads.
Cutting of threads may penetrate as deeply as one-half the wall thickness, thus weakening the pipe in the joint area.

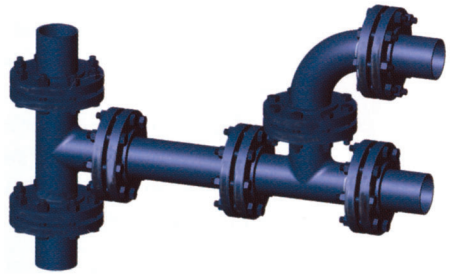


However, threaded systems usually take more time to prepare and install as they almost always require a substantial amount of field fabrication such as threading pipe ends, etc.

Unnecessary field fabrication and threaded joints present potential problem areas at higher operation pressures.

Flanges

These are forged fittings with an integral flanges for bolting to mated parts. Chief disadvantages of flaged fittings atr high weight loads and increased space occupancy.



Socket Weld

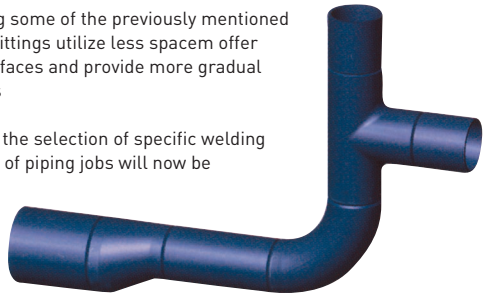
These fittings have an inside diameter that accommoates a specific pipe size.

The pipe is inserted into the fitting and then welded outside circumferentially.

A major disadvantage is a potential “mismatch” inside the fitting where a recess is formed, allowing initiation of corrosion.

Butt Weld

In addition to having some of the previously mentioned advantages, these fittings utilize less spacem offer smoother inner surfaces and provide more gradual directional changes



Some useful tips in the selection of specific welding fittings for a variety of piping jobs will now be discussed.

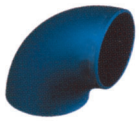
90° and 45° Elbows

Since elbows are very commonly used fittings, they will be considered first.

Generally, their size designations are either **long** radius or **short** radius. The long radius elbow is usually adequate for standard service conditions .The center-to-end dimension is always 1-1/2times the nominal size of the elbow. Short radius elbows have a center-to-end measurement equl to pipe diameter.

90° Long Radius Elbow

For a particular job, the type of elbow selected is usually a compromise based on three considerations, namely, the material flow rate, space available and initial cost.



90° Short Radius Elbow

For service where the flow rate is critical and space is available, the user may select the long radius fittings. This gives him the least reduction in flow and pressure drop from internal frictional resestance and stream turbulence.

When space is limited and the flow rate is non-critical, a short radius elbow is often selected.

When fluids are moved long distances or must encounter many directinal changes, short radius elbows are not recommended because of their greater friction loss, which may require installation of larger pumping equipment.

A long radius elbow costs less than a short radius fittings. Long radius elbows offer minimum resistance to flow consistent with space savings and presently account for more than 90 percent of all elbows in use.

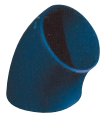
Because of the countless variations occurring in piping systems, fitting manufacturers produce a number of fittings with special shapes and parts as standard items. Some of the major welding fittings and flanges currently available are described below.

90° Reducing Elbow

The 90° **reducing** elbow is designed to change direction as well as reduce the length of flow within a piping system. Usng both a standard 90° elbow and reducer could do this or a 90° long radius-reducing elbow could do this. The latter is normally preferred because it eliminates one fitting and reduces the necessary welding by more than one-third. Also, the gradual reduction in diameter throughout the arc of the reducing elbow provides lower resistance to flow and reduces the effect of stream turbulence and potential internal eosion. These features prevent sizeable pressure drops in the line.

Because this fitting takes up less space than the straight elbow and reducer combination, the application of piping insulation is simplified.

The reducing elbow is more difficult to make and costs more than the elbow and reducer combination. However, since less welding is required and installation is faster, the actual cast differential may be very little.

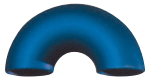


45° long Radius Elbow

The **45° long reducing** elbow has all the flow advantages of the 90° long radius elbow. It is generally used when a partial or gradual change in direction is desired. The demand for 45° long radius elbow is somewhat limited and they constitute a very small segment of the market.

180° Returns

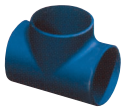
180° Long Radius Return



180° Short Radius Return

The recommended procedure for a 180° change in direction is to use a formed 180° return fitting rather than combine two 90° elbows or field fabricate a 180° pipe bend from a straight pipe piece. Returns are used primarily in heater coils and heat exchangers. The number of coils the space has available determines whether a **short** or **long** radius return is desirable. All long and short 180° radius returns have center-to center dimensions that are double those of matching 90° elbows.

Tees



Stright Tee

Reducing Tee

A tee is a branched, reinforced outlet fitting that permits flow at 90° to the main flow. The main flow passes through the "run" of the tee. The 90° outlet is called the "branch" of the tee. A **straingt** tee is manufactured with all three outlets, the run as well as the branchm the same size. A **reducing** tee is made with the branch outlet smaller than the run to accoomodate the design flow rate.

Lap Joint Stub End

Lap Joint Stub Ends

These fittings are used in lines that might require a quick-disconnect system. They are also used to facilitate lining up the bolt holes of flanges when there flanges are now welded or fastened to the pipe. Normally, **stub ends** are installed in pairs, the paired fittings mating with two lap joint flanges. This allows wasy opening of the line for future cleaning and inspection and if the line requires replacement, the flanges can be reused because they are not fastened to the system. They ride freely in the outside of the pipe. Lap joint stub ends are made with serrated gasket surfaces for improved sealing of the connection and prevention of leakage at the joint. This surface has replaced the raised gasket surface of a flange.

Eccentric Reducer

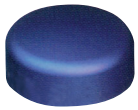
Reducers

All reducers, either **eccentric** or **concentric**, decrease the effective size of the pipe. With smaller cross-sectional area there is increased frictional resistance to the flowing material and an increase system pressure.

Concentric Reducer

The eccentric reducer has the reducing outlet end off center. It will line up straight with one side of the inlet but not with the other outlet. This reducer is harder to manufacture than the concentric reducer and costs more.
One advantage over the concentric reducer is that can be hung or suspended flush against a flat ceilling or wall. This lends greater support to the piping system and many times reduces the required space. When used in horizontal piping systems with the straight side up, it acts as a trap for foreign material. When installed straight side down, it prevents trapping of foreign material.

The concentric reducer is made with both inlet and outlet on a common center line. This reducer is less ostly t manufacture than the eccentric type and is adaptable to most piping installations.


Cap

Caps

The function of a **cap** is to block off the end of a line. The cap is placed over the open end and welded around the joint.

Flanges

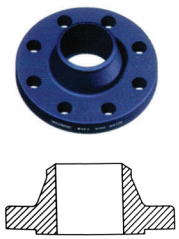
A flange is forged or cast ring of metal designed to join two sections of a piping system or originate a piping system at a pressure vessel outlet, valve, or any other integral flanged assembly. Flanges are joined to the piping system by threading or welding and are joined to each other with bolts. For example, every pressure vessel made has at least one flanged outlet. This outlet has a predetermined bolt circle and number of holes. Flanges are designed and made to match the bolt circle and bolt holes so the two can be mated together. From this flange the piping system is started. Normally, the thickness and O.D.(Outside Diameter) of the flange increase as the pressure rating of the piping system increases. The most important part of a flange is its face. Flange faces are machined to provide adequate surface contact area for a gasket. Flange classifications are:

Raised-Face : The contact area is raised 0.0625 inched for classes 150 and 300. For classed above 300, the contact area is raised 0.25 inches.
Flat-Face : When bolting class 150 or 300 flanges to cast iron flanges, flat-face should be used.
Ring Type Joint : Normal use is with flanges in classes 400 and over but can be designed for lower classes if desired.

Flanges are designed specifically for classes 150, 300, 400, 600, 900, 1500 and 2500. Common types of flanges are "high-hub" weld neck, "low-hub" slip-on, lap joint, threaded, socket and blind.

Weld Neck Flanges

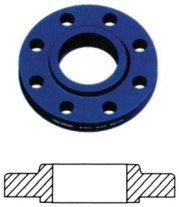
The weld neck flange is normally referred to as the "high-hub" flanges. It is designed to transfer and eaually distribute stresses to the pipe, thereby reducing any concentration of high stress at the bottom of the flange after connections are made. The weld neck flange is the best-designed flange for butt-welding because of its inherent strength. A long tapered hub and gradual transition of thickness in the region of the butt-weld joint adds reinforcement from the standpoint of strength and resestance to dishing. The smooth transition from the flange thickness to the pipe wall thickness effected by the taper is extremely beneficial under conditions of repreated bending caused by line expansion or other variable forces.


Weld Neck Flange

Weld neck flanges are used in serve services generally involving high pressure and sub-zero or high temperatures. Wld neck flnges are bored to match the I.D.(Inside Diameter) of the matching pipe. Therefore, the lighter(lower schedule) the pipe, the larger is the bore of the flanges.

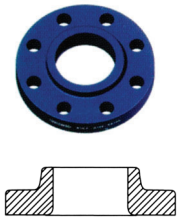
The flange is bored to match the I.D. of the pipe after joining so there is no restriction in flow that could increase stream turbulence and contribute to metal erosion.

Slip-on, Lap Joint Threaded



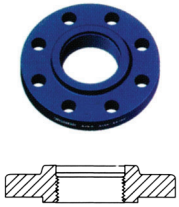
Slip-on Flange

A Slip-on flange has a low hub because the pipe slips into the flange prior to welding. It is welded both inside and out to provide sufficient strength and prevent leakage. Slip-on flanges are all bored slightly larger than the O.D. of the matching pipe. Their lower cost makes them preferable to weld neck flanges to many users. However, installed cost is not much less than for a weld neck flange because of the additional welding involved.



Lap Joint Flange

The lap joint flange is almost identical to a slip-on flange except for the radius at the intersection of the bore and flange face. This radius is necessary to accommodate connection to a lap joint stub end. Normally, a lap joint flange and a lap joint stub end assembly is used mainly in piping systems that are frequently dismantled for inspection or cleaning. These flanges are advantageous in systems where the ability to swivel flanges and align bolt holes simplifies erection of large diameter and hard-to-adjust piping.

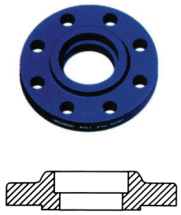


Threaded Flange

A threaded flange is similar to the slip-on flange, but the bore is threaded. Its chief merit is that it can be assembled without welding. This feature makes it preferable for services operating at low pressures and ambient temperatures. Threaded flanges can be installed in highly dangerous areas where welding might be hazardous.

Threaded flanges are unsuited for extreme temperature conditions or bending stresses of any great magnitude.

Widely fluctuating conditions could cause leakage through the threads after only a fer cycles of heating or repeated exposure to stresses. “Seal “ welding around the joint is sometimes performed to overcome the possibility of leakage, but this is not always satisfactory, nor possible.

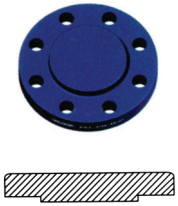


Socket Weld Flange

Socket Weld

Socket weld flanges were initially developed for use in small-size high-pressure piping and slightly more expensive than the slip-ons.

When provided with an internal weld, their static strength is equal to, but their fatigue strength is much greater than double-welded slip-on flanges.



Blind Flange

Blind

The blind flange is a solid forging used to blank off the end of a pipiing system and for gaining access to interior of the line. These flanges from the stance of internal pressure and bolt load are the most highly stressed type of all. However, since the maximum stresses in a blind flange are bending stesses at the center, they can safely be permitted to be higher than in other types of flanges. However, they are not apt for repeated severe water hammer or when temperature is a critical factor.

For these situations, a welding cap is better suited.

GEOMETRIC FORMULAS

Where:

A = Plane Area
V = Volume
C = Circumference
S = Surface Area of Solid
L = Arc on Chord

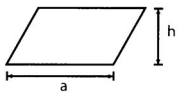
For Capacity solid containers:

Capacity in gallons = V / 231
when V is cubic inches

Capacity in gallons = 7.48 × V
when V is cubic feet

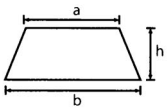
Parallelogram

$A = ah$



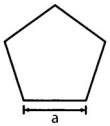
Trapezoid

$A = \frac{h}{2}(a+b)$



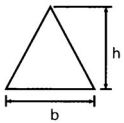
Regular Pentagon

$A = 1.720\ a^2$



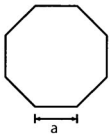
Triangle

$A = \frac{bh}{2}$



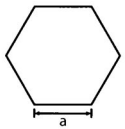
Regular Octagon

$A = 4.828\ a^2$



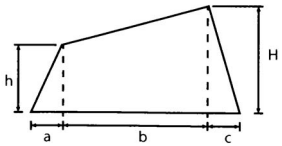
Regular Hexagon

$A = 2.598\ a^2$



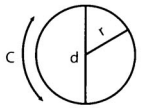
Trapezium

$A = \frac{1}{2}[b(H + h) + ah + cH]$



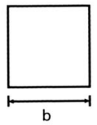
Circle

$C = 2\pi r$
$= \pi d$
$A = \pi r^2$
$D = 2r$
$R = \frac{d}{2}$



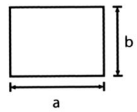
Square

$A = b^2$



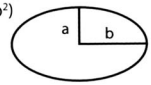
Rectanle

$A = ab$



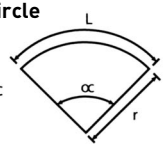
Ellipse

$A = \pi ab$
$C = \pi\sqrt{2(a^2 + b^2)}$



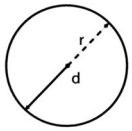
Sector of Circle

$A = \frac{\pi r^2 \alpha}{360}$
$L = .01745r\alpha$



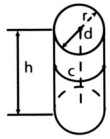
Sphere

$S = 4\pi r^2$
$= \pi d^2$
$V = \frac{3}{4}\pi r^3$
$V = \frac{1}{6}\pi d^3$



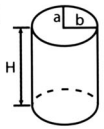
Cylinder

$S = 2\pi r\ (r + h)$
$V = \pi r^2 h$
$V = \frac{c^2 h}{4\pi}$



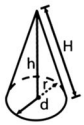
Elliptical Tank

$S = 6.283 \times \sqrt{\frac{a^2 + b^2}{2}} \times H + 6.283 \times a \times b$
$V = 3.142 \times a \times b \times H$



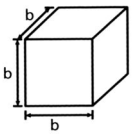
Cone

$S = \pi r(H + r)$
$= \pi r(\sqrt{r^2 + h^2} + r)$
$V = \frac{\pi r^2 h}{3}$
$= 1.047r^2h$
$= 0.2618d^2h$



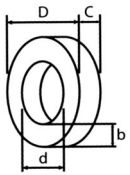
Cube

$S = 6b^2$
$V = b^3$



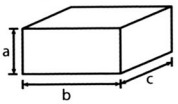
Ring of Rectangular Cross Section

$V = \frac{\pi c}{4}(D^2 - d^2)$
$= \frac{(D + d)}{2}\pi bc$

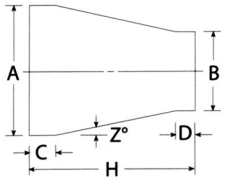


Rectangular Solid

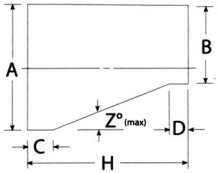
$S = 2(ab + bc + ac)$
$V = abc$



Calculation of Transition Slope



$$\text{Tan } Z = \frac{\frac{A-B}{2}}{H-(C+D)}$$



$$\text{Tan } Z\ (Max) = \frac{\frac{A-B}{2}}{H-(C+D)}$$

Compression Ratio or Pressure Ratio

$$\frac{\text{ABSOLUTE DISCHARGE PRESSURE}}{\text{ABSOLUTE SUCTION PRESSURE}} = \text{PRESSURE RATIO}$$

Barlow's Formula

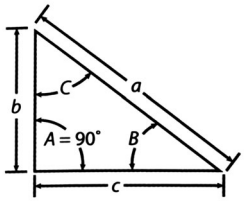
Barlow's Formular is used to find the relationship between internal fluid pressure and stress in the pipe wall. It is simple to use and is conservative; the results are safe. Barlow's Formular is sometimes known as the "outside diameter" formular because it utilizes the outside diameter of the pipe. Bursting tests on commercial steel pipe of the commonly used thickness have shown that Barlow's Formular predicts the pressure at which the pipe will rupture with an accuracy well within the limits of uniformity of commercial pipe thickness.

$$P = \frac{2 \times t \times S}{D}$$

Where:

P = Internal units pressure, psi
S = unit stress, psi
D = outside diameter of pipe, in.
t = wall thickness, in.

RIGHT-ANGLED TRIANGLES



As Shown in the illustrations, the sides of the right angled triangle are designated ***a***, ***b***, and ***c***. the angles opposite each of these sides are designated ***A***, ***B***, and ***B*** respectively.

Angle ***A***, opposite the hypotenuse ***a*** is the right angle and is therefore always one of the known quantities.

SOLUTION OF RIGHT-ANGLED TRAIANGLES

Sides and Angles Known	Formulas for Sides and Angles to be Found		
Sides ***a*** and ***b***	$c = \sqrt{a^2 - b^2}$	$\sin B = \frac{b}{a}$	$C = 90° - B$
Sides ***a*** and ***c***	$b = \sqrt{a^2 - c^2}$	$\sin C = \frac{c}{a}$	$B = 90° - C$
Sides ***b*** and ***c***	$a = \sqrt{b^2 - c^2}$	$\tan B = \frac{b}{c}$	$C = 90° - B$
Sides ***a*** ; angle ***B***	$b = a \times \sin B$	$c = a \times \cos B$	$C = 90° - B$
Sides ***a*** ; angle ***C***	$b = a \times \cos C$	$c = a \times \sin C$	$B = 90° - C$
Sides ***b*** ; angle ***B***	$a = \frac{b}{\sin B}$	$c = b \times \cot B$	$C = 90° - B$
Sides ***b*** ; angle ***C***	$a = \frac{c}{\cos C}$	$c = b \times \tan C$	$B = 90° - C$
Sides ***c*** ; angle ***B***	$a = \frac{c}{\cos B}$	$b = c \times \tan B$	$C = 90° - B$
Sides ***c*** ; angle ***C***	$a = \frac{c}{\sin C}$	$b = c \times \tan C$	$B = 90° - C$

PRESSURE	
1 lb. per sq. in.	= 2.31 ft. water at 60° F
	= 2.04 in. hg at 60° F
1 ft. water at 60° F	= 0.433 lb. per sq. in.
	= 0.844 in. hq at 60° F
1 in. hg at 60° F	= 2.31 ft. water at 60° F
	= 2.04 in. hg at 60° F
lb. per sq. in. Absolute(pisa)	= lb. per sq. in. quage(pisg) + 14.7

TEMPERATURE	
°C	= (0° F –32) × 0.5556

WEIGHT OF LIQUID	
1 gal. (US)	= 8.34 lb. × sp. gr.
1 cu. ft.	= 62.4 lb. × sp. gr.
1 lb.	= 0.12 US gal. ÷ sp. gr.
	= 448.8 gal. per hr. (gph)

FLOW	
1 gpm	= 0.134 cu. ft. per min.
	= 500 lb. per hr. × sp. gr.
500 lb. per hr.	= 1 gpm ÷ sp. gr.
1 cu. ft. per min. (cfm)	= 448.8 gal. per hr. (gph)

WORK	
1 Btu (mean)	= 778 ft. lb.
	= 0.293 watt hr.
	= 0.0056 of heat required to change temp of 1 lb. water from 32° F to 212° F
1 hp-hr	= 2.545 Btu (mean)
	= 0.746 kwhr
1 kwhr	= 3416 Btu (mean)
	= 1.34 hp-hr

POWER	
1 Btu per hr.	= 0.293 watt
1 Btu per hr.	= 12.96 ft. lb. per min.
	= 0.00039 hp
1 ton refrigeration (US)	= 288,000 Btu per 24 Hr.
	= 12,000 Btu per hr.
	= 12,000 Btu per min.
	= 83.33 lb. ice melted per hr. from and at 32° F
	= 2,000 lb. ice melted per hr. from and at 32° F
1 hp	= 550 ft. lb. per sec.
	= 746 watt
	= 2,545 Btu per hr.
1 boiler hp.	= 33,480 Btu per hr.
	= 34.5 lb. water evap. per hr. from and at 212° F
	= 9.8 kw

MASS	
1 lb.(qvoir.)	= 16 oz. (avoir.)
	= 7,000 grain
1 ton (short)	= 2,000 lb.
1 ton (long)	= 2,240 lb.

VOLUME	
1 gal. (US)	= 128 fl.oz. (US)
	= 231 cu. in.
	= 0.833 gal. (Brit.)
1 cu. ft.	= 7.48 gal. (US)

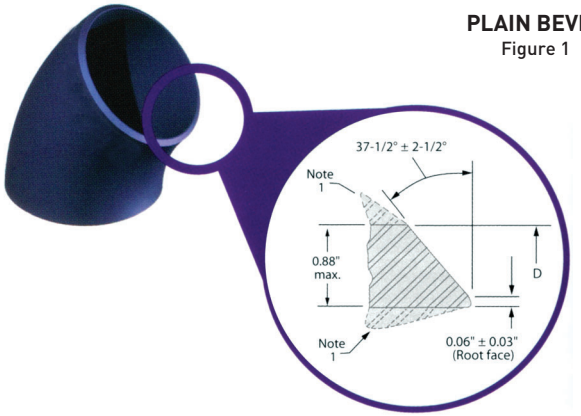
WEIGHT OF WATER
1 cu. ft. at 50° F weighs 62.41 lb.
1 gal at 50° Fweoghs 8.34 lb.
1 cu. ft. of ice weighs 57.2 lb.
Water is at its greatest density at 39.2° F
1 cu. ft. at 39.2° F weighs 62.43 lb.

CONVERSION CONTANTS		
To Change	To	Multiply By
Inches	Feet	0.0833
Inches	Millimeters	25.4
Feet	Inches	12
Feet	Yards	0.3333
Yards	Feet	3
Square inches	Squre feet	0.00694
Square feet	Squre inches	144
Square feet	Squre yards	0.11111
Square yards	Squre feet	9
Cubic inches	Cubic feet	0.00058
Cubic feet	Cubic inches	1728
Cubic feet	Cubic yards	0.303703
Cubic yards	Cubic feet	27
Cubic inches	Gallons	0.00433
Cubic feet	Gallons	7.48
Gallons	Cubic inches	231
Gallons	Cubic feet	0.1337
Gallons	Pounds of water	8.33
Pounds of Water	Gallons	0.12004
Ounces	Pounds	0.0625
Pounds	Ounces	16
Inches of Water	Pounds per square inch	0.0361
Inches of Water	Inches of mercury	0.0735
Inches of Water	Ounces per square inch	0.578
Inches of Water	Pounds per square inch	5.2
Inches of mercury	Inches of Water	13.6
Inches of mercury	Feet of water	1.1333
Inches of mercury	Pounds per square inch	0.4914
Ounces per square inch	Inches of mercury	0.127
Ounces per square inch	Inches of Water	1.733
Pounds per square inch	Inches of Water	27.72
Pounds per square inch	Feet of water	2.310
Pounds per square inch	Inches of mercury	2.04
Pounds per square inch	Atmospheres	0.0681
Feet of water	Pounds per square inch	0.434
Feet of water	Pounds per square foot	62.5
Feet of water	Inches of mercury	0.8824
Atmospheres	Pounds per square inch	14.696
Atmospheres	Inches of mercury	29.92
Atmospheres	Feet of water	34
Long tons	Pounds	2240
Short tons	Pounds	2000
Short tons	Long tons	0.89285

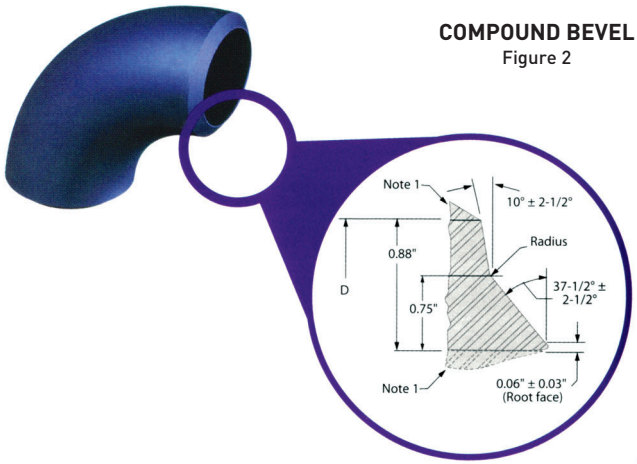
ENGLISJ-METRIC CONVERSION FACTORS		
Multiply	By	To Obtain
Millimeters	0.03937	Inches
Inches	25.4	Millimeters
Centimeters	0.3937	Inches
Inches	2.54	Centimeters
Meters	39.37	Inches
Inches	0.0254	Meters
Millimeters^2	0.00155	Inches^2
Inches^2	654.16	Millimeters^2
Millimeters^2	0.0000107639	Foot^2
Foot^2	92903.04	Millimeters^2
Kilograms	2.204624	Pounds
Pounds	0.453592	Kilograms
Kilograms/Centimeters^2	14.223	Pounds/Inches^2
Pounds/Inches^2	0.070307	Kilograms/Centimeters^2
Bars	14.504	Pounds/Inches^2
Pounds/Inches^2	0.0689	Bars
Millimeters of mercury	0.03937	Inches of mercury
Inches of mercury	25.4	Millimeters of mercury
Liters per minute	0.26417	Gallons per minute
Gallons per minute	3.785	Liters per minute
Liters	0.26414	Gallons
Gallons	3.785	Liters
Meters per second	3.281	Feet per second
Feet per second	0.3048	Meters per second
Cubic meters	35.3144	Cubic feet
Cubic feet	0.028317	Cubic meters

BEVEL DETAIL - WELDING FITTINGS

PLAIN BEVEL
Figure 1



COMPOUND BEVEL
Figure 2

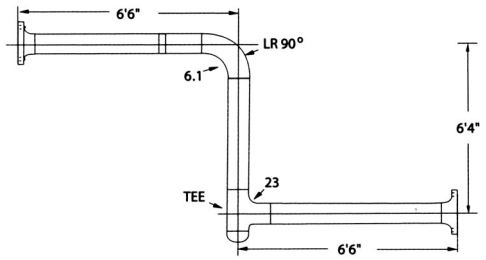


Wall Thickness(T)	End Preparation
Less than x [2]	Cut square or slightly chamfer, at manufacturer's option (not illustrated).
x to 0.88, inclusive	Plain bevel as in Figure 1 above.
More than 0.88	Compound bevel as in Figure 2 above.

Note:
1. See ASME B16.9 for transition contours.
2. x = 0.19″ for carbon steel or ferritic alloy steel and 0.12″ for austenitic alloy steel.

FLOW RESISTANCE EQUIVALENT LENGTH OF WELDBEND ELBOWS AND TEES

Nominal Pipe Size	Long Radius	Short Radius	Welding Tee
1	1.1	1.4	3.9
1-1/4	1.4	1.8	5.2
1-1/2	1.6	2.1	6.0
2	2.1	2.8	7.8
2-1/2	2.6	3.3	9.3
3	3.1	4.1	11.0
4	4.0	5.4	15.0
5	5.1	6.7	19.0
6	6.1	8.1	23.0
8	8.0	11.0	30.0
10	10.0	12.0	38.0
12	12.0	16.0	45.0
14	13.0	18.0	49.0
16	15.0	20.0	56.0
18	17.0	23.0	63.0
20	19.0	25.0	71.0
24	23.0	30.0	85.0
30	30.0	36.0	140.0
36	38.0	42.0	170.0
42	45.0	50.0	200.0
48	52.0	58.0	240.0



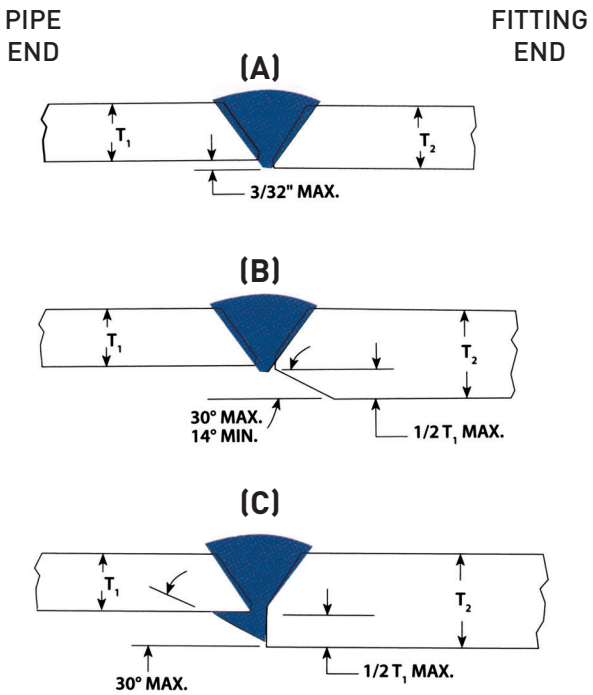
The infrmation given in the chart above illustrates the resestance of fittings ti the flow of liquids. This resistance is given in the equivalent of the straight pipe, and should be assumed as approximate information. Allowances have been made p for the curvature of elbows, so that the resistance values should be added to the total center-to end dimensions of the piping configuration.

Example using 6″ pipe:

Resistance of Pipe:	(6.6+6.4+6.6)	= 19.6
+ Resistance of Elbow:		= 6.1
Resistance of Tee:		= 23.0
		= 48.7

Therefore, the total resistance of the entire assembly to the flow of liquid would be equal to the resistance of 48.7 Linear feet of 6″ straight pipe.

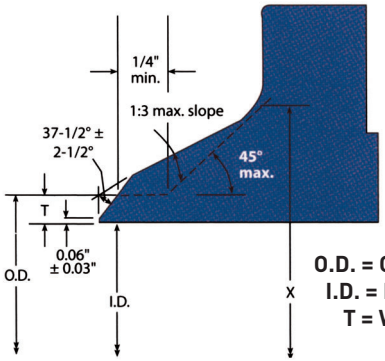
JOINING BUTTWELDING FITTINGS TO PIPE
of equal or less wall thickness



NOTES

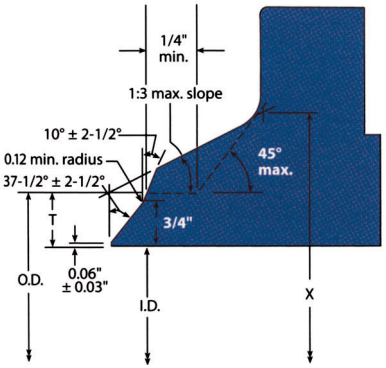
1. Buttwelding fittings can be joined to pipe of lesser wall thickness with proper end preparation and joint design.
2. Above diagrams and recommendations that follow apply to components with ends originally prepared as standard 37-1/2° or 30°degree bevels and where the wall thickness of the thicker end to be jined does not exceed 1-1/2times the thinner (pipe) end.
3. The nominal thickness T (pipe) end T (fitting) shall comply with the design requirements of the applicable section of the ASME B3?1 Code For Pressure Piping.
4. Where the total nominal offser(T_2-T_1) dose not exceed 3/32" and full penetration and bonding is obtained during welding, no special treatment is required [see (A)].
5. When the internal offset exceeds 3/32", taper cut in accordance with (B) ... or tape weld in accordance with (C)
6. When joining ends with materials of unequal minimum specified yield strenghs (or unequal allowable stress), the deposited weld metal shall have mechanical properties at least equal to thoes of the higher strengh (pipe) end.
7. For treatments of ends with inequal external diameters and/or where T_2 is thicker than 1-1/2 times T_1, refer to the applicable section of the ASME Code, e., B31.4 or B31.8 or B16.9.

BEVEL FOR WELDNECK FLANGES



Bevel for Wall Thickness (T) from 0.19 in. to 0.88 in. Inclusive

O.D. = Outside Diameter of pipe
I.D. = Inside Diameter of pipe
T = Wall thickness of pipe



Bevel for Wall Thickness (T) Greater Than 0.88 in.

NOTES

1. All dimensions are in inches/
2. When the thickness of the hub at the bevel is greater than that of the pipe to which the flange is joined and the additional thickness is provided on the outside diameter, a taper weld having a slope not exceeding 1 to 3 may be employed ot, alternatively, the greater outside diameter may be tapered at the same maximum slope or less, from a point on the welding bevel equal to the outside diameter of the mating pipe. Similarly, when the greater thickness is provided on the inside of the flange, it shall be taper-bored from the welding end at the slope not exceeding 1 to 3. When flanges covered by this Standard are intended for services with light wall, hugher stengh pipe, the thickness of the hub at the bevel may be greater than that of the pipe to shich the flange is joined. Under there conditions, a single taper hub may be provided, and the outside diameter of the hub at the base (dimension X) may also be modified. The additional thickness may be provided on either inside or outside or partially on each side, but the total additional thickness shall not exceed one-half times the nominal wall thickness of intended mating pipe. See page 58.
3. The hub transition from the outside diameter to the X diameter shall fall within the maximum and minimum envelope outlined by the 1:3 max. slope and dashed line.
4. For welding end dimensions, refer to ASME B16.25.

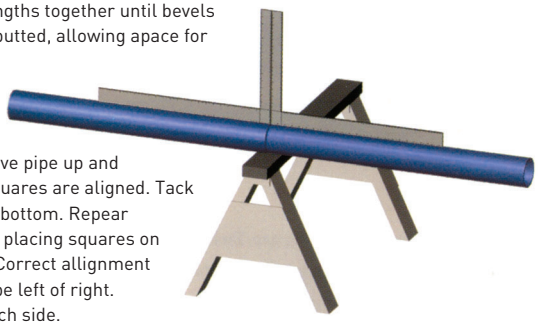
PIPE ALIGNMENT

Proper alignment is one of the most important tasks performed by the pipe filter.If done correctly, welding will be much easier and the piping system will be properly fabricated. if alignment is poor, however, welding will be difficult and the piping system may not function property.

Many device are available to aid alignment and methods of alignment vary widely throughout the trade. There is no best system ... any number of methods have proven successful. The procedures suggested by this manual are popular with many craftsmen and will enable you to quickly obtain good alignment.

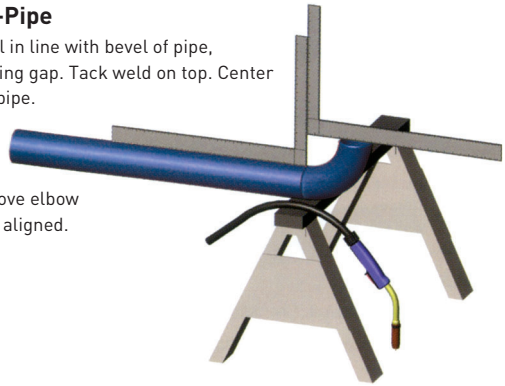
Pipe-to-Pipe

Move pipe lengths together until bevels are nearby abutted, allowing apace for welding gap. Center squares on top of both pipes and move pipe up and dawn until squares are aligned. Tack weld top and bottom. Repear procedure by placing squares on side of pipe. Correct allignment by moving pipe left of right. Tack weld each side.



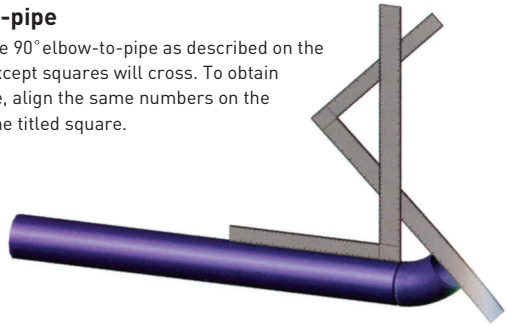
90° Elbow-to-Pipe

Place fitting bevel in line with bevel of pipe, allowing for welding gap. Tack weld on top. Center square on top of pipe. Center second square on elbow's alternate face. Move elbow until squares are aligned.



45° Elbow-to-pipe

Follow procedure 90° elbow-to-pipe as described on the previous page except squares will cross. To obtain correct 45° angle, align the same numbers on the inside scale of the titled square.

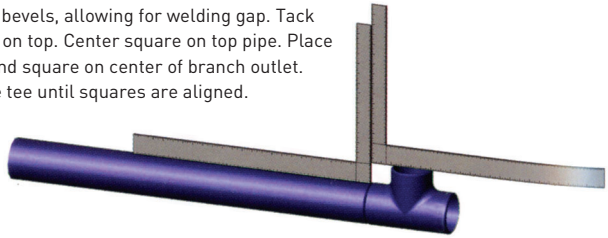


Alternate Method for 45° Elbow-to-pipe

Use same procedure to abut pipe and fitting. Center spirit level pipe. Next, center 45° spirit level on face of elbow and move elbow until 45° bubble is centered.

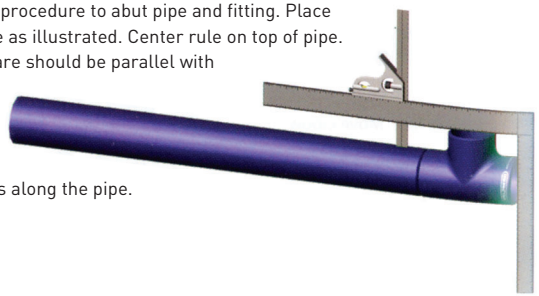
Tee-to-Pipe

Abut bevels, allowing for welding gap. Tack weld on top. Center square on top pipe. Place second square on center of branch outlet. Move tee until squares are aligned.



Alternate Method for Tee-to-Pipe

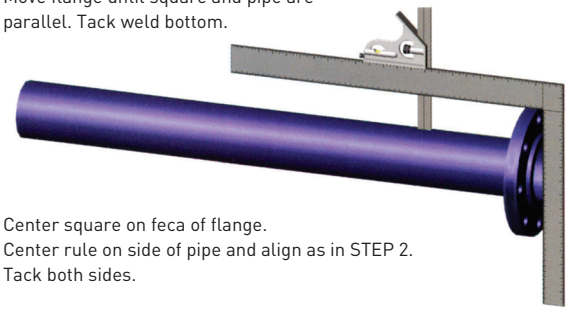
Follow same procedure to abut pipe and fitting. Place square on tee as illustrated. Center rule on top of pipe. Blade of square should be parallel with pipe. Check by measuring with rule at several points along the pipe.



Flange-to-Pipe

STEP 1. Abut flange to pipe. Align top two holes of flange with spirit level. Move flange until bubble centerd. Make one tack weld on top.

STEP 2. Center square on feca of flange. Center rule on top of pipe. Move flange until square and pipe are parallel. Tack weld bottom.

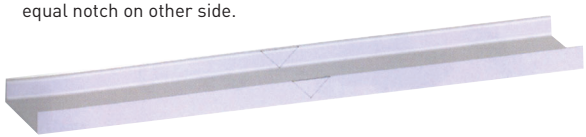


STEP 3. Center square on feca of flange. Center rule on side of pipe and align as in STEP 2. Tack both sides.

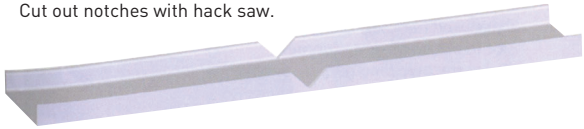
JIG FOR SMALL DIAMETER PIPING

Many pipe fitters have found this simple jig to be helpful in aligning small diameter pipe and elbows. It is made from channel iron approximately 3'9"long. Use 1/8" ×1-1/2" for pipe sizes 1-1/4" thru 3";, 1/8" ×3/4" for sizes 1" or smaller.

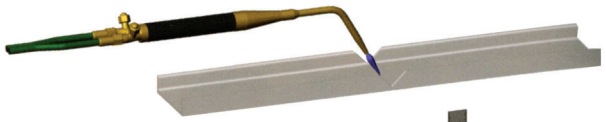
STEP 1. Mark 90° notch on side of channel iron about 9" from end. Make equal notch on other side.



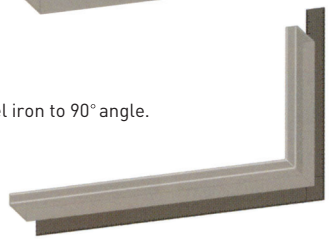
STEP 2. Cut out notches with hack saw.



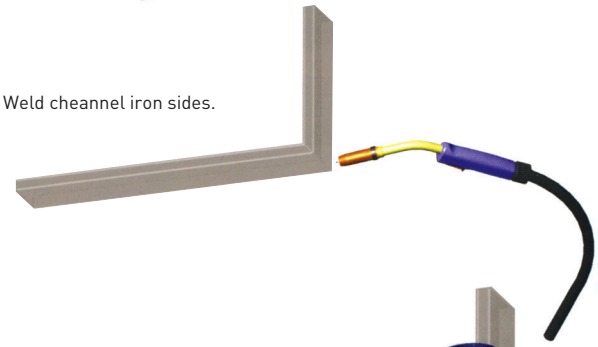
STEP 3. Heat Bottome of channel iron between the notches.



STEP 4. Bend channel iron to 90° angle.

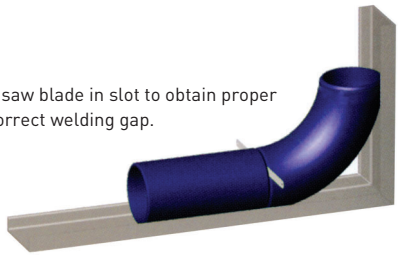


STEP 5. Weld cheannel iron sides.



STEP 6. Place 90° Long Radius Elbow in jig. Saw half thru both sides of channel iron as shown in illustration. Repeat with other size elbows so jig may be used for several sizes.

STEP 7. Place used hack saw blade in slot to obtain proper alignment and correct welding gap.



주식회사 한일배관
HANIL FITTING CO., LTD.

#502, Wooyoung B/D, 12 Minam-ro 146beon-gil,
Dongnae-gu, Busan 47821 KOREA
Tel. +82-51-714-6400 Fax. +82-51-714-6401

44986 울산광역시 울주군 청량면 화창길 45-4
Tel. 052-224-0909 Fax. 052-224-0216
www.hanilfitting.co.kr hanil@hanilfitting.co.kr