서 문

PLANT의 규보가 대형화로 변화함에 따라 PLANT배관 설계가 소규모 인원 수행 체제로부터, 탄력성 있는 기술과 경험이 요구되며 서로 능력이 다른 다수 집합형의 대규모 인원 수행체제로 전환되고 있다.

이에 설계의 통일성과 기술적인 면 및 관리적인 측면에서의 업무 수행을 원활하게 하기 위하여 PLANT 배관설계에서 가장 많이 적용되고 있는 배관재의 DIMENSION TABLE 및 각종 ENGINEERING DATA를 종합하여 간단한 HAND BOOK 으로 펴 냄으로서 통일성 있는 DATA를 활용하도록 하고 취급이 용이하도록 하여 업무 수행의 신속성과 생산성을 높이는데 그 효과를 두고자 한다.

본 HAND BOOK은 설계에서 주로 적용하고 있는 ANSI 및 JIS규격을 중심으로 작성되었으므로 선별적 사용이 요구되며 설계과정에서는 물론 FIELD ENGINEERING 등의 업무에서도 유익한 활용이 되기를 기대한다.

1988. 11.

HAND BOOK 소요량 증가로 인한 내용 변경 없이 2차 발행.

1993. 2.

ISO-9001의 인증(1994. 8. 7)과 일부 내용 추가 및 보완 실시로 인한 3차 발행.

1994. 12.

일부 내용 추가 및 보완에 따른 4차 발행.

1997. 12.

목 차

FORCE(힘)

Newton N	Kilonewton KN	Kilogram Force Kgf	Pound Force lbf
1	0.001	0.102	0.225
1000	1	101.97	224.81
9.807	0.0098	1	2.205
4.448	0.0044	0.454	1

PRESSURE AND LIQUID HEAD(압력 및 수두)

Newton per Square Metre N/m^2	Millbar $(10^2 N/m^2)$ mbar	Bar $(10^5 N/m^2)$ bar	Kilogram Force per Square Centimetre kbf/cm^2	Pound Force per Square inch lbf/in^2	Foot of water ft H_2O	Meter of water m H_2O	Milimeter of Mercury mm Hg	Inch of Mercury in Hg
1	0.01	10^{-5}	1.02x10	$1.45x10^{-4}$	3.3x10	1.02x10	0.0075	$2.95x10^{4}$
100	1	0.001	$1.02x10^{-3}$	0.0145	0.033	0.0102	0.75	0.029
10	1000	1	1.02	14.5	33.455	10.2	750.1	29.53
98067	980.7	0.981	1	14.22	32.808	10.0	735.6	28.96
6895	68.95	0.069	0.0703	1	2.307	0.703	51.71	2.036
2989	29.89	0.03	0.0305	0.433	1	0.305	22.42	0.883
9807	98.07	0.098	0.1	1.42	3.28	1	73.55	2.896
133.3	1.333	0.0013	0.0014	0.019	0.045	0.014	1	0.039
3386	33.86	0.0338	0.0345	0.491	1.133	0.345	25.4	1

$1pa=1N/m^2$, 1mmHg=1torr, 국제 표준 대기압(1atm)=101325poscals=1,03323kgf/m^2

VELOCITY(속도)

Metre per second m/s	Foot per second ft/s	Metre per minute m/min	Foot per minute ft/min	Kilometre per hour km/h	Mile per hour mile/h
1	3.281	60	196.85	3.6	2.2369
0.305	1	18.288	60	1.0972	0.6818
0.017	0.055	1	3.281	0.06	0.0373
0.005	0.017	0.305	1	0.0183	0.01136
0.278	0.911	16.667	54.68	1	0.6214
0.447	1.467	26.822	88	1.6093	1

MASS FLOW RATE(질량 유동율)

Kilogram per second kg/s	Pound per second lb/s	Kilogram per hour kg/h	Pound per hour lb/h	U.K.Ton/hour ton/h	Tonne per hour t/h
1	2.205	3600	7936.64	3.5431	3.6
0.454	1	1633	3600	1.607	1.633
$2.78x10^{-4}$	$6.12x10^{-4}$	1	2.205	$9.84x10^{-4}$	0.001
$1.26x10^{-4}$	$2.78x10^{-4}$	0.454	1	$4.46x10^{-4}$	$4.45x10^{-4}$
0.282	0.622	1016	2240	1	1.016
0.278	0.612	1000	2204.6	0.9842	1

VOLUMETRIC RATE OF FLOW(체적 유동율)

Litre per second l/s	Litre per Minute l/min	Cubic Metre per Hour m^3/h	Cubic Metre per Hour ft^3/h	Cubic Metre per Hour ft^3/min	U.K.Gallon per Minute U.K.gal/min	U.S.Gallon per Minute U.S.gal/min	U.S.Barrel per Day U.S.barrel/d
1	60	3.6	127.133	2.1189	13.2	15.85	543.439
0.017	1	0.06	2.1189	0.0353	0.22	0.264	9.057
0.278	16.667	1	35.3147	0.5886	3.666	4.403	150.955
0.008	0.472	0.0283	1	0.0167	0.104	0.125	4.275
0.472	28.317	1.6990	60	1	6.229	7.480	256.475
0.076	4.546	0.2728	9.6326	0.1605	1	1.201	41.175
0.063	3.785	0.2271	8.0209	0.1337	0.833	1	34.286
0.002	0.110	0.0066	0.2339	0.0039	0.024	0.029	1

COMPONENT STANDARDS

Standard or Specification	Designation
Bolting	
Square and Hex Bolts and Screws, Inch Series, Including Hex Cap Screws and Lag Screws	ANSI B18.2.1
Square and Hex Nuts	ASME B18.2.2
Metallic Fittings, Valves, and Flanges	
Ductile Iron Fittings, 3 Inch Through 24 Inch, for Gas	ANSI A21.14
Cast Iron Pipe Flanges and Flanged Fittings, Class 25,125,250 and 800	ASME B16.1
Malleable Iron Threaded Fittings, Class 150 and 300	ASME B16.3
Cast Iron Threaded Fittings, Class 125 and 250	ASME B16.4
Pipe Flanges and Flanged Fittings	ASME B16.5
Factory-Mode Wrought Steel Buttwelding Fittings	ASME B16.9
Face-to-Face and End-to-End Dimensions of Ferrous Valves	ASME B16.10
Forged Steel Fittings, Socket Welding and Threaded	ASME B16.11
Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads	ASME B16.14
Cast Bronze Threaded Fittings, Class 125 and 250	ASME B16.15
Cast Copper Alloy Solder Joint Pressure Fittings	ANSI B16.18
Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	ASME B16.22
Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300	ASME B16.24
Cast Copper Alloy Fittings for Flared Copper Tubes	ASME B16.26
Wrought Steel Buttwelding Short Radius Elbows and Returns	ASME B16.28
Large Diameter Steel Flange	ASME B16.47
Valves, Flanged and Buttwelding End	ASME B16.34
Steel Orifice Flanges, Class 300, 600, 900, 1500 AND 2500	ASME B16.36
Malleable Iron Threaded Pipe Unions, Class 150, 250, and 300	ASME B16.39
Ductile Iron Pipe Flanges and Flanged Fittings, Class 150 and 300	ASME B16.42
Ductile Iron Plug Valves, Flanged Ends	*API 593
Wafer Check Valves	*API 594
Steel Plug Valves, Flanged or Buttwelding Ends	API 599
Steel Gate Valves, Flanged and Buttwelding Ends	API 600
Compact Carbon Steel Gate Valves	API 602
Class 150, Corrosion-Resistant Gate Valves	API 603
Compact Carbon Steel Gate Valves (Extended Body)	API 606
Butterfly Valves, Lug-Type and Wafer-Type	API 609
Ductile-Iron and Gray-Iron Fittings, 3 Inch Through 48 Inch, for Water and other Liquids	AWWA C110
Steel Pipe Flanges for Water Works Service, 4 Inch Through 144 Inch	AWWA C207
Dimensions for Steel Water Pipe Fittings	AWWA C208
Gate Valves, 3 Inch Through 48 Inch, for Water and Sewage Systems	AWWA C500
Rubber-Seated Butterfly Valves	AWWA C504
Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings	MSS SP-6
Spot Facing for Bronze, Iron and Steel Flanges	MSS SP-9
Standard Maeking System for Valves, Fittings, Flanges, and Unions	MSS SP-25
Corrosion-Resitant Gate, Globe, Angle and Check Valves With Flanged and Buttweld Ends	MSS SP-42
Wrought Stainless Steel Buttwelding Fittings	MSS SP-43
Steel Pipe Line Flanges	MSS Sp-44

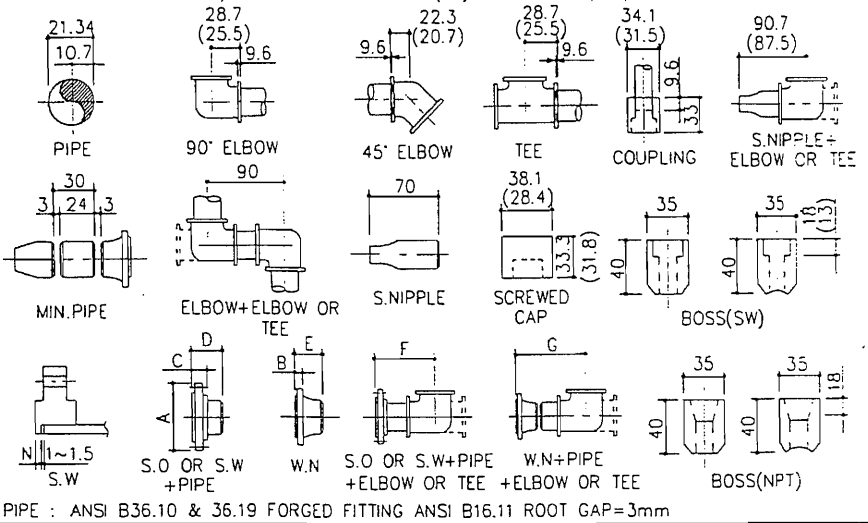
COMPONENT STANDARDS

Standard or Specification	Designation
Metallic Fittings, Valves, and Flanes (Cont'd)	
Bypass and Drain Connection Standrad	MSS SP-45
Class 150LW Corrosion Resistant Cast Flanges and Flanged Fittings	MSS SP-51
High Pressure Chemical Industry Flanges and Threaded Stubs for Use with Lens Gaskets	MSS SP-65
Cast Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves With Flanged or Buttwelding Ends for General Service	MSS SP-72
Specification for High Test Wrought Buttwelding Fittings	MSS SP-75
Socket-Welding Reducer Inserts	MSS SP-79
Bronze Gate, Globe, Angel and Check Valves	MSS SP-80
Stainless Steel, Bonnetless, Flanged, Knife Gate Valves	MSS SP-81
Carbon Steel Pipe Unions, Socket-Welding and Threaded	MSS SP-83
Cast Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Diaphragm Type Valves	MSS SP-88
Refrigeration Flare Type Fittings	SAE J513
hydraulic Tube Fittings	SAE J514
Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Bolt Split Flanged Type	SAE J518
Metallic Pipe and Tubes	
Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for gas	ANSI A21.52
Welded and Seamless Wrought Steel Pipe	ASME B36.10M
Stainless Steel Pipe	ASME B36.19M
Seamless Low Carbon Steel Hydraulic Line Tybing	ANSI B93.11
Glanged Cast-Iron and Ductile-Iron Pipe with Threaded Flanges	AWWA C115
Thickness Design of Ductile-Iron Pipe	AWWA C150
Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids	AWWA C151
Steel Water Pipe 6 Inches and Larger	AWWA C200
Miscellaneous	
Unified Inch Screw Threads (UN and UNR Thread Form)	ASME B1.1
Pipe Threads (Except Dryseal)	ASME B1.20.1
Druseal Pipe Threads (Inch)	ANSI B1.20.3
Hose Coupling Screw Threads	ASME B1.20.7
Ring-Joint Gaskets and Grooves for Steel Pipe Flanges	ASME B16.20
Nonmetallic Flat Gaskets for Pipe Flanges	ASME B16.21
Buttwelding Ends	ASME B16.25
Surface Texture	ASME B46.1
Threading, Gaging and Tjread Inspection of Casing, Tubing, and Line Pipe Threads	API 5B
Metallic Gaskets for Piping, Double-Jacketed Corrugated and Spiral Wound	API 601
Rubber Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings	AWWA C111
Pipe Hangers and Supports - Materials, Design, and Manufacture	MSS SP-58
Silver Brazing Joints for Wrought and Cast Solder Joint Fittings	MSS SP-73
Screw Threads and Gaskets for Fire Hose Connections	NEPA 1963

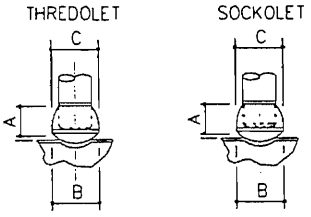
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 1/2" (15mm)

UPPER DIM.:FOR SCH.160/6000LB,LOWER DIM.: IN ( ) :FOR SCH.40/80/3000LB



PIPE : ANSI B36.10 & 36.19 FORGED FITTING ANSI B16.11 ROOT GAP=3mm



	RATING	A	B	C	WEIGHT (kg)
THRD.	STD,3000LB	25.4	34.9	31.7	0.11
	6000LB	31.7	44.5	39.7	0.20
SOCK.	STD.	25.4	34.9	31.7	0.06
	XS	25.4	34.9	31.7	0.10
	SCH.160/XXS	31.8	44.5	39.7	0.23

BONNEY FORGE'S STANDARD FITTING

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	89	95	95	95	95	121	121	133
B	11.2	14.3	20.7	19.9	19.9	28.7	28.7	36.5
C	15.9	22.2	28.6	–	–	–	–	–
D	43	50	56	–	–	–	–	–
E	47.6	52.4	58.8	58.0	58.0	66.7	66.7	79.4
F	100	100	110	–	–	–	–	–
G	130	140	140	140	140	150	150	160
H								
J								
K								
N	6.4	12.7	19.1	–	–	–	–	–
BOLT DIA.	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
BOLT NO.	4	4	4	4	4	4	4	4
BOLT L STUD	65	70	85	80	80	115	115	130
BOLT L MACH	50	55	RING NO.	R11	R11	R12	R12	R13
			S	3.2	3.2	4.0	4.0	4.0
B . C . D	60.5	66.5	66.5			82.6	82.6	88.9

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

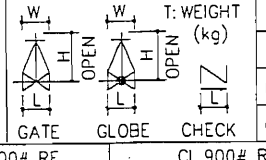
WEIGHT OF FLANGE (kg)

RATING		S.O	W.N	BLIND
ANSI B16.5	CL.150	0.4	0.5	0.5
	CL.300	0.6	0.8	0.9
	CL.600	0.8	0.9	0.9
	CL.900	1.8	1.9	1.8
	CL.1500	1.8	1.9	1.8
	CL.2500	3.2	3.2	3.2

* Bolt Holes are 1/8" larger than bolt diameters.

VALVE DATA

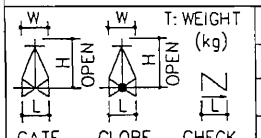
RATING & CONN.



MARK	CL.800 SW (API 602) L	H	W	T
GATE	84	134	83	
GLOBE	84	151	76	
CHECK	84	45		

VALVE DATA

RATING & CONN.



MARK	CL.150# RF L	H	W	T	CL.300# RF L	H	W	T	CL.600# RF L	H	W	T	CL.900# RF L	H	W	T	CL.1500# RF L	H	W	T
GATE	107.95				139.7				165.1								215.9			
GLOBE	107.95				152.4				165.1								215.9			
CHECK	107.95				152.4				165.1								215.9			

PIPE DATA

D=21.34 mm

OUTSIDE SURFACE =0.07 m²/m

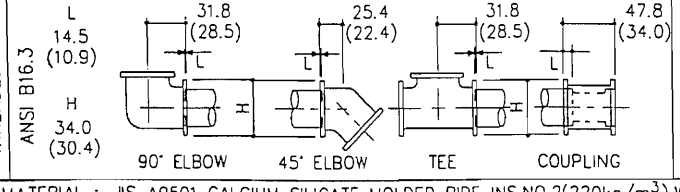
SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)
5S	1.65	18.03	1.02	0.499	0.70	0.468	0.80	0.25
10S	2.11	17.12	1.27	0.596	0.68	0.559	1.00	0.23
STD. 40 40S	2.77	15.80	1.62	0.712	0.66	0.667	1.27	0.16
XS. 80 80S	3.73	13.87	2.07	0.836	0.64	0.784	1.62	0.15
160	4.75	11.84	2.48	0.922	0.61	0.864	1.94	0.11
XXS	7.47	6.40	3.25	1.01	0.56	0.946	2.55	0.03

WEIGHT OF FITTING (kg)

90° ELBOW	45° ELBOW	TEE FULL	TEE X	TEE X	SWG NIPP.	COUPL.	BOSS	CAP

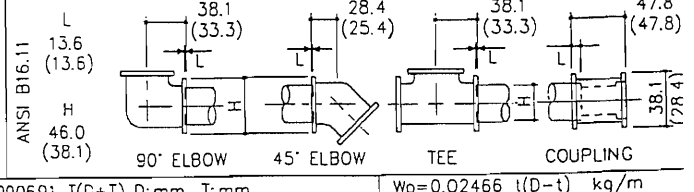
MALLEABLE IRON THREADED FITTING ANSI B16.3

UPPER DIM.FOR CLASS 300; LOWER DIM.IN ( ):FOR CLASS 150



FORGED STEEL THREADED FITTING ANSI B16.11

UPPER DIM.FOR XXS/6000LB, LOWER DIM.IN ( ) FOR SCH.160/3000LB



WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2(220kg/m³),W=0.000691 T(D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

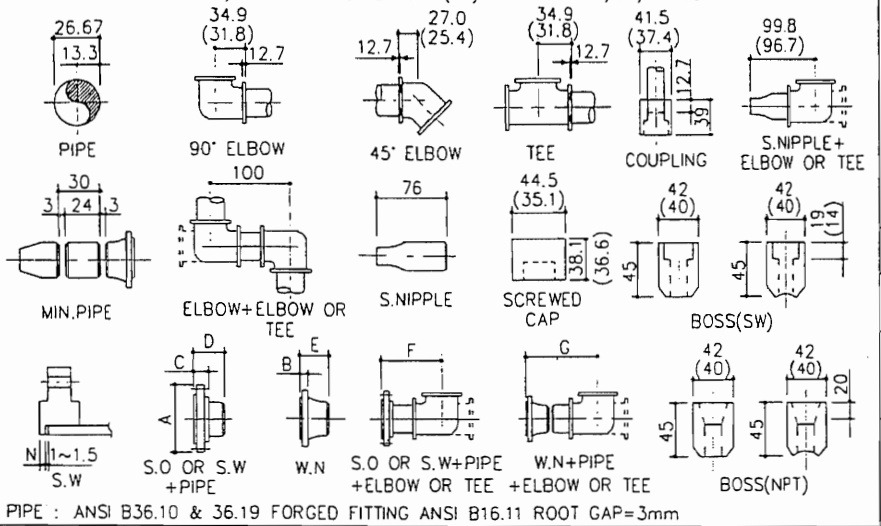
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	0.8 (0.7)	1.1 (0.8)	1.7 (1.0)	2.4 (1.1)	4.0 (1.4)	5.1 (1.6)					

Wp=0.02466 t(D-t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (d^2-d^2) cm²
I=0.000004909 (D^4-d^4) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

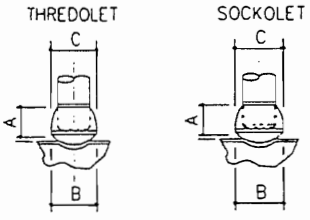
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 3/4" (20mm)

UPPER DIM.:FOR SCH.160/6000LB.LOWER DIM.:IN ( ) :FOR SCH.40/80/3000LB



PIPE : ANSI B36.10 & 36.19 FORGED FITTING ANSI B16.11 ROOT GAP=3mm



	RATING	A	B	C	WEIGHT (kg)
THRD.	STD.3000LB	27.0	44.5	36.5	0.16
	6000LB	36.5	50.8	46.0	0.34
SOCK.	STD.	27.0	44.5	36.5	0.15
	XS	27.0	41.3	36.5	0.15
	SCH.160/XXS	36.5	50.8	45.2	0.36

BONNEY FORGE'S STANDARD FITTING

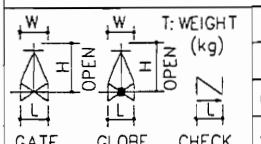
TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	98	117	117	117	117	130	130	140
B	12.7	15.9	22.3	22.3	22.3	31.8	31.8	38.1
C	15.9	25.4	31.8	–	–	–	–	–
D	43	53	59	–	–	–	–	–
E	52.4	57.2	63.6	63.6	63.6	76.2	76.2	85.7
F	100	110	120	–	–	–	–	–
G	140	140	150	150	150	160	160	170
H								
J								
K								
N	4.7	14.3	20.7	–	–	–	–	–
BOLT DIA.	1/2"	5/8"	5/8"	5/8"	5/8"	3/4"	3/4"	3/4"
BOLT NO.	4	4	4	4	4	4	4	4
BOLT L STUD	65	75	90	95	95	120	120	130
BOLT L MACH	55	65	RING NO.	R13	R13	R14	R14	R16
			S	4.0	4.0	4.0	4.0	4.0
B . C . D	69.9	82.6	82.6			88.9	88.9	95.3

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

WEIGHT OF FLANGE (kg) RATING	S.O	W.N	BLIND
ANSI B16.5 CL.150	0.6	0.8	0.9
CL.300	1.1	1.3	1.4
CL.600	1.3	1.5	1.4
CL.900	2.3	2.7	2.7
CL.1500	2.3	2.7	2.7
CL.2500	3.6	3.6	3.6

*Blot Holes are 1/8" larger than bolt diameters.

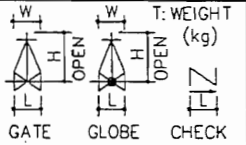
VALVE DATA — RATING & CONN. — T: WEIGHT (kg)



MARK	L	H	W	T
GATE	91	143	95	
GLOBE	91	162	89	
CHECK	91	51		

CL.800 SW (API 602)

VALVE DATA — RATING & CONN. — T: WEIGHT (kg)

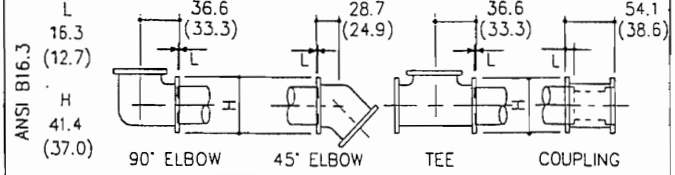


MARK	CL.150# RF L	H	W	T	CL.300# RF L	H	W	T	CL.600# RF L	H	W	T	CL.900# RF L	H	W	T	CL.1500# RF L	H	W	T
GATE	117.4				152.4				190.5				–				–			
GLOBE	117.4				177.8				190.5				228.6				228.6			
CHECK	117.4				177.8				190.5				228.6				228.6			

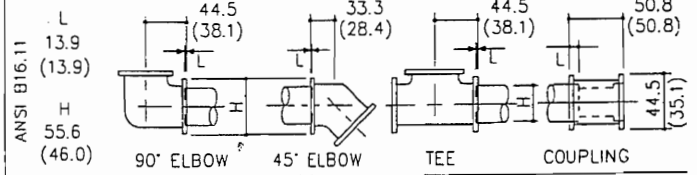
PIPE DATA — D=26.67 mm — OUTSIDE SURFACE =0.08 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° ELBOW	45° ELBOW	TEE FULL	TEE X	TEE X	SWG NIPP.	COUPL.	BOSS	CAP
5S	1.65	23.37	1.30	1.020	0.89	0.764	1.02	0.43									
10S	2.11	22.45	1.63	1.237	0.87	0.927	1.28	0.39									
STD. 40 40S	2.87	20.93	2.15	1.542	0.85	1.156	1.68	0.34									
XS. 80 80S	3.91	18.85	2.80	1.864	0.82	1.398	2.19	0.27									
160	5.54	15.60	3.68	2.193	0.77	1.644	2.84	0.19									
XXS	7.82	11.02	4.63	2.411	0.72	1.808	3.64	0.09									

MALLEABLE IRON THREADED FITTING ANSI B16.3 — UPPER DIM.FOR CLASS 300; LOWER DIM.IN ( ):FOR CLASS 150



FORGED STEEL THREADED FITTING ANSI B16.11 — UPPER DIM.FOR XXS/6000LB, LOWER DIM.IN ( ) FOR SCH.160/3000LB



WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2(220kg/m³),W=0.000691 T(D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

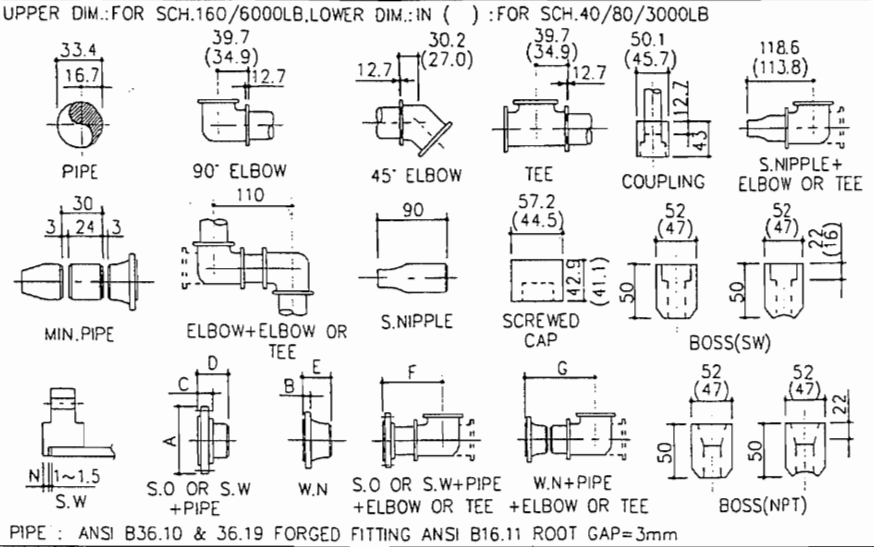
THICKNESS (mm):T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	0.9 (0.7)	1.2 (0.8)	1.8 (1.0)	2.6 (1.2)	4.2 (1.5)	5.3 (1.7)					

Wp=0.02466 t(D-t) kg/m
Ww=0.0007854 d² kg/m
A=0.007854 (d²-d²) cm²
I=0.000004909 (D⁴-d⁴) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

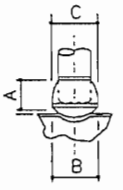
NPS 1" / 25mm

UPPER DIM.:FOR SCH.160/6000LB,LOWER DIM.: IN ( ) :FOR SCH.40/80/3000LB



PIPE : ANSI B36.10 & 36.19 FORGED FITTING ANSI B16.11 ROOT GAP=3mm

THREDOLET



SOCKOLET

	RATING	A	B	C	WEIGHT (kg)
THRD.	STD,3000LB	33.3	54.0	46.0	0.28
	6000LB	39.7	61.9	57.2	0.56
SOCK.	STD.	33.3	54.0	46.0	0.27
	XS	33.3	54.0	46.0	0.27
	SCH.160/XXS	39.7	61.9	57.2	0.59

BONNEY FORGE'S STANDARD FITTING

TAPE	ANSI B16.5							
	CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	108	124	124	124	124	149	149	159
B	14.3	17.5	23.9	23.9	23.9	35.0	35.0	41.3
C	17.5	27.0	33.4	–	–	–	–	–
D	45	54	61	–	–	–	–	–
E	55.6	61.9	68.3	68.3	68.3	79.4	79.4	95.3
F	110	120	130	–	–	–	–	–
G	150	160	160	160	160	170	170	190
H								
J								
K								
N	4.8	14.3	20.7	–	–	–	–	–
BOLT DIA.	1/2"	5/8"	5/8"	5/8"	5/8"	7/8"	7/8"	7/8"
BOLT NO.	4	4	4	4	4	4	4	4
BOLT L STUD	70	85	95	95	95	135	135	145
BOLT L MACH	55	70	RING NO.	R16	R16	R16	R16	R18
			S	4.0	4.0	4.0	4.0	4.0
B . C . D	79.2	88.9	88.9			101.6	101.6	108

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

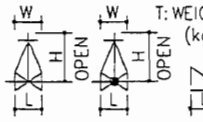
WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND	
ANSI B16.5	CL.150	0.8	1.1	0.9	
	CL.300	1.4	1.7	1.4	
	CL.600	1.5	1.8	1.8	
	CL.900	3.4	3.8	3.6	
	CL.1500	3.4	3.8	3.6	
	CL.2500	5.0	5.4	5.0	

*Bolt Holes are 1/8" larger than bolt diameters.

VALVE DATA

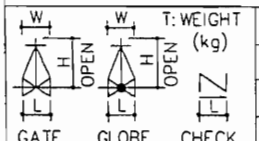
RATING & CONN.



	CL.800 SW (API 602)			
MARK	L	H	W	T
GATE	114	182	108	
GLOBE	111	197	102	
CHECK	111	67		

VALVE DATA

RATING & CONN.



MARK	CL.150# RF L	H	W	T	CL.300# RF L	H	W	T	CL.600# RF L	H	W	T	CL.900# RF L	H	W	T	CL.1500# RF L	H	W	T
GATE	127				165.1				215.9				254				254			
GLOBE	127				203.2				215.9				254				254			
CHECK	127				203.2				215.9				254				254			

PIPE DATA

D=33.4 mm

OUTSIDE SURFACE =0.10 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)
5S	1.65	30.10	1.65	2.08	1.12	1.25	1.29	0.71
10S	2.77	27.86	2.66	3.15	1.09	1.89	2.09	0.61
STD. 40 40S	3.38	26.64	3.19	3.64	1.07	2.18	2.50	0.56
XS. 80 80S	4.55	24.30	4.12	4.40	1.03	2.63	3.24	0.46
160	6.35	20.70	5.40	5.21	0.98	3.12	4.24	0.34
XXS	9.09	15.22	6.94	5.85	0.92	3.50	5.45	0.18

WEIGHT OF FITTING (kg)

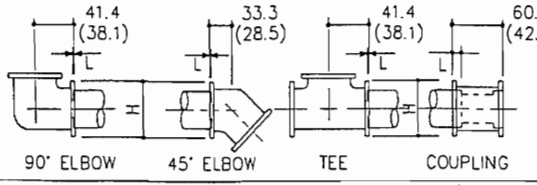
90° ELBOW	45° ELBOW	TEE FULL	TEE X	TEE X	SWG NIPP.	COUPL.	BOSS	CAP

MALLEABLE IRON THREADED FITTING ANSI B16.3

UPPER DIM.FOR CLASS 300; LOWER DIM.IN ( ):FOR CLASS 150

L 19.1 (14.7)

H 49.5 (45.0)

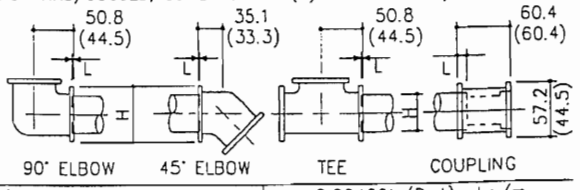


FORGED STEEL THREADED FITTING ANSI B16.11

UPPER DIM.FOR XXS/6000LB, LOWER DIM.IN ( ) FOR SCH.160/3000LB

L 17.3 (17.3)

H 62.0 (55.6)



WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2(220kg/m^3),W=0.000691 T(D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

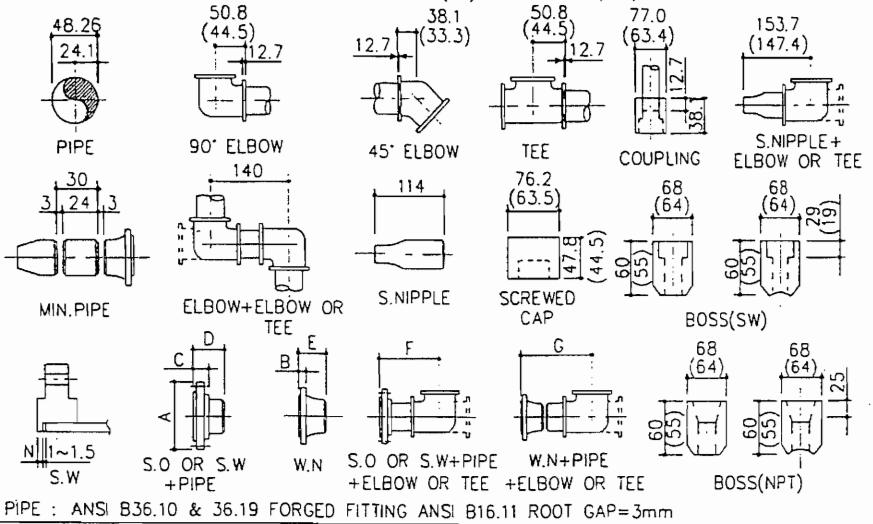
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	1.0 (0.8)	1.3 (0.9)	2.0 (1.1)	2.9 (1.3)	4.4 (1.6)	5.7 (1.7)					

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

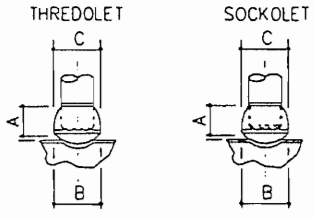
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 1 1/2" (40mm)

UPPER DIM.:FOR SCH.160/6000LB,LOWER DIM.:IN ( ) :FOR SCH.40/80/3000LB



PIPE : ANSI B36.10 & 36.19 FORGED FITTING ANSI B16.11 ROOT GAP=3mm



	RATING	A	B	C	WEIGHT (kg)
THRD.	STD,3000LB	34.9	73.0	61.9	0.45
	6000LB	42.9	82.6	76.2	0.89
SOCK.	STD.	34.9	73.0	61.9	0.47
	XS	34.9	73.0	60.3	0.47
	SCH.160/XXS				

BONNEY FORGE'S STANDARD FITTING

TAPE	ANSI B16.5							
	CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A (A)	127	156	156	156	156	178	178	203
B (B)	17.5	20.7	28.7	27.1	28.7	38.2	38.2	52.4
C (C)	22.2	30.2	38.2	–	–	–	–	–
D (D)	50	58	66	–	–	–	–	–
E (E)	61.9	68.3	76.2	74.7	76.2	89.0	89.0	119.1
F (F)	130	130	140	–	–	–	–	–
G (G)	170	170	180	180	180	190	190	220
H								
J								
K								
N	6.3	14.3	22.3	–	–	–	–	–
BOLT DIA.	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/8"
BOLT NO.	4	4	4	4	4	4	4	4
BOLT L STUD	75	95	110	110	110	145	145	175
BOLT L MACH	65	75	RING NO.	R20	R20	R20	R20	R23
			S	4.0	4.0	4.0	4.0	3.2
B . C . D	98.6	114.3	114.3			124	124	146.1

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

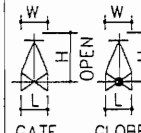
WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
ANSI B16.5	CL.150	1.3	1.9	1.8
	CL.300	2.5	3.0	2.7
	CL.600	3.0	3.5	3.6
	CL.900	5.4	6.0	5.9
	CL.1500	5.4	6.0	5.9
	CL.2500	10.0	11.3	10.4

*Bolt Holes are 1/8" larger than bolt diameters.

VALVE DATA

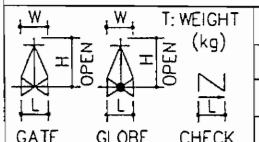
RATING & CONN. — CL.800 SW (API 602)



MARK	L	H	W	T
GATE	121	229	140	
GLOBE	165	245	140	
CHECK	165	110		

VALVE DATA

RATING & CONN.



MARK	CL.150# RF L	H	W	T	CL.300# RF L	H	W	T	CL.600# RF L	H	W	T	CL.900# RF L	H	W	T	CL.1500# RF L	H	W	T
GATE	165.1				190.5				241.3				304.8				304.8			
GLOBE	165.1				228.6				241.3				304.8				304.8			
CHECK	165.1				228.6				241.3				304.8				304.8			

PIPE DATA

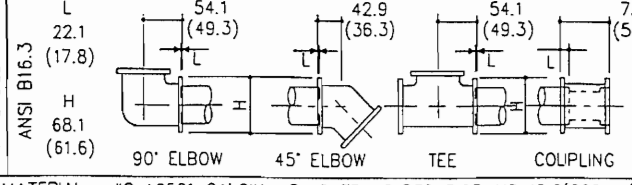
SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)
D=48.26 mm, OUTSIDE SURFACE =0.15 m²/m								
5S	1.65	44.96	2.42	6.57	1.65	2.72	1.90	1.59
10S	2.77	42.72	3.96	10.28	1.61	4.26	3.11	1.43
STD. 40 40S	3.68	40.90	5.16	12.89	1.58	5.34	4.05	1.31
XS. 80 80S	5.08	38.10	6.89	16.28	1.54	6.75	5.41	1.14
160	7.14	33.98	9.22	20.08	1.48	8.32	7.24	0.91
XXS	10.16	27.94	12.16	23.64	1.39	9.79	9.55	0.61

WEIGHT OF FITTING (kg)

SCH.	90° ELBOW	45° ELBOW	TEE FULL	TEE X	TEE X	SWG NIPP.	COUPL.	BOSS	CAP
5S									
10S									
STD. 40 40S									
XS. 80 80S									
160									
XXS									

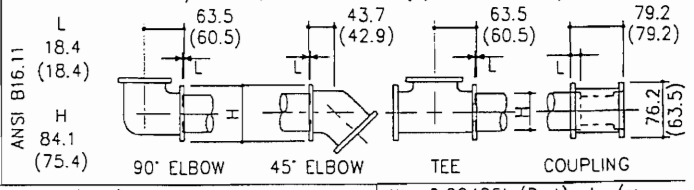
MALLEABLE IRON THREADED FITTING ANSI B16.3

UPPER DIM.FOR CLASS 300; LOWER DIM.IN ( ):FOR CLASS 150



FORGED STEEL THREADED FITTING ANSI B16.11

UPPER DIM.FOR XXS/6000LB, LOWER DIM.IN ( ) FOR SCH.160/3000LB



WEIGHT OF INS.

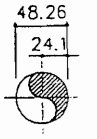
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2(220kg/m³),W=0.000691 T(D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	1.3 (0.9)	1.6 (1.0)	2.4 (1.2)	3.5 (1.4)	5.1 (1.7)	6.4 (1.9)					

Wp=0.02466t (D-t) kg/m
Ww=0.0007854 d² kg/m
A=0.007854 (D²-d²) cm²
I=0.000004909 (D⁴-d⁴) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

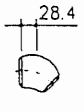
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 1 1/2" — 40mm

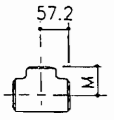


PIPE

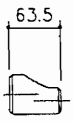
90° ELBOW



45° ELBOW

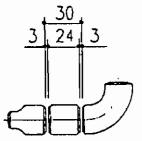


TEE

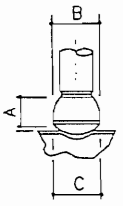


REDUCER

CAP

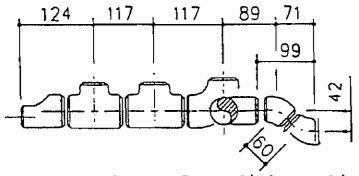


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.3000LB	34.9	73.0	61.9	0.45
6000LB	42.9	82.6	76.2	0.89
STD.	34.9	73.0	61.9	0.47
XS	34.9	73.0	60.3	0.47
SCH.160/XXS				

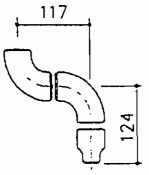
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



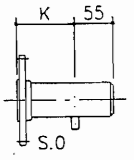
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

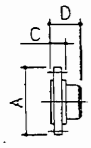
SIZE	M
x 1"	57.2
x	
x	
x	



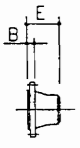
ELBOW+ELBOW
ELBOW+REDUCER



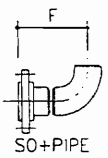
MAX.SIZE OF BOSS= 3/4"



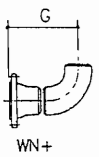
SO+PIPE



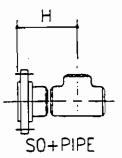
W.N



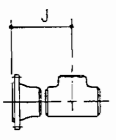
SO+PIPE +90° ELBOW



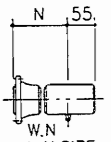
WN+ +90° ELBOW



SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS= 3/4"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5							
	CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	127	156	156	156	156	178	178	203
B	17.5	20.7	28.7	27.1	28.7	38.2	38.2	52.4
C	22.2	30.2	38.2	–	–	–	–	–
D	49	57	65	–	–	–	–	–
E	61.9	68.3	76.2	74.7	76.2	89.0	89.0	119.1
F	109	117	125	–	–	–	–	–
G	122	129	136	135	136	149	149	179
H	129	137	145					
J	122	129	136	135	136	149	149	179
K	80	85	95					
N	120	125	130	130	130	145	145	175
BOLT DIA.	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/8"
BOLT NO.	4	4	4	4	4	4	4	4
BOLT L STUD	75	95	110	110	110	145	145	175
BOLT L MACH	65	75	RING NO.	R20	R20	R20	R20	R23
			S	4.0	4.0	4.0	4.0	3.2
B . C . D	98.6	114.3	114.3			124	124	146.1

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
ANSI B16.5	CL.150	1.3	1.9	1.8
	CL.300	2.5	3.0	2.7
	CL.600	3.0	3.5	3.6
	CL.900	5.4	6.0	5.9
	CL.1500	5.4	6.0	5.9
	CL.2500	10.0	11.3	10.4

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA

RATING & CONN.	ANSI CL.2500 RJ			
T: WEIGHT (kg)	MARK	L	H	W	T
GATE	GATE	387			
GLOBE	GLOBE	387			
CHECK	CHECK	387			

VALVE DATA

RATING & CONN.	ANSI CL.125FF ANSI CL.150RF				ANSI CL.300RF ANSI CL.300RJ				ANSI CL.600RF ANSI CL.600RJ				ANSI CL.900RJ				ANSI CL.1500RJ			
T: WEIGHT (kg)	MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
GATE	GATE	165				191 203				241				305				305			
GLOBE	GLOBE	165				229 241				241				305				305			
CHECK	CHECK	165				241 254				241				305				305			

PIPE DATA

D=48.26 mm OUTSIDE SURFACE =0.15 m²/m SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE x 1"	TEE x 3/4"	TEE x 1/2"	REDUCER x 1"	REDUCER x 3/4"	REDUCER x 1/2"
5S	1.65	44.96	2.42	6.57	1.65	2.72	1.90	1.59	0.170	0.076							
10S	2.77	42.72	3.96	10.28	1.61	4.26	3.11	1.43	0.283	0.130							
STD. 40 40S	3.68	40.90	5.16	12.89	1.58	5.34	4.05	1.31	0.37	0.17	0.60	0.55	0.53	0.52	0.22	0.20	0.19
XS. 80 80S	5.08	38.10	6.89	16.28	1.54	6.75	5.41	1.14	0.49	0.24	0.81	0.73	0.70	0.68	0.29	0.27	0.25
160	7.14	33.98	9.22	20.08	1.48	8.32	7.24	0.91	0.65	1.31	1.07	1.0	0.93		0.38	0.38	0.32
XXS	10.16	27.94	12.16	23.64	1.39	9.79	9.55	0.61	0.87		1.42				0.50	0.45	0.41

WEIGHT OF INS.

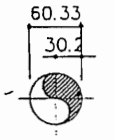
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	1.3 (0.9)	1.6 (1.0)	2.4 (1.2)	3.5 (1.4)	5.1 (1.7)	6.4 (1.9)					

Wp = 0.02466t (D−t) kg/m
Ww = 0.0007854 d² kg/m
A = 0.007854 (D²−d²) cm²
I = 0.000004909 (D⁴−d⁴) cm⁴
Z = 0.00009817 (D⁴−d⁴)/D cm³

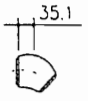
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 2" (50mm)

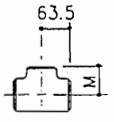


PIPE

90° ELBOW



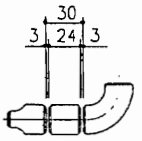
45° ELBOW



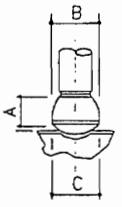
TEE

REDUCER

CAP

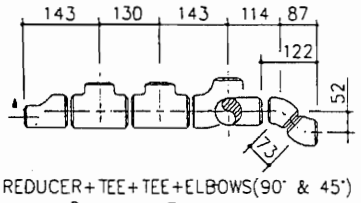


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	38.1	89	65	0.8
XS	38.1	89	65	0.8
SCH.160/XXS	55.6	81	43	1.0

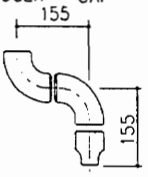
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



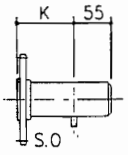
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

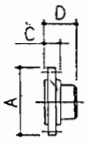
SIZE	M
x1 1/2"	60.5
x 1"	50.8
x	
x	



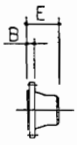
ELBOW+ELBOW
ELBOW+REDUCER



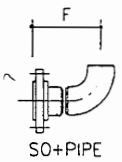
MAX.SIZE
OF BOSS=1"



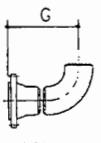
SO+PIPE



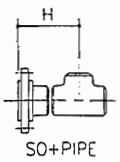
W.N



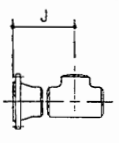
SO+PIPE
+90° ELBOW



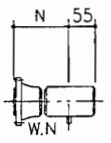
WN+
+90° ELBOW



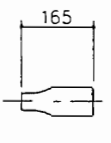
SO+PIPE
+TEE



W.N+TEE



MAX.SIZE
OF BOSS=1"



S.NIPPLE

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	152	165	165	165	165	216	216	235
B	19.1	22.3	31.8	30.3	33.4	46.1	46.1	58.8
C	25.4	33.3	42.9	–	–	–	–	–
D	52	60	70	–	–	–	–	–
E	63.5	69.8	79.4	77.8	81.0	109.6	109.6	134.9
F	132	140	149	–	–	–	–	–
G	143	149	159	157	160	189	189	214
H	139	147	156					
J	130	136	146	144	148	176	176	201
K	80	135	160					
N	120	125	135	135	140	165	165	190
BOLT DIA.	5/8"	5/8"	5/8"	5/8"	5/8"	7/8"	7/8"	1"
BOLT NO.	4	8	8	8	8	8	8	8
BOLT L STUD	85	105	110	110	115	155	155	185
BOLT L MACH	70	75	RING NO.	R23	R23	R24	R24	R26
			S	5.6	4.8	3.2	3.2	3.2
B . C . D	120.7	127	127			165.1	165.1	171.5

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

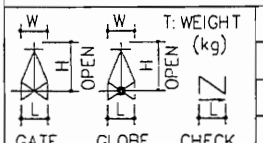
WEIGHT OF FLANGE (kg)

RATING		S.O	W.N	BLIND
ANSI B16.5	CL.150	2.1	2.8	2.3
	CL.300	2.9	3.6	3.6
	CL.600	3.6	4.4	4.5
	CL.900	10.0	11.0	11.3
	CL.1500	10.0	11.0	11.3
	CL.2500	17.2	19.0	17.7

*Bolt Holes are 1/8" larger than bolt diameters.

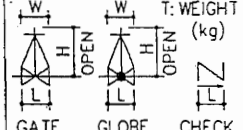
L : ANSI B16.10

VALVE DATA



RATING & CONN. MARK	ANSI CL.2500 RJ L	H	W	T
GATE	454			
GLOBE	454			
CHECK	454			

VALVE DATA



RATING & CONN. MARK	ANSI CL.125FF / ANSI CL.150RF L	H	W	T	ANSI CL.300RF / ANSI CL.300RJ L	H	W	T	ANSI CL.600RF / ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	178	330 / 400	203	19 / 25	216 / 232	457	203	34	292 / 295	464	203	43	371				371			
GLOBE	203	283 / 349	203	13 / 21	267 / 283	451	229	37	292 / 295	483	254	41	371				371			
CHECK	203			11 / 15	267 / 283			28	292 / 295			38	371				371			

PIPE DATA

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X1 1/2"	TEE X 1"	TEE X	REDUCER X1 1/2"	REDUCER X 1"	REDUCER X
D=60.33 mm, OUTSIDE SURFACE =0.19 m^2/m																	
5S	1.65	57.03	3.04	13.10	2.08	4.3	2.39	2.55									
10S	2.77	54.79	5.01	20.79	2.04	6.9	3.93	2.36									
STD. 40 40S	3.91	52.51	6.93	27.71	2.00	9.2	5.44	2.17	0.65	0.23	0.87	0.81	0.74		0.37	0.32	
XS. 80 80S	5.54	49.25	9.53	36.15	1.95	12.0	7.49	1.91	0.89	0.33	1.20	0.11	1.01		0.51	0.44	
160	8.74	42.85	14.17	48.48	1.85	16.1	11.09	1.45	1.33		1.78	1.63			0.75	0.64	
XXS	11.07	38.19	17.13	54.59	1.78	18.1	13.45	1.15	1.62		2.17	2.01			0.91	0.77	

WEIGHT OF INS.

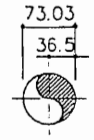
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3),W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	1.9 (1.1)	1.9 (1.1)	2.9 (1.3)	3.7 (1.5)	5.7 (1.8)	7.0 (2.0)					

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

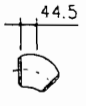
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 2 1/2" (65mm) | PAGE 11

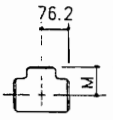


PIPE

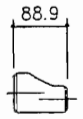
90° ELBOW



45° ELBOW

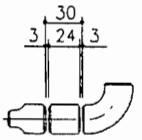


TEE

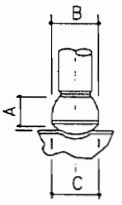


REDUCER

CAP

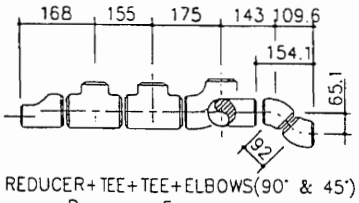


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	41.3	103	76	1.2
XS	41.3	103	76	1.2
SCH.160/XXS	61.9	97	54	1.5

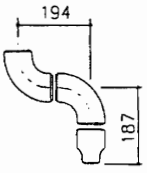
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



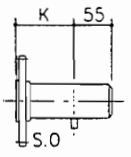
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED. TEE

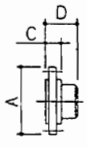
SIZE	M
x 2"	69.9
x1 1/2"	66.5
x 1"	57.2
x	



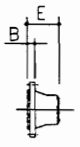
ELBOW+ELBOW
ELBOW+REDUCER



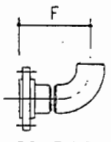
MAX.SIZE OF BOSS=1"



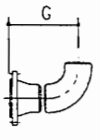
SO+PIPE



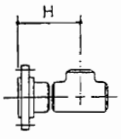
W.N



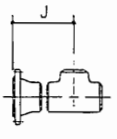
SO+PIPE +90° ELBOW



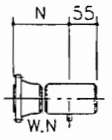
WN+ +90° ELBOW



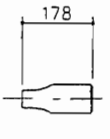
SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=1"



S.NIPPLE

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	178	190	190	190	190	244	244	267
B	22.3	25.4	35.0	33.4	36.6	49.3	49.3	66.7
C	28.6	38.1	47.7	–	–	–	–	–
D	56	65	75	–	–	–	–	–
E	69.8	76.2	85.8	84.2	87.4	112.8	112.8	152.4
F	154	163	173	–	–	–	–	–
G	168	175	184	183	186	211	211	251
H	155	164	174					
J	149	155	165	163	167	192	192	232
K	85	95	105					
N	125	130	140	140	145	170	170	210
BOLT DIA.	5/8"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/8"
BOLT NO.	4	8	8	8	8	8	8	8
BOLT L STUD	90	105	125	125	130	165	165	210
BOLT L MACH	75	90	RING NO.	R26	R26	R27	R27	R28
			S	5.6	4.8	3.2	3.2	3.2
B . C . D	139.7	149.4	149.4			190.5	190.5	196.9

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

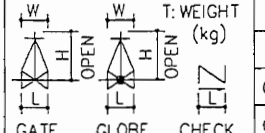
WEIGHT OF FLANGE (kg)

RATING		S.O	W.N	BLIND
ANSI B16.5	CL.150	3.2	4.3	3.2
	CL.300	4.2	5.3	5.4
	CL.600	5.2	6.3	6.8
	CL.900	13.6	15.2	15.9
	CL.1500	13.6	15.2	15.9
	CL.2500	24.9	23.6	25.4

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

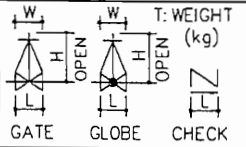
VALVE DATA



GATE GLOBE CHECK

RATING & CONN.	ANSI CL.2500 RJ MARK	L	H	W	T
	GATE	514			
	GLOBE	514			
	CHECK	514			

VALVE DATA



GATE GLOBE CHECK

RATING & CONN.	MARK	ANSI CL.125FF ANSI CL.150RF L	H	W	T	ANSI CL.300RF ANSI CL.300RJ L	H	W	T	ANSI CL.600RF ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
	GATE	191				241 257				330 333				422				422			
	GLOBE	216				292 308				330 333				422				422			
	CHECK	216				292 308				330 333				422				422			

PIPE DATA

D=73.03 mm
OUTSIDE SURFACE =0.23 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A_2 (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X 2"	TEE X1 1/2"	TEE X 1"	REDUCER X 2"	REDUCER X1 1/2"	REDUCER X 1"
5S	2.11	68.81	4.70	30	2.51	8.1	3.69	3.72									
10S	3.05	66.93	6.71	41	2.48	11.3	5.26	3.52									
STD. 40 40S	5.16	62.71	11.00	64	2.41	17.4	8.64	3.09	1.37	0.42	1.74	1.56	1.51	1.44	0.72	0.66	0.59
XS. 80 80S	7.01	59.01	14.54	80	2.35	21.9	11.41	2.73	1.79	0.56	2.28	2.06	1.98	1.85	0.95	0.86	0.76
160	9.52	53.99	18.99	98	2.27	26.8	14.91	2.29	2.34		2.98	2.74	2.59		1.23	1.12	1.00
XXS	14.02	44.99	25.99	120	2.14	32.7	20.40	1.59	3.22		4.10	3.71	3.55		1.68	1.51	1.30

WEIGHT OF INS.

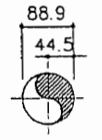
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mmt WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT											

Wp=0.02466t (D-t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

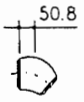
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 3" / 80mm

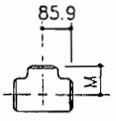


PIPE

90° ELBOW



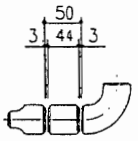
45° ELBOW



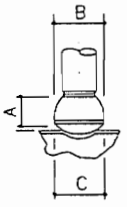
TEE

REDUCER

CAP

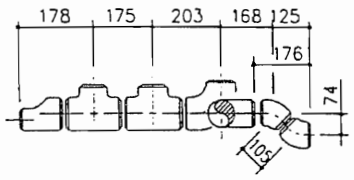


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	44.5	122	94	1.8
XS	44.5	122	94	1.9
SCH.160/XXS	73.0	121	73	2.9

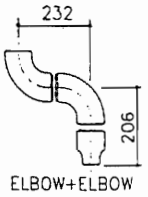
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



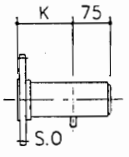
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

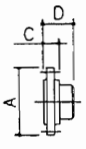
SIZE	M
x2½"	82.6
x 2"	76.2
x1½"	73.2
x	



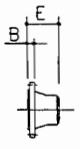
ELBOW+ELBOW
ELBOW+REDUCER



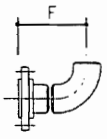
MAX.SIZE OF BOSS=1"



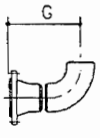
SO+PIPE



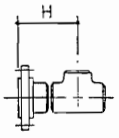
W.N



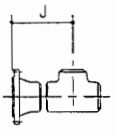
SO+PIPE +90° ELBOW



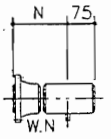
WN+ +90° ELBOW



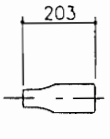
SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=1"



S.NIPPLE

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	190	210	210	210	210	241	267	305
B	23.9	28.6	38.2	36.6	39.8	46.1	55.7	76.2
C	30.2	42.9	52.4	–	–	–	–	–
D	77	90	99	–	–	–	–	–
E	69.8	79.4	89.0	87.4	90.6	109.6	125.5	177.8
F	194	207	216	–	–	–	–	–
G	187	197	206	205	208	227	243	295
H	166	179	188					
J	159	168	178	176	180	199	214	267
K	105	120	130					
N	145	155	165	165	165	185	200	255
BOLT DIA.	5/8"	3/4"	3/4"	3/4"	3/4"	7/8"	1 1/8"	1 1/4"
BOLT NO.	4	8	8	8	8	8	8	8
BOLT L STUD	95	110	130	130	135	155	185	235
BOLT L MACH	85	95	RING NO.	R31	R31	R31	R35	R32
			S	5.6	4.8	4.0	3.2	3.2
B . C . D	152.4	168.1	168.1			190.5	203.2	228.6

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

WEIGHT OF FLANGE (kg)

ANSI B16.5 RATING	S.O	W.N	BLIND
CL.150	3.9	5.2	4.1
CL.300	5.9	7.2	7.3
CL.600	7.0	8.6	9.1
CL.900	11.7	13.9	13.2
CL.1500	18.0	20.1	21.8
CL.2500	37.6	42.6	40.0

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA

RATING & CONN. ANSI CL.2500 RJ	MARK	L	H	W	T
T: WEIGHT (kg)	GATE	584			
	GLOBE	584			
	CHECK	584			

GATE GLOBE CHECK

VALVE DATA

RATING & CONN.	ANSI CL.125FF ANSI CL.150RF				ANSI CL.300RF ANSI CL.300RJ				ANSI CL.600RF ANSI CL.600RJ				ANSI CL.900RJ				ANSI CL.1500RJ			
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
GATE	203	394 / 527	229	32 / 43	283 / 298	591	229	66	356 / 359	654	254	77	384	692	304	118	473			
GLOBE	241	337 / 419	229	23 / 36	318 / 333	521	254	54	356 / 359	597	305	73	384	610	305	102	473			
CHECK	241			18 / 29	318 / 333			54	356 / 359			64	384			82	473			

T: WEIGHT (kg)

GATE GLOBE CHECK

PIPE DATA

D=88.9 mm
OUTSIDE SURFACE =0.28 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE x2½"	TEE x 2"	TEE x1½"	REDUCER x2½"	REDUCER x 2"	REDUCER x1½"
5S	2.11	84.68	5.75	54	3.07	12.2	4.52	5.63									
10S	3.05	82.80	8.23	76	3.04	17.1	6.46	5.38									
STD. 40 40S	5.49	77.92	14.39	126	2.96	28.3	11.29	4.77	2.04	0.66	2.41	2.29	2.21	2.06	0.93	0.85	0.78
XS. 80 80S	7.62	73.66	19.46	162	2.89	36.5	15.27	4.26	2.74	0.92	3.25	3.07	2.85	2.77	1.25	1.13	1.04
160	11.13	66.64	27.19	210	2.78	47.2	21.35	3.49	3.83		4.54	4.25	4.01		1.75	1.57	1.44
XXS	15.24	58.42	35.27	249	2.66	56.1	27.68	2.68	4.97		5.89	5.57	5.18		2.25	2.01	1.83

WEIGHT OF INS.

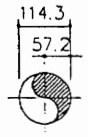
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2(220kg/m³),W=0.000691 T(D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T).(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	2.0 (1.3)	2.4 (1.4)	3.5 (1.6)	4.8 (1.8)	6.8 (2.1)	8.6 (2.3)	13.0 (2.7)				

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d² kg/m
A=0.007854 (D²−d²) cm²
I=0.000004909 (D⁴−d⁴) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

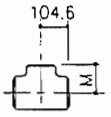
NPS 4" (100mm)



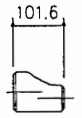
PIPE

90° ELBOW

45° ELBOW

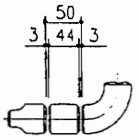


TEE

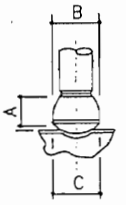


REDUCER

CAP

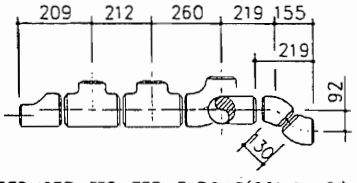


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	50.8	152	121	2.9
XS	50.8	152	121	2.9
SCH.160/XXS	84.1	121	98	4.8

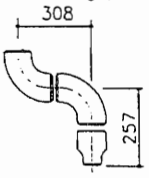
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



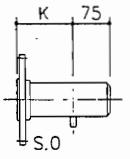
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

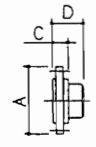
SIZE	M
x 3"	98.6
x2½"	95.3
x 2"	88.9
x1½"	85.9



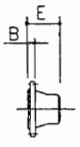
ELBOW+ELBOW
ELBOW+REDUCER



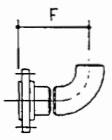
MAX.SIZE OF BOSS=1"



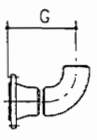
SO+PIPE



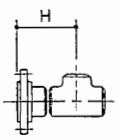
W.N



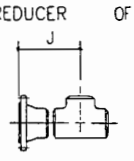
SO+PIPE +90° ELBOW



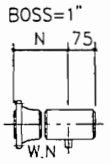
WN+ +90° ELBOW



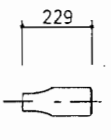
SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=1"



S.NIPPLE

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A A	229	254	273	254	273	292	311	356
B B	23.9	31.8	44.5	39.8	46.1	52.5	62.0	87.3
C C	33.3	47.6	60.4	–	–	–	–	–
D D	80	95	107	–	–	–	–	–
E E	76.2	85.7	108	93.7	109.6	122.3	131.8	201.6
F F	236	250	263	–	–	–	–	–
G G	232	241	263	249	265	278	287	357
H H	188	203	215					
J	184	193	216	201	217	230	239	309
K	110	125	135					
N	150	160	185	170	185	200	210	280
BOLT DIA.	5/8"	3/4"	7/8"	3/4"	7/8"	1 1/8"	1 1/4"	1 1/2"
BOLT NO.	8	8	8	8	8	8	8	8
BOLT L STUD	95	120	150	135	155	180	205	270
BOLT L. MACH	85	100	RING NO.	R37	R37	R37	R39	R38
			S	5.6	4.8	4.0	3.2	4.0
B . C . D	190.5	200.2	215.9			235	241.3	273.1

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

WEIGHT OF FLANGE (kg)

RATING	S.O	W.N	BLIND
ANSI B16.5 CL.150	5.3	7.4	7.7
CL.300	9.7	11.9	12.3
CL.600	14.6	17.5	18.6
CL.900	19.9	22.8	24.5
CL.1500	27.8	30.0	31.1
CL.2500	57.6	65.7	61.2

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA

RATING & CONN. — T: WEIGHT (kg)

GATE GLOBE CHECK

MARK	ANSI CL.2500 RJ L	H	W	T
GATE	683			
GLOBE	683			
CHECK	683			

VALVE DATA

RATING & CONN. — T: WEIGHT (kg)

GATE GLOBE CHECK

MARK	ANSI CL.125FF / CL.150RF L	H	W	T	ANSI CL.300RF / CL.300RJ L	H	W	T	ANSI CL.600RF / CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	229	476 654	254	45 63.5	305 321	718	254	98	432 435	800	356	150	460	800	356	195	549			
GLOBE	292	394 502	254	41 64	356 371	629	356	100	432 435	699	457	145	460	749	508	177	549			
CHECK	292			36 45	356 371			82	432 435			118	460			154	549			

PIPE DATA

D=114.3 mm

OUTSIDE SURFACE =0.36 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE x 3"	TEE x2½"	TEE x 2"	REDUCER x 3"	REDUCER x2½"	REDUCER x 2"
5S	2.11	110.08	7.44	117	3.97	20.5	5.84	9.52									
10S	3.05	108.20	10.66	165	3.93	28.9	8.37	9.19									
STD. 40 40S	6.02	102.26	20.48	301	3.83	52.7	16.07	8.21	3.84	1.17	4.12	3.83	3.71	3.53	1.45	1.37	1.27
XS. 80 80S	8.56	97.18	28.44	400	3.75	70.0	22.32	7.42	5.36	1.68	5.77	5.33	5.15	4.94	2.02	1.90	1.76
120	11.13	92.04	36.07	486	3.67	85.0	28.32	6.65									
160	13.49	87.32	42.72	552	3.60	96.7	33.54	5.99	8.03		8.63	7.91	7.63	7.39	3.01	2.82	2.59
XXS	17.12	80.06	52.27	636	3.49	111.3	41.03	5.03	9.81		10.5	9.73	9.41	9.02	3.65	3.41	3.11

WEIGHT OF INS.

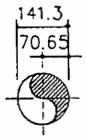
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	2.4 (1.3)	3.1 (1.7)	4.2 (1.9)	5.7 (2.0)	8.1 (2.3)	9.9 (2.5)	14.7 (3.0)				

Wp=0.02466 t(D−t) kg/m
Ww=0.0007854 d² kg/m
A=0.007854 (D²−d²) cm²
I=0.000004909 (D⁴−d⁴) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

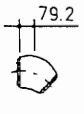
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 5" / 125mm

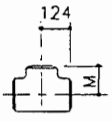


PIPE

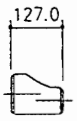
90° ELBOW



45° ELBOW

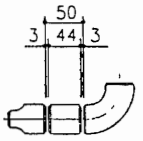


TEE

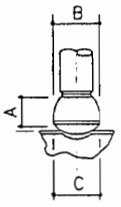


REDUCER

CAP

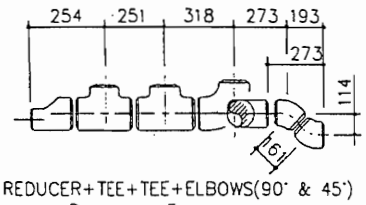


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	57.2	179	141	4.6
XS	57.2	179	141	4.7
SCH.160/XXS	93.7	187	122	6.5

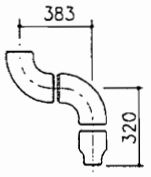
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



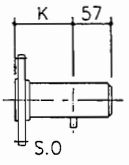
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

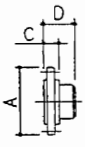
SIZE	M
x 4"	117.3
x 3"	111.3
x2 1/2"	108.0
x 2"	104.6



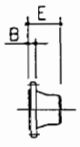
ELBOW+ELBOW
ELBOW+REDUCER



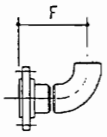
MAX.SIZE
OF BOSS=1"



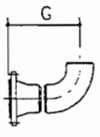
SO+PIPE



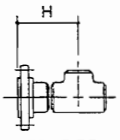
W.N



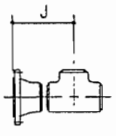
SO+PIPE
+90° ELBOW



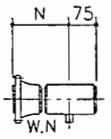
WN+
+90° ELBOW



SO+PIPE
+TEE



W.N+TEE



MAX.SIZE
OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5							
	CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	254	279	330	279	330	349	375	419.1
B	23.9	35.0	50.9	43.0	52.5	58.8	81.1	104.8
C	36.5	50.8	66.7	–	–	–	–	–
D	83.5	97.8	113.7	–	–	–	–	–
E	88.9	98.4	120.7	106.4	122.3	135.0	163.6	241.3
F	277	201	307	–	–	–	–	–
G	282	292	314	300	316	328	357	435
H	210	225	241					
J	216	225	248	233	249	262	291	368
K	110	125	140					
N	165	175	195	180	200	210	240	315
BOLT DIA.	3/4"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"
BOLT NO.	8	8	8	8	8	8	8	8
BOLT L STUD	105	125	170	145	175	200	260	320
BOLT L MACH	85	110	RING NO.	R41	R41	R41	R44	R42
			S	5.6	4.8	4.0	3.2	4.0
B.C.D	215.9	235.0	266.7			279.4	292.1	323.9

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

WEIGHT OF FLANGE (kg)

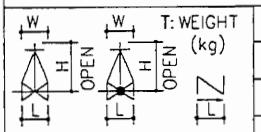
RATING		S.O	W.N	BLIND
ANSI B16.5	CL.150	6.2	9.6	9.1
	CL.300	12.3	16.0	17.1
	CL.600	24.7	29.3	28.0
	CL.900	32.3	37.0	38.0
	CL.1500	52.6	57.1	60.4
	CL.2500	95.1	111.0	101.9

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA

RATING & CONN.



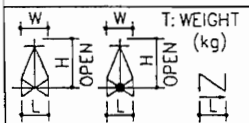
GATE GLOBE CHECK

MARK	L	H	W	T
GATE	806			
GLOBE	806			
CHECK	806			

ANSI CL.2500 RJ

VALVE DATA

RATING & CONN.



GATE GLOBE CHECK

MARK	ANSI CL.125FF ANSI CL.150RF				ANSI CL.300RF ANSI CL.300RJ				ANSI CL.600RF ANSI CL.600RJ				ANSI CL.900RJ				ANSI CL.1500RJ			
	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
GATE	254				381 397				508 511				562				676			
GLOBE	356				400 416				508 511				562				676			
CHECK	330				400 416				508 511				562				676			

PIPE DATA

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X 4"	TEE X 3"	TEE 2 1/2"	REDUCER X 4"	REDUCER X 3"	REDUCER 2 1/2"
D=141.3 mm OUTSIDE SURFACE =0.44 m²/m																	
5S	2.77	135.76	12.06	289	4.90	40.9	9.46	14.48									
10S	3.40	134.50	14.73	350	4.88	49.6	11.56	14.21									
STD. 40 40S	6.55	128.20	27.73	631	4.77	89.3	21.77	12.91	6.48	1.90	6.54	6.13	5.83	5.72	2.50	2.27	2.16
XS. 80 80S	9.52	122.26	39.41	860	4.67	121.7	30.94	11.74	9.13	2.73	9.20	8.63	8.19	8.01	3.52	3.18	3.02
120	12.70	115.90	51.31	1071	4.57	151.6	40.28	10.55									
160	15.88	109.54	62.57	1250	4.47	176.9	49.11	9.42	14.5		14.6	13.6	12.9	12.6	5.57	5.00	4.73
XXS	19.05	103.20	73.16	1400	4.37	198.1	57.43	8.36	16.9		17.1	16.0	15.2	14.8	6.47	5.78	5.46

WEIGHT OF INS.

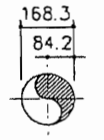
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T), (kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT											

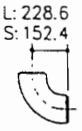
Wp = 0.02466t (D−t) kg/m
Ww = 0.0007854 d^2 kg/m
A = 0.007854 (D^2-d^2) cm^2
I = 0.000004909 (D^4-d^4) cm^4
Z = 0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 6" | 150mm | PAGE 15

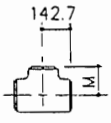


PIPE

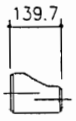


90° ELBOW

45° ELBOW

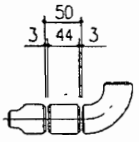


TEE

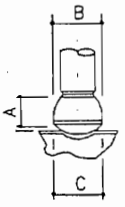


REDUCER

CAP

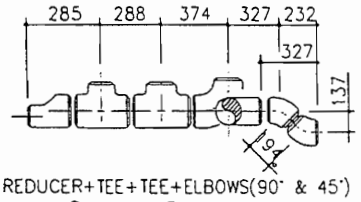


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	60.3	216	170	6.4
XS	77.8	225	170	10.4
SCH.160/XXS	104.8	221	147	12.7

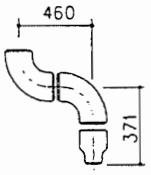
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



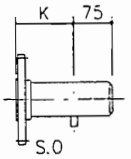
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED. TEE

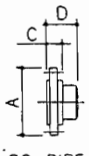
SIZE	M
x 5"	136.7
x 4"	130
x 3"	124
x2½"	120.7



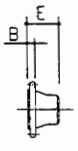
ELBOW+ELBOW
ELBOW+REDUCER



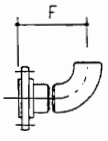
MAX.SIZE OF BOSS=1"



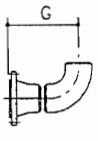
SO+PIPE



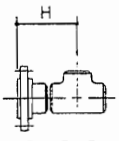
W.N



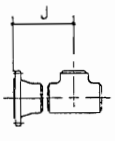
SO+PIPE +90° ELBOW



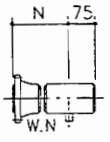
WN+ +90° ELBOW



SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A A	279	318	356	318	356	381	394	483
B B	25.4	36.6	54.1	44.6	55.7	63.6	92.2	120.7
C C	39.7	52.4	73.1	–	–	–	–	–
D D	87	99	120	–	–	–	–	–
E E	88.9	98.4	123.9	106.4	125.5	147.7	181.0	285.8
F F	319	331	352	–	–	–	–	–
G G	321	330	356	338	357	379	413	517
H H	233	245	266					
J	235	244	270	252	271	293	327	432
K	115	130	150					
N	165	175	200	180	200	225	255	360
BOLT DIA.	3/4"	3/4"	1"	3/4"	1"	1 1/8"	1 3/8"	2"
BOLT NO.	8	12	12	12	12	12	12	8
BOLT L STUD	105	130	175	145	180	205	275	365
BOLT L MACH	90	110	RING NO.	R45	R45	R45	R46	R47
			S	5.6	4.8	4.0	3.2	4.0
B . C . D	241.3	269.7	292.1			317.5	317.5	368.3

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

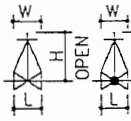
WEIGHT OF FLANGE (kg)

RATING		S.O	W.N	BLIND
ANSI B16.5	CL.150	7.7	12.1	11.8
	CL.300	15.9	20.8	22.7
	CL.600	29.6	35.3	39.0
	CL.900	41.8	48.4	52.2
	CL.1500	62.2	69.0	72.6
	CL.2500	147.2	172.1	156.3

*Bolt Holes are 1/8" larger than bolt diameters.

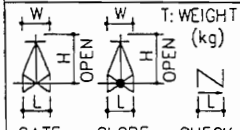
L : ANSI B16.10

VALVE DATA



RATING & CONN. ANSI CL.2500 RJ	L	H	W	T
GATE	927			
GLOBE	927			
CHECK	927			

VALVE DATA



RATING & CONN.	ANSI CL.125FF ANSI CL.150RF				ANSI CL.300RF ANSI CL.300RJ				ANSI CL.600RF ANSI CL.600RJ				ANSI CL.900RJ				ANSI CL.1500RJ			
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
GATE	267	591 895	305 356	77 109	403 419	978	356	191	559 562	1086	508	327	613	1086	508	408	711			
GLOBE	356 406	495 622	305	82 113	445 460	756	457	177	559 562	889	610	290	613	959	686	417	711			
CHECK	356			68 91	445 460			150	559 562			240	613			290	711			

PIPE DATA

D=168.3 mm OUTSIDE SURFACE =0.53 m²/m SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X 5"	TEE X 4"	TEE X 3"	REDUCER X 4"	REDUCER X 3"	REDUCER X 3"
5S	2.77	162.76	14.40	494	5.85	58.6	11.31	20.81									
10S	3.40	161.50	17.61	599	5.83	71.2	13.83	20.48									
STD. 40 40S	7.11	154.08	36.00	1172	5.70	139.2	28.26	18.65	9.94	2.83	9.58	9.08	8.67	8.38	3.75	3.30	3.04
XS. 80 80S	10.97	146.36	54.22	1686	5.57	200.3	42.56	16.82	15.0	4.38	14.5	13.6	13.0	12.6	5.38	4.96	4.56
120	14.27	139.76	69.05	2066	5.47	245.4	54.20	15.34									
160	18.26	131.78	86.07	2458	5.34	292.1	67.56	13.64	23.7		22.8	21.5	20.5	19.7	8.45	7.75	7.08
XXS	21.95	124.40	100.92	2763	5.23	328.3	79.22	12.15	27.8		26.8	25.2	24.1	23.2	9.89	8.98	8.21

WEIGHT OF INS.

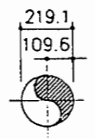
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³),W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mmt WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	3.3 (2.0)	4.0 (2.1)	5.7 (2.3)	7.5 (2.5)	10.3 (2.8)	12.5 (3.0)	18.3 (3.5)				

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d² kg/m
A=0.007854 (D²−d²) cm²
I=0.000004909 (D⁴−d⁴) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

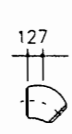
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 8" / 200mm

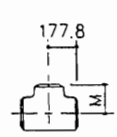


PIPE

90° ELBOW

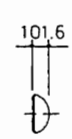


45° ELBOW

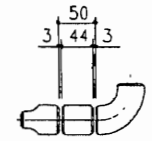


TEE

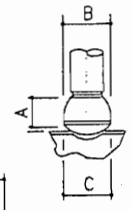
REDUCER



CAP

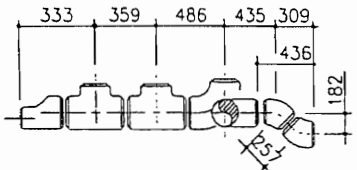


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	69.9	264	221	10.6
XS	98.4	292	221	16.8
SCH.160/XXS	111.1	284	173	20.4

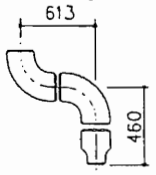
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



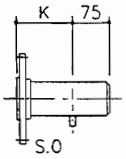
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED. TEE

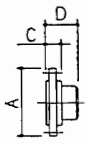
SIZE	M
x 6"	168.1
x 5"	162.1
x 4"	155.4
x	



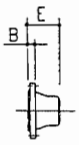
ELBOW+ELBOW
ELBOW+REDUCER



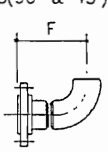
MAX.SIZE
OF BOSS=1"



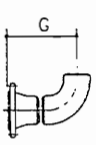
SO+PIPE



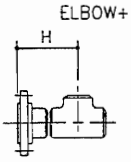
W.N



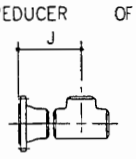
SO+PIPE
+90° ELBOW



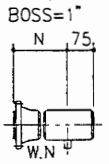
WN+
+90° ELBOW



SO+PIPE
+TEE



W.N+TEE



MAX.SIZE
OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	343	381	419	381	419	470	483	552
B	28.6	41.3	62.0	49.3	63.6	71.5	103.3	141.3
C	44.4	61.9	82.6	–	–	–	–	–
D	91	109	130	–	–	–	–	–
E	101.6	111.1	139.8	119.1	141.4	169.9	223.9	331.8
F	399	417	438	–	–	–	–	–
G	409	419	448	427	449	478	532	640
H	272	290	311					
J	282	292	321	300	322	351	405	513
K	120	140	160					
N	180	185	215	195	215	245	300	410
BOLT DIA.	3/4"	7/8"	1 1/8"	7/8"	1 1/8"	1 3/8"	1 5/8"	2"
BOLT NO.	8	12	12	12	12	12	12	12
BOLT L STUD	115	145	200	165	205	235	330	400
BOLT L MACH	95	120	RING NO.	R49	R49	R49	R50	R51
			S	5.6	4.8	4.0	4.0	4.8
B . C . D	298.5	330.2	349.3			393.7	393.7	438.2

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

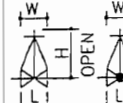
WEIGHT OF FLANGE (kg)

ANSI B16.5 RATING	S.O	W.N	BLIND
CL.150	12.5	20.1	20.4
CL.300	24.7	32.2	36.7
CL.600	44.1	53.6	63.5
CL.900	72.3	83.3	90.7
CL.1500	104.5	118.4	136.1
CL.2500	219.7	262.7	240.1

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

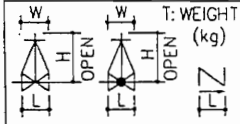
VALVE DATA



RATING & CONN. ANSI CL.2500 RJ	L	H	W	T
GATE	1038			
GLOBE	1038			
CHECK	1038			

T: WEIGHT (kg)

VALVE DATA



T: WEIGHT (kg)

RATING & CONN.	ANSI CL.125FF / ANSI CL.150RF				ANSI CL.300RF / ANSI CL.300RJ				ANSI CL.600RF / ANSI CL.600RJ				ANSI CL.900RJ				ANSI CL.1500RJ			
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
GATE	292	699 1118	406	141 181	419 435	1194	406	318	660 664	1327	610	553	740	1327	610	708	841			
GLOBE	495				569 575				660 664				740				841			
CHECK	495			132 177	533 549			281	660 664			408	740			535	841			

PIPE DATA

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg): 90° LR ELBOW	CAP	TEE FULL	TEE X 5"	TEE X 4"	TEE X 3"	REDUCER X 4"	REDUCER X 3"	REDUCER X 3"
D=219.1 mm OUTSIDE SURFACE =0.69 m^2/m																	
5S	2.77	213.56	18.83	1101	7.65	100.5	14.78	35.82									
10S	3.76	211.58	25.44	1475	7.61	134.6	19.97	35.16									
20	6.35	206.40	42.44	2404	7.52	219.4	33.31	33.46									
30	7.04	205.02	46.90	2639	7.50	240.9	36.81	33.01									
STD. 40 40S	8.18	202.74	54.20	3019	7.46	275.5	42.55	32.28	20.1	5.11	17.9	16.6	16.1	15.7	5.71	5.40	5.10
60	10.31	198.48	67.63	3694	7.39	337.2	53.08	30.94									
XS. 80 80S	12.70	193.70	82.35	4402	7.31	401.8	64.64	29.47	30.5	7.91	27.1	25.2	24.7	23.7	8.63	8.14	7.68
100	15.09	188.92	96.71	5059	7.23	461.8	75.92	28.03									
120	18.26	182.58	115.21	5857	7.13	534.6	90.44	26.18									
140	20.62	177.86	128.57	6400	7.05	584.2	100.92	24.85									
XXS	22.22	174.66	137.43	6744	7.00	615.6	107.9	23.96	50.8		45.2	42.4	40.8	39.7	14.3	13.4	12.6
160	23.01	173.08	141.75	6907	6.98	630.4	111.3	23.53	52.5		46.6	43.0	41.6	40.6	14.7	13.8	12.9

WEIGHT OF INS.

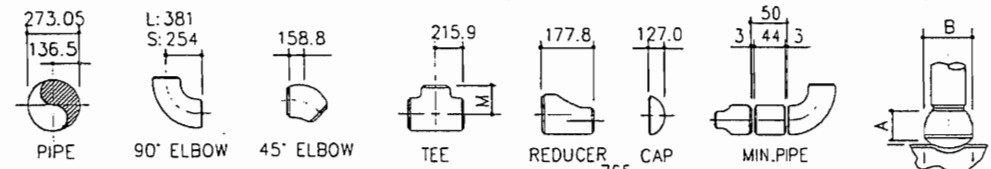
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3),W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	4.2 (2.5)	5.1 (2.6)	7.0 (2.8)	9.2 (3.0)	12.5 (3.3)	15.2 (3.5)	21.8 (3.9)	29.5 (4.4)			

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
$Z=0.00009817\ \frac{(D^4-d^4)}{D}$ cm^3

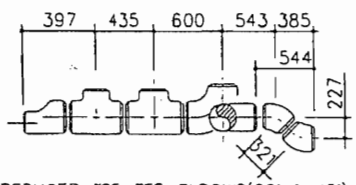
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 10" (250mm) | PAGE 17



RATING	A	B	C	WEIGHT (kg)
STD.	77.8	322	274	17.7
XS	93.7	324	265	20.8
SCH.160/XXS	125.4	313	216	38.5

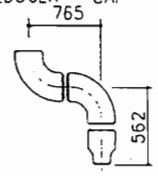
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



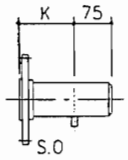
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

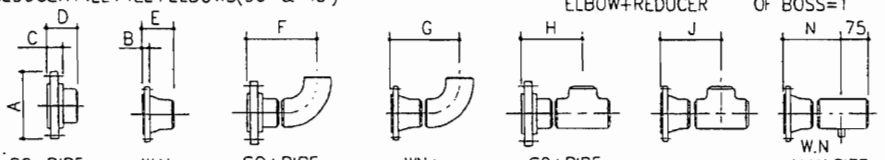
SIZE	M
x 8"	203.2
x 6"	193.5
x 5"	190.5
x 4"	184.2



ELBOW+ELBOW
ELBOW+REDUCER



MAX.SIZE
OF BOSS=1"



SO+PIPE | W.N | SO+PIPE +90° ELBOW | WN+ +90° ELBOW | SO+PIPE +TEE | W.N+TEE | W.N MAX.SIZE OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	406	444	508	444	508	546	584	673
B	30.2	47.7	69.9	55.7	71.5	77.9	119.2	182.6
C	49.2	66.7	92.1	–	–	–	–	–
D	95	114	139	–	–	–	–	–
E	101.6	117.5	158.8	125.5	160.4	192.2	265.2	436.6
F	480	498	523	–	–	–	–	–
G	486	502	543	510	544	576	649	821
H	315	333	358					
J	321	336	378	344	379	411	484	656
K	125	145	170					
N	180	195	235	200	235	270	340	515
BOLT DIA.	7/8"	1"	1 1/4"	1"	1 1/4"	1 3/8"	1 7/8"	2 1/2"
BOLT NO.	12	16	16	16	16	16	12	12
BOLT L STUD	120	165	220	180	230	245	350	515
BOLT L MACH	100	140	RING NO.	R53	R53	R53	R54	R55
			S	5.6	4.8	4.0	4.0	6.4
B . C . D	362	387.4	431.8			469.9	482.6	539.8

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

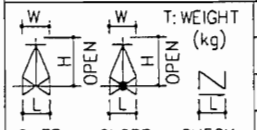
WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
ANSI B16.5	CL.150	17.5	28.3	31.8
	CL.300	35.7	46.6	56.7
	CL.600	71.9	89.1	104.2
	CL.900	102.7	123.8	131.5
	CL.1500	178.6	208.2	231.3
	CL.2500	421.3	487.0	464.3

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA



RATING & CONN.	ANSI CL.2500 RJ MARK	L	H	W	T
	GATE	1292			
	GLOBE	1292			
	CHECK	1292			

VALVE DATA

RATING & CONN.	MARK	ANSI CL.125FF ANSI CL.150RF L	H	W	T	ANSI CL.300RF ANSI CL.300RJ L	H	W	T	ANSI CL.600RF ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
	GATE	330	838 1334	508 457	209 285	457 473	1435	508	476	787 790	1581	686	853	841	1581	686	1066	1000			
	GLOBE	622				622 638				787 790				841				1000			
	CHECK	622			204 231	622 638			417	787 790			653	841				1000			

PIPE DATA

D=273.05 mm
OUTSIDE SURFACE =0.86 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X 8"	TEE X 6"	TEE X 5"	REDUCER X 8"	REDUCER X 6"	REDUCER X 4"
5S	3.40	266.25	28.80	2618	9.53	191.8	22.61	55.68									
10S	4.19	264.67	35.39	3199	9.51	234.3	27.78	55.02									
20	6.35	260.35	53.20	4733	9.43	346.7	41.76	53.24									
30	7.80	257.45	65.00	5722	9.38	419.0	51.02	52.06									
STD. 40 40S	9.27	254.51	76.82	6690	9.33	490.0	60.30	50.87	35.4	8.92	30.4	28.5	27.2	26.8	9.58	8.78	8.06
XS. 60 80S	12.70	247.65	103.9	8823	9.22	646.2	81.54	48.17									
80	15.09	242.87	122.29	10207	9.14	747.6	95.99	46.35	56.2	16.4	48.3	45.0	43.2	42.3	15.2	13.9	12.7
100	18.26	236.53	146.16	11922	9.03	873.2	114.73	43.94									
120	21.44	230.17	169.47	13509	8.93	989.4	133.03	41.61									
XXS.140	25.40	222.25	197.6	15310	8.80	1121	155.1	38.79	90.7								
160	28.57	215.91	219.4	16619	8.70	1217	172.2	36.61	101.0		86.6	80.3	76.7	39.7	27.0	24.5	22.1

WEIGHT OF INS.

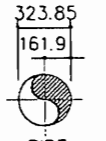
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3),W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	5.1 (3.0)	6.2 (3.1)	8.6 (3.3)	11.0 (3.5)	15.0 (3.8)	17.8 (3.9)	25.3 (4.4)	33.9 (4.9)			

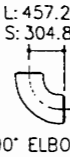
Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 12" / 300mm

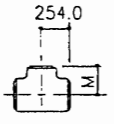


PIPE



90° ELBOW

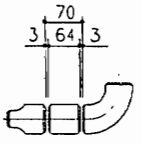
45° ELBOW



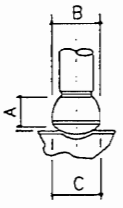
TEE

REDUCER

CAP

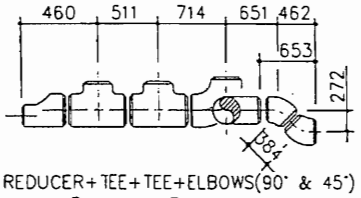


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.	85.7	378	325	26.7
XS	103.2	379	318	27.6
SCH.160/XXS				

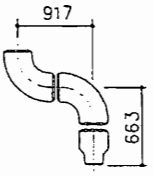
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



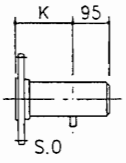
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

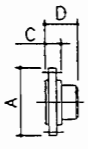
SIZE	M
x10"	241.3
x 8"	228.6
x 6"	218.9
x 5"	215.9



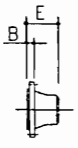
ELBOW+ELBOW
ELBOW+REDUCER



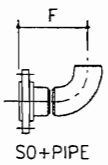
MAX.SIZE
OF BOSS=1"



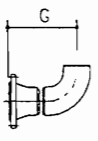
SO+PIPE



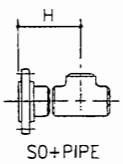
W.N



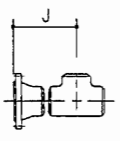
SO+PIPE
+90° ELBOW



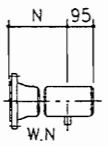
WN+
+90° ELBOW



SO+PIPE
+TEE



W.N+TEE



MAX.SIZE
OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	483	521	559	521	559	610	673	762
B	31.8	50.8	73.1	58.8	74.7	87.4	138.2	201.6
C	55.6	73.0	98.5	–	–	–	–	–
D	123	140	166	–	–	–	–	–
E	114.3	130.2	162.0	138.2	163.6	208.0	296.9	481.0
F	583	600	626	–	–	–	–	–
G	575	590	622	598	624	668	757	941
H	380	397	423					
J	371	387	419	395	421	465	554	738
K	150	170	195					
N	210	225	260	235	260	305	395	575
BOLT DIA.	7/8"	1 1/8"	1 1/4"	1 1/8"	1 1/4"	1 3/8"	2"	2 3/4"
BOLT NO.	12	16	20	16	20	20	16	12
BOLT L STUD	125	180	230	195	235	265	400	565
BOLT L MACH	110	150	RING NO.	R57	R57	R57	R58	R60
			S	5.6	4.8	4.0	4.8	7.9
B . C . D	431.8	450.9	489			533.4	571.5	619.3

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

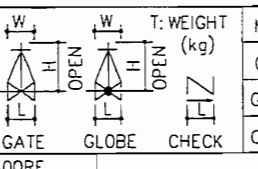
WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
ANSI B16.5	CL.150	27.4	43.0	49.9
	CL.300	51.6	69.0	83.9
	CL.600	95.4	110.2	133.8
	CL.900	136.7	166.9	188.3
	CL.1500	267.8	313.1	313.0
	CL.2500	498.3	690.8	588.9

*Bolt Holes are 1/8" larger than bolt diameters.

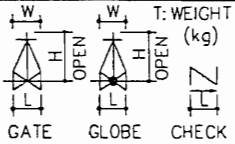
L : ANSI B16.10

VALVE DATA — RATING & CONN. — ANSI CL.2500 RJ



MARK	L	H	W	T
GATE	1445			
GLOBE	1445			
CHECK	1445			

VALVE DATA — RATING & CONN.



MARK	ANSI CL.125FF / ANSI CL.150RF L	H	W	T	ANSI CL.300RF / ANSI CL.300RJ L	H	W	T	ANSI CL.600RF / ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	356	927 1537	508 457	313 376	502 518	1632	508	676	838 841	1778	686	1193	968	1867	762	1588	1146			
GLOBE	699				711 727				838 841				968				1146			
CHECK	699			304 352	711 727			585	838 841			894	968				1146			

PIPE DATA — D=323.85 mm — OUTSIDE SURFACE =1.02 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg): 90° LR ELBOW	CAP	TEE FULL	TEE X 8"	TEE X 6"	TEE X 5"	REDUCER X 8"	REDUCER X 6"	REDUCER X 4"
5S	3.96	315.93	39.80	5092	11.30	314.4	31.24	78.39									
10S	4.57	314.71	45.84	5843	11.29	360.8	35.98	77.79									
20	6.35	311.15	63.34	7985	11.23	493.7	49.72	76.04									
30	8.38	307.09	83.05	10340	11.16	638.5	65.19	74.07									
STD. 40S	9.52	304.81	94.01	11622	11.12	717.7	73.79	72.97									
40	10.31	303.23	101.6	12494	11.09	771.5	79.72	72.22	56.2	14.1	47.2	44.6	42.7	41.4	14.7	13.7	12.8
XS 80S	12.70	298.45	124.1	15049	11.01	929.3	97.45	69.96									
60	14.27	295.31	138.8	16663	10.96	1029	108.9	68.49									
80	17.48	288.89	168.2	19805	10.85	1223	132.06	65.55	92.7	26.4	77.9	73.3	70.1	68.1	24.2	22.5	20.9
100	21.44	280.97	203.69	23403	10.72	1445	159.9	62.0									
XXS.120	25.40	273.05	238.2	26710	10.59	1649	186.9	58.56	132.0								
140	28.57	266.71	265.0	29157	10.49	1800	208.0	55.87									
160	33.32	257.21	304.1	32511	10.34	2008	238.7	51.96	168.0		141.0	133.0	127.0		47.6	40.3	37.2

WEIGHT OF INS.

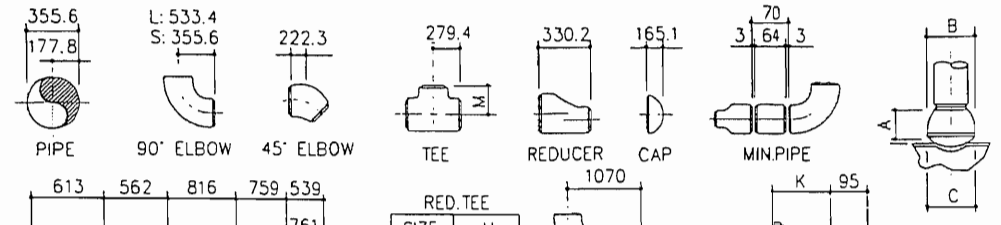
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	5.9 (3.5)	7.3 (3.6)	9.9 (3.8)	12.8 (4.0)	17.2 (4.2)	20.5 (4.4)	29.0 (4.9)	38.3 (5.4)			

$Wp = 0.02466t\,(D-t)$ kg/m
$Ww = 0.0007854\,d^2$ kg/m
$A = 0.007854\,(D^2-d^2)$ cm²
$I = 0.000004909\,(D^4-d^4)$ cm⁴
$Z = 0.00009817\,\frac{(D^4-d^4)}{D}$ cm³

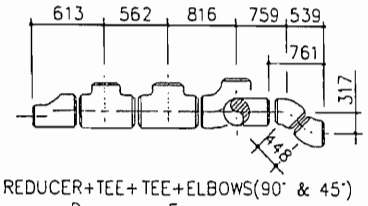
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 14" (350mm)



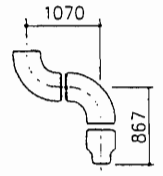
RATING	A	B	C	WEIGHT (kg)
STD.	88.9	410	357	30.0
XS	100.0	432	351	31.7
SCH.160/XXS				

BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET

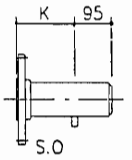


REDUCER+TEE+TEE+ELBOWS(90° & 45°)

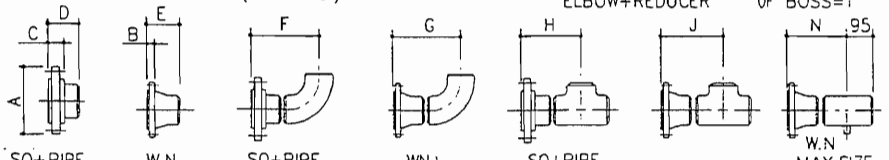
RED.TEE	
SIZE	M
x12"	269.7
x10"	257
x 8"	247.7
x 6"	238.3



ELBOW+ELBOW
ELBOW+REDUCER



MAX.SIZE
OF BOSS=1"



SO+PIPE | W.N | SO+PIPE +90° ELBOW | WN+ +90° ELBOW | SO+PIPE +TEE | W.N+TEE | MAX.SIZE OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	533	584	603	584	603	641	749	
B	35.0	54.0	76.3	62.0	77.9	97.0	149.3	
C	57.2	76.2	100.1	–	–	–	–	
D	124	143	167	–	–	–	–	
E	127	142.9	171.5	150.9	173.1	223.9	314.3	
F	660	679	703	–	–	–	–	
G	663	679	708	687	710	760	851	
H	406	425	449					
J	409	425	454	433	456	506	597	
K	155	170	195					
N	225	240	270	245	270	320	410	
BOLT DIA.	1"	1 1/8"	1 3/8"	1 1/8"	1 3/8"	1 1/2"	2 1/4"	
BOLT NO.	12	20	20	20	20	20	16	
BOLT L STUD	140	185	240	200	245	290	435	
BOLT L MACH	115	160	RING NO.	R61	R61	R62	R63	
			S	5.6	4.8	4.0	5.6	
B . C . D	476.3	514.4	527.1			558.8	635	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

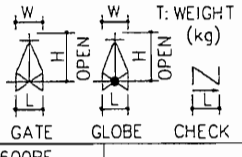
WEIGHT OF FLANGE (kg)

RATING	S.O	W.N	BLIND	
ANSI B16.5 CL.150	34.7	56.2	63.5	
CL.300	69.8	93.4	113.4	
CL.600	98.7	126.9	161.1	
CL.900	153.9	189.3	255.9	
CL.1500		465.5	442.3	
CL.2500				

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

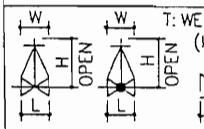
VALVE DATA



T: WEIGHT (kg)

RATING & CONN. MARK	ANSI CL.2500 RJ L	H	W	T
GATE				
GLOBE				
CHECK				

VALVE DATA



T: WEIGHT (kg)

RATING & CONN. MARK	ANSI CL.125FF ANSI CL.150RF L	H	W	T	ANSI CL.300RF ANSI CL.300RJ L	H	W	T	ANSI CL.600RF ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	381	1003 1784	508 559	236 522	762 778	1911	686	984	889 892	1962	762	1452	1038	1962	762	2123	1276			
GLOBE																				
CHECK	787 889			435 544	838 854				889 892				1038				1276			

PIPE DATA

D=355.6 mm
OUTSIDE SURFACE =1.12 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X12"	TEE X10"	TEE X 8"	REDUCER X12"	REDUCER X10"	REDUCER X 8"
5S	3.96	347.68	43.75	6763	12.43	380.3	34.34	94.94									
10S	4.78	346.04	52.68	8107	12.40	455.9	41.35	94.05									
10	6.35	342.90	69.67	10627	12.35	597.6	54.69	92.35									
20	7.92	339.76	86.51	13079	12.30	735.5	67.90	90.66									
STD. 30	9.53	336.54	103.61	15524	12.24	873.0	81.33	88.96									
40	11.13	333.34	120.4	17885	12.19	1006	94.55	87.27	79.0		62.3	59.9	57.4	55.6	14.7	13.7	12.8
XS	12.70	330.20	136.8	20137	12.13	1132	107.4	85.63									
60	15.09	325.42	161.4	23443	12.05	1318	126.5	83.20									
80	19.05	317.50	201.4	28610	11.92	1609	158.1	79.17	132.0		105.0	100.0	96.0	55.6	49.3	45.7	42.2
100	23.83	307.94	248.4	34352	11.76	1932	194.96	74.48									
120	27.79	300.02	286.2	38721	11.63	2178	224.65	70.7									
140	31.75	292.10	323.0	42758	11.50	2405	253.6	67.01									
160	35.71	284.18	358.9	46479	11.38	2614	281.7	63.43	236.0		186.0	179.0	171.0		87.7	80.9	74..

WEIGHT OF INS.

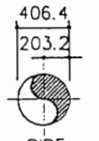
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	6.6 (4.5)	7.9 (4.6)	11.0 (4.8)	14.1 (5.0)	18.9 (5.4)	22.4 (5.6)	31.5 (6.1)	41.6 (6.7)	52.4 (7.2)		

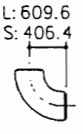
Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 16" (400mm) | PAGE 20

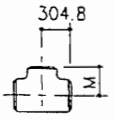


PIPE

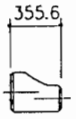


90° ELBOW

45° ELBOW

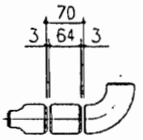


TEE

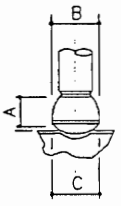


REDUCER

CAP

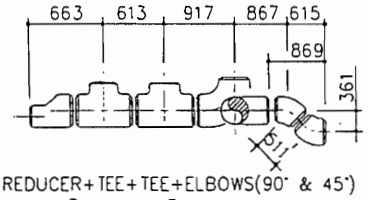


MIN.PIPE



RATING	A	B	C	WEIGHT (kg)
STD.				
XS				
SCH.160/XXS				

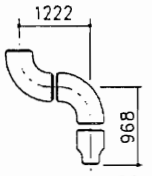
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET



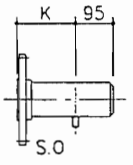
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

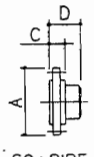
SIZE	M
x14"	304.8
x12"	295.1
x10"	282.4
x 8"	273.1
x 6"	263.7



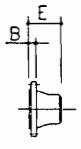
ELBOW+ELBOW
ELBOW+REDUCER



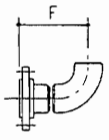
MAX.SIZE OF BOSS=1"



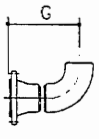
SO+PIPE



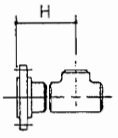
W.N



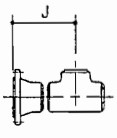
SO+PIPE +90° ELBOW



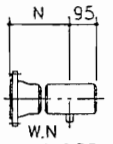
WN+ +90° ELBOW



SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=1"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	597	648	686	648	686	705	826	
B	36.6	57.2	82.6	65.2	84.2	100.1	163.6	
C	63.5	82.6	112.8	–	–	–	–	
D	131	150	180	–	–	–	–	
E	127.0	146.0	184.2	154.0	185.8	227.1	328.7	
F	744	763	793	–	–	–	–	
G	740	759	797	767	798	840	941	
H	439	458	488					
J	435	454	492	462	494	535	637	
K	160	180	210					
N	225	240	280	250	280	325	425	
BOLT DIA.	1"	1 1/4"	1 1/2"	1 1/4"	1 1/2"	1 5/8"	2 1/2"	
BOLT NO.	16	20	20	20	20	20	16	
BOLT L STUD	140	195	260	215	265	305	475	
BOLT L MACH	120	165	RING NO.	R65	R65	R66	R67	
			S	5.6	4.8	4.0	7.9	
B . C . D	539.8	571.5	603.3			616	704.9	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

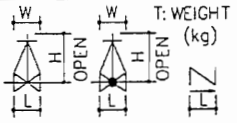
WEIGHT OF FLANGE (kg)

RATING		S.O	W.N	BLIND	
ANSI B16.5	CL.150	44.2	73.2	81.6	
	CL.300	87.6	119.6	133.8	
	CL.600	143.0	181.7	224.6	
	CL.900	184.8	234.7	272.2	
	CL.1500		525.0	589.7	
	CL.2500				

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

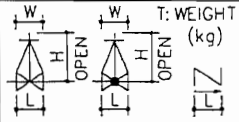
VALVE DATA — RATING & CONN. ANSI CL.2500 RJ



GATE GLOBE CHECK

MARK	L	H	W	T
GATE				
GLOBE				
CHECK				

VALVE DATA — RATING & CONN.



GATE GLOBE CHECK

MARK	ANSI CL.125FF ANSI CL.150RF L	H	W	T	ANSI CL.300RF ANSI CL.300RJ L	H	W	T	ANSI CL.600RF ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	406	1232 2026	508 610	236 717	838 854	2057	686	1270	991 994	2127	762	1919	1140	2178	914	2948	1407			
GLOBE																				
CHECK																				

PIPE DATA — D=406.40 mm, OUTSIDE SURFACE =1.28 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X14"	TEE X12"	TEE X10"	REDUCER X14"	REDUCER X12"	REDUCER X10"
5S	4.19	398.02	52.94	10708	14.22	526.9	41.56	124.4									
10S	4.78	396.84	60.31	12162	14.20	598.5	47.34	123.7									
10	6.35	393.70	79.81	15970	14.15	785.9	62.64	121.7									
20	7.92	390.56	99.15	19688	14.09	968.8	77.83	119.8	74.3								
STD. 30	9.52	387.36	118.7	23386	14.04	1151	93.17	117.8	89.0								
XS 40	12.70	381.00	157.1	30467	13.93	1499	123.3	114.0	118.0	26.7	87.7	84.7	82.4	79.9	41.1	39.2	36.8
60	16.66	373.08	204.0	38804	13.79	1909	160.1	109.3	153.6								
80	21.44	363.52	259.3	48184	13.63	2371	203.5	103.8	194.0	49.0	144.0	140.0	136.0	131.0	67.7	64.5	60.3
100	26.19	354.02	312.8	56800	13.47	2795	245.6	98.43	235.2								
120	30.96	344.48	365.2	64781	13.32	3188	286.6	93.2	274.0								
140	36.53	333.34	424.5	73299	13.14	3607	333.2	87.27	318.8								
160	40.49	325.42	465.4	78857	13.02	3880	365.4	83.20	342.5								

WEIGHT OF INS.

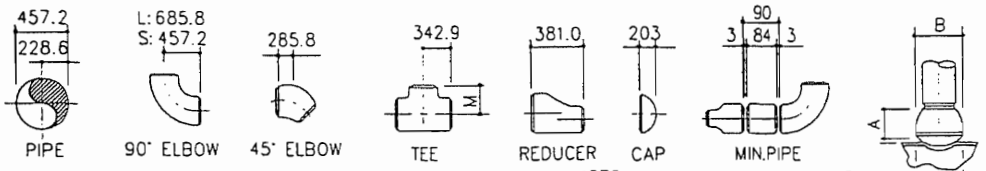
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm' WEIGHT IN ( )=0.00943 (D+2T).(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	7.5 (5.0)	9.0 (5.1)	12.3 (5.4)	15.8 (5.6)	21.1 (5.9)	24.9 (6.1)	35.0 (6.7)	46.0 (7.2)	57.6 (7.8)		

$Wp = 0.02466t\ (D-t)$ kg/m
$Ww = 0.0007854\ d^2$ kg/m
$A = 0.007854\ (D^2-d^2)$ cm²
$I = 0.000004909\ (D^4-d^4)$ cm⁴
$Z = 0.00009817\ \frac{(D^4-d^4)}{D}$ cm³

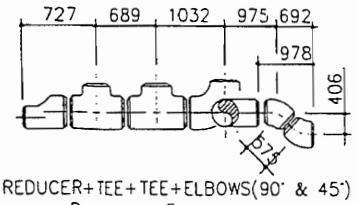
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 18" (450mm) | PAGE 21



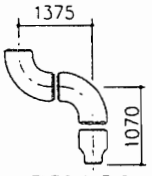
RATING	A	B	C	WEIGHT (kg)
STD.				
XS				
SCH.160/XXS				

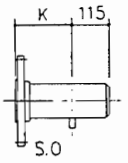
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET

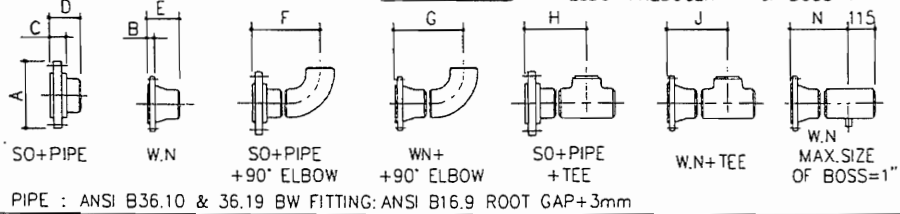


RED. TEE

SIZE	M
x16"	330.2
x14"	330.2
x12"	320.5
x10"	307.8
x8"	298.5







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	635	711	743	711	743	787	914	
B	39.7	60.4	89.0	68.4	90.6	114.3	179.5	
C	68.3	88.9	123.9	–	–	–	–	
D	155	176	211	–	–	–	–	
E	139.7	158.8	190.6	166.8	192.2	241.3	344.5	
F	844	865	900	–	–	–	–	
G	829	848	879	856	881	930	1033	
H	501	522	557					
J	486	505	537	513	538	587	690	
K	185	205	240					
N	255	275	305	285	310	355	460	
BOLT DIA.	1 1/8"	1 1/4"	1 5/8"	1 1/4"	1 5/8"	1 1/8"	2 3/4"	
BOLT NO.	16	24	20	24	20	20	16	
BOLT L STUD	155	205	280	220	285	345	535	
BOLT L MACH	125	170	RING NO.	R69	R69	R70	R71	
			S	5.6	4.8	4.8	7.9	
B . C . D	577.9	628.7	654.1			685.8	774.7	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

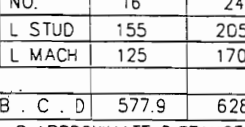
WEIGHT OF FLANGE (Kg)

	RATING	S.O	W.N	BLIND	
ANSI B16.5	CL.150	51.9	86.1	99.8	
	CL.300	108.7	150.5	179.2	
	CL.600	174.0	221.1	285.8	
	CL.900	261.2	318.9	385.6	
	CL.1500		687.2	793.7	
	CL.2500				

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA



RATING & CONN. MARK	ANSI CL.125FF ANSI CL.150RF L	H	W	T	ANSI CL.300RF ANSI CL.300RJ L	H	W	T	ANSI CL.600RF ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	432	1245 2261	610 686	626 866	914 930	2324	762	1687	1092 1095	2381	914	3266	1232				1559			
GLOBE																				
CHECK																				

RATING & CONN. MARK	ANSI CL.2500 RJ L	H	W	T
GATE				
GLOBE				
CHECK				

PIPE DATA

D=457.20 mm
OUTSIDE SURFACE =1.44 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X16"	TEE X14"	TEE X12"	REDUCER X16"	REDUCER X14"	REDUCER X12"
5S	4.19	448.82	59.63	15299	16.02	669.2	46.81	158.2									
10S	4.78	447.64	67.94	17385	16.00	760.4	53.33	157.4									
10	6.35	444.50	89.94	22858	15.94	999.8	70.60	155.2									
20	7.92	441.36	111.8	28216	15.89	1234	87.75	153.0	94.3								
STD	9.52	438.16	133.9	33560	15.83	1468	105.1	150.8	112.5								
30	11.13	434.94	156.0	38820	15.78	1698	122.4	148.6	131.5								
XS	12.70	431.80	177.3	43839	15.72	1918	139.2	146.4	148.9								
40	14.27	428.66	198.6	48749	15.67	2132	155.9	144.3	168.0	41.5	125.0	120.0	117.0	114.0	65.2	53.1	51.0
60	19.05	419.10	262.2	63047	15.51	2758	205.8	138.0	222.3								
80	23.83	409.54	324.1	76400	15.35	3342	254.7	131.8	274.0	69.0	204.4	195.0	191.0	186.0	91.4	86.3	82.7
100	29.36	398.48	394.6	90724	15.16	3968	309.8	124.7	334.1								
120	34.92	387.36	463.3	103973	14.98	4548	363.6	117.8	391.5								
140	39.67	377.86	520.4	114422	14.83	5005	408.5	112.1	440.2								
160	45.24	366.72	585.5	125712	14.65	5499	459.6	105.6	495.0								

WEIGHT OF INS.

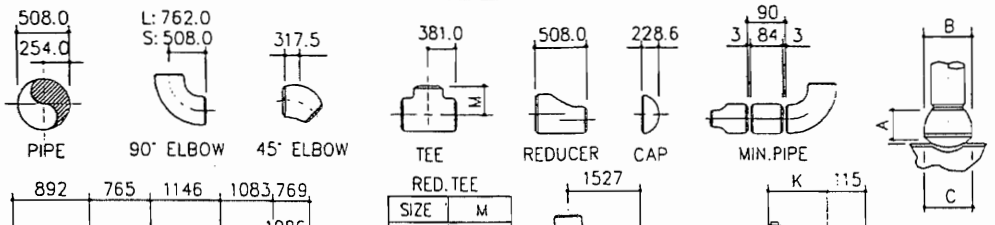
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3),W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm' WEIGHT IN ( )=0.00943 (D+2T).(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	8.4 (5.6)	10.1 (5.7)	13.6 (5.9)	17.6 (6.1)	23.5 (6.4)	27.5 (6.7)	38.5 (7.2)	50.4 (7.8)	62.9 (8.3)	76.3 (8.9)	

Wp=0.024661 (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
$Z=0.00009817 \frac{(D^4-d^4)}{D}$ cm^3

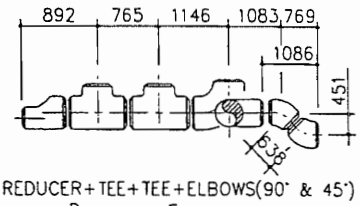
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 20" (500mm)



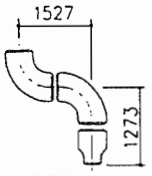
RATING	A	B	C	WEIGHT (kg)
STD.				
XS				
SCH.160/XXS				

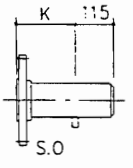
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET

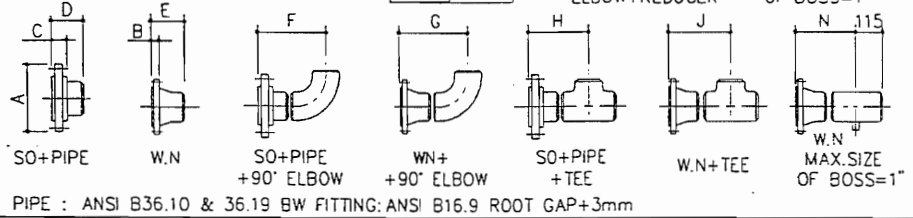


RED. TEE

SIZE	M
x18"	368.3
x16"	355.6
x14"	355.6
x12"	345.9
x10"	333.2
x8"	323.9







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	698	775	813	775	813	875	984	
B	42.9	63.5	95.3	73.1	98.5	120.7	195.3	
C	73.0	95.2	133.4	–	–	–	–	
D	160	182	220	–	–	–	–	
E	144.5	161.9	196.9	171.5	200.1	260.3	373.1	
F	925	947	985	–	–	–	–	
G	910	927	962	937	965	1025	1138	
H	544	566	604					
J	529	546	581	556	584	644	757	
K	190	210	250					
N	260	280	315	290	315	375	490	
BOLT DIA.	1 1/8"	1 1/4"	1 5/8"	1 1/4"	1 5/8"	2"	3"	
BOLT NO.	20	24	24	24	24	20	16	
BOLT L STUD	165	210	295	235	305	370	575	
BOLT L MACH	140	185	RING NO.	R73	R73	R74	R75	
			S	5.6	4.8	4.8	9.5	
B . C . D	635	685.8	723.9			749.3	831.9	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

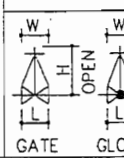
WEIGHT OF FLANGE (Kg)

RATING		S.O	W.N	BLIND
ANSI B16.5	CL.150	61.7	109.7	129.3
	CL.300	134.5	184.4	229.1
	CL.600	222.0	278.2	367.4
	CL.900	317.9	399.3	487.6
	CL.1500		852.6	1009.3
	CL.2500			

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

VALVE DATA — RATING & CONN. — ANSI CL.2500 RJ



MARK	L	H	W	T
GATE				
GLOBE				
CHECK				

VALVE DATA — RATING & CONN.

MARK	ANSI CL.125FF / CL.150RF L	H	W	T	ANSI CL.300RF / CL.300RJ L	H	W	T	ANSI CL.600RF / CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	457	1334 2470	610 762	780 1066	991 1010	2534	914	2105	1194 1200	2654	914	4445	1334				1686			
GLOBE																				
CHECK																				

PIPE DATA — D=508.00 mm — OUTSIDE SURFACE =1.59 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)
5S	4.78	498.44	75.57	23923	17.79	941.8	59.32	195.1
10S	5.54	496.92	87.45	27603	17.77	1087	68.64	193.9
10	6.35	495.30	100.1	31487	17.74	1240	78.55	192.7
STD 20	9.52	488.96	149.1	46326	17.63	1824	117.0	187.8
XS 30	12.70	482.60	197.6	60643	17.52	2387	155.1	182.9
40	15.09	477.82	233.7	71037	17.44	2796	183.4	179.4
60	20.62	466.76	315.7	93919	17.25	3697	247.8	171.1
80	26.19	455.62	396.4	115379	17.06	4542	311.2	163.0
100	32.54	442.92	486.1	138000	16.85	5432	381.5	154.1
120	38.10	431.80	562.4	156268	16.67	6152	441.5	146.4
140	44.45	419.10	647.3	175477	16.46	6908	508.1	138.0
160	50.01	407.98	719.6	190922	16.29	7516	564.8	130.7

WEIGHT OF FITTING (kg)

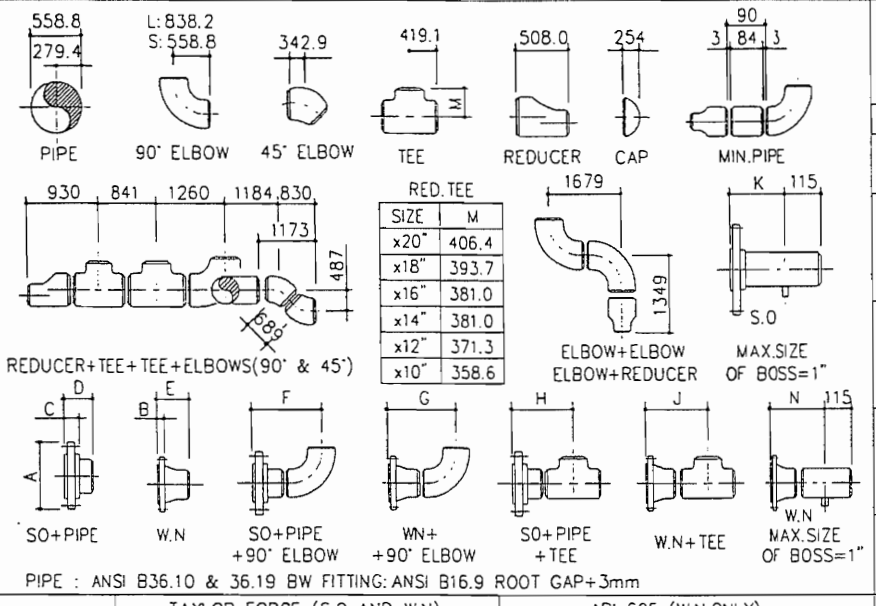
90° LR ELBOW	CAP	TEE FULL	TEE X18"	TEE X16"	TEE X14"	REDUCER X18"	REDUCER X16"	REDUCER X14"
139.8								
184.5								
220.0	54.1	163.3	158.0	152.0	149.0	88.6	84.0	79.7
296.4								
372.0	93.8	277.0	266.0	258.0	253.0	150.0	142.0	135.0
456.2								
528.4								
607.5								
676.0								

WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T).(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	9.2 (6.1)	11.2 (6.2)	15.2 (6.5)	19.4 (6.7)	25.7 (7.0)	30.1 (7.2)	42.0 (7.8)	54.8 (8.3)	68.2 (8.9)	82.5 (9.5)	

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d² kg/m
A=0.007854 (D²−d²) cm²
I=0.000004909 (D⁴−d⁴) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³



PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
TAYLORFORGE	CL.150	83.8	101.9	160.8
	CL.300	167.6	210.6	289.9
	CL.600	267.3	326.2	453.0
	CL.900			
API 605	CL.150			
	CL.300			
	CL.600			
	CL.900			
MSS SP 44	CL.150	83.8	101.9	160.8
	CL.300	167.6	210.6	289.9
	CL.600	267.3	326.2	453.0
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				API 605 (W.N.ONLY)				MSS SP44 (W.N.ONLY)						
	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	RF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	749.4	838.2	870.0						749.3	838.2		870.0			
B	46.0	66.6	101.6						46.0	66.5	77.7	101.6	106.4		
C	73.0	101.6	139.7												
D															
E	149.2	165.1	203.2						149.4	165.1	176.2	203.2	208.0		
F															
G	990	1006	1044						990	1006	1017	1044	1049		
H															
J	571	587	625						572	587	598	625	630		
K															
N															
BOLT DIA.	1¼"	1½"	1¾"						1¼"	1½"		1¾"			
BOLT NO.	20	24	24						20	24		24			
BOLT L															
RING NO.											R81		R81		
S															
B . C . D	692.2	743	777.7						692.2	743	743	777.7	777.7		

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.																					
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	

PIPE DATA

D=558.8 mm, OUTSIDE SURFACE =1.76 m²/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X20"	TEE X18"	TEE X16"	REDUCER X20"	REDUCER X18"	REDUCER X16"
5S	4.78	549.24	83.20	31924	19.59	1142	65.30	236.9									
10S	5.54	547.72	96.29	36849	19.56	1319	75.58	235.6									
10	6.35	546.10	110.21	42053	19.53	1505	86.51	234.2	114.8		85.3	83.1	81.2	79.5	42.3	40.4	38.6
STD 20	9.52	539.76	164.28	61977	19.42	2218	129.0	228.8	169.4		126	123	120	117	62.4	59.6	56.9
XS 30	12.70	533.40	217.88	81271	19.31	2908	171.0	223.5	225.2		167	163	159	156	83.0	79.2	75.6
	15.88	527.04	270.85	99888	19.20	3575	212.6	218.2	282.0								
60	22.22	514.36	374.57	135044	18.99	4833	294.0	207.8	400.1								
80	28.57	501.66	475.91	167743	18.77	6003	373.6	197.7	490.7								
100	34.92	488.96	574.72	198051	18.56	7088	451.1	187.8	606.4								
120	41.27	476.26	671.00	226088	18.36	8091	526.7	178.1	704.8								
140	47.62	463.56	764.74	251969	18.15	9017	600.3	168.8	802.0								
160	53.97	450.86	855.95	275808	17.95	9870	671.9	159.7	896.8								

WEIGHT OF INS.

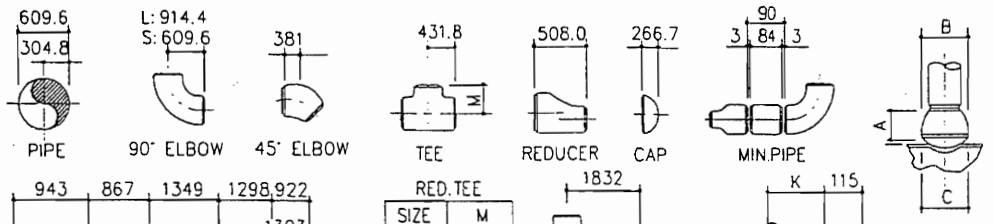
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm' WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	10.1 (6.7)	12.1 (6.8)	16.5 (7.0)	21.1 (7.2)	27.9 (7.6)	32.8 (7.8)	45.5 (8.3)	59.0 (8.9)	73.5 (9.5)	88.7 (10.0)	104.9 (10.5)

Wp=0.02466t (D-t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

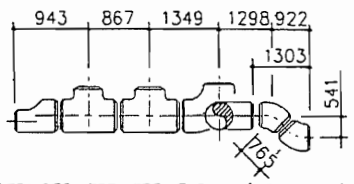
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 24" (600mm) | PAGE 24



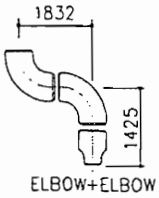
RATING	A	B	C	WEIGHT (kg)
STD.				
XS				
SCH.160/XXS				

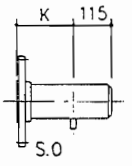
BONNEY FORGE'S STANDARD FITTING (kg)
WELDOLET

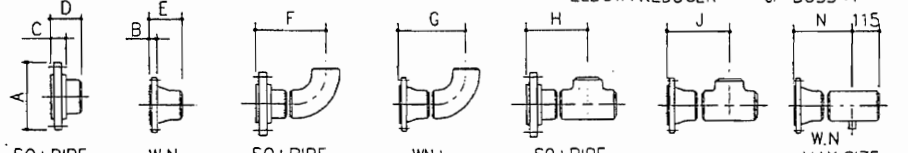


RED.TEE

SIZE	M
x20"	431.8
x18"	419.1
x16"	406.4
x14"	406.4
x12"	396.7







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

TAPE	ANSI B16.5 CL.125FF / CL.150RF	CL.300 RF	CL.600 RF	CL.300 RJ	CL.600 RJ	CL.900 RJ	CL.1500 RJ	CL.2500 RJ
A	813	914	940	914	940	1041	1168	
B	47.7	69.9	108.0	81.1	112.8	155.6	223.9	
C	82.6	106.4	146.1	–	–	–	–	
D	170	193	233	–	–	–	–	
E	152.4	168.3	209.6	179.5	214.4	308.0	427.1	
F	1087	1110	1150	–	–	–	–	
G	1070	1086	1127	1097	1132	1225	1345	
H	605	628	668					
J	587	603	644	614	649	743	862	
K	200	220	260					
N	270	285	325	295	330	425	545	
BOLT DIA.	1¼"	1½"	1⅞"	1½"	1⅞"	2½"	3½"	
BOLT NO.	20	24	24	24	24	20	16	
BOLT L STUD	180	240	335	265	350	470	655	
BOLT L MACH	150	205	RING NO.	R77	R77	R78	R79	
			S	6.4	5.6	5.6	11.1	
B . C . D	749.3	812.8	838.2			901.7	990.6	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

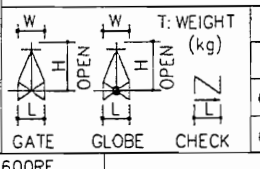
WEIGHT OF FLANGE (Kg)

ANSI B16.5 RATING	S.O	W.N	BLIND
CL.150	87.4	157.5	195.0
CL.300	203.0	274.7	358.3
CL.600	312.2	399.4	566.7
CL.900		607.7	918.3
CL.1500		1366.8	1644.3
CL.2500			

*Bolt Holes are 1/8" larger than bolt diameters.

L : ANSI B16.10

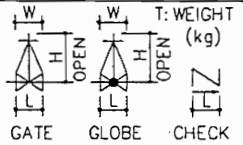
VALVE DATA



T: WEIGHT (kg)

RATING & CONN. MARK	ANSI CL.2500 RJ L	H	W	T
GATE				
GLOBE				
CHECK				

VALVE DATA



T: WEIGHT (kg)

RATING & CONN. MARK	ANSI CL.125FF / ANSI CL.150RF L	H	W	T	ANSI CL.300RF / ANSI CL.300RJ L	H	W	T	ANSI CL.600RF / ANSI CL.600RJ L	H	W	T	ANSI CL.900RJ L	H	W	T	ANSI CL.1500RJ L	H	W	T
GATE	508	1613 2864	762	1207 1769	1143 1165	3061	914	3348	1397 1407	3200	1067	5352	1568				1972			
GLOBE																				
CHECK																				

PIPE DATA

D=609.6 mm, OUTSIDE SURFACE =1.92 m²/m — SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg): 90° LR ELBOW	CAP	TEE FULL	TEE X20"	TEE X18"	TEE X16"	REDUCER X20"	REDUCER X18"	REDUCER X16"
5S	5.54	598.52	105.1	47959	21.36	1573	82.52	281.4									
10 10S	6.35	596.90	120.3	54752	21.33	1796	94.46	279.8			94.3	92.3	90.3		44.5	42.7	
STD 20	9.52	590.56	179.5	80808	21.22	2651	140.9	273.9	198.8		139	136	133		65.7	133	
XS	12.70	584.20	238.2	106118	21.11	3481	186.9	268.0	270.0		185	181	177		177	177	
30	14.27	581.06	266.9	118312	21.05	3881	209.5	265.2	301.6								
40	17.48	574.64	325.2	142637	20.94	4679	255.2	259.3	365.0	89.7	252.0	243.0	237.0	232.0	119.0	114.0	109.0
60	24.61	560.38	452.3	193824	20.70	6358	355.0	246.6	509.7								
80	30.94	547.72	562.5	236110	20.49	7746	439.2	235.6	635.0	160.0	437.0	420.0	410.0	401.0	206.0	197.0	189.0
100	38.89	531.82	697.3	285220	20.22	9357	547.3	222.1	786.1								
120	46.02	517.56	814.8	325674	19.99	10684	639.6	210.4	918.3								
140	52.37	504.86	916.8	358995	19.79	11777	719.6	200.2	1033								
160	59.54	490.52	1028.9	393714	19.56	12916	807.6	189.0	1160								

WEIGHT OF INS.

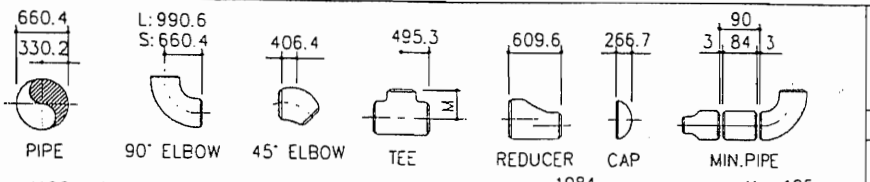
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

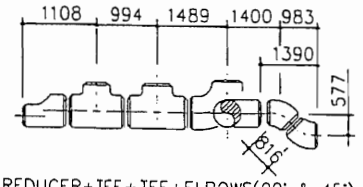
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	11.0 (7.2)	13.2 (7.4)	18.0 (7.6)	22.9 (7.8)	30.4 (8.1)	35.4 (8.3)	49.1 (8.9)	63.4 (9.5)	78.8 (10.0)	94.8 (10.5)	111.8 (11.1)

$Wp = 0.02466t\ (D-t)$ kg/m
$Ww = 0.0007854\ d^2$ kg/m
$A = 0.007854\ (D^2-d^2)$ cm²
$I = 0.000004909\ (D^4-d^4)$ cm⁴
$Z = 0.00009817\ \frac{(D^4-d^4)}{D}$ cm³

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

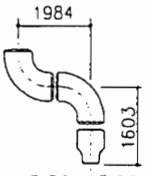
NPS 26" / 550mm

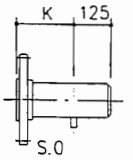


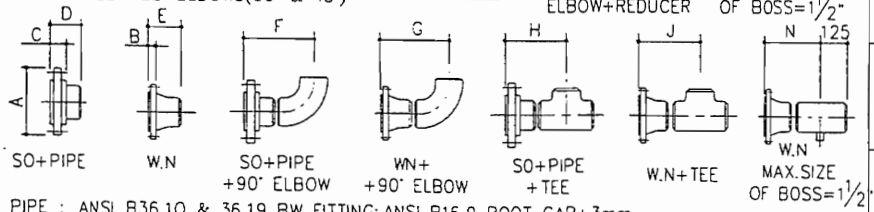


RED.TEE

SIZE	M
x24"	482.6
x22"	469.9
x20"	457.2
x18"	444.5
x16"	431.8







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
MSS SP 44 TAYLORFORGE	CL.125	106.6	117.9	
	CL.175	47.6	54.4	183.7
	CL.250	240.4	240.4	
	CL.350	102.1	111.1	263.1
	CL.150			
	CL.300	258.2	303.5	475.7
	CL.600	430.4	464.3	690.8
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (W.N)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (W.N)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	870.0	800.1	971.6	831.9	785.9	866.6	889	1022.4	870	971.6		1016.0		1085.9	
B	50.8	34.9	71.4	63.5	41.1	88.9	111.3	134.9	68.3	79.2	91.9	114.3	120.7	146.1	157.2
C	85.7	69.9	120.7	114.3											
D	173	157	208	201											
E	127	85.7	147.6	127.0	88.9	144.5	180.8	258.8	120.7	184.2	196.9	228.6	235	292.1	303.2
F	1166	1151	1201	1195											
G	1121	1079	1141	1121	1083	1138	1174	1252	1114	1178	1191	1223	1229	1286	1297
H															
J	625	584	646	625	587	643	679	757	619.0	683	695	727	733	790	802
K															
N															
BOLT DIA.	1¼"	1½"	1¾"	1"	¾"	1½"	1⅝"	2½"	1¼"	1⅝"		1⅞"		2¾"	
BOLT NO.	24	28	28	28	36	32	28	20	24	28		28		20	
BOLT L					140	260	337	425							
RING NO.											R93		R93		R100
S															
B . C . D					744.5	803.1	806.5	901.7	806.5	876.3	876.3	914.4	914.4	952.5	952.5

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.	CL.150# RF				CL.300# RF				CL.600# RF				CL.900# RF							
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
W.CHE																				
BUTT																				

WAFER CHECK BUTT.VA

PIPE DATA

D=660.4 mm, OUTSIDE SURFACE =2.07 m²/m									WEIGHT OF FITTING (kg)							
SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	90° LR ELBOW	CAP	TEE			REDUCER		
											FULL	X	X	X	X	X
	6.35	647.70	130.5	69780		2113	102.4	329.5	150.7							
10	7.92	644.56	162.3	86412	23.07	2617	127.4	326.3	200.3							
STD	9.53	641.34	194.9	103217	23.01	3126	153.0	323.0	237.2							
	11.13	638.14	227.0	119669		3624	178.2	319.8								
XS 20	12.70	635.00	258.4	135574	22.90	4105	202.8	316.7	316.0							
	15.88	628.64	321.5	167073		5059	252.2	310.4								
	19.05	622.30	383.8	197536		5982	301.1	304.2								
	22.23	615.94	445.7	227174		6879	349.6	298.0								
	25.40	609.60	506.7	255819		7747	397.5	291.9								

WEIGHT OF INS.

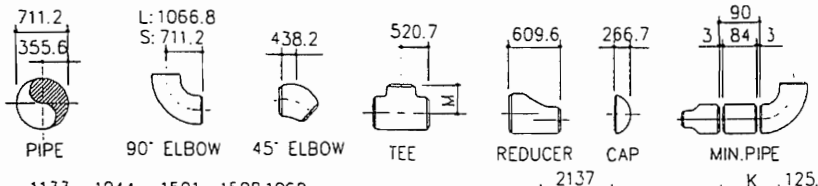
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³),W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

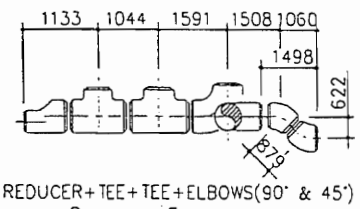
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	11.9 (7.8)	14.3 (7.9)	19.4 (8.1)	24.4 (8.4)	32.6 (8.7)	38.1 (8.9)	52.6 (9.5)	67.8 (10.0)	84.0 (10.6)	101.0 (11.0)	118.8 (11.7)

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm²
I=0.000004909 (D^4-d^4) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 28" (700mm)

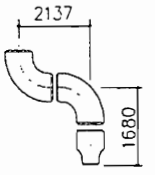




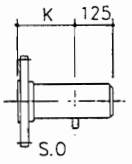
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED. TEE

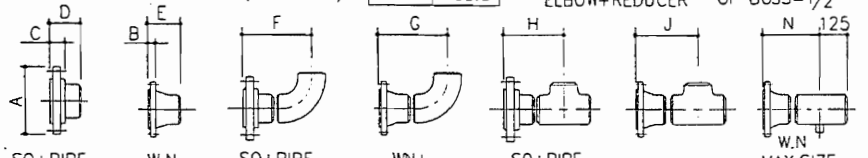
SIZE	M
x26"	520.7
x24"	508.0
x22"	495.3
x20"	482.6
x18"	469.9



ELBOW+ELBOW
ELBOW+REDUCER



MAX.SIZE OF BOSS=1½"



SO+PIPE | W.N | SO+PIPE +90° ELBOW | WN+ +90° ELBOW | SO+PIPE +TEE | W.N+TEE | MAX.SIZE OF BOSS=1½"

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
MSS SP 44 TAYLORFORGE	CL.125	122.5	133.8	
	CL.175	52.2	59.0	222.3
	CL.250	290.3	285.8	
	CL.350	113.4	117.9	340.2
	CL.150			
	CL.300	326.2	366.9	577.6
	CL.600	486.9	532.3	792.7
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (W.N)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (W.N)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	927.1	850.9	1035.1	882.7	836.7	920.8	952.5	1104.9	927.1	1035.1		1073.2		1168.4	
B	52.4	34.9	74.6	63.5	44.5	88.9	122.2	153.9	71.4	85.9	98.6	117.6	124.0	149.1	160.2
C	87.3	69.9	127.0	114.3											
D	174	157	214	201											
E	128.6	85.7	150.8	127.0	95.2	149.4	196.9	282.7	125.5	196.9	209.6	241.3	247.7	304.8	316.0
F	1244	1227	1284	1271											
G	1198	1156	1221	1197	1165	1219	1267	1353	1195	1267	1280	1311	1318	1375	1386
H															
J	652	609	675	651	619	673	721	806	649	721	733	765	771	829	840
K															
N.															
BOLT DIA.	1¼"	¾"	1¾"	1"	¾"	1¼"	1¾"	2¾"	1¼"	1⅝"		2"		3"	
BOLT NO.	28	28	28	28	40	36	28	20	28	28		28		20	
BOLT L					146	260	349	470							
RING NO.											R94		R94		R101
S															
B . C . D					795.3	857.3	863.6	971.6	863.6	939.8	939.8	965.2	965.2	1022.4	1022.4

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.	CL.150# RF				CL.300# RF				CL.600# RF				CL.900# RF							
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
W.CHE																				
BUTT																				

WAFER CHECK | BUTT.VA

PIPE DATA

D=711.2 mm, OUTSIDE SURFACE =2.23 m²/m		INSIDE DIA.	METAL SECTION AREA	MOMENT OF INERTIA	RADIUS OF GYRATION	SECTION MODULUS	WEIGHT OF PIPE	WEIGHT OF WATER	WEIGHT OF FITTING (kg)								
									90° LR ELBOW	CAP	TEE				REDUCER		
SCH.	THICK (mm)t	d (mm)	A (cm²)	I (cm⁴)	(cm)	Z (cm³)	Wp (kg/m)	Ww (kg/m)			FULL	X	X	X	X	X	X
	6.35	698.50	140.6	87334		2456	110.4	383.2									
10	7.92	695.36	175.0	108205	24.87	3043	137.4	379.8									
STD	9.53	692.14	210.1	129317	24.81	3636	164.9	376.3									
	11.13	688.94	244.8	150007		4218	192.1	372.6									
XS 20	12.70	685.80	278.7	170032	24.70	4781	218.8	369.4									
30	15.88	679.44	346.9	209756	24.59	5898	272.3	362.6									
	19.05	673.10	414.2	248260		6981	325.2	355.8									
	22.23	666.74	481.2	285809		8037	377.7	349.1									
	25.40	660.40	547.2	322184		9059	429.6	342.5									

WEIGHT OF INS.

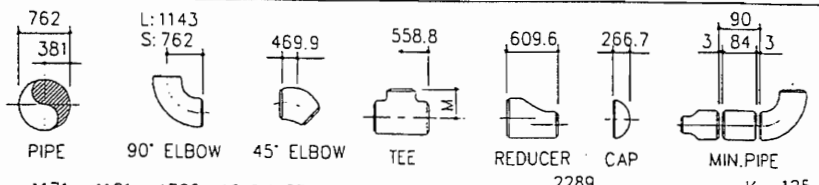
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³),W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm' WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

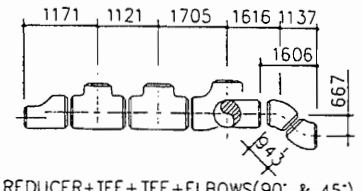
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	12.8 (8.4)	15.4 (8.5)	20.7 (8.7)	26.2 (8.9)	34.8 (9.2)	40.7 (9.5)	56.1 (10.0)	72.2 (10.6)	89.3 (11.1)	107.1 (11.7)	125.8 (12.2)

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

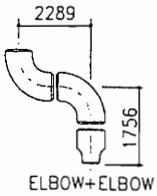
NPS 30" / 750mm

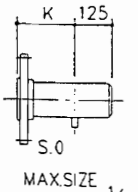


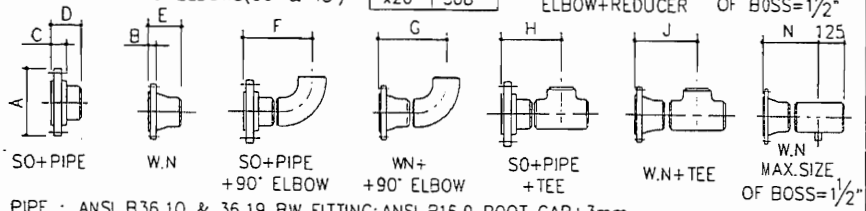


RED. TEE

SIZE	M
x28"	546.1
x26"	546.1
x24"	533.4
x22"	520.7
x20"	508







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

RATING		S.O	W.N	BLIND
TAYLOR FORGE	CL.125	138.3	154.2	
	CL.175	59	68	267.6
	CL.250	322	317.5	
	CL.350	133.8	138.3	403.7
MSS SP 44	CL.150			
	CL.300	366.9	421.3	679.5
	CL.600	532.3	588.9	906.0
	CL.900	940.0	973.9	1370

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (W.N)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (W.N)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	984.3	908.1	1092.2	939.8	887.5	990.6	1022.4	1181.1	984.3	1092.2		1130.3		1231.9	
B	54.0	34.9	76.2	66.7	44.5	93.7	131.8	161.8	74.7	91.9	104.6	120.7	127.0	155.7	166.8
C	88.9	69.9	127.0	120.7											
D	176	157	214	208											
E	130.2	92.1	152.4	133.4	100	158	211.1	295.4	136.7	209.6	222.3	254.0	260.4	317.5	328.7
F	1322	1303	1360	1354											
G	1276	1238	1298	1279	1246	1304	1357	1441	1283	1356	1368	1400	1406	1464	1475
H															
J	692	654	714	695	662	720	773	857	699	771	784	816	822	879	891
K															
N															
BOLT DIA.	1¼"	¾"	1¾"	1"	¾"	1⅜"	1⅞"	3"	1¼"	1¾"		2"		3"	
BOLT NO.	28	36	28	32	44	36	28	20	28	28		28		20	
BOLT L					146	273	375	495							
RING NO.											R95		R95		R102
S															
B . C . D					846.1	920.8	927.1	1035.1	914.4	997.0	997.0	1022.4	1022.4	1085.9	1085.9

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.		CL.150# RF				CL.300# RF				CL.600# RF				CL.900# RF							
	MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
WAFER CHECK / BUTT.VA	W.CHE	305				368				505											
	BUTT	165																			

PIPE DATA

D=762 mm, OUTSIDE SURFACE =2.39 m²/m									WEIGHT OF FITTING (kg)								
SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	90° LR ELBOW	CAP	TEE			REDUCER			
											FULL	X	X	X	X	X	X
	6.35	749.30	150.7	107609	26.72	2824	118.3	441.0									
10,10S	7.92	746.16	187.6	133385	26.66	3501	147.3	437.3									
STD	9.53	742.94	225.3	159483	26.61	4185	176.8	433.5									
	11.13	739.74	262.5	185084		4857	206.1	429.8									
XS 20	12.70	736.60	299.0	209884	26.50	5508	234.7	426.1									
30	15.88	730.24	372.2	259153	26.39	6801	292.2	418.8									
	19.05	723.90	444.6	307003		8057	349.0	411.6									
	22.23	717.54	516.6	353757		9284	405.5	404.4									
	25.40	711.20	587.8	399143		10475	461.4	397.3									

WEIGHT OF INS.

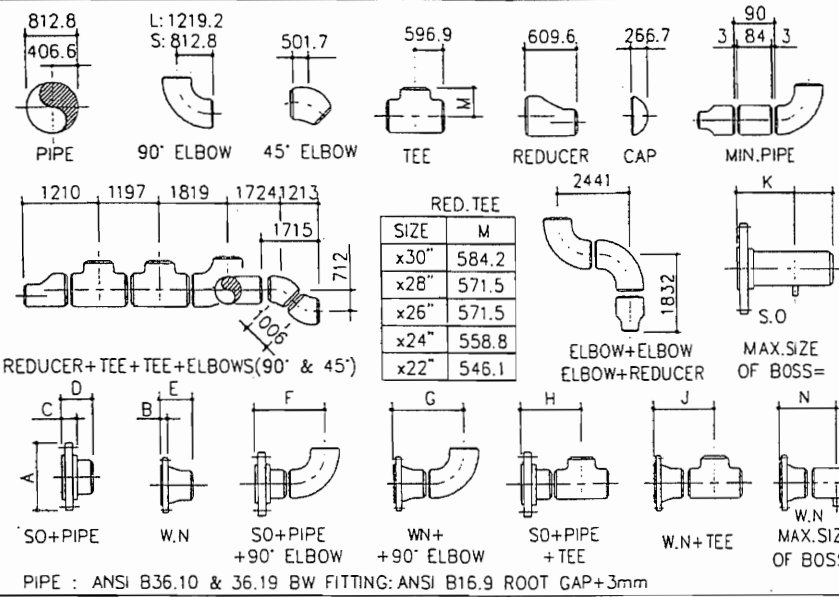
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	13.6 (8.9)	16.5 (9.0)	22.2 (9.3)	27.9 (9.5)	37.2 (9.8)	43.3 (10.0)	59.6 (10.6)	76.6 (11.1)	94.6 (11.7)	113.3 (12.2)	132.9 (12.8)

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm²
I=0.000004909 (D^4-d^4) cm⁴
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm³

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 32" | 800mm | PAGE 28



RED.TEE

SIZE	M
x30"	584.2
x28"	571.5
x26"	571.5
x24"	558.8
x22"	546.1

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
TAYLORFORGE	CL.125	170.1	186	
	CL.175	63.5	72.6	317.5
	CL.250	362.9	358.3	
	CL.350	147.4	154.2	555.6
MSS SP 44	CL.150			
	CL.300			
	CL.600			
	CL.900			

	TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B(WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
		CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
		FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
	A	1060.5	958.9	1149.4	990.6	941.3	1054.1	1085.9	1238.3	1060.5	1149.4	1149.4	1193.8	1193.8	1314.5	1314.5
	B	57.2	34.9	79.4	69.9	46.0	103.1	136.4	166.6	80.8	98.6	112.8	123.7	131.6	165.1	176.2
	C	92.1	69.9	130.2	127.0											
	D	179	157	217	214											
	E	133.4	92.1	155.6	139.7	108	168.1	222.3	309.6	144.5	222.3	236.5	266.7	274.6	336.6	347.7
	F	1401	1379	1439	1436											
	G	1356	1314	1378	1362	1330	1390	1445	1532	1367	1444	1459	1489	1497	1559	1570
	H	779	757	817	814											
	J	733	692	756	740	708	768	822	910	744	822	836	867	875	937	948
	K															
	N															
BOLT	DIA.	1 1/2"	3/4"	1 3/4"	1"	3/4"	1 1/2"	2"	3"	1 1/2"	1 7/8"	1 7/8"	2 1/4"	2 1/4"	3 1/4"	3 1/4"
BOLT	NO.	28	36	28	36	48	32	28	20	28	28	28	28	28	20	20
BOLT	L					146	298	419	508							
	RING NO.											R96		R96		R103
	S															
	B . C . D					900.2	977.9	984.3	1092.2	977.9	1054.1	1054.1	1079.5	1079.5	1155.7	1155.7

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.		CL.150# RF				CL.300# RF				CL.600# RF											
	MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
WAFER CHECK / BUTT.VA	W.CHE																				
	BUTT																				

PIPE DATA

D=812.8 mm OUTSIDE SURFACE =2.55 m²/m		INSIDE DIA.	METAL SECTION AREA	MOMENT OF INERTIA	RADIUS OF GYRATION	SECTION MODULUS	WEIGHT OF PIPE	WEIGHT OF WATER	WEIGHT OF FITTING (kg)								
									90° LR ELBOW	CAP	TEE				REDUCER		
SCH.	THICK (mm)t	d (mm)	A (cm²)	I (cm⁴)	(cm)	Z (cm³)	Wp (kg/m)	Ww (kg/m)			FULL	X	X	X	X	X	X
10	7.92	796.96	200.3	162197		3991	157.20	498.84									
STD	9.53	793.74	240.5	194009		4773	188.78	494.82									
XS 20	12.70	787.40	319.2	255522		6287	250.58	486.95									
30	15.88	781.04	397.6	315755		7769	312.07	479.11									
40	17.48	777.84	436.8	345509		8501	342.83	475.19									
	25.40	762.00	628.3	487478		11994	493.20	456.04									
	28.58	755.64	704.1	542045		13336	552.70	448.46									
	31.75	749.30	779.1	595087		14641	611.53	440.96									

WEIGHT OF INS.

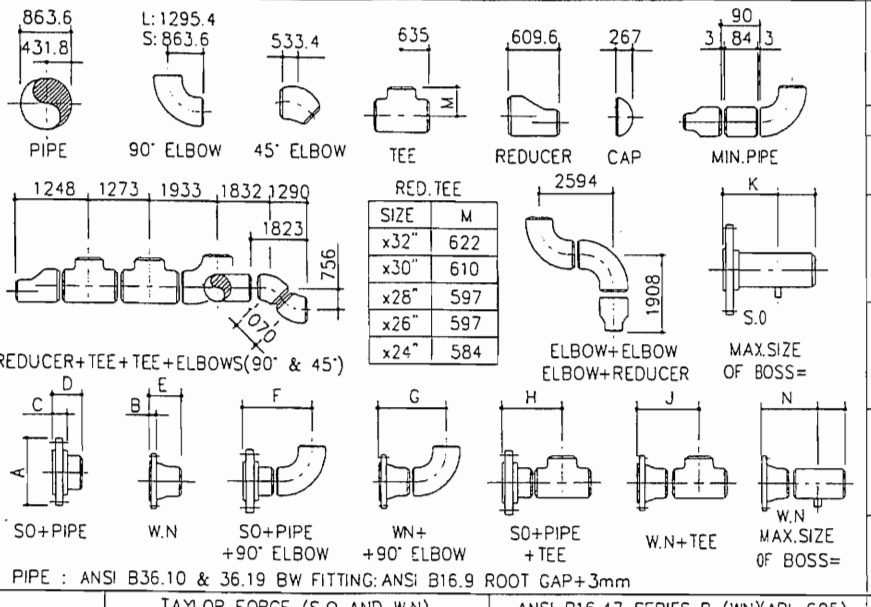
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³),W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	14.5 (9.5)	17.5 (9.6)	23.6 (9.8)	29.8 (10.0)	39.4 (10.4)	46.0 (10.6)	63.1 (11.1)	81.0 (11.7)	99.8 (12.2)	119.4 (12.8)	140.0 (13.3)

Wp=0.02466t (D-t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 34" / 850mm



RED.TEE

SIZE	M
x32"	622
x30"	610
x28"	597
x26"	597
x24"	584

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND	
MSS SP 44 TAYLORFORGE	CL.125	181.4	199.6		
	CL.175	90.7	88.5	381	
	CL.250	403.7	399.2		
	CL.350	161	170.1	680.4	
	CL.150				
	CL.300				
	CL.600				
	CL.900				

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1111.3	1022.4	1206.5	1041.4	1004.8	1107.9	1162.1	1314.5	1111.3	1206.5	1206.5	1244.6	1244.6	1397.0	1397.0
B	58.7	44.5 38.1	82.6	73.0	49.3	103.1	147.6	177.8	82.6	101.6	115.9	127.0	134.9	171.5	185.7
C	93.7	85.7	133.4	130.2											
D	181	173	220	217											
E	134.9	95.3	158.8	146.1	110.2	173.0	239.8	325.4	149.4	231.6	245.9	276.1	284.0	355.6	369.9
F	1479	1471	1518	1515											
G	1433	1394	1457	1445	1409	1471	1538	1624	1448	1530	1544	1574	1582	1654	1668
H	819	811	858	855											
J	773	733	797	784	748	811	878	963	787	870	884	914	922	994	1008
K															
N															
BOLT DIA.	1½"	⅞"	1¾"	1"	⅞"	1½"	2¼"	3¼"	1½"	1⅞"	1⅞"	2¼"	2¼"	3½"	3½"
BOLT NO.	32	36	28	40	40	36	24	20	32	28	28	28	28	20	20
BOLT L					159	298	425	540							
RING NO.											R97		R97		R104
S															
B . C . D					957.3	1031.7	1054.1	1155.7	1028.7	1104.9	1104.9	1130.3	1130.3	1225.6	1225.6

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.	CL.150# RF				CL.300# RF				CL.600# RF											
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T

PIPE DATA

D=863.6 mm
OUTSIDE SURFACE =2.71 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
10	7.92	847.76	212.9	194886		4513	167.12	564.46									
STD	9.53	844.54	255.7	233190		5400	200.71	560.18									
	11.13	841.34	298.1	270825		6271	233.97	555.95									
XS 20	12.70	838.20	339.5	307340		7117	266.49	551.81									
30	15.88	831.84	422.9	380052		8801	331.97	543.46									
40	17.48	828.64	464.6	416012		9633	364.73	539.29									
	25.40	812.80	668.9	587974		13615	525.02	518.87									
	28.58	806.44	749.7	654251		15150	588.51	510.78									
	31.75	800.10	829.7	718777		16644	651.30	502.78									

WEIGHT OF INS.

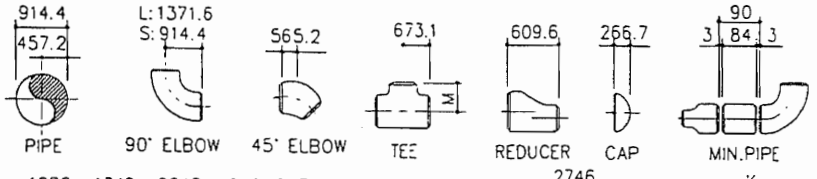
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.0094J (D+2T).(kg/m) t: mm, d: mm

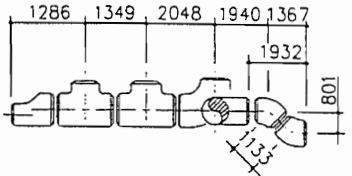
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	15.4 (10.0)	18.5 (10.2)	25 (10.4)	31.6 (10.6)	41.7 (10.9)	48.6 (11.1)	66.6 (11.7)	85.4 (12.7)	105.1 (12.8)	125.6 (13.3)	147.0 (13.9)

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

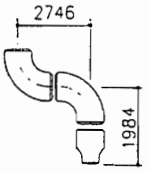
NPS 36" / 900mm

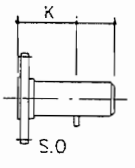


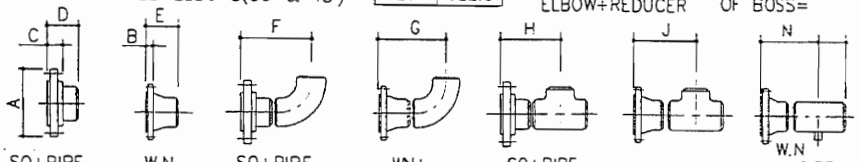


RED. TEE

SIZE	M
x34"	660.4
x32"	647.7
x30"	635.0
x28"	622.3
x26"	622.3







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

WEIGHT OF FLANGE (kg)

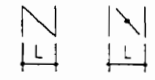
	RATING	S.O	W.N	BLIND
MSS SP 44 TAYLORFORGE	CL.125	204.1	224.5	
	CL.175	95.3	93	440
	CL.250	440	440	
	CL.350	210.9	217.7	771.1
	CL.150			
	CL.300			
	CL.600			
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1168.4	1073.2	1270.0	1111.3	1057.1	1171.4	1212.9	1346.2	1168.4	1270.0	1270.0	1314.5	1314.5	1460.5	1460.5
B	60.3	44.5 | 38.1	85.7	79.4	52.3	103.1	152.4	179.3	90.5	104.6	118.9	130.3	138.2	177.8	192.1
C	95.3	85.7	136.5	142.9											
D	182	173	224	230											
E	136.5	95.3	161.9	155.6	117.3	180.8	249.2	331.7	157.2	241.3	255.6	288.8	296.7	368.3	382.6
F	1557	1547	1598	1605											
G	1511	1470	1537	1530	1492	1556	1624	1706	1532	1616	1630	1664	1671	1743	1758
H	858	849	900	906											
J	813	771	838	832	793	857	925	1008	833	917	932	965	973	1044	1059
K															
N															
BOLT DIA.	1 1/2"	7/8"	2"	1 1/8"	7/8"	1 3/8"	2 1/4"	3"	1 1/2"	2"	2"	2 1/2"	2 1/2"	3 1/2"	3 1/2"
BOLT NO.	32	36	32	40	44	32	28	24	32	32	32	28	28	20	20
BOLT L					165	305	438	533							
RING NO.											R98		R98		R105
S															
B . C . D					1009.7	1089.2	1104.9	1200.2	1085.9	1168.4	1168.4	1193.8	1193.8	1289.1	1289.1

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.	CL.150# RF				CL.300# RF				CL.600# RF											
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
W.CHE																				
BUTT																				



PIPE DATA

D=914.4 mm		INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg)							
OUTSIDE SURFACE = 2.87 m^2/m									90° LR ELBOW	CAP	TEE			REDUCER		
SCH.	THICK (mm)t										FULL	X	X	X	X	X
10	7.92	898.56	225.5	231695		5067	177.04	634.14								
STD	9.53	895.34	270.9	277321		6065	212.65	629.60								
	11.13	892.14	315.8	322179		7046	247.92	625.11								
XS 20	12.70	889.00	359.8	365729		7999	282.40	620.72								
30	15.88	882.64	448.3	452535		9897	351.86	611.87								
40	19.05	876.30	535.8	537221		11749	420.61	603.11								
	25.40	863.60	709.4	701417		15340	556.84	585.76								
	28.58	857.24	795.3	780969		17080	624.31	577.16								
	31.75	850.90	880.4	858527		18776	691.08	568.65								

WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T), (kg/m) t: mm, d: mm

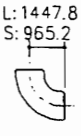
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	16.3 (10.6)	19.6 (10.7)	26.4 (10.9)	33.2 (11.2)	44.0 (11.5)	51.3 (11.7)	70.2 (12.3)	89.8 (12.8)	110.2 (13.4)	131.8 (13.9)	154.0 (14.5)

Wp = 0.02466t (D-t) kg/m
Ww = 0.0007854 d^2 kg/m
A = 0.007854 (D^2-d^2) cm^2
I = 0.000004909 (D^4-d^4) cm^4
Z = 0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

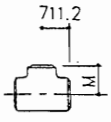
NPS 38" 950mm | PAGE 31

PIPE

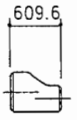


90° ELBOW

45° ELBOW

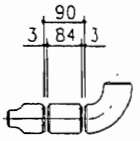


TEE

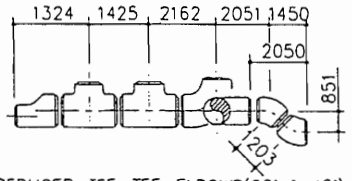


REDUCER

CAP



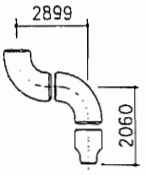
MIN.PIPE



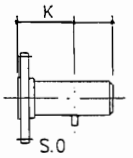
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED. TEE

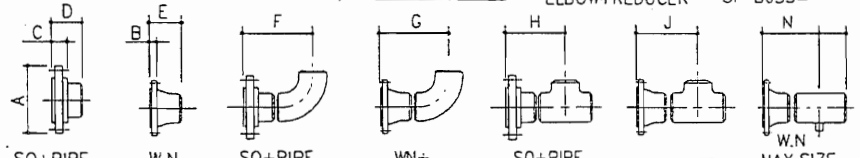
SIZE	M
x36"	711
x34"	699
x32"	686
x30"	673
x28"	648



ELBOW+ELBOW
ELBOW+REDUCER



MAX.SIZE OF BOSS=



SO+PIPE | W.N | SO+PIPE +90° ELBOW | WN+ +90° ELBOW | SO+PIPE +TEE | W.N+TEE | W.N MAX.SIZE OF BOSS=

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

• DIM.S IN( ) FOR CL.600 AND CL.900 OF ANSI B16.47 SERIES B ARE ONLY REFERENCE.

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
TAYLORFORGE	CL.125	240.4	258.5	
	CL.175	113.4	111.1	510.3
	CL.250	476.3	476.3	
	CL.350	222.3	231.3	895.8
MSS SP 44	CL.150			
	CL.300			
	CL.600			
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1238.3	1124.0	1327.2	1162.1	1124.0	1222.2	(1270)	(1460.5)	1238.3	1168.4		1270		1460.5	
B	60.3	50.8 | 44.5	87.3	79.4	53.8	111.3	(158.8)	(196.9)	87.4	108.0		158.8		196.9	
C	95.3	95.3	139.7	142.9											
D	182	182	227	230											
E	136.5	104.8	163.5	155.6	124.0	192.0	(260.4)	(358.9)	157.2	180.8		260.4		358.9	
F	1633	1633	1678	1681											
G	1587	1556	1614	1606	1575	1643	(1711)	(1810)	1608	1632		1711		1810	
H	896	896	941	944											
J	851	819	878	870	838	906	(975)	(1073)	871	895		975		1073	
K															
N															
BOLT DIA.	1 1/2"	7/8"	2"	1 1/8"	1"	1 5/8"	(2 1/4")	(3 1/2")	1 1/2"	1 1/2"		2 1/4"		3 1/2"	
BOLT NO.	32	36	32	40	40	36	(28)	(20)	32	32		28		20	
BOLT L					178	324	(451)	(591)							
RING NO.															
S															
B . C . D					1069.8	1140.0	(1162.1)	(1289.1)	1149.4	1092.2		1162.1		1289.1	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.																						
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T

PIPE DATA

D=965.2 mm, OUTSIDE SURFACE =3.03 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
STD	9.53	946.14	286.1	326695		6769	224.59	703.08									
	11.13	942.94	333.6	379645		7866	261.86	698.33									
XS	12.70	939.80	380.0	431081		8932	298.31	693.68									
	15.88	933.44	473.6	533695		11058	371.75	684.33									
	19.05	927.10	566.2	633919		13134	444.48	675.06									
	22.23	920.74	658.5	732415		15175	516.93	665.83									
	25.40	914.40	749.9	828591		17168	588.66	656.69									
	28.58	908.04	841.0	923081		19125	660.11	647.59									
	31.75	901.70	931.1	101532		21036	730.85	638.58									

WEIGHT OF INS.

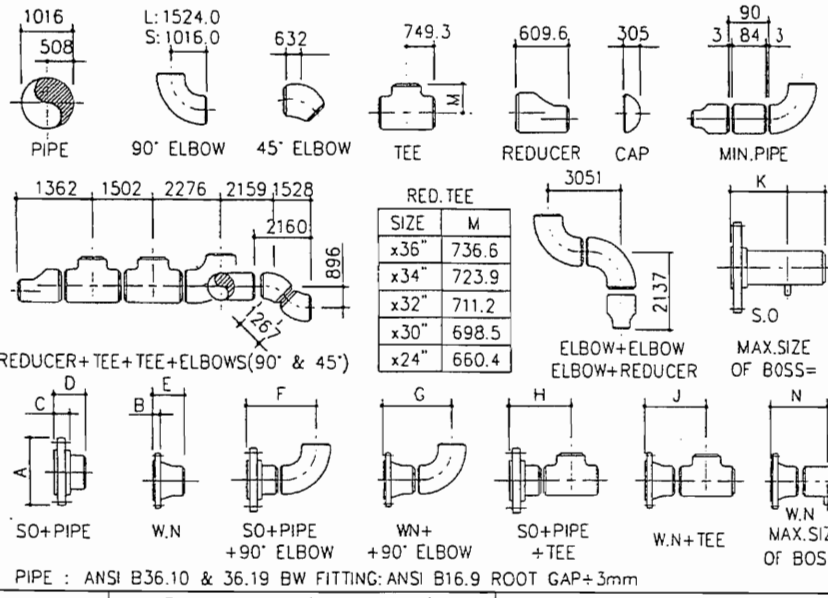
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	17.1 (11.2)	20.6 (11.3)	27.8 (11.5)	35.1 (11.7)	46.3 (12.0)	53.9 (12.3)	73.6 (12.8)	94.2 (13.4)	115.6 (13.9)	137.9 (14.5)	161.0 (15.0)

Wp=0.024661 (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 40" / 1000mm



SIZE	M
x36"	736.6
x34"	723.9
x32"	711.2
x30"	698.5
x24"	660.4

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

• DIM.S IN( ) FOR CL.600 AND CL.900 OF ANSI B16.47 SERIES B ARE ONLY REFERENCE.

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND	
TAYLORFORGE	CL.125	258.5	281.2		
	CL.175	112.5	115.7	589.7	
	CL.250	533	521.6		
	CL.350	240.4	244.9	1009.2	
MSS SP 44	CL.150				
	CL.300				
	CL.600				
	CL.900				

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)							
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1289.1	1174.8	1384.3	1212.9	1174.8	1273.0	(1320.8)	(1511.3)	1289.1	1238.3		1320.8		1511.3	
B	63.5	50.8 / 44.5	90.5	82.6	55.6	115.8	(165.1)	(203.2)	90.4	114.3		165.1		203.2	
C	98.4	101.6	139.7	149.2											
D	185	189	227	236											
E	139.7	104.8	166.7	158.8	128.5	198.4	(270.0)	(369.8)	163.6	193.5		270.0		369.8	
F	1712	1716	1754	1763											
G	1667	1632	1694	1686	1656	1725	(1797)	(1897)	1691	1721		1797		1897	
H	937	941	979	988											
J	892	857	919	911	881	951	(1022)	(1122)	916	946		1022		1122	
K															
N															
BOLT DIA.	1 1/2"	7/8"	2"	1 1/8"	1"	1 5/8"	(2 1/4")	(3 1/2")	1 1/2"	1 5/8"		2 1/4"		3 1/2"	
BOLT NO.	36	40	36	44	44	40	(32)	(24)	36	32		32		24	
BOLT L					178	330	(464)	(603)							
RING NO.															
S															
B . C . D					1120.6	1190.8	(1212.9)	(1339.9)	1200.2	1155.7		1212.9		1339.9	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.																								
	MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T

PIPE DATA

D=1016 mm

OUTSIDE SURFACE =3.19 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
STD	9.53	996.94	301.3	381608		7511	236.53	780.60									
	11.13	993.74	351.4	443569		8731	275.80	775.60									
XS	12.70	990.60	400.3	503789		9916	314.22	770.70									
	15.88	984.24	498.9	624021		12283	391.65	760.84									
	19.05	977.90	596.6	741578		14596	468.34	751.07									
	22.23	971.54	694.0	857230		16873	544.78	741.33									
	25.40	965.20	790.5	970280		19098	620.48	731.69									
	28.58	958.84	886.6	1081471		21287	695.92	722.08									
	31.75	952.50	981.7	1190131		23425	770.62	712.56									

WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T), (kg/m) t: mm, d: mm

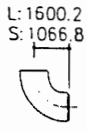
THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT	18.0 (11.7)	21.7 (11.8)	29.2 (12.1)	36.8 (12.3)	48.6 (12.6)	55.5 (12.8)	77.1 (13.4)	98.6 (13.9)	120.9 (14.5)	144.0 (15.0)	168.1 (15.6)

Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

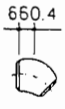
PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

NPS 42" / 1050mm

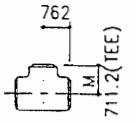
PIPE



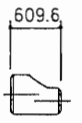
90° ELBOW



45° ELBOW

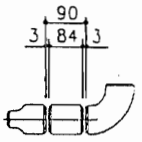


TEE

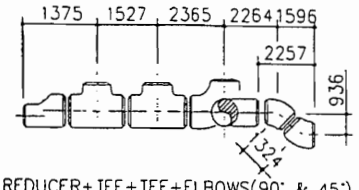


REDUCER

CAP



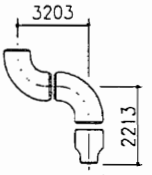
MIN.PIPE



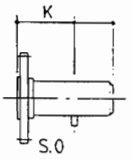
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

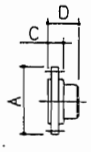
SIZE	M
x40"	711.2
x36"	711.2
x32"	711.2
x30"	711.2
x24"	660.4



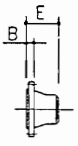
ELBOW+ELBOW
ELBOW+REDUCER



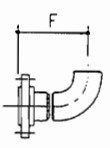
MAX.SIZE OF BOSS=



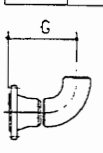
SO+PIPE



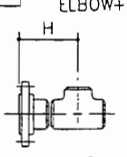
W.N



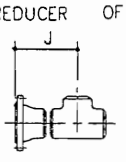
SO+PIPE +90° ELBOW



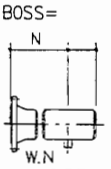
WN+ +90° ELBOW



SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

• DIM.S IN( ) FOR CL.600 AND CL.900 OF ANSI B16.47 SERIES B ARE ONLY REFERENCE.

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
TAYLOR FORGE	CL.125	294.8	322	
	CL.175	165.6	154.2	680.4
	CL.250	589.7	601.0	
	CL.350	281.2	290.3	1190.7
MSS SP 44	CL.150			
	CL.300			
	CL.600			
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1346.2	1244.6	1447.8	1270.0	1225.6	1333.5	(1403.4)	(1562.1)	1346.2	1289.1		1403.4		1562.1	
B	66.7	60.3 50.8	93.7	88.9	58.7	119.1	(174.5)	(212.6)	96.8	119.1		174.5		212.6	
C	101.6	111.1	142.9	155.6											
D	189	198	230	243											
E	142.9	114.3	176.2	165.1	133.4	204.7	(285.8)	(377.7)	171.5	200.2		285.8		377.7	
F	1792	1801	1833	1846											
G	1746	1718	1779	1768	1737	1808	(1889)	(1981)	1775	1803		1889		1981	
H	954	963	995	1008											
J	908	879	941	930	898	970	(1051)	(1143)	937	965		1051		1143	
K															
N															
BOLT DIA.	1½"	1"	2"	1⅛"	1"	1¾"	(2½")	(3½")	1½"	1⅝"		2½"		3½"	
BOLT NO.	36	40	36	48	48	36	(28)	(24)	36	32		28		24	
BOLT L					184	343	(495)	(622)							
RING NO.															
S															
B . C . D					1171.4	1244.6	(1282.7)	(1390.7)	1257.3	1206.5		1282.7		1390.7	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.	CL.150# RF				CL.300# RF				CL.600# RF											
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
W.CHE																				
BUTT																				

WAFER CHECK BUTT.VA

PIPE DATA

D=1066.8 mm

OUTSIDE SURFACE =3.35 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
STD	9.53	1047.74	316.5	442353		8292	248.47	862.18									
	11.13	1044.54	369.1	514293		9641	289.75	856.92									
XS	12.70	1041.40	420.6	584245		10952	330.13	851.78									
	15.88	1035.04	524.3	724005		13572	411.54	841.41									
	19.05	1028.70	627.1	860785		16136	492.20	831.13									
	22.23	1022.34	729.5	995478		18661	572.62	820.88									
	25.40	1016.00	831.0	1127269		21132	652.30	810.73									
	28.58	1009.64	932.2	1257021		23564	731.72	800.62									
	31.75	1003.30	1032.4	1383946		25943	810.40	790.59									

WEIGHT OF INS.

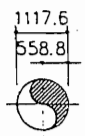
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT											

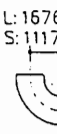
Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

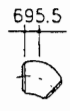
NPS 44" / 1100mm



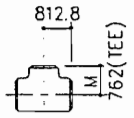
PIPE



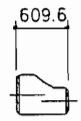
90° ELBOW



45° ELBOW

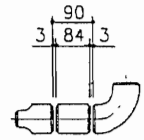


TEE

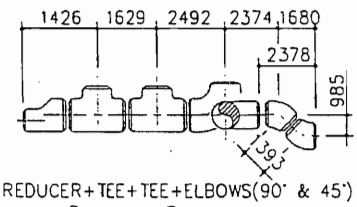


REDUCER

CAP



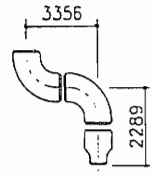
MIN.PIPE



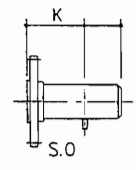
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

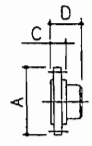
SIZE	M
x42"	762
x40"	749.3
x36"	723.9
x34"	723.9
x30"	711.2



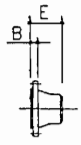
ELBOW+ELBOW
ELBOW+REDUCER



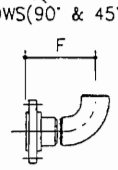
MAX.SIZE OF BOSS=



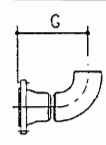
SO+PIPE



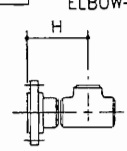
W.N



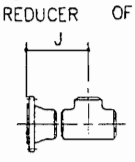
SO+PIPE +90° ELBOW



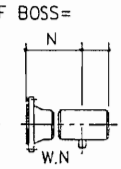
WN+ +90° ELBOW



SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

• DIM.S IN( ) FOR CL.600 AND CL.900 OF ANSI B16.47 SERIES B ARE ONLY REFERENCE.

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
TAYLORFORGE	CL.125	313	340.2	
	CL.175	172.4	163.3	771.1
	CL.250	635	646.4	
	CL.350	344.7	344.7	1338.1
MSS SP 44	CL.150			
	CL.300			
	CL.600			
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)							
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1403.4	1295.4	1505.0	1339.9	1276.4	1384.3	(1454.2)	(1648.0)	1403.4	1352.6		1454.2		1648.0	
B	66.7	60.3 / 50.8	95.3	95.3	60.5	127.0	(179.3)	(220.7)	101.6	124.0		179.3		220.7	
C	101.6	111.1	146.1	171.5											
D	189	198	233	259											
E	142.9	114.3	177.8	171.5	136.7	214.4	(295.4)	(397.0)	177.8	206.2		295.4		397.0	
F	1868	1878	1913	1938											
G	1822	1794	1857	1851	1816	1894	(1975)	(2076)	1857	1886		1975		2076	
H	1005	1014	1049	1075											
J	959	930	994	988	953	1030	(1111)	(1213)	994	1022		1111		1213	
K															
N															
BOLT DIA.	1½"	1"	2"	1½"	1"	1¾"	(2½")	(3¾")	1½"	1¾"		2½"		3¾"	
BOLT NO.	40	40	36	44	52	40	(32)	(24)	40	32		32		24	
BOLT L					191	362	(508)	(654)							
RING NO.															
S															
B . C . D					1222.2	1295.4	(1333.5)	(1463.5)	1314.5	1263.7		1333.5		1463.5	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.																						
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T

PIPE DATA

D=1117.6 mm
OUTSIDE SURFACE =3.51 m²/m

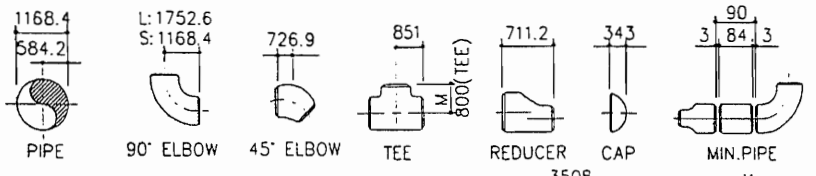
SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm²)	MOMENT OF INERTIA I (cm⁴)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm³)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
STD	9.53	1098.54	331.7	509225		9112	260.41	947.81									
	11.13	1095.34	386.9	592163		10596	303.69	942.30									
XS	12.70	1092.20	440.8	672842		12040	346.03	936.90									
	15.88	1085.84	549.6	834137		14926	431.43	926.02									
	19.05	1079.5	657.5	992129		17753	516.07	915.24									
	22.23	1073.14	765.0	1147847		20539	600.47	904.49									
	25.40	1066.80	871.5	1300343		23268	684.11	893.83									
	28.58	1060.44	977.8	1450614		25957	767.52	883.21									
	31.75	1054.10	1083.1	1597745		28590	850.17	872.68									

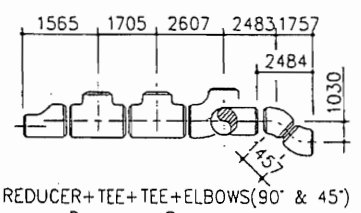
WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m³),W=0.000691T (D+T) D:mm, T:mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT											

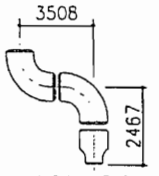
Wp=0.02466t (D−t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

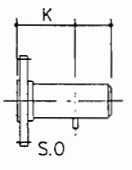


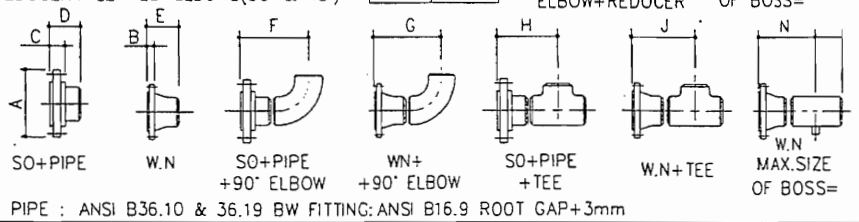


RED.TEE

SIZE	M
x42"	787.4
x40"	774.7
x36"	762.0
x32"	749.3
x30"	736.6







PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

• DIM.S IN( ) FOR CL.600 AND CL.900 OF ANSI B16.47 SERIES B ARE ONLY REFERENCE.

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
TAYLORFORGE	CL.125	331.1	362.9	
	CL.175	186.0	170.0	873.2
	CL.250	680.4	691.7	
	CL.350	399.2	399.2	1496.8
MSS SP 44	CL.150			
	CL.300			
	CL.600			
	CL.900			

TAPE		TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
		CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
		FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A		1454.2	1346.2	1562.1	1390.7	1341.4	1460.5	(1511.3)	1733.6	1454.2	1416.1		1511.3		1733.6	
B		68.3	60.3 50.8	98.4	108.0	62.0	128.5	(185.7)	(231.9)	103.1	128.5		185.7		231.9	
C		103.2	117.5	149.2	184.2											
D		190	205	236	271											
E		144.5	114.3	181.0	184.2	144.5	222.3	(306.3)	(417.6)	185.7	215.9		306.3		417.3	
F		1946	1960	1992	2027											
G		1900	1870	1937	1940	1900	1978	(2062)	(2173)	1941	1972		2062		2173	
H		1044	1059	1090	1125											
J		999	968	1035	1038	999	1076	(1160)	(1272)	1040	1070		1160		1271	
K																
N																
BOLT	DIA.	1 1/2"	1"	2"	1 1/4"	1 1/8"	1 7/8"	(2 1/2")	(4")	1 1/2"	1 7/8"		2 1/2"		4"	
	NO.	40	40	40	48	40	36	(32)	(24)	40	28		32		24	
	L					203	368	(521)	(686)							
RING NO.																
S																
B . C . D						1284.2	1365.3	(1390.7)	(1536.7)	1365.3	1320.8		1390.7		1536.7	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.																							
	MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T

PIPE DATA

D=1168.4 mm
OUTSIDE SURFACE =3.67 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
STD	9.53	1149.34	347.0	582518		9970	272.35	1037.5									
	11.13	1146.14	404.7	677520		11596	317.63	1031.7									
XS	12.70	1143.00	461.1	769971		13179	361.94	1026.1									
	15.88	1136.64	575.0	954908		16344	451.33	1014.7									
	19.05	1130.30	687.9	1136198		19447	539.93	1003.4									
	22.23	1123.94	800.5	1315022		22507	628.32	992.15									
	25.40	1117.60	912.1	1490287		25507	715.93	980.99									
	28.58	1111.24	1023.4	1663133		28466	803.33	969.85									
	31.75	1104.90	1113.8	1832507		31365	889.95	958.82									

WEIGHT OF INS.

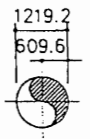
MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3), W=0.000691T (D+T) D: mm, T: mm
COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t: mm, d: mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT											

Wp=0.02466t (D-t) kg/m
Ww=0.0007854 d^2 kg/m
A=0.007854 (D^2-d^2) cm^2
I=0.000004909 (D^4-d^4) cm^4
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

PIPING DESIGN DATA
PIPING PARTS DIMENSION AND WEIGHT

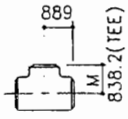
NPS 48" / 1200mm



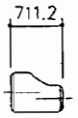
PIPE

90° ELBOW

45° ELBOW

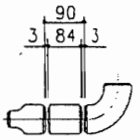


TEE

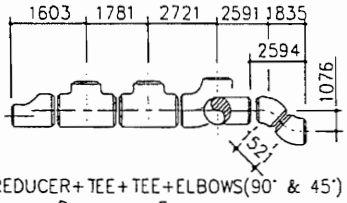


REDUCER

CAP



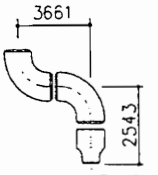
MIN.PIPE



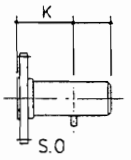
REDUCER+TEE+TEE+ELBOWS(90° & 45°)

RED.TEE

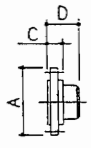
SIZE	M
x42"	812.8
x40"	812.8
x36"	787.4
x32"	787.4
x30"	762



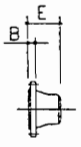
ELBOW+ELBOW
ELBOW+REDUCER



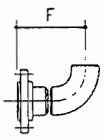
MAX.SIZE OF BOSS=



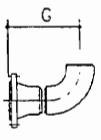
SO+PIPE



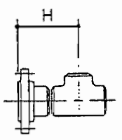
W.N



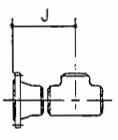
SO+PIPE +90° ELBOW



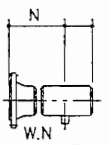
WN+ +90° ELBOW



SO+PIPE +TEE



W.N+TEE



MAX.SIZE OF BOSS=

PIPE : ANSI B36.10 & 36.19 BW FITTING: ANSI B16.9 ROOT GAP+3mm

• DIM.S IN( ) FOR CL.600 AND CL.900 OF ANSI B16.47 SERIES B ARE ONLY REFERENCE.

WEIGHT OF FLANGE (kg)

	RATING	S.O	W.N	BLIND
MSS SP 44 TAYLORFORGE	CL.125	362.9	394.6	
	CL.175	208.7	195	1009.2
	CL.250	816.5	827.8	
	CL.350	417.3	417.3	
	CL.150			
	CL.300			
	CL.600			
	CL.900			

TAPE	TAYLOR FORGE (S.O AND W.N)				ANSI B16.47 SERIES B (WN)(API-605)				ANSI B16.47 SERIES A/MSS SP-44 (WN)						
	CL.125	CL.175	CL.250RF	CL.350RF	CL.150	CL.300	CL.600	CL.900	CL.150	CL.300		CL.600		CL.900	
	FF	RF	RF	RF	RF	RF	RF	RF	RF	RF	RJ	RF	RJ	RF	RJ
A	1511.3	1397.0	1651.0	1441.5	1392.2	1511.3	(1593.9)	(1784.4)	1511.3	1466.9		1593.9		1784.4	
B	69.9	66.7 57.2	101.6	108.0	65.0	128.5	(195.3)	(239.8)	108.0	133.4		195.3		239.8	
C	104.8	123.8	152.4	184.2											
D	192	211	239	271											
E	146.1	123.8	184.2	184.2	149.4	223.8	(322.3)	(425.5)	192.0	223.8		322.3		425.5	
F	2024	2043	2071	2103											
G	1978	1956	2016	2016	1981	2056	(2154)	(2257)	2024	2056		2154		2257	
H	1084	1103	1131	1163											
J	1038	1016	1076	1076	1041	1116	(1214)	(1318)	1084	1116		1214		1318	
K															
N															
BOLT DIA.	1½"	1"	2"	1¼"	1⅛"	1⅞"	(2¾")	(4")	1½"	1⅞"		2¾"		4"	
BOLT NO.	44	44	40	48	44	40	(32)	(24)	44	32		32		24	
BOLT L					203	368	(552)	(705)							
RING NO.															
S															
B . C . D					1335.0	1416.1	(1460.5)	(1587.5)	1422.4	1371.6		1460.5		1587.5	

S: APPROXIMATE DISTANCE BETWEEN FLANGE FACES WHEN RING IS COMPRESSED

VALVE DATA

RATING & CONN.	CL.150# RF				CL.300# RF																	
MARK	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T	L	H	W	T
W.CHE																						
BUTT																						

WAFER CHECK

BUTT.VA

PIPE DATA

D=1219.2 mm

OUTSIDE SURFACE =3.83 m^2/m

SCH.	THICK (mm)t	INSIDE DIA. d (mm)	METAL SECTION AREA A (cm^2)	MOMENT OF INERTIA I (cm^4)	RADIUS OF GYRATION (cm)	SECTION MODULUS Z (cm^3)	WEIGHT OF PIPE Wp (kg/m)	WEIGHT OF WATER Ww (kg/m)	WEIGHT OF FITTING (kg) 90° LR ELBOW	CAP	TEE FULL	TEE X	TEE X	TEE X	REDUCER X	REDUCER X	REDUCER X
STD	9.53	1200.14	362.2	662527		10867	284.28	1131.2									
	11.13	1196.94	422.4	770711		12642	331.57	1125.2									
XS	12.70	1193.80	481.4	876026		14369	377.85	1119.3									
	15.88	1187.44	600.3	1086807		17826	471.22	1107.4									
	19.05	1181.10	718.3	1293582		21218	563.80	1095.6									
	22.23	1174.74	835.9	1497690		24566	656.17	1083.9									
	25.40	1168.40	952.6	1697884		27850	747.75	1072.2									
	28.58	1162.04	1069.0	1895461		31090	839.13	1060.6									
	31.75	1155.70	1184.4	2089215		34268	929.72	1049.0									

WEIGHT OF INS.

MATERIAL : JIS A9501 CALCIUM SILICATE MOLDED PIPE INS.NO.2 (220kg/m^3),W=0.000691T (D+T) D:mm, T:mm

COVER MAT'L: PRECOATED GALVANIZED SHEET, 0.3mm^t WEIGHT IN ( )=0.00943 (D+2T),(kg/m) t:mm, d:mm

THICKNESS (mm): T	25	30	40	50	65	75	100	125	150	175	200
WEIGHT											

Wp=0.02466t (D−t) kg/m

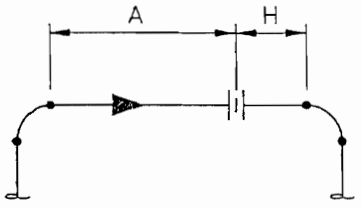
Ww=0.0007854 d^2 kg/m

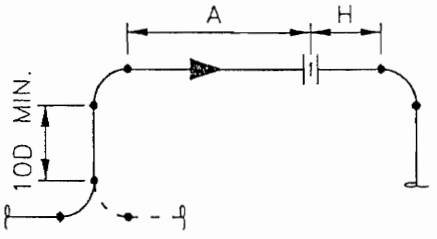
A=0.007854 (D^2-d^2) cm^2

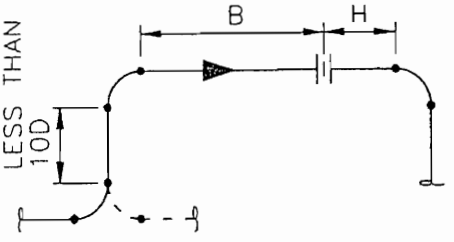
I=0.000004909 (D^4-d^4) cm^4

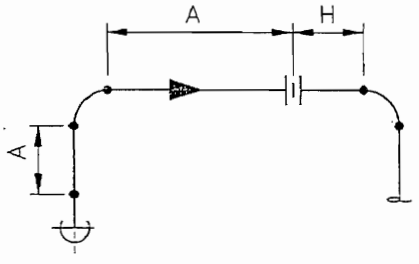
Z=0.00009817 $\frac{(D^4-d^4)}{D}$ cm^3

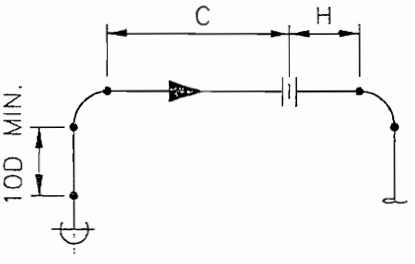
MINIMUM ORIFICE METER RUN

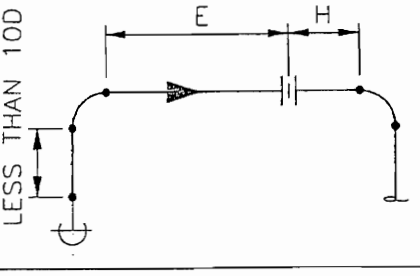


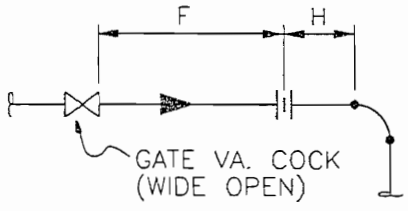


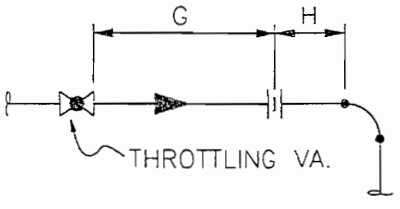


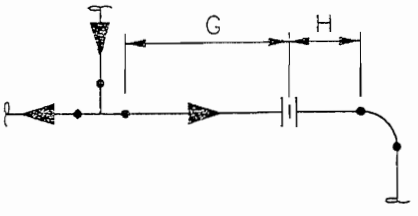


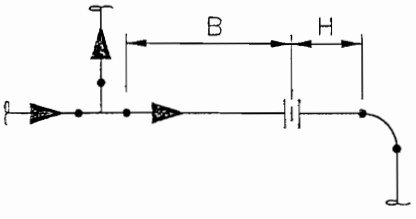


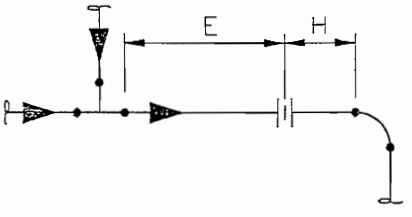


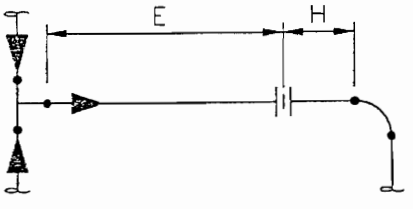


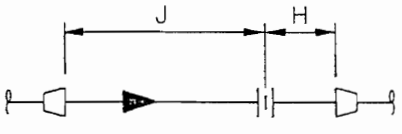






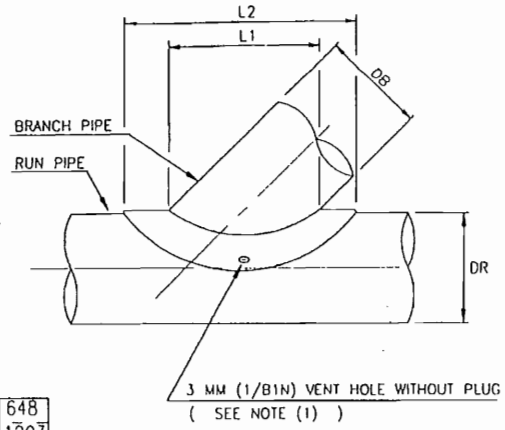


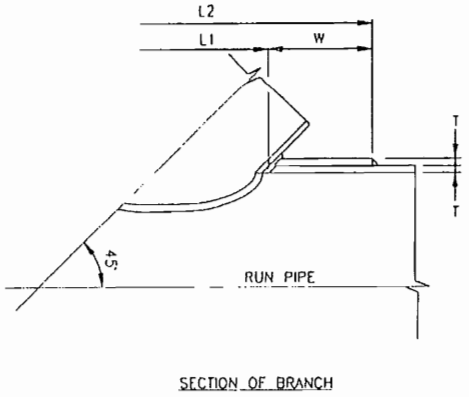




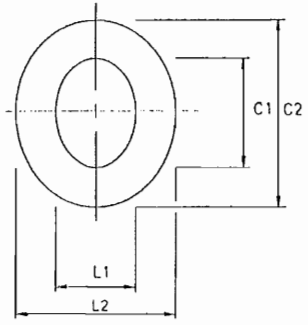
MINIMUM ORIFICE METER RUN	RATIO OF INTERNAL DIAMETERS OF ORIFICE PLATE PER PIPE (d/D)													
	0.8	0.75	0.7	0.65	0.6	0.55	0.5	0.45	0.4	0.35	0.3	0.25		
	MINIMUM RUNS OF STRAIGHT PIPE REQUIRED UPSTREAM AND DOWNSTREAM OF ORIFICE IN PIPE DIAMETERS (NPS)													
A	20	17	14	12	10	9	8	7	7	6	6	6		
B	25	21	19	15	14	12	10	9	9	9	9	9		
C	33	27	23	21	19	18	17	16	15	14	14	14		
E	40	35	31	28	25	22	21	20	18	17	16	16		
F	14	11	9	8	8	7	7	5	5	5	5	5		
G	50	44	39	34	31	28	25	24	22	21	20	19		
H	5	5	5	5	5	5	5	5	5	5	5	5		
J	15	14	13	11	10	9	8	7	7	6	6	6		

DIMENSIONS OF REINFORCEMENT PAD FOR 45° BRANCH





SECTION OF BRANCH



DEVELOPMENT OF PAD

NOTES :

(1) REINFORCEMENT PADS MAY BE DIVIDED INTO TWO HALVES WITH A LONGITUDINAL WELDING SEAM. AND WITH A TEST HOLE ON EACH HALF

(2) MATERIALS FOR REINFORCEMENT PADS SHALL BE THE SAME AS THAT OF RUN PIPE.

(3) IN PRINCIPLE. THICKNESS OF REINFORCEMENT PADS SHALL BE THE SAME AS THAT OF RUN PIPE. HOWEVER. THE THICKNESS SHALL BE ANALYZED AND CONFIRMED IN ACCORDANCE WHTH ANSI B31.3 ON EACH PROJECT.

(4) OUTSIDE DIAMETER OF PIPE IS BASED ON ANSI B36. 10.

(5) DETAILS FOR BRANCH ATTACHMENT WELDS SHALL BE IN ACCORDANCE WITH ANSI B31.3.

(6) DIMENSIONS ARE DETERMINED IN ACCORDANCE WITH THE FOLLOWING :

$L1 = \sqrt{2} \times DB + 10$

$L2 = 2\sqrt{2} \times DB$

$W = (L2 - L1) / 2$

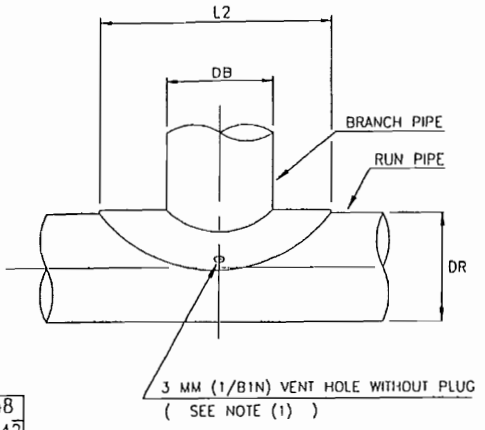
$C1 = DR \times SIN^{1} (DB/DR) \times (X/180) + 10$

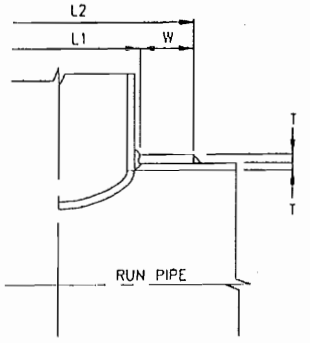
$C2 = C1 + 2 \times W$

RUN PIPE		BRANCH 2	3	4	6	8	10	12	14	16	18	20	22	24
2	C1	105												
	C2	180												
3	C1	76	150											
	C2	151	264											
4	C1	74	112	190										
	C2	149	226	338										
6	C1	72	104	136	274									
	C2	147	218	284	496									
8	C1	71	102	130	202	439								
	C2	146	216	278	424	644								
10	C1	71	101	128	191	264	519							
	C2	146	215	276	413	554	813							
12	C1	71	100	127	187	251	335	519						
	C2	146	214	275	409	541	709	961						
14	C1	71	100	126	185	246	321	417	569					
	C2	146	214	274	407	536	695	859	1056					
16	C1	71	100	126	184	241	309	385	443	648				
	C2	146	214	274	406	531	683	827	930	1203				
18	C1	70	99	126	182	238	303	370	417	511	728			
	C2	145	213	274	404	528	677	812	904	1066	1361			
20	C1	70	99	125	182	237	298	361	404	481	579	808		
	C2	145	213	273	404	527	672	803	891	1036	1212	1510		
22	C1	70	99	125	181	235	295	355	395	465	545	648	888	
	C2	145	213	273	403	525	669	797	882	1020	1178	1350	1668	
24	C1	70	99	125	181	234	293	351	390	455	527	611	717	968
	C2	145	213	273	403	524	667	793	877	1010	1160	1313	1497	1816

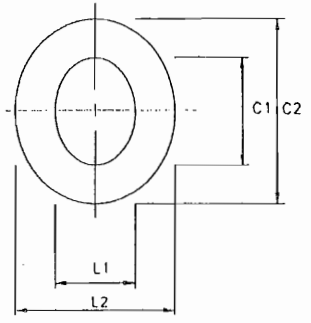
RUN PIPE		BRANCH 2	3	4	6	8	10	12	14	16	18	20	22	24		26	28	30	32	34	36	38	40	42	44	46	48
26	C1	70	99	125	180	232	292	349	386	448	515	590	676	787	26	1047											
	C2	145	213	273	402	522	666	791	873	1003	1148	1292	1456	1635		1963											
28	C1	70	99	125	180	232	290	346	382	443	507	576	653	742	28	857	1127										
	C2	145	213	273	402	522	664	788	869	998	1140	1278	1433	1590		1773	2121										
30	C1	70	99	125	180	232	289	345	380	439	500	566	637	717	30	809	927	1207									
	C2	145	213	273	402	522	663	787	867	994	1133	1268	1417	1565		1725	1921	2269									
32	C1	70	99	125	180	232	289	343	378	436	496	559	626	699	32	781	876	998	1287								
	C2	145	213	273	402	522	663	785	865	991	1129	1261	1406	1547		1697	1870	2060	2418								
34	C1	70	99	125	179	232	288	342	377	433	492	553	618	687	34	762	846	943	1069	1367							
	C2	145	213	273	401	522	662	784	864	988	1125	1255	1398	1535		1678	1840	2005	2200	2576							
36	C1	70	99	125	179	231	287	341	375	431	489	549	611	677	36	748	825	911	1011	1140	1446						
	C2	145	213	273	401	521	661	783	862	986	1122	2151	1391	1525		1664	1819	1973	2142	2349	2723						
38	C1	70	99	125	179	231	287	340	374	429	486	545	606	670	38	737	810	888	976	1079	1212	1526					
	C2	145	213	273	401	521	661	782	861	984	1119	1247	1306	1518		1653	1804	1950	2107	2288	2489	2871					
40	C1	70	99	125	179	231	287	340	373	428	484	542	602	664	40	729	798	872	952	1042	1148	1283	1606				
	C2	145	213	273	401	521	661	782	860	983	1117	1244	1382	1512		1645	1792	1934	2083	2251	2425	2628	3029				
42	C1	70	99	125	179	231	286	339	373	427	482	539	598	659	42	722	788	859	934	1016	1108	1216	1355	1686			
	C2	145	213	273	401	521	660	781	860	982	1115	1241	1378	1507		1638	1782	1921	2065	2225	2385	2561	2778	3177			
44	C1	70	99	125	179	231	286	339	372	426	481	537	595	655	44	717	781	848	920	997	1081	1175	1285	1427	1766		
	C2	145	213	273	401	521	660	781	859	981	1114	1239	1375	1503		1633	1775	1910	2051	2206	2358	2520	2708	2918	3335		
46	C1	70	99	124	179	230	286	338	371	425	480	536	593	651	46	712	775	840	909	982	1060	1146	1242	1354	1500	1845	
	C2	145	213	272	401	520	660	780	858	980	1113	1238	1373	1499		1628	1769	1902	2040	2191	2337	2491	2665	2845	3069	3483	
48	C1	70	99	124	179	230	285	338	371	424	479	534	590	648	48	708	769	833	900	970	1044	1124	1211	1309	1424	1572	1925
	C2	145	213	272	401	520	659	780	858	979	1112	1236	1370	1496		1627	1763	1895	2031	2179	2321	2469	2634	2800	2993	3210	3631
BRANCH		2	3	4	6	8	10	12	14	16	18	20	22	24		26	28	30	32	34	36	38	40	42	44	46	48
	L1	95	136	172	248	320	396	468	513	585	657	728	800	872	L1	944	1016	1088	1159	1231	1303	1375	1447	1519	1519	1662	1734
	L2	170	250	320	470	610	770	910	1000	1140	1290	1430	1580	1720	L2	1860	2010	2150	2290	2440	2580	2720	2870	3010	3160	3300	3440
	W	37.5	57	74	111	145	187	221	243.5	277.5	316.5	351	390	424	W	458	497	531	565.5	604.5	638.5	672.5	711.5	745.5	784.5	819	853

DIMENSIONS OF REINFORCEMENT PAD FOR 90° BRANCH





SECTION OF BRANCH



DEVELOPMENT OF PAD

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(6) DIMENSIONS ARE DETERMINED IN ACCORDANCE WITH THE FOLLOWING :

L1 = DB + 10

L2 = 2 x DB

W = (L2 − L1) / 2

C1 = DR x SIN^{-1} (DB/DR) x (X/180) + 10

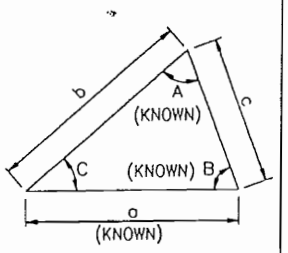
C2 = C1 + 2 x W

RUN PIPE		BRANCH 2	3	4	6	8	10	12	14	16	18	20	22	24
2	C_1	105												
	C_2	155												
3	C_1	76	150											
	C_2	126	221											
4	C_1	74	112	190										
	C_2	124	183	286										
6	C_1	72	104	136	274									
	C_2	122	175	232	426									
8	C_1	71	102	130	202	354								
	C_2	121	173	226	354	555								
10	C_1	71	101	128	191	264	439							
	C_2	121	172	224	343	465	696							
12	C_1	71	100	127	187	251	335	519						
	C_2	121	171	223	339	452	592	825						
14	C_1	71	100	126	185	246	321	417	569					
	C_2	121	171	222	337	447	578	723	913					
16	C_1	71	100	126	184	241	309	385	443	648				
	C_2	121	171	222	336	442	566	691	787	1042				
18	C_1	70	99	126	182	238	303	370	417	511	728			
	C_2	120	170	222	334	439	560	676	761	905	1171			
20	C_1	70	99	125	182	237	298	361	404	481	579	808		
	C_2	120	170	221	334	438	555	667	748	875	1022	1300		
22	C_1	70	99	125	181	235	295	355	395	465	545	648	888	
	C_2	120	170	221	333	436	552	661	739	859	988	1140	1429	
24	C_1	70	99	125	181	234	293	351	390	455	527	611	717	968
	C_2	120	170	221	333	435	550	657	734	849	970	1103	1258	1558

RUN PIPE		BRANCH 2	3	4	6	8	10	12	14	16	18	20	22	24		26	28	30	32	34	36	38	40	42	44	46	48
26	C_1	70	99	125	180	232	292	349	386	448	515	590	676	787	26	1047											
	C_2	120	170	221	332	434	549	655	730	842	958	1082	1217	1377		1697											
28	C_1	70	99	125	180	232	290	346	382	443	507	576	653	742	28	857	1127										
	C_2	120	170	221	332	434	547	652	726	837	950	1060	1194	1332		1607	1826										
30	C_1	70	99	125	180	232	289	345	380	439	500	566	637	717	30	809	927	1207									
	C_2	120	170	221	332	433	546	651	724	833	943	1058	1178	1307		1459	1626	1955									
32	C_1	70	99	125	180	232	289	343	378	436	496	559	626	699	32	781	876	998	1287								
	C_2	120	170	221	332	433	545	549	722	830	939	1051	1167	1289		1431	1575	1748	2084								
34	C_1	70	99	125	179	232	288	342	377	433	492	553	618	687	34	762	846	943	1069	1367							
	C_2	120	170	221	331	433	545	648	721	827	935	1045	1159	1277		1412	1545	1691	1866	2213							
36	C_1	70	99	125	179	231	287	341	375	431	489	549	611	677	36	748	825	911	1011	1140	1446						
	C_2	120	170	221	331	432	544	647	719	825	932	1041	1152	1267		1398	1524	1659	1808	1986	2342						
38	C_1	70	99	125	179	231	287	340	374	429	486	545	606	670	38	737	810	888	976	1079	1212	1526					
	C_2	120	170	221	331	432	544	646	718	823	929	1037	1147	1260		1387	1509	1636	1773	1925	2108	2481					
40	C_1	70	99	125	179	231	287	340	373	428	484	542	602	664	40	729	798	872	952	1042	1148	1283	1606				
	C_2	120	170	221	331	432	544	646	717	822	927	1034	1143	1254		1379	1497	1620	1749	1888	2044	2238	2610				
42	C_1	70	99	125	179	231	286	339	373	427	482	539	598	659	42	722	788	859	934	1016	1108	1216	1355	1686			
	C_2	120	170	221	331	432	544	645	717	821	925	1031	1139	1249		1372	1487	1607	1731	1862	2004	2171	2359	2739			
44	C_1	70	99	125	179	231	286	339	372	426	481	537	595	655	44	717	781	848	920	997	1081	1175	1285	1427	1766		
	C_2	120	170	221	331	432	543	645	716	820	924	1029	1136	1245		1367	1480	1596	1717	1843	1977	2130	2289	2480	2868		
46	C_1	70	99	124	179	230	286	338	371	425	480	536	593	651	46	712	775	840	909	982	1060	1146	1242	1354	1500	1845	
	C_2	120	170	220	331	431	543	644	715	819	923	1028	1134	1241		1362	1474	1588	1705	1828	1956	2101	2246	2407	2602	2997	
48	C_1	70	99	124	179	230	285	338	371	424	479	534	590	648	48	708	769	833	900	970	1044	1124	1211	1309	1424	1572	1925
	C_2	120	170	220	331	431	542	644	715	818	922	1026	1131	1238		1358	1468	1581	1697	1816	1940	2079	2215	2362	2526	2724	3126

BRANCH		2	3	4	6	8	10	12	14	16	18	20	22	24		26	28	30	32	34	36	38	40	42	44	46	48
	L 1	70	99	124	178	229	283	334	366	416	467	518	569	620	L 1	670	721	772	823	874	924	975	1026	1077	1128	1178	1229
	L 2	120	170	220	330	430	540	640	710	810	910	1010	1110	1210	L 2	1320	1420	1520	1620	1720	1820	1930	2030	2130	2230	2330	2430
	W	25	35.5	48	76	100.5	128.5	153	172	197	221.5	246	270.5	295	W	325	349.5	374	398.5	423	448	477.5	502	526.5	551	576	600.5

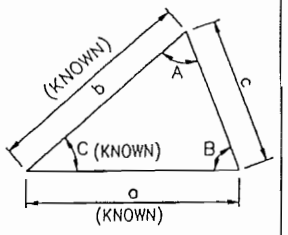
Solution of oblique – angled Triangles



One side and two angles known:
Call the known side a, the angle opposite it A, and the other known angle B, then:
$C = 180° - (A+B)$: or if angles B and C are given, but not A, then $A = 180° - (B+C)$.
$C = 180° - (A+B)$

$$b = \frac{a \times \sin B}{\sin A} \qquad c = \frac{a \times \sin C}{\sin A}$$

$$\text{Area} = \frac{a \times b \times \sin C}{2}$$



Two sides and the angle between them known:
Call the known sides a and b, and the known angle between them C. Then:

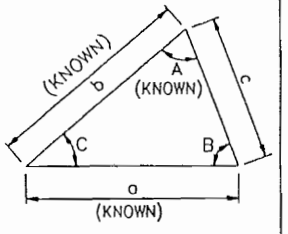
$$\tan A = \frac{a \times \sin C}{b - (a \times \cos C)}$$

$$B = 180° - (A+C) \qquad c = \frac{a \times \sin C}{\sin A}$$

Side c may also be found directly as below:

$$c = \sqrt{a^2 + b^2 - (2ab \times \cos C)}$$

$$\text{Area} = \frac{a \times b \times \sin C}{2}$$

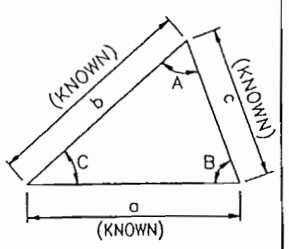


Two sides and the angle opposite one of the sides known:
Call the known angle A, the side opposite it a, and the other known side b, Then:

$$\sin B = \frac{b \times \sin A}{a} \qquad C = 180° - (A+B)$$

$$c = \frac{b \times \sin C}{\sin A} \qquad \text{Area} = \frac{a \times b \times \sin C}{2}$$

if, in the above, angle B> angle A but <90°, then a second solution B_2, C_2, c_2 exists for which: $B_2 = 180° - B$; $C_2 = 180° - (A+B_2)$; $c_2 = (a \times \sin C_2) \div \sin A$; Area $= (a \times b \times \sin C) \div 2$. if $a \geq b$, then the first solution only exists, if $a < b \times \sin A$, then no solution exists.

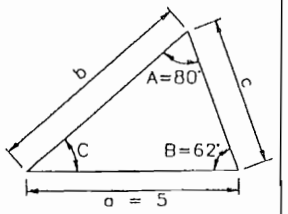


All three sides known:
Call the side a,b and c, and the angles opposite them, A,B, and C. then:

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \qquad \sin B = \frac{b \times \sin A}{a}$$

$$C = 180° - (A+B) \qquad \text{Area} = \frac{a \times b \times \sin C}{2}$$

Examples of the solution of oblique – angled Triangles (English and metric units)



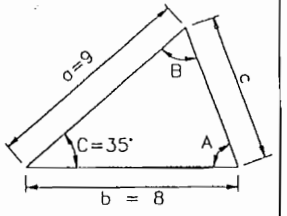
Side and angle known:
a = 5 centimeters; A=80°; B=62°
Then, by the formulars on the preecding page:
$C = 180° - (80° + 62°) = 180° - 142° = 38°$

$$b = \frac{a \times \sin B}{\sin A} = \frac{5 \times \sin 62°}{\sin 80°} = \frac{5 \times 0.88295}{0.98481} = 4.483$$

centimeters.

$$c = \frac{a \times \sin C}{\sin A} = \frac{5 \times \sin 38°}{\sin 80°} = \frac{5 \times 0.61566}{0.98481} = 3.126$$

centimeters.



Sides and angle known:
a = 9inches; b = 8inches; C = 35°

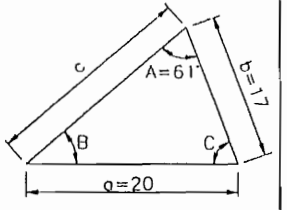
$$\tan A = \frac{a \times \sin C}{b - (a \times \cos C)} = \frac{9 \times \sin 35°}{8 - (9 \times \cos 35°)}$$

$$= \frac{9 \times 0.57358}{8 - (9 \times 0.81915)} = \frac{5.16222}{0.62765} = 8.22468.$$

Hence, A=83°4'

$B = 180° - (A+C) = 180° - 118°4' = 61°56'$

$$c = \frac{a \times \sin C}{\sin A} = \frac{9 \times 0.57358}{0.99269} = 5.2 \text{inches.}$$



Sides and angle known:
a = 20 centimeters; b = 17 centimeters; A = 61°

$$\sin B = \frac{b \times \sin A}{a} = \frac{17 \times \sin 61°}{20}$$

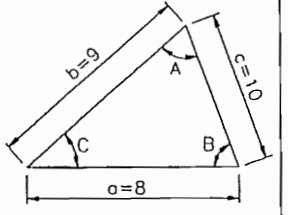
$$= \frac{17 \times 0.87462}{20} = 0.74343.$$

Hence, B=48°1'

$C = 180° - (A+B) = 180° - 109°1' = 70°59'$

$$c = \frac{a \times \sin C}{\sin A} = \frac{20 \times \sin 70°59'}{\sin 61°} = \frac{20 \times 0.94542}{0.87462}$$

$$= 21.62 \text{ centimeters.}$$



Sides known:
a = 8 inches; b = 9 inches ; c = 10 inches

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} = \frac{9^2 \times 10^2 - 8^2}{2 \times 9 \times 10}$$

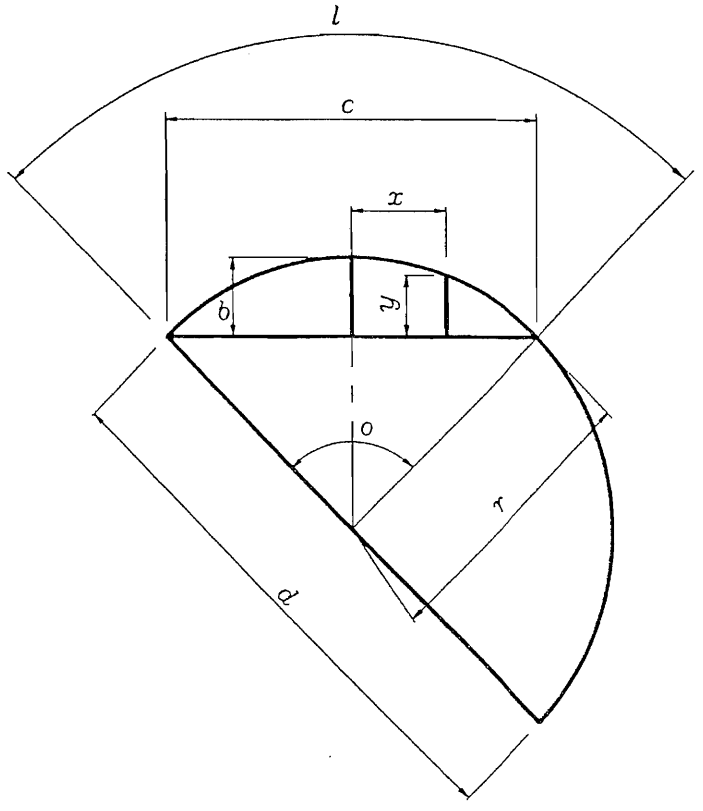
$$= \frac{81 + 100 - 64}{180} = \frac{117}{180} = 0.65000.$$

Hence, A=49°27'

$$\sin B = \frac{b \times \sin A}{a} = \frac{9 \times \sin A}{8} = 0.85482.$$

Hence, B=58°44'

$C = 180° - (A+B) = 180° - 108°11' = 71°49'$



PROPERTIES OF THE CIRCLE

Circumference of Circle of Diameter 1 = π = 3.14159265
Circumference of Circle = 2π = πd
Diameter of Circle = Circumference x 0.31831
Diameter of Circle of equal periphery as squares = side x 1.27324
Side of Square of equal periphery as circle = diameter x 0.78540
Diameter of Circle circumscribed about square = side x 1.41421
Side of square inscribed in Circle = diameter x 0.70711

Arc, $l = \frac{\pi r \theta^\circ}{180} = 0.017453\ r\theta^\circ$

Angle, $\theta = \frac{180^\circ l}{\pi r} = 57.29578\ \frac{l}{r}$

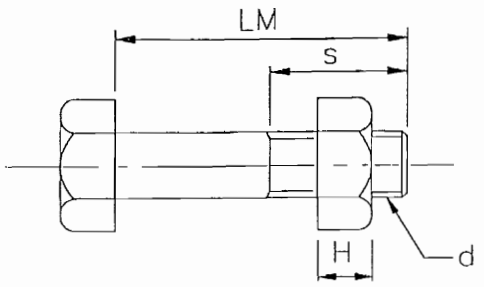
Radius, $r = \frac{4b^2 + c^2}{8b}$ Diameter, $d = \frac{4b^2 + c^2}{4b}$

Chord, $c = 2\sqrt{2br - b^2} = 2\ r\ \sin\frac{\theta}{2} = d\ \sin\frac{\theta}{2}$

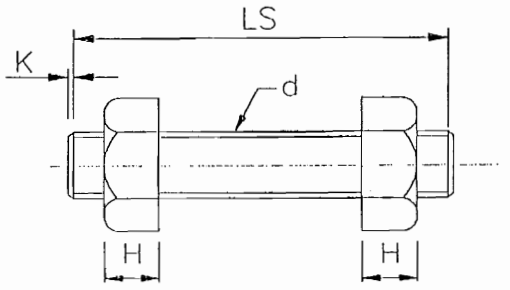
Rise, $b = r - \frac{1}{2}\sqrt{4r^2 - c^2} = \frac{c}{2}\ \tan\ \frac{\theta}{4} = 2\ r\ \sin\frac{\theta}{4}$

Rise, $b = r + y - \sqrt{r^2 - x^2}$ $Y = b - r + \sqrt{r^2 - x^2}$ $x = r - \sqrt{(r^2 + y - b)^2}$

π = 3.14159265	$\log \pi$ = 0.4971499	π^2 = 9.869604	$\log \pi^2$ = 0.4971499
		π^3 = 31.006277	$\log \pi^3$ = 1.491450
$\frac{1}{\pi}$ = 0.318310	$\log \frac{1}{\pi}$ = 9.502850 − 10	$\frac{1}{\pi^2}$ = 0.101321	$\log \frac{1}{\pi^2}$ = 9.005700 − 10
$\frac{2}{\pi}$ = 0.636620	$\log \frac{2}{\pi}$ = 9.803880 − 10	$\frac{1}{\pi^3}$ = 0.032252	$\log \frac{1}{\pi^3}$ = 8.508557 − 10
		$\sqrt{\pi}$ = 1.772452	$\log \sqrt{\pi}$ = 0.248575
$\frac{180}{\pi}$ = 57.295780	$\log \frac{180}{\pi}$ = 1.758123	$1/\sqrt{\pi}$ = 0.564190	$\log \frac{1}{\sqrt{\pi}}$ = 9.751425 − 10
$\frac{\pi}{180}$ = 0.017453	$\log \frac{\pi}{180}$ = 8.241870 − 10	$\sqrt[3]{\pi}$ = 1.464592	$\log \sqrt[3]{\pi}$ = 0.165717



MACHINE BOLT (NUT)

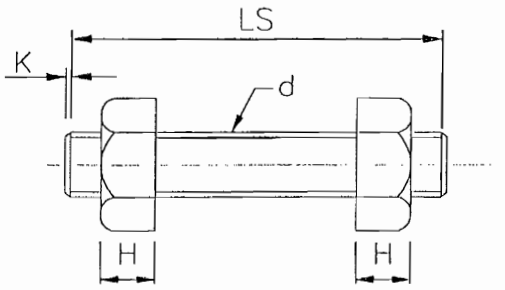


STUD BOLT (NUT)

UNIT : mm

NOMINAL FLANGE SIZE		150#							300#							400#						600#				
		d	NUMBER OF BOLT	NUT DIMENSION		LM	LS	S	d	NUMBER OF BOLT	NUT DIMENSION		LM	LS	S	d	NUMBER OF BOLT	NUT DIMENSION		LS	d	NUMBER OF BOLT	NUT DIMENSION		LS
(A)	(B)			H	K						H	K						H	K					H	K	
15	1/2	U1/2	4	12.7		55	65	34	U1/2	4	12.7		60	70	34	U1/2	4	12.7		85	U1/2	4	12.7		85
20	3/4	U1/2	4	12.7		55	65	34	U5/8	4	15.8		65	75	42	U5/8	4	15.9		90	U3/8	4	15.9		90
25	1	U1/2	4	12.7		60	70	34	U5/8	4	15.8		70	85	42	U5/8	4	15.9		95	U5/8	4	15.9		95
(32)	(1 1/4)	U1/2	4	12.7		65	70	34	U5/8	4	15.8		70	95	42	U5/8	4	15.9		100	U5/8	4	15.9		100
40	1 1/2	U1/2	4	12.7		65	75	34	U3/4	4	19.1		80	95	50	U3/4	4	19.1		110	U3/4	4	19.1		110
50	2	U5/8	4	15.9		70	85	42	U5/8	8	15.9		80	105	40	U5/8	8	15.9		110	U5/8	8	15.9		110
65	2 1/2	U5/8	4	15.9		80	90	42	U3/4	8	19.1		90	105	50	U3/4	8	15.9		125	U3/4	8	19.1		125
80	3	U5/8	4	15.9		85	95	42	U3/4	8	19.1		95	110	50	U3/4	8	15.9		130	U3/4	8	19.1		130
(90)	(3 1/2)	U5/8	8	15.9		85	95	42	U3/4	8	19.1		100	115	50	U7/8	8	22.2		140	U7/8	8	22.2		140
100	4	U5/8	8	15.9		85	95	42	U3/4	8	19.1		100	120	50	U7/8	8	22.2		140	U7/8	8	22.2		150
(125)	(5)	U3/4	8	19.1		85	105	50	U3/4	8	19.1		110	125	50	U7/8	8	22.2		150	U1	8	25.4		170
150	6	U3/4	8	19.1		90	105	50	U3/4	12	19.1		110	130	50	U7/8	12	22.2		155	U1	12	25.4		175
200	8	U3/4	8	19.1		95	115	50	U7/8	12	22.2		125	145	53	U1	12	25.4		175	U1.1/8	12	26.6		200
250	10	U7/8	12	22.2		105	120	53	U1	16	25.4		140	165	63	U1.1/8	16	28.6		195	U1.1/4	16	31.8		220
300	12	U7/8	12	22.2		110	125	53	U1.1/8	16	28.6		150	180	71	U1.1/4	16	31.8		205	U1.1/4	20	31.8		230
350	14	U1	12	25.4		115	140	63	U1.1/8	20	28.6		160	185	71	U1.1/4	20	31.8		210	U1.3/8	20	34.9		240
400	16	U1	16	25.4		120	140	63	U1.1/4	20	31.8		170	195	75	U1.3/8	20	31.9		225	U1.1/2	20	38.1		260
450	18	U1.1/8	16	28.6		130	155	71	U1.1/4	24	31.8		175	205	75	U1.3/8	24	31.9		230	U1.5/8	20	41.3		280
500	20	U1.1/8	20	28.6		140	165	71	U1.1/4	24	31.8		185	210	75	U1.1/2	24	38.1		250	U1.5/8	24	41.3		295
600	24	U1.1/4	20	31.8		150	180	75	U1.1/2	24	38.1		205	240	80	U1.3/4	24	44.5		275	U1.7/8	24	47.6		335

Remarks 1. These dimensions conform to ANSI B16.5-'81.
2. If possible, nominal flange size given in brackets shoule be avoided from use.



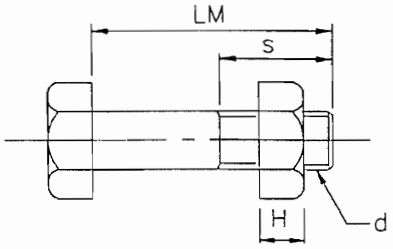
STUD BOLT (NUT)

UNIT : mm

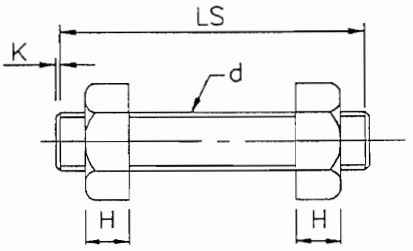
NOMINAL FLANGE SIZE		600#					900#					1500#					2500#				
(A)	(B)	d	NO	H	K	LS	d	NO	H	K	LS	d	NO	H	K	LS	d	NO	H	K	LS
15	1/2	U1/2	4	12.7	2	80	U3/4	4	19.1	2.5	110	U3/4	4	19.1	2.5	115	U3/4	4	19.1	2.5	130
20	3/4	U5/8	4	15.9	2	95	U3/4	4	19.1	2.5	120	U3/4	4	19.1	2.5	120	U3/4	4	19.1	2.5	130
25	1	U5/8	4	15.9	2	95	U7/8	4	22.2	3	135	U7/8	4	22.2	3	135	U7/8	4	22.2	3	145
(32)	(1 1/4)	U5/8	4	15.9	2	100	U7/8	4	22.2	3	135	U7/8	4	22.2	3	135	U1	4	25.4	3	155
40	1 1/2	U3/4	4	19.1	2.5	110	U1	4	25.2	3	145	U1	4	25.4	3	145	U1.1/8	4	28.6	3.5	175
50	2	U5/8	8	15.9	2	115	U7/8	8	22.2	3	155	U7/8	8	22.2	3	155	U1	8	25.4	3	185
65	2 1/2	U3/4	8	19.1	2.5	130	U1	8	25.4	3	165	U1	8	25.4	3	165	U1.1/8	8	28.6	3.5	210
80	3	U3/4	8	19.1	2.5	135	U7/8	8	22.2	3	155	U1.1/8	8	28.6	3.5	185	U1.1/4	8	31.8	3.5	235
(90)	(3 1/2)	U7/8	8	22.2	3	145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
100	4	U7/8	8	22.2	3	155	U1.1/8	8	28.6	3.5	180	U1.1/4	8	31.8	3.5	205	U1.1/2	8	38.1	4	270
(125)	(5)	U1	8	25.4	3	175	U1.1/4	8	31.8	3.5	200	U1.1/2	8	38.1	4	260	U1.3/4	8	44.5	4.5	320
150	6	U1	12	25.4	3	180	U1.1/8	12	28.6	3.5	205	U1.3/8	12	34.9	4	275	U2	8	50.8	5	365
200	8	U1.1/8	12	28.6	3.5	205	U1.3/8	12	34.9	4	235	U1.5/8	12	41.3	4.5	330	U2	12	50.8	5	400
250	10	U1.1/4	16	31.8	3.5	230	U1.3/8	16	34.9	4	245	U1.7/8	12	47.6	5	350	U2.1/2	12	63.5	6	515
300	12	U1.1/4	20	31.8	3.5	235	U1.3/8	20	34.9	4	265	U2	16	50.8	5	400	U2.3/4	12	69.9	6	565
350	14	U1.3/8	20	34.9	4	245	U1.1/2	20	38.1	4	290	U2.1/4	16	57.2	5.5	435	–	–	–	–	–
400	16	U1.1/2	20	38.1	4	265	U1.5/8	20	41.3	4.5	305	U2.1/2	16	63.5	6	475	–	–	–	–	–
450	18	U1.5/8	20	41.3	4.5	285	U1.7/8	20	47.6	5	345	U2.3/4	16	69.9	6	535	–	–	–	–	–
500	20	U1.5/8	24	41.3	4.5	305	U2	20	50.8	5	370	U3	16	76.2	6	575	–	–	–	–	–
600	24	U1.7/8	24	47.6	5	350	U2.1/2	20	63.5	6	470	U3.1/2	16	88.9	6	655	–	–	–	–	–

Remark : If possible, nominal flange size given in brackets should be avoided from use.

BOLT DIMENSION FOR ANSI B.16.47/MSS SP-44
150#, 300#(RF)



MACHINE BOLT (NUT)



STUD BOLT (NUT)

I. ANSI B16.47 SERIES B

UNIT : mm

NOMINAL FLANGE SIZE		150#							300#						
		d	NUMBER OF BOLT	NUT DIMENSION		LM	LS	S	d	NUMBER OF BOLT	NUT DIMENSION		LM	LS	S
(A)	(B)			H	K						H	K			
(650)	(26)	U 3/4	36	19.1	2.5	125	140	50	U1.1/4	32	31.8	3.5	235	260	75
700	28	U 3/4	40	19.1	2.5	130	150	50	U1.1/4	36	31.8	3.5	235	260	75
(750)	(30)	U 3/4	44	19.1	2.5	130	150	50	U1.3/8	36	34.9	4	245	275	80
800	32	U 3/4	48	19.1	2.5	135	150	50	U1.1/2	32	38.1	4	275	300	95
(850)	(34)	U 7/8	40	22.2	3	150	160	53	U1.1/2	36	38.1	4	275	300	95
900	36	U 7/8	44	22.2	3	155	165	53	U1.5/8	32	41.3	4.5	275	305	95
950	38	U1	40	25.4	3	160	180	63	U1.5/8	36	41.3	4.5	295	325	95
1000	40	U1	44	25.4	3	165	180	63	U1.5/8	40	41.3	4.5	300	330	95
1050	42	U1	48	25.4	3	165	185	63	U1.3/4	36	44.5	4.5	315	345	100
1100	44	U1	52	25.4	3	175	190	63	U1.3/4	40	44.5	4.5	325	365	100
1150	46	U1.1/8	40	28.6	3.5	180	205	71	U1.7/8	36	47.6	5	330	370	110
1200	48	U1.1/8	44	28.6	3.5	185	205	71	U1.7/8	40	47.6	5	330	370	110
1250	50	U1.1/8	48	28.6	3.5	190	210	71	U1.7/8	44	47.6	5	350	390	110
1300	52	U1.1/8	52	28.6	2.5	200	215	71	U1.7/8	48	47.6	5	365	400	110
1350	54	U1.1/8	56	28.6	3.5	200	215	71	U1.7/8	48	47.6	5	350	390	110
1400	56	U1.1/8	60	28.6	3.5	205	225	71	U2.1/4	36	57.2	5.5	395	440	125
1450	58	U1.1/4	48	31.8	3.5	210	230	75	U2.1/4	40	57.2	5.5	395	440	125
1500	60	U1.1/4	52	31.8	3.5	210	235	75	U2.1/4	40	57.2	5.5	390	435	125

II. ANSI B16.47 SERIES A/MSS SP-44

UNIT : mm

NOMINAL FLANGE SIZE		150#					300#				
		d	NUMBER OF BOLT	NUT DIMENSION		LS	d	NUMBER OF BOLT	NUT DIMENSION		LS
(A)	(B)			H	K				H	K	
(650)	(26)	U1.1/4	24	31.8	3.5	220	U1.5/8	28	41.3	4.5	265
700	28	U1.1/4	28	31.8	3.5	230	U1.5/8	28	41.3	4.5	280
(750)	(30)	U1.1/4	28	31.8	3.5	235	U1.3/4	28	44.4	4.5	300
800	32	U1.1/2	28	38.1	4	260	U1.7/8	28	47.6	5	320
(850)	(34)	U1.1/2	32	38.1	4	265	U1.7/8	28	47.6	5	325
900	36	U1.1/2	32	38.1	4	280	U2	32	50.8	5	340
950	38	U1.1/2	32	38.1	4	275	U1.1/2	32	38.1	4	315
1000	40	U1.1/2	36	38.1	4	280	U1.5/8	32	41.3	4.5	335
1050	42	U1.1/2	36	38.1	4	300	U1.5/8	32	41.3	4.5	345
1100	44	U1.1/2	40	38.1	4	305					
1150	46	U1.1/2	40	38.1	4	305					
1200	48	U1.1/2	44	38.1	4	320					
1250	50	U1.3/4	44	44.4	4.5	335					
1300	52	U1.3/4	44	44.4	4.5	345					
1350	54	U1.3/4	44	44.4	4.5	355					
1400	56	U1.3/4	48	44.4	4.5	365					
1450	58	U1.3/4	48	44.4	4.5	375					
1500	60	U1.3/4	52	44.4	4.5	380					

Remork : If possible, nominal size given in brokers should be avoided from use.

PIPE MAX. SPAN CHART
(BASED ON ASME B31.1 PARA 121.5)

NOMINAL PIPE SIZE (INCH)	SCH. NO.	PIPE SPAN (M)			
		EMPTY	WATER FULL	EMPTY +INS	WATER FULL+INS
3/4	80	2.7	2.6	2.1	2.1
1	80	3.0	2.9	2.4	2.4
1-1/2	80	3.7	3.5	3.1	3.0
2	40	4.2	4.0	3.5	3.3
	80	4.1	3.9	3.5	3.4
3	40	5.1	4.6	4.4	4.2
	80	5.0	4.7	4.5	4.3
4	40	5.8	5.2	5,1	4.7
	80	5.7	5.3	5.2	4.9
6	40	7.0	6.2	6.4	5.8
	80	7.0	6.4	6.5	6.1
8	20	8.1	6.8	7.2	6.4
	40	8.1	7.0	7.4	6.6
10	20	9.1	7.4	8.2	7.0
	40	9.0	7.7	8.3	7.4
12	20	9.9	7.8	8.9	7.5
	40	9.8	8.3	9.1	7.9
14	STD. WT.	10.3	8.62	9.5	8.2
16	STD. WT.	11.1	9.0	10.2	8.7
18	STD. WT.	11.7	9.4	10.9	9.0
20	STD.WT.	12.4	9.8	11.5	9.4
24	STD. WT.	13.6	10.4	12.6	10.0

적용식 $L = \sqrt[4]{\frac{1920\ EID}{19\ W}}$

WHERE L = SPAN (MM)
W = DISTRIBUTED WEIGHT (KG/MM)
E = MODULUS OF ELASTICITY (KG/MM^2)
D = DEFLECTION (MM)
I = MOMENT OF INERTIA (CM^4)

GENERAL NOTES

1. SUGGESTED MAXIMUM SPACING BETWEEN PIPE SUPPORTS FOR HORIZONTAL STRAIGHT RUNS OF STANDARD AND HEAVIER PIPE AT MAXIMUM OPERATING TEMPERATURE OF 750°F (400°C).
2. DOES NOT APPLY WHERE SPAN CALCULATIONS ARE MADE OR WHERE THERE ARE CONCENTRATED LOADS BETWEEN SUPPORTS, SUCH AS FLANGES, VALVES, SPECIALTIES, etc.
3. THE SPACING IS BASED ON A FIXED BEAM SUPPORT WITH A BENDING STRESS NOT EXCEEDING 2300 PSI (15.86 MPA) AND INSULATED PIPE FILLED WITH WATER OR THE EQUIVALENT WEIGHT OF STEEL PIPE FOR STEAM, GAS, OR AIR SERVICE, AND THE PITCH OF THE LINE IS SUCH THAT A SAG OF 0.1 IN. (2.5 MM) BETWEEN SUPPORTS IS PERMISSIBLE.

EXPANSION LOOP의 설계

PIPE LOOP DESIGN

1. LOOP는 가능한 한 앙 ANCHOR의 중심에 위치시키며, GROUP화 한다.
2. 앙 ANCHOR 간 RECOMMENDED TOTAL MOVEMENT : 125 ~ 150 mm
   ANCHOR 간 MAX. TOTAL MOVEMENT : 250 ~ 300 mm
3. ANCHOR 간 권장길이

DESIGN TEMP (°C)	THERMAL EXPANSION (mm/m)		권장길이 (m)	
	C.S.	S.S.	C.S.	S.S.
70	0.56	0.82	150 ~ 250	100 ~ 170
100	0.91	1.33	100 ~ 200	70 ~ 140
120	1.15	1.67	90 ~ 130	60 ~ 90
150	1.53	2.19	80 ~ 100	55 ~ 70
200	2.19	3.09	50 ~ 90	35 ~ 65
250	2.88	3.99	45 ~ 80	30 ~ 60
300	3.60	4.91	40 ~ 70	30 ~ 50
350	4.36	5.85	35 ~ 60	25 ~ 45
400	5.15	6.81	30 ~ 50	20 ~ 40
450	5.97	7.80	24 ~ 40	18 ~ 30
500	6.80	8.80	24 ~ 40	18 ~ 30

주) 상기 TABLE은 RECOMMENDED TOTAL MOVEMENT, 온도를 고려하여 작성하였다.

4. RECOMMENDED LOOP WIDTH : 6D (D ; O.D OF PIPE) 이상
5. LOOP 양편의 첫번째 GUIDE 간격은 18m로 한다.
6. LOOP LINE SPACING

앙 ANCHOR 간 MOVEMENT (mm)	LINE 간격
100	표준간격
100 ~ 150	표준간격 + 20 mm
150 ~ 200	표준간격 + 45 mm
200 ~ 250	표준간격 + 70 mm

7. LOOP의 형상
   LOOP의 기본 형상은 LINE SIZE와 온도가 비슷할 때 그림 #1을 기본으로 하며, 대구경 LINE이 있을 경우나, LINE 온도가 높을 경우에는 FLEXIBILITY 를 고려하여 그림 #2로 할 수 있다. COLD LINE은 HOT LINE의 EXPANSION 방향과 반대이므로 주의하여 설계한다.

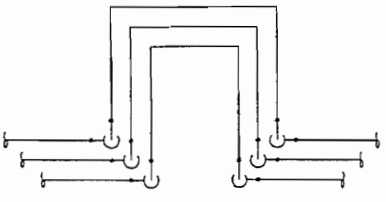


그림 #1

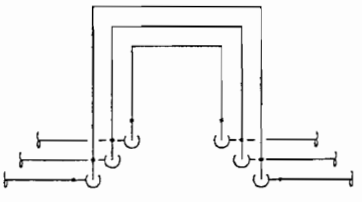
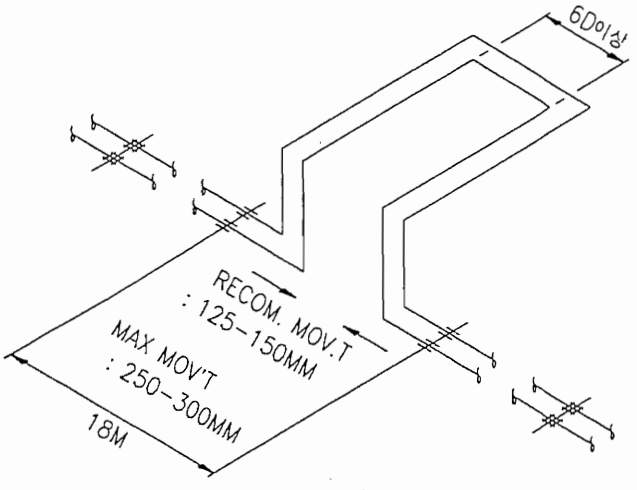


그림 #2

EXPANSION LOOP DETAIL



RACK PIPING의 LOOP ARM 길이 및 ANCHOR간 거리

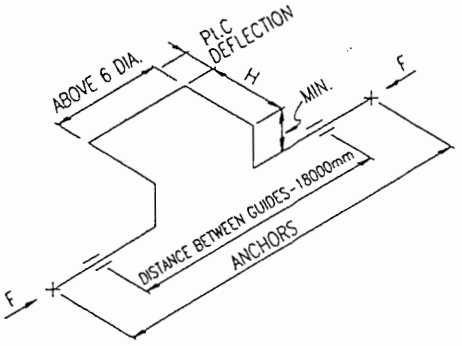


TABLE 1

EXPANSION BETWEEN ANCHORS (MM)	NOM. PIPE SIZE & WALL NOTE 1	H LOOP DIMENSION (MM)	F ANCHOR DIMENSION (KG)	F FORCE-50% COLD SPRING (KG)	PT.C COLD DEFL. NOTE 4 (MM)
50 (2")	3 x .216	1830	125	90	66
	4 x .237	2135	180	125	56
	6 x .280	2440	385	260	46
	8 x .322	2590	700	475	61
	10 x .365	2745	1145	770	36
	12 x .375	2745	1610	1075	33
	14 x .375	2745	1930	1290	30
	16 x .375	2745	2530	1690	30
	18 x .375	2745	3130	2085	28
	20 x .375	2745	3650	2440	25
	24 x .375	2895	4455	2980	20
70 (3")	3 x .216	2590	90	70	74
	4 x .237	2895	145	102	64
	6 x .280	3200	330	225	53
	8 x .322	3505	555	375	46
	10 x .365	3810	860	580	38
	12 x .375	3960	1120	760	33
	14 x .375	3960	1340	895	30
	16 x .375	3960	1735	1170	30
	18 x .375	3960	2130	1430	28
	20 x .375	3960	2485	1665	25
	24 x .375	4115	3095	2075	20
100 (4")	3 x .216	3200	80	55	81
	4 x .237	3660	110	80	69
	6 x .280	4115	260	180	56
	8 x .322	4420	455	305	48
	10 x .365	4570	780	535	43
	12 x .375	5030	895	600	33
	14 x .375	5030	1065	715	30
	16 x .375	5030	1385	930	30
	18 x .375	5030	1690	1135	28
	20 x .375	5030	1975	1325	25
	24 x .375	5180	2485	1665	20
125 (5")	3 x .216	3810	70	45	89
	4 x .237	4420	102	70	71
	6 x .280	4875	225	160	58
	8 x .322	5335	375	260	48
	10 x .365	5485	660	440	43
	12 x .375	6095	750	510	36
	14 x .375	6095	885	600	33
	16 x .375	6095	1145	770	30
	18 x .375	6095	1395	930	28
	20 x .375	6095	1620	1090	25
	24 x .375	6250	2065	1385	20
150 (6")	3 x .216	4420	55	45	91
	4 x .237	4875	90	70	79
	6 x .280	5640	195	135	61
	8 x .322	6250	315	215	48
	10 x .365	6400	565	385	43
	12 x .375	7010	660	440	36
	14 x .375	7010	795	535	33
	16 x .375	7010	1010	680	30
	18 x .375	7010	1235	630	28
	20 x .375	7010	1440	965	25
	24 x .375	7315	1760	1180	20
175 (7")	3 x .216	4875	55	45	97
	4 x .237	5335	90	70	84
	6 x .280	6250	180	125	64
	8 x .322	7010	285	195	51
	10 x .365	7160	510	350	46
	12 x .375	7770	610	420	38
	14 x .375	7770	735	500	36
	16 x .375	7770	940	635	33
	18 x .375	7770	1155	770	28
	20 x .375	7770	1350	910	25
	24 x .375	7925	1725	1155	23
200 (8")	3 x .216	5180	55	45	104
	4 x .237	5790	80	55	89
	6 x .280	6860	170	115	66
	8 x .322	7620	270	180	53
	10 x .365	7925	465	315	46
	12 x .375	8380	600	410	38
	14 x .375	8380	715	490	36
	16 x .375	8380	920	625	33
	18 x .375	8380	1120	750	30
	20 x .375	8380	1305	975	28
	24 x .375	8535	1680	1120	23

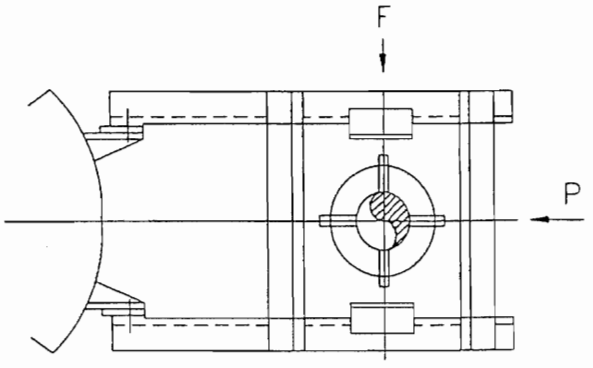
TABLE 2

EXPANSION BETWEEN ANCHORS(MM)	50	75	100	125	150	175	200
Fg/Fa	.25	.35	.5	.6	.65	.75	.8

NOTE

1. TABLE 1.2는 WELDING ELLS 및 STD WALL TH'K를 기준으로 작성됨.
2. TABLE 1의 ANCHOR FORCE는 THERMAL FORCE임 (FRICTION FORCE는 제외)
3. GUIDE의 LATERAL FORCE는 TABLE 2 참조
   (LATERAL FORCE = Fg/Fa(ELEBOW 관련 보정계수) x (TABLE 1의 "F")
4. ACTUAL DEFLECTION = COLD DEFLECTION + H x (EXPANSION/M)
   (PIPE LOAD가 GROUP 일시에는 충분한 여유를 주어야 함.)

VESSEL GUIDE ALLOWABLE LOAD TABLE

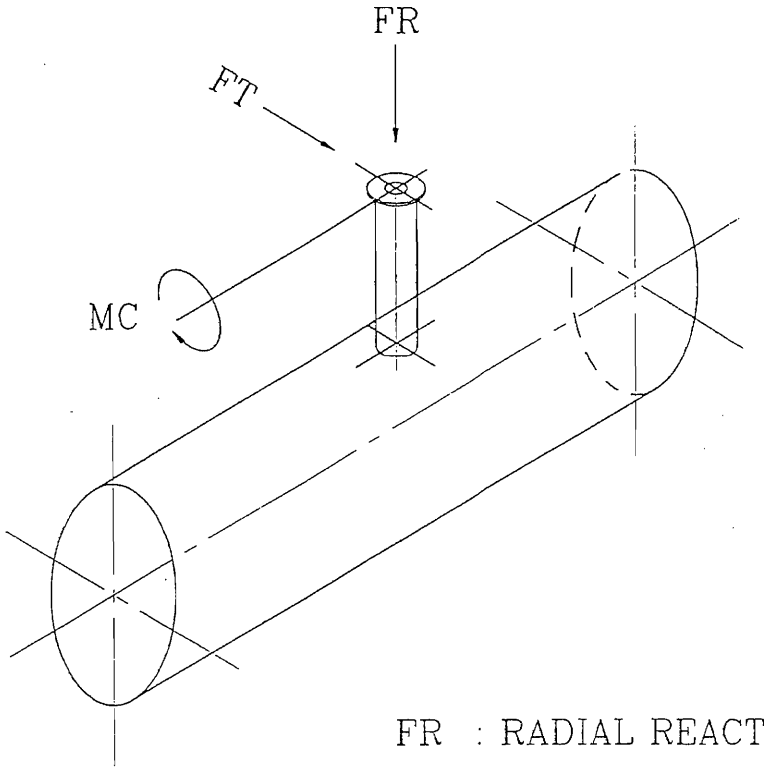


TYPE NO.	MEMBER	F(KG)	P(KG)	CLIP TYPE	LOAD(KG)
R 17	L50 x 50 x 6	100	300	101A	100
	L75 x 75 x 9	350	300	101B	350
R 17	L50 x 50 x 6	110	300	102A	150
	L75 x 75 x 9	180	300	102B	250
R 19	L100 x 50 x 5	470	570	103A	–
	L150 x 75 x 9	740	670	103B	–
R22,R23 R24,R25	L150 x 75 x 9	600	940	104A	–
	L200 x 90 x 8	730	520	104B	–
	L300 x 90 x 9	900	330	104C	–
R 18	L50 x 50 x 6	100	300	121	100
	L75 x 75 x 9	350	300	121	350
R 21	L100 x 50 x 5	470	570	103A	—
	L150 x 75 x 9	740	670	103B	—
R27,R28	L150 x 75 x 9	600	940	104A	—
	L200 x 90 x 8	730	520	104B	—
	L300 x 90 x 9	900	330	104C	–
R 17	L50 x 50 x 6	100	300	101A	100
	L75 x 75 x 9	350	300	101B	350
R 20	L100 x 50 x 5	470	570	103A	—
	L150 x 75 x 9	740	670	103B	—
R 26	L150 x 75 x 9	600	940	104A	—
	L200 x 90 x 8	730	520	104B	—
	L300 x 90 x 9	900	330	104C	–

Classification	Class	Symbol	Allowable tensile Stress at Various temperature. (°C) (Kg/mm²)																							
			-190	-100	-80	-60	-45	-30	-10	0	40	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
JIS G 3101	1	S330	–	–	–	–	–	–	–	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	–	–	–	–	–	–	–	–	–
	2	S400	–	–	–	–	–	–	–	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	–	–	–	–	–	–	–	–	–
JIS G 3103	2	SB410	–	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	9.0	5.8	(3.7)	(1.8)	–	–	–	–	–
	3	SB450	–	–	–	–	–	–	–	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	9.7	5.9	(3.7)	(1.8)	–	–	–	–	–
	4	SB480	–	–	–	–	–	–	–	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	10.3	5.9	(3.7)	(1.8)	–	–	–	–	–
	5	SB480	–	–	–	–	–	–	–	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	10.3	(7.7)	(3.4)	–	–	–	–	–
	6	SB480	–	–	–	–	–	–	–	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	10.8	(7.7)	(3.4)	–	–	–	–	–
JIS G 3106	1	SM400A	–	–	–	–	–	–	–	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	–	–	–	–	–	–	–	–	–
		SM400B	–	–	–	–	–	–	–	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	–	–	–	–	–	–	–	–	–
		SM400C	–	–	–	–	–	–	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	–	–	–	–	–	–	–	–	–
	2	SM490A	–	–	–	–	–	–	–	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	–	–	–	–	–	–	–	–	–
		SM490B	–	–	–	–	–	–	–	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	–	–	–	–	–	–	–	–	–
		SM490C	–	–	–	–	–	–	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	–	–	–	–	–	–	–	–	–
	4	SM520B	–	–	–	–	–	–	–	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	–	–	–	–	–	–	–	–	–
		SM520C	–	–	–	–	–	–	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	–	–	–	–	–	–	–	–	–
	5	SM570	–	–	–	–	–	–	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	–	–	–	–	–	–	–	–	–
JIS G 3115	1	SPV235	–	–	–	–	–	–	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	–	–	–	–	–	–	–	–	–
	2	SPV315	–	–	–	–	–	–	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	14.4	14.4	14.4	13.5	13.0	12.8	12.8	12.8	12.8	–	–	–	–	–	–	–	–	–
	3	SPV355	–	–	–	–	–	–	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	16.2	16.2	16.2	15.4	14.6	14.6	14.6	14.6	14.6	–	–	–	–	–	–	–	–	–
	4	SPV450	–	–	–	–	–	–	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	18.5	18.5	18.5	17.6	16.6	16.6	16.6	16.6	16.6	–	–	–	–	–	–	–	–	–
	5	SPV490	–	–	–	–	–	–	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	19.8	19.8	19.8	17.6	17.8	17.8	17.8	17.8	17.8	–	–	–	–	–	–	–	–	–
JIS G 3116	1	SC250	–	–	–	–	–	–	–	10.3	10.3	10.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	2	SC290	–	–	–	–	–	–	–	11.3	11.5	11.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	3	SC320	–	–	–	–	–	–	–	12.5	12.5	12.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	4	SC360	–	–	–	–	–	–	–	13.8	13.8	13.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Classification	Class	Symbol		Allowable tensile Stress at Various Temperature. (°C) (Kg/mm²)																						
				-196	-100	-80	-60	-45	-30	-10	0	40	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
Jis G 3452		SGP	E	–	–	–	–	–	–	–	6.4	6.4	6.4	(6.4)	(6.4)	(6.4)	(6.4)	(6.4)	–	–	–	–	–	–	–	–	–
			B	–	–	–	–	–	–	–	4.9	4.9	4.9	(4.9)	(4.9)	(4.9)	(4.9)	(4.9)	–	–	–	–	–	–	–	–	–
Jis G 3454	2	STPG 370	S	–	–	–	–	–	–	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	–	–	–	–	–	–	–	–	–
			E	–	–	–	–	–	–	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	–	–	–	–	–	–	–	–	–
	3	STPG 410	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	–	–	–	–	–	–	–	–	–
			E	–	–	–	–	–	–	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	–	–	–	–	–	–	–	–	–
Jis G 3455	2	STS 370	S	–	–	–	–	–	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	–	–	–	–	–	–	–	–	–
	3	STS 410	S	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	–	–	–	–	–	–	–	–	–
	4	STS 480	S	–	–	–	–	–	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	–	–	–	–	–	–	–	–	–
Jis G 3455	2	STPT 370	S	–	–	–	–	–	–	–	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	8.2	5.7	(3.7)	(1.8)	–	–	–	–	–
			E	–	–	–	–	–	–	–	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	7.0	4.9	(3.1)	(1.5)	–	–	–	–	–
Jis G 3457	3	STPT 480	S	–	–	–	–	–	–	–	10.6	10.5	10.5	10.5	10.5	10.5	10.5	10.5	9.0	5.0	(3.7)	(1.8)	–	–	–	–	–
		STPY 400	A	–	–	–	–	–	–	–	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	7.6	4.9	(3.1)	(1.5)	–	–	–	–	–
	4	STPT 480	S	–	–	–	–	–	–	–	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	10.3	5.9	–	–	–	–	–	–	–
		STPY 400	A	–	–	–	–	–	–	–	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	–	–	–	–	–	–	–	–	–
Jis G 3458	12	STPA 0	S	–	–	–	–	–	–	–	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.3	(6.9)	(3.4)	–	–	–	–	–
	20	STPA 20	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	9.7	7.7	4.4	–	–	–	–	–
	22	STPA 22	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.0	8.3	3.8	1.7	0.7	–	–	–
	23	STPA 23	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.0	8.3	3.8	1.7	0.7	–	–	–
	24	STPA 24	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.0	8.3	3.8	1.7	0.7	–	–	–
	25	STPA 25	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.3	9.9	9.6	9.2	8.5	6.0	3.5	1.9	0.9	–	–	–
	26	STPA 26	S	–	–	–	–	–	–	10.5	10.5	10.5	10.5	10.5	10.5	10.3	9.9	9.6	9.2	8.8	7.9	5.0	2.1	1.0	–	–	–
Jis G 3459		SUS 304 TP	S	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	11.1	9.6	8.7	8.1	7.7	7.5	7.3	7.1	6.9	6.5	5.6	3.8	2.5	1.6	1.0
				13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	11.6	10.9	10.5	10.3	10.1	10.0	9.9	9.7	9.5	8.4	5.8	3.8	2.5	1.6	1.0
			W	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	9.4	8.2	7.4	6.9	6.5	6.4	6.2	6.0	5.9	5.5	4.8	3.2	2.1	1.4	0.9
				11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	9.9	9.3	8.9	8.8	8.6	8.5	8.4	8.2	3.1	7.1	4.9	3.2	2.1	1.4	0.9
		SUS304H TP	S	–	–	–	–	–	13.1	13.1	13.1	13.1	11.1	9.6	8.7	8.1	7.7	7.5	7.3	7.1	6.9	6.5	5.6	3.8	2.5	1.6	1.0
				–	–	–	–	–	13.1	13.1	13.1	13.1	11.6	10.9	10.5	10.3	10.1	10.0	9.9	9.7	9.5	8.4	5.8	3.8	2.5	1.6	1.0

JIS B 8243



FR : RADIAL REACTION

FT : TANGENTAL REACTION

MC : CIRCUMFERENTIAL BENDING MOMENT

PIPE SIZE	FR (KG)	FT (KG)	MC (KG-M)
1-1/2"	170	80	80
2"	230	100	100
3"	400	180	190
4"	620	280	290
6"	1.310	600	610
8"	2,310	1,070	1,080
10"	3,830	1,770	1,790
12"	5,760	2,660	2,690
14"	7,240	3,340	3,390
16"	10,110	4,670	4,730
18"	13,650	6,300	6,390
20"	17,930	8,280	8,390
24"	29,010	13,390	13,580