

# *World Best!*

*Forged Fittings*

*Wrought Fittings*

*Flanges*

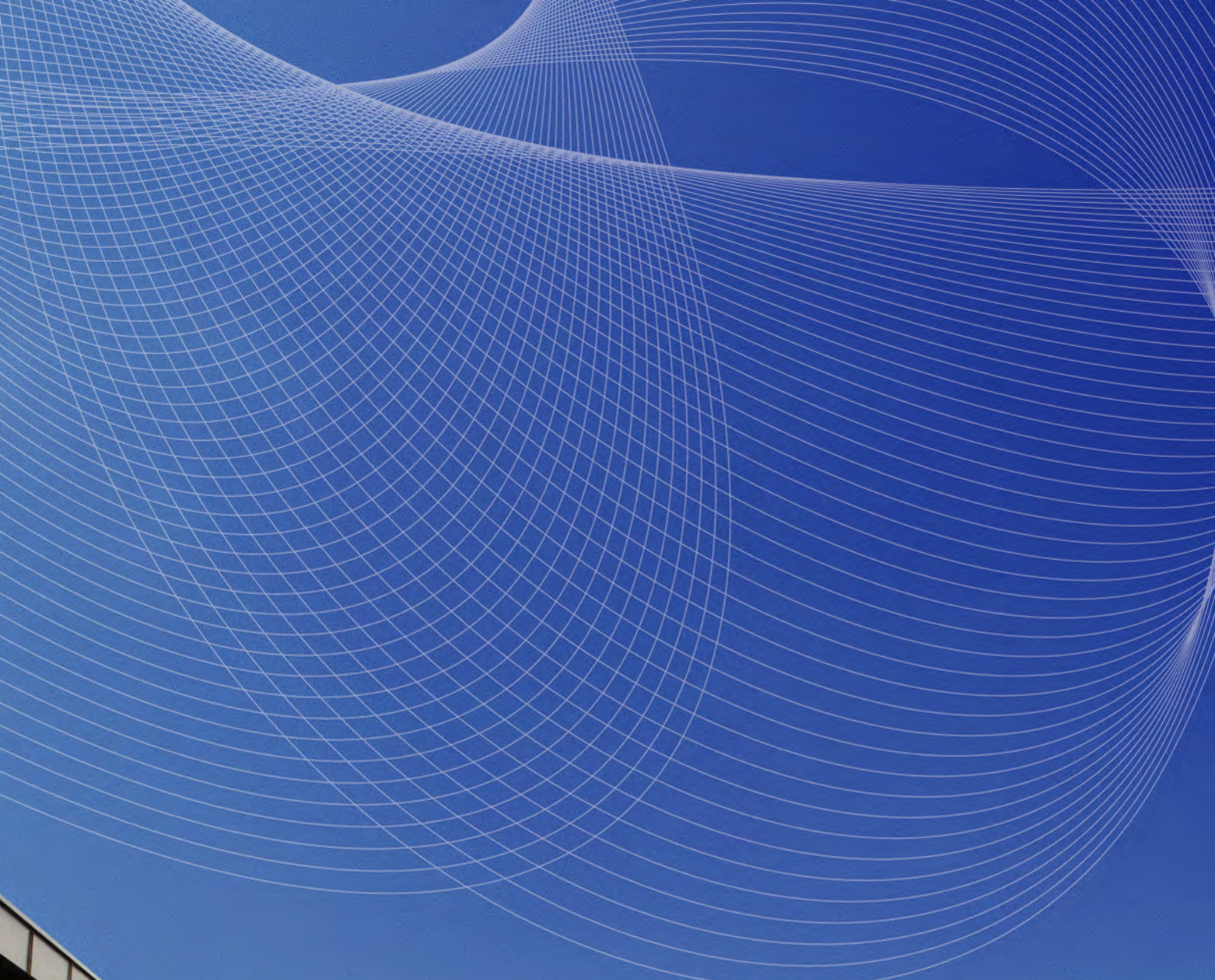
 (株) 健世高壓  
KEON SAE HIGH PRESSURE CO., LTD.



**KEONSAE HIGH PRESSURE CO., LTD.**  
*The Best Solution of Fittings!*



 (株) 健世高壓



# CEO's Message

Keonsae High Pressure Co., Ltd. has been growing as one of the best forged fitting manufacturer since 1978.

The accumulated technology and eco-friendly business value in over 30 years are proved through getting ISO 14001, ISO 9001. KEPIC-MN, BV, INNO-BIZ, and we have executed the world-wide projects with the major Korean and overseas EPC companies.

We've tried our best to improve the technology with active research of R&D department, and we've run of ERP(Enterprise Resource Planning)system to set up the product traceability.

So this system can be controled by the electronic data processing management from raw material stage to the finished products.

We expect to get a higher customer's satisfaction with our PMS (Project Management System) which can have a smooth and intimate communication with customers in their position.

## Human Centered Management

We, Keonsae High Pressure Co., Ltd. will try to produce the best quality products and our efforts for making the value re-creation will be carried on.

Sincerely yours.

*Y. K. Yang*

CEO

Keonsae High Pressure Co., Ltd.



# History

**1978.03** Establishment

**1992.05** Approved vendor of K.H.I.C (Now Doosan Heavy Industries & Construction)

**1995.04** Approved vendor of Hyundai E & C

**1995.06** Approved vendor of Daelim Industrial Co., Ltd.

**1995.07** Approved vendor of GS E & C

**1996.01** Approved vendor of KEPCO (Korea Electric Power Corp.)-GRADE : "R"

**1996.05** Approved vendor of Hyundai Heavy Industries Co., Ltd.

**1996.06** ISO9002:1994/KSA9002:1995 QUALITY SYSTEM Achieved

**1996.10** Approved vendor of Samsung Engineering Co., Ltd.

**1997.02** Approved vendor of KEPCO (Korea Electric Power Corp.)-Nuclear Power Plant GRADE Q,S

**1997.06** Approved vendor of SK E & C

**1997.08** Approved vendor of KEPIC CODE (KOREA ELECTRIC POWER INDUSTRY)-NUCLEAR MN

**2000.03** QGPC (Qatar General Petroleum corporation) Forged Fitting Supplier

**2000.12** Approved vendor of KNPC (Kuwait National Petroleum Company)

**2002.10** Exxonmobil( Kizomba A-PJT) Forged Fitting Supplier

**2002.12** Shell (SPDC-BTIP-Onshore PJT) Forged Fitting Supplier

**2003.06** ISO 9001:2000/KSA 9001:2001 QUALITY SYSTEM Achieved

**2003.06** BV(BUREAU VERITAS) (CERT NO SMS.W.II/22819/A.I) Achieved

**2003.08** Expansion of manufacturing range -COPPER ALLOY Fittings & Flanges

**2005.11** PIC (Petrochemical Industries Company) Forged Fitting Supplier

**2006.02** Approved vendor of KOC (Kuwait Oil Company)

**2008.02** ADMA UAE (Umm Shaif PJT) Forged Fitting Supplier

**2008.03** Technical Innovation Small Business (INNO-BIZ) acquired from Korea Government

**2008.09** Awarded a prize of development for the best capital goods from Korea Government

**2008.10** ISO 14001:2004/KSA 14001:2004 Environmental Management System

**2009.01** Approved vendor of SAIPEM Italy

**2009.06** Awarded a prize of an excellent supplier from Hyundai Heavy Industries CO.,Ltd

**2009.08** Approved vendor of RELIANCE Infrastructure Ltd.

**2009.10** Approved vendor of TECHNIP France

**2009.11** Approved vendor of EIL India.

**2009.12** Awarded "Support of real economy" from Ministry of knowledge economy.

**2010.03** Approved vendor of QP (Qatar Petroleum)

**2010.03** Approved vendor of DESCON.

**2010.06** Approved vendor of TAKREER U.A.E

**2010.06** Approved vendor of GASCO U.A.E

**2011.01** Approved vendor of ENPPI Egypt

**2011.09** Approved vendor of Petrofac U.A.E

**2011.09** Approved vendor of Larsen & Toubro India

**2011.11** Approved vendor of ESSAR India

**2011.11** Approved vendor of JGC Japan

**2011.11** Approved vendor of Chiyoda Japan

**2012.01** Approved vendor of PDO Oman

WORLD BEST  
ISO 9001:2008

ISO 9001

ISO 9001

ISO 9001

ISO 9001

## Materials & Standards

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ASME	II	Part A, Ferrous Materials	Part B, Nonferrous Materials
ASTM	I	A53, A106, A105, A182, A234, A312, A333, A350, A403, A420, A694, A815	Duplex and Super Duplex(UNS S31803, S32760), etc.....
ASTM	II	* Nickel Alloy Forgings : ASTM B564, Alloy 20 (N08020), Monel 400 (N04400)	Inconel 600, 625 (N06600, N06625), Incoloy 800, 825 (N08800, N08825)
		Hastelloy (UNS N10276)	
		* Copper and Copper Alloy : ASTM B124 (C11000), B111(C12200)	
		* Copper - Nickel - Zinc Alloy and Copper - Nickel	ASTM B151, B466, B150 : Cu - Ni 90/10 (C70600), Cu - Ni 70/30 (C71500), Ai -Bronze (C60600)
		* Lead yellow Brass : UNS C85400	
		* Bronze Casting : B61, B62 (UNS C92200, C83600)	
		* Titanium and Titanium Alloy etc.....	
JIS		H3300 (C7060T, C7150T) / Copper - Nickel	(C6870T, C6871T, C6872T) / Al - Brass
		H3250 / Copper	
		H5120 CAC202(YBsC2) / Lead yellow brass	BC1 - BC7 / Cast Bronze
KEPIC		KEPIC MDF	
DIN		17660, 17671 (CuZn20A12) / Al - Brass	7664,17671, 86019 / Copper - Nickel
BS		BS2781 CN102, CN107, CZ110	
MIL - T		16420K C70600	

## ASME Standards

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- B 16.5 : Pipe flanges and flanged fittings
- B 16.9 : Factory-Made Wrought Steel buttweldingFittings
- B 16.11 : Forged Steel Fittings Socket Welding and Threaded
- B 16.14 : Ferrous Pipe Plugs. Bushings and Locknuts
- B 16.15 : Cast Copper Alloy Threaded Fittings
- B 16.25 : Buttwelding Ends
- B 16.28 : Wrought Steel Buttwelding Short Radius Elbows and Returns
- B 31.1 : Power Piping
- B 31.3 : Process Piping
- B 36.10 : Welded and Seamless Wrought Steel Pipe
- B 36.19 : Stainless Steel Pipe
- B 1.20.1 : Pipe Threads, General Purpose
- MSS : Manufacturers Standardization Society of the Valve and FittingsIndustry Inc.
- MSS SP.25 : Standard Marking system for Valves, Fittings, Flanges and Unions
- MSS SP.79 : Socket-Welding Reducer Inserts
- MSS SP.83 : Steel Pipe Unions, Socket-Welding and Threaded
- MSS SP.97 : Forged Carbon Steel Branch Outlet Fittings
- API : American Petroleum Institutes
- API 5L : Seamless and Welded Steel Line-Pipe
- EEMUA : The Engineering Equipment and Materials Users Association(144/145/146)
- BS EN12449 / 1652 / 12163
- BS 4504 Part 2
- BS 2871 Part1,2,3 : Copper and Copper Alloys
- NACE MR 0175 : Sulfide Stress Cracking Resistant-Metallic Materials for Oil field equipment
- ISO : International Organization of Standardization
- ※ Other standards or drawings specified by customer can be available for manufacturing.

# Quality Assurance

KEONSAE has maintained Quality System Management is recognized through the acquisition of certificates such as ISO 14001, ISO 9001, INNO-BIZ, BV, KEPIC-MN and our products have been performed by international authorized organizations such as LLOYD, DNV, BV, ABS, MOODY, S.G.S KR etc.



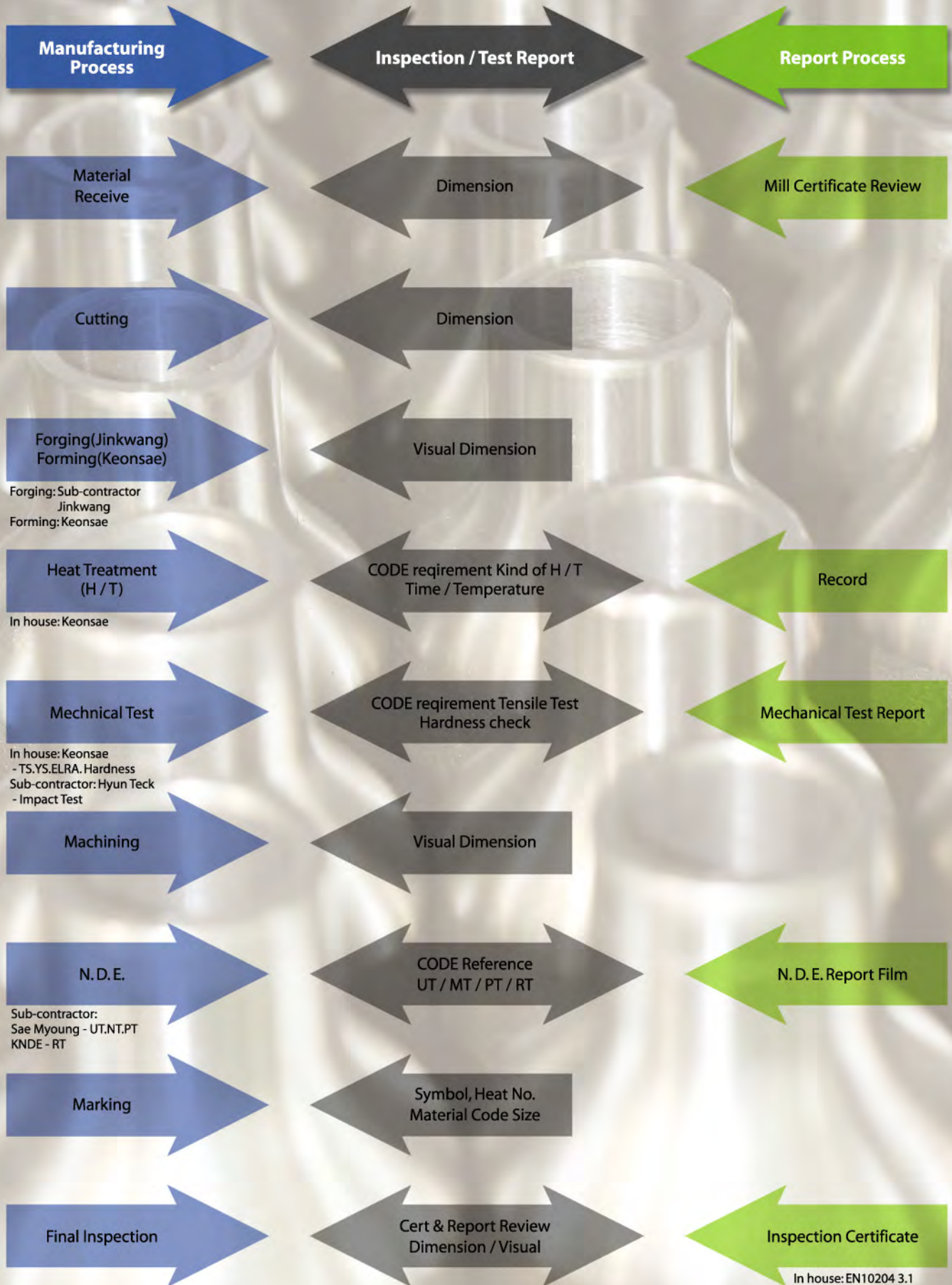
## Certification

CERTIFICATES	SCOPE	CERT NO.
ISO 14001	Manufacture of Fittings and Flanges for High Pressure	DE - 110108
ISO 9001	Manufacture and Service of Fittings and Flanges for High Pressure	DQ - 100644
KEPIC - MN	As a Material Organization Manufacturing and Supplying of Fittings and Flanges Except for Welding & Repair Welding	DN - 100
BV	Alloy and non - alloy Pipe Fittings And Flanges(1/8" to 24" )	SMS.W. II / 22819 / A.1
INNO-BIZ	Grade A	R8111-0549



# Process

## Manufacturing Process Inspection / Test Report Report Process



# Products

Keon Sae High Pressure Co., Ltd has a manufacturing ability for most of ranges of forged fittings which are used in industrial piping system for oil & gas plant, petrochemical plant, power & desalination plant, shipbuilding instrument etc. Through the standardization of the molding and manufacturing process, we've executed the domestic and abroad major projects under the over 30 years history.





Flanges



Forged Fittings



Forged Fittings (C 70600)



Wrought Fittings



**WORLD BEST**  
**Global Keonsae**

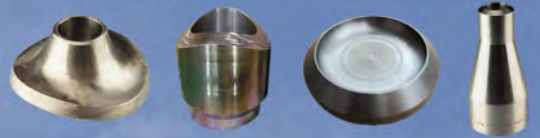


## **Value Recreation to Make the Future**

*Keonsae High Pressure Co., Ltd.  
has taken major role in providing  
the best forged fittings all over the world.*



**POWER PLANT** *Thermal&Nuclear*



**SHIPBUILDING**



**ON/OFF SHORE OIL**



**INSTRUMENTS**



**CONSTRUCTION FIELDS**



**GAS PLANT**



**PETROCHEMICAL**



**OIL REFINERY**



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## 15 FORGED FITTINGS (ASME B16.11, MSS-SP)

- ELBOW (90° 45°)
- TEE (STRAIGHT, REDUCING)
- COUPLING (FULL, HALF)
- UNION
- CAP
- BOSS
- REDUCER (CONCENTRIC, ECCENTRIC)
- PLUG (ROUND HEAD, SQUARE HEAD, HEX HEAD)
- BUSHING (HEX HEAD, FLUSH)
- NIPPLE (PIPE, HEX)
- SWAGE
- BRANCH OUTLET NIPPLE
- BRANCH OUTLET BUTT WELD
- BRANCH OUTLET SOCKET
- BRANCH OUTLET THREADS
- BRANCH OUTLET FLANGE

## 39 FORGED FITTINGS (JIS B2316-1997)

- ELBOW (90° 45°)
- TEE (STRAIGHT, REDUCING)
- SERVICE TEE
- COUPLING (FULL, HALF)
- UNION
- CAP
- REDUCER (CONCENTRIC, ECCENTRIC)

## 47 FLANGES

- SOLID WELD NECK
- SOLID SLIP - ON
- STUB ENDS

## 55 ASME FLANGES

- CLASS 150 FLANGE
- CLASS 300 FLANGE
- CLASS 400 FLANGE
- CLASS 600 FLANGE
- CLASS 900 FLANGE
- CLASS 1500 FLANGE
- CLASS 2500 FLANGE

## 71 RING JOINT FLANGES

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- CLASS 900 FLANGE
- CLASS 1500 FLANGE
- CLASS 2500 FLANGE

## 79 ORIFICE FLANGES

- ASME ORIFICE FLANGE
- CLASS 300 ORIFICE FLANGE
- CLASS 400 ORIFICE FLANGE
- CLASS 600 ORIFICE FLANGE
- CLASS 900, 1500 ORIFICE FLANGE
- CLASS 2500 ORIFICE FLANGE

## 91 LONG WELDING NECKS FLANGES

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- CLASS 400 FLANGE
- CLASS 600 FLANGE
- CLASS 900 FLANGE
- CLASS 1500 FLANGE
- CLASS 2500 FLANGE

## 103 WROUGHT FITTINGS

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- BUTT WELDING FITTING
- SOCKET WELDING FITTING
- THREADED FITTING
- BRANCH CONNECTION FITTING

## 121 APPENDIX

- TOLERANCE FOR
  - ▶ BUTT WELDING FITTINGS
  - ▶ SOLID WELD NECK FLANGES
  - ▶ SLIP - ON FLANGE
  - ▶ WELD NECK STUB ENDS
  - ▶ BACKING FLANGE
- APPROX WEIGHT LIST
- STANDARD THREADS SPECIFICATION
- INTERNATIONAL STANDARDS
- COMPARISON OF MATERIALS SPECIFICATION
- AN ABBREVIATION OF STANDARDS
- WALL THICKNESS OF WELDED AND SEAMLESS PIPE

# World Best!

**Keonsae High Pressure Co., Ltd.**

PRODUCTS LINE-UP **FORGED FITTINGS**  
(ASME B16.11, MSS-SP)

- ELBOW (90° 45°)
- TEE (STRAIGHT, REDUCING)
- COUPLING (FULL, HALF)
- UNION
- CAP
- BOSS
- REDUCER (CONCENTRIC, ECCENTRIC)
- PLUG (ROUND HEAD, SQUARE HEAD, HEX HEAD)
- BUSHING (HEX HEAD, FLUSH)
- NIPPLE (PIPE, HEX)
- SWAGE
- BRANCH OUTLET NIPPLE
- BRANCH OUTLET BUTT WELD
- BRANCH OUTLET SOCKET
- BRANCH OUTLET THREADS
- BRANCH OUTLET FLANGE



## Pressure Ratings

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

**Table 1. : Correlation of Fittings Class With Schedule Number or Wall Designation of Pipe for Calculation of Ratings.**

Pressure Class Designation of Fitting	Type of Fitting	Pipe Used for Rating Basic	
		Schedule No.	Wall Designation
2000	Threaded	80	XS
3000	Threaded	160	-
6000	Threaded	-	XXS
3000	Socket-Welding	80	XS
6000	Socket-Welding	160	-
9000	Socket-Welding	-	XXS

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

**Table 2. : Nominal wall thickness of Schedule 160 and Double Extra Strong Pipe.**

NPS.	Schedule 160		XXS	
	inch	mm	inch	mm
1/8	0.124	3.15	0.190	4.83
1/4	0.145	3.68	0.238	6.05
3/8	0.158	4.01	0.252	6.40





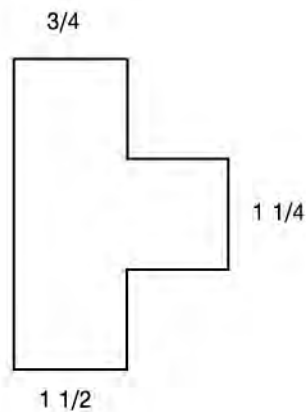
## Size Identification

The size of a fitting is identified by nominal pipe size,

For reducing fittings, the size of the largest run opening is to be given first, followed by the size of the opening opposite of the same run,

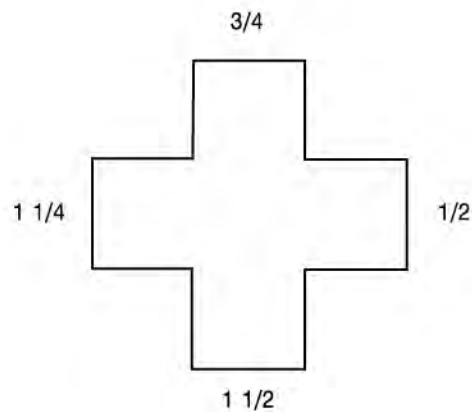
The branch size of a Tee is given last. Where the case is a Cross, The largest side-outlet is thirdly given, then the opening opposite.

### TEE



1 1/2 X 3/4 X 1 1/4

### CROSS



1 1/2 X 3/4 X 1 1/4 X 1/2

## Threads

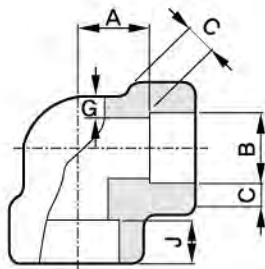
Unless otherwise specified in inquiry, all threaded fittings are supplied with NPT threads(ASME B1. 20. 1 American Standard Taper Pipe Thread) for reference, other available threads are:

- ISO/R7 Pipe Threads for Gas List Tubes and Screwed Fittings where Pressure-tight Joints are made on the threads (BS 21 & JIS B0203 PT Thread).
- API 5B, Line Pipe Threads.
- KS B0222 Taper Pipe Threads.

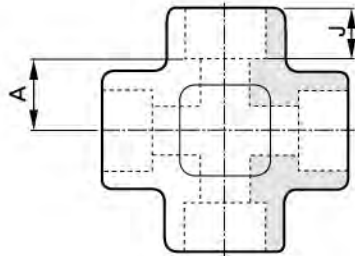




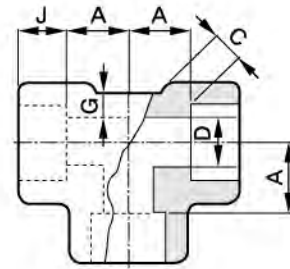
## 90° Elbow, 45° Elbow, Tee, Cross, Coupling Class 3000, 6000, 9000



90° Elbow



Cross



Tee

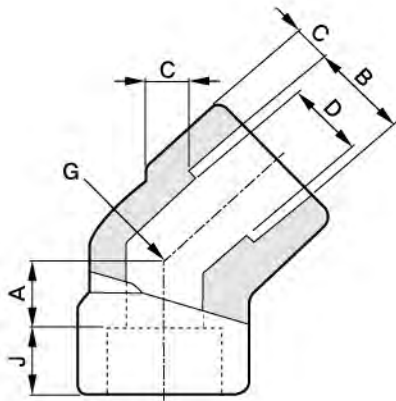
### ASME B16.11

(in millimeters)

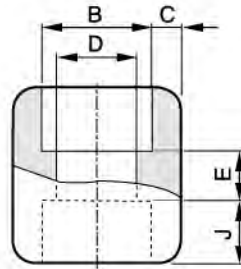
Nominal Pipe Size	Socket Bore Diameter, B	Bore Diameter of Fitting, D			Socket Wall Thickness, C						Body Wall, G		
					45 Elbows								
		Class Designation			Class Designation						Class Designation		
		3000	6000	9000	3000		6000		9000		3000	6000	9000
			Avg.	Min.	Avg.	Min.	Avg.	Min.	Min.	Min.	Min.		
1/8	10.8 ~ 11.2	6.1 ~ 7.6	3.2 ~ 4.8		3.18	3.18	3.96	3.43			2.41	3.15	
1/4	14.2 ~ 14.6	8.5 ~ 10.0	5.6 ~ 7.1		3.78	3.30	4.60	4.01			3.02	3.68	
3/8	17.6 ~ 18.0	11.8 ~ 13.3	8.4 ~ 9.9		4.01	3.50	5.03	4.37			3.20	4.01	
1/2	21.8 ~ 22.2	15.0 ~ 16.6	11.0 ~ 12.5	5.6 ~ 7.2	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47
3/4	27.2 ~ 27.6	20.2 ~ 21.7	14.8 ~ 16.3	10.3 ~ 11.8	4.90	4.27	6.96	6.04	9.78	8.56	3.91	5.56	7.82
1	33.9 ~ 34.3	25.9 ~ 27.4	19.9 ~ 21.5	14.4 ~ 16.0	5.69	4.98	7.92	6.93	11.38	9.96	4.55	6.35	9.09
1 1/4	42.7 ~ 43.1	34.3 ~ 35.8	28.7 ~ 30.2	22.0 ~ 23.5	6.07	5.28	7.92	6.93	12.14	10.62	4.85	6.35	9.70
1 1/2	48.8 ~ 49.2	40.1 ~ 41.6	33.2 ~ 34.7	27.2 ~ 28.7	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15
2	61.2 ~ 61.7	51.7 ~ 53.3	42.1 ~ 43.6	37.4 ~ 38.9	6.93	6.04	10.92	9.50	13.84	12.12	5.54	8.74	11.07
2 1/2	73.9 ~ 74.4	61.2 ~ 64.2			8.76	7.67					7.01		
3	89.8 ~ 90.3	76.4 ~ 79.4			9.52	8.30					7.62		
4	115.2 ~ 115.7	100.7 ~ 103.8			10.69	9.35					8.56		

\*For Approx Weight See page 124

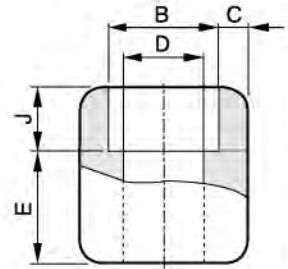
90° Elbow, 45° Elbow, Tee, Cross, Coupling  
Class 3000, 6000, 9000



45° Elbow



Coupling



Half Coupling

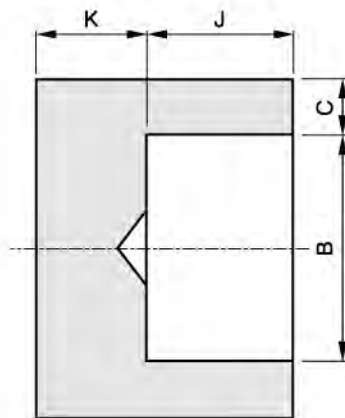
ASME B16.11

(in millimeters)

Nominal Pipe Size	Min. Depth of Socket, J	Center to Bottom of Socket, A						Laying Lengths		Tolerances, ±		
		90° Elbows, Tees and Cross			45° Elbows			Couplings, E	Half Couplings, F	A	E	F
		Class Designation			Class Designation							
		3000	6000	9000	3000	6000	9000					
1/8	9.5	11.0	11.0		8.0	8.0		6.5	16.0	1.0	1.5	1.0
1/4	9.5	11.0	13.5		8.0	8.0		6.5	16.0	1.0	1.5	1.0
3/8	9.5	13.5	15.5		8.0	11.0		6.5	17.5	1.5	3.0	1.5
1/2	9.5	15.5	19.0	25.5	11.0	12.5	15.5	9.5	22.5	1.5	3.0	1.5
3/4	12.5	19.0	22.5	28.5	13.0	14.0	19.0	9.5	24.0	1.5	3.0	1.5
1	12.5	22.5	27.0	32.0	14.0	17.5	20.5	12.5	28.5	2.0	4.0	2.0
1 1/4	12.5	27.0	32.0	35.0	17.5	20.5	22.5	12.5	30.0	2.0	4.0	2.0
1 1/2	12.5	32.0	38.0	38.0	20.5	25.5	25.5	12.5	32.0	2.0	4.0	2.0
2	16.0	38.0	41.0	54.0	25.5	28.5	28.5	19.0	41.0	2.0	4.0	2.0
2 1/2	16.0	41.0			28.5			19.0	43.0	2.5	5.0	2.5
3	16.0	57.0			32.0			19.0	44.5	2.5	5.0	2.5
4	19.0	66.5			41.0			19.0	48.0	2.5	5.0	2.5

## CAP

Class 3000, 6000, 9000



### ASME B16.11

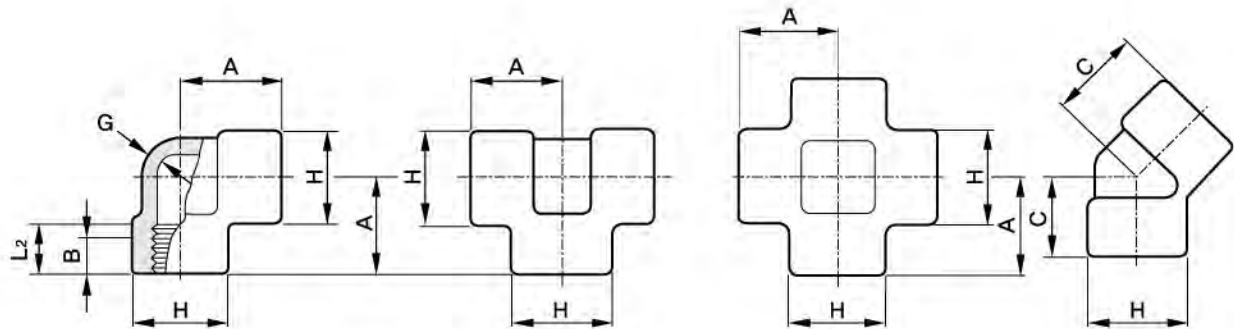
(in millimeters)

Nominal Pipe Size	Socket Bore Dia, B	Socket Wall Thickness C (Min)			Depth of Socket J (Min)	K (Min)		
		Class Designation				Class Designation		
		3000	6000	9000		3000	6000	9000
1/8	10,8 ~ 11,2	3,18	3,43		9,5	4,8	6,4	
1/4	14,2 ~ 14,6	3,30	4,01		9,5	4,8	6,4	
3/8	17,6 ~ 18,0	3,50	4,37		9,5	4,8	6,4	
1/2	21,8 ~ 22,2	4,09	5,18	8,18	9,5	6,4	7,9	11,2
3/4	27,2 ~ 27,6	4,27	6,04	8,56	12,5	6,4	7,9	12,7
1	33,9 ~ 34,3	4,98	6,93	9,96	12,5	9,6	11,2	14,2
1 1/4	42,7 ~ 43,1	5,28	6,93	10,62	12,5	9,6	11,2	14,2
1 1/2	48,8 ~ 49,2	5,54	7,80	11,12	12,5	11,2	12,7	15,7
2	61,2 ~ 61,7	6,04	9,50	12,12	16,0	12,7	15,7	19,0
2 1/2	73,9 ~ 74,4	7,67			16,0	15,7	19,0	
3	89,8 ~ 90,3	8,30			16,0	19,0	22,4	
4	115,2 ~ 115,7	9,35			19,0	22,4	28,4	

For Approx Weight See Page 124



## 90° Elbow, 45° Elbow, Tee, Cross Class 2000, 3000, 6000



### ASME B16.11

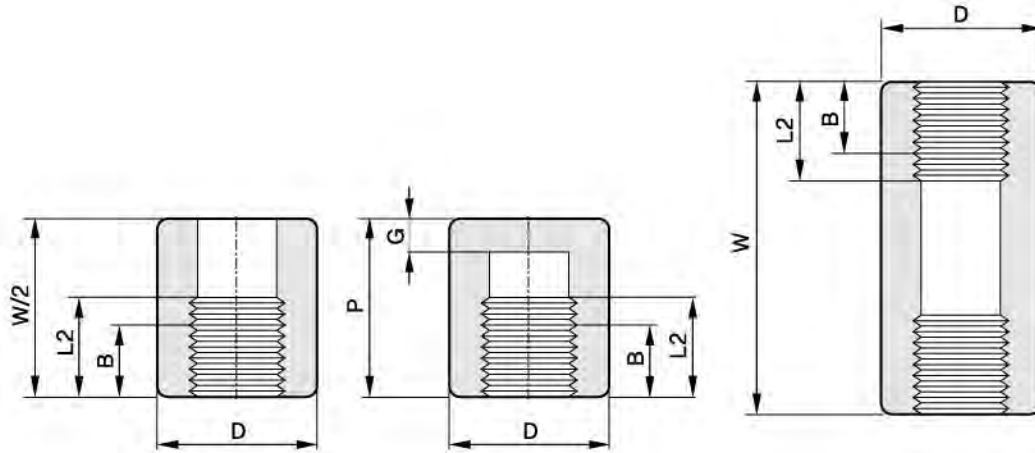
(in millimeters)

Nominal Pipe Size	Center to End Elbows, Tees, Crosses A			Center to End 45° Elbows C			Outside Diameter of Band H			Minimum Wall Thickness G			Length of Thread Min(1)	
	2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L <sub>2</sub>
1/8	21	21	25	17	17	19	22	22	25	3,18	3,18	6,35	6,4	6,7
1/4	21	25	28	17	19	22	22	25	33	3,18	3,30	6,60	8,1	10,2
3/8	25	28	33	19	22	25	25	33	38	3,18	3,51	6,98	9,1	10,4
1/2	28	33	38	22	25	28	33	38	46	3,18	4,09	8,15	10,9	13,6
3/4	33	38	44	25	28	33	38	46	56	3,18	4,32	8,53	12,7	13,9
1	38	44	51	28	33	35	46	56	62	3,68	4,98	9,93	14,7	17,3
1 1/4	44	51	60	33	35	43	56	62	75	3,89	5,28	10,59	17,0	18,0
1 1/2	51	60	64	35	43	44	62	75	84	4,01	5,56	11,07	17,8	18,4
2	60	64	83	43	44	52	75	84	102	4,27	7,14	12,09	19,0	19,2
2 1/2	76	83	95	52	52	64	92	102	121	5,61	7,65	15,29	23,6	28,9
3	86	95	106	64	64	79	109	121	146	5,99	8,84	16,64	25,9	30,5
4	106	114	114	79	79	79	146	152	152	6,55	11,18	18,67	27,7	33,0

(1) Dimension B is minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L<sub>2</sub> (effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1)

For Approx Weight See Page 125

Coupling, Half Coupling, Cap  
Class 3000, 6000



ASME B16.11

(in millimeters)

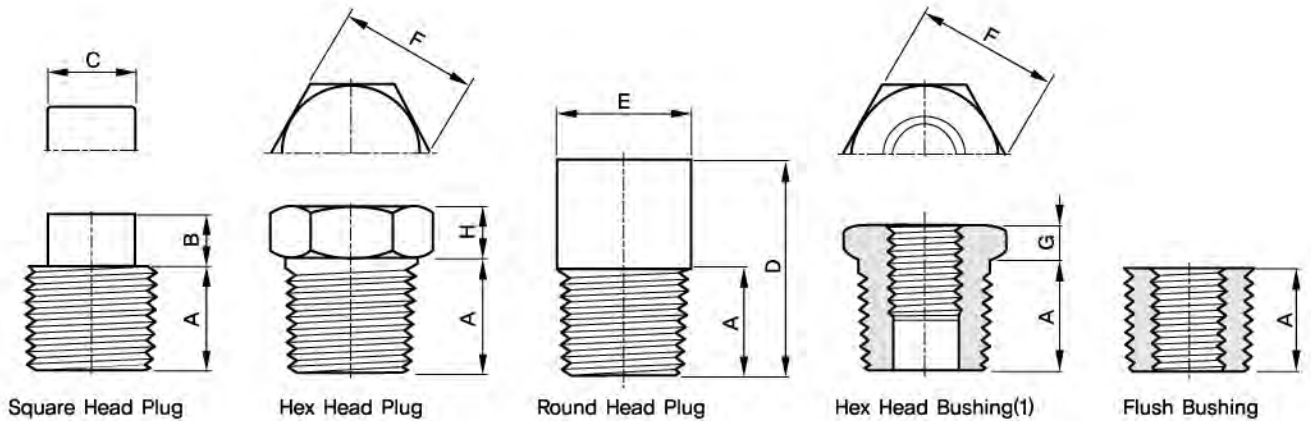
Nominal Pipe Size	End-to-End Couplings W	End-to-End Caps P		Outside Diameter D		End Wall Thickness Min G		Length of Thread Min (1)	
	3000 and 6000	3000	6000	3000	6000	3000	6000	B	L <sub>2</sub>
1/8	32	19		16	22	4,8		6,4	6,7
1/4	35	25	27	19	25	4,8	6,4	8,1	10,2
3/8	38	25	27	22	32	4,8	6,4	9,1	10,4
1/2	48	32	33	28	38	6,4	7,9	10,9	13,6
3/4	51	37	38	35	44	6,4	7,9	12,7	13,9
1	60	41	43	44	57	9,7	11,2	14,7	17,3
1 1/4	67	44	46	57	64	9,7	11,2	17,0	18,0
1 1/2	79	44	48	64	76	11,2	12,7	17,8	18,4
2	86	48	51	76	92	12,7	15,7	19,0	19,2
2 1/2	92	60	64	92	108	15,7	19,0	23,6	28,9
3	108	65	68	108	127	19,0	22,4	25,9	30,5
4	121	68	75	140	159	22,4	28,4	27,7	33,0

(1) Dimension B is minimum length of perfect thread. The length of useful thread (B plus threads with fully formed roots and flat crests) shall not be less than L<sub>2</sub> (effective length of external thread) required by American National Standard for Pipe Threads (ASME B1.20.1)  
\*Class 2000 and NPT 1/8 class 6000 couplings, half couplings, and caps are not included in this standard.

For Approx Weight See Page 125



## Plug, Bushing



### ASME B16.11

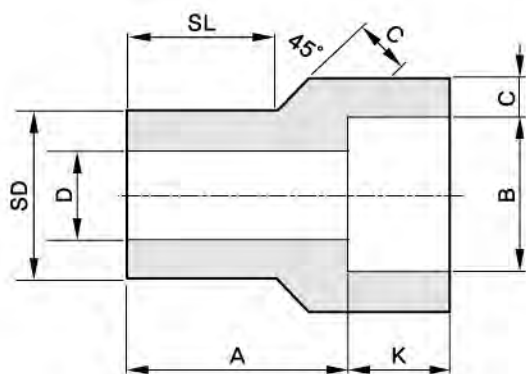
(in millimeters)

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

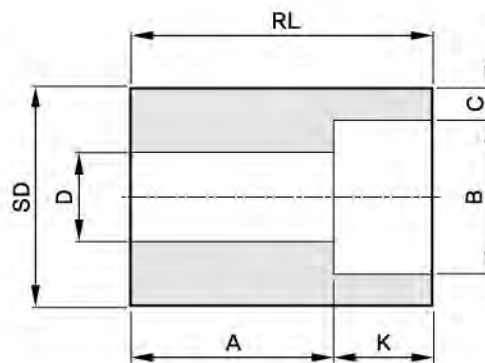
(1) Cautionary Note Regarding Hex Bushings, Hex Head Bushings of one-size reduction should not be used in services wherein they might be subject to harmful loads and forces other than internal pressures.

For Approx Weight See Page 125

## Reducer insert Class 3000, 6000



Type.1



Type. 2<sup>1)</sup>

### MSS SP-79

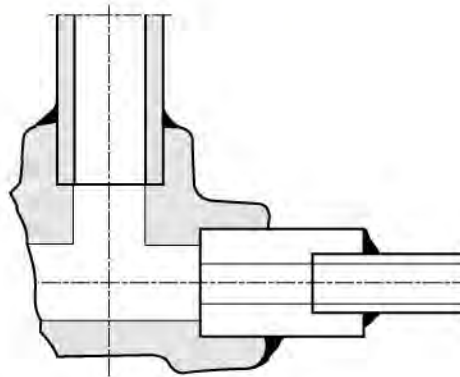
(in millimeters)

Nominal Pipe Size	Type		Socket		Shank Dia SD	Laying Length A		Bore D		Wall Min C		Length Min			
			Dia B	Depth Min K		3M	6M	3M	6M	3M	6M	SL		RL	
	3M	6M			3M							6M	3M	6M	3M
3/8 X 1/4	1	1	14,35	10	17,15	19	21	9,0	6,5	3,78	4,60	14	16		
1/2 X 3/8	1	1	17,78	10	21,34	21	23	12,5	9,0	4,01	5,03	16	16		
X 1/4	2	1	14,35	10	21,34	21	21	9,0	6,5	3,78	4,60	16	16		
3/4 X 1/2	1	1	21,97	10	26,67	22	25	16,0	11,5	4,67	5,97	17	19		
X 3/8	2	1	17,78	10	26,67	16	22	12,5	9,0	4,01	5,03		19	27	
X 1/4	2	2	14,35	10	26,67	18	22	9,0	6,5	3,78	4,60			27	32
1 X 3/4	1	1	27,31	13	33,40	24	28	21,0	15,5	4,90	6,96	19	21		
X 1/2	2	1	21,97	10	33,40	16	28	16,0	11,5	4,67	5,97		21	28	
X 3/8	2	2	17,78	10	33,40	18	22	12,5	9,0	4,01	5,03			28	33
X 1/4	2	2	14,35	10	33,40	19	24	9,0	6,5	3,78	4,60			28	33
1-1/4 X 1	1	1	34,04	13	42,16	25	30	26,5	20,5	5,69	7,92	21	22		
X 3/4	2	2	27,31	13	42,16	18	21	21,0	15,5	4,90	6,96			32	35
X 1/2	2	2	21,97	10	42,16	19	22	16,0	11,5	4,67	5,97			32	35
X 3/8	2	2	17,78	10	42,16	21	24	12,5	9,0	4,01	5,03			32	35
X 1/4	2	2	14,35	10	42,16	22	25	9,0	6,5	3,78	4,60			32	35
1-1/2 X 1-1/4	1	1	42,80	13	48,26	28	35	35,0	29,5	6,07	7,92	22	25		
X 1	2	1	34,04	13	48,26	18	29	26,5	20,5	5,69	7,92		25	33	
X 3/4	2	2	27,31	13	48,26	19	25	21,0	15,5	4,90	6,96			33	40
X 1/2	2	2	21,97	10	48,26	21	27	16,0	11,5	4,67	5,97			33	40
X 3/8	2	2	17,78	10	48,26	22	28	12,5	9,0	4,01	5,03			33	40

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



## Reducer insert Class 3000, 6000



Application of Reducer insert

### MSS SP-79

(in millimeters)

Nominal Pipe Size	Type		Socket		Shank Dia SD	Laying Length A		Bore D		Wall Min C		Length Min			
			Dia B	Depth Min K		3M	6M	3M	6M	3M	6M	SL		RL	
	3M	6M			3M							6M	3M	6M	3M
2 X 1-1/2	1	1	48,90	13	60,32	32	39	41,0	34,0	6,35	8,90	25	28		
X 1-1/4	2	2	42,80	13	60,32	21	24	35,0	29,5	6,07	7,92			38	41
X 1	2	2	34,04	13	60,32	22	25	26,5	21,0	5,69	7,92			38	41
X 3/4	2	2	27,31	13	60,32	24	27	21,0	15,5	4,90	6,96			38	41
X 1/2	2	2	21,97	10	60,32	25	28	16,0	11,5	4,67	5,97			38	41
2-1/2 X 2	1	1	61,37	16	73,02	46	43	52,5	43,0	6,93	10,92	38	32		
X 1-1/2	2	2	48,90	13	73,02	35		41,0		6,35				54	
X 1-1/4	2	2	42,80	13	73,02	37		35,0		6,07				54	
X 1	2	2	34,04	13	73,02	38		26,5		5,69				54	
X 3/4	2	2	27,31	13	73,02	40		21,0		4,90				54	
3 X 2-1/2	1		74,07	16	88,90	38		62,5		8,76		32			
X 2	2		61,37	16	88,90	25		52,5		6,93				48	
X 1-1/2	2		48,90	13	88,90	29		41,0		6,35				48	
X 1-1/4	2		42,80	13	88,90	30		35,0		6,07				48	
X 1	2		34,04	13	88,90	32		26,5		5,69				48	
4 X 3	2		90,04	16	114,30	33		78,0		9,50				60	
X 2-1/2	2		74,07	16	114,30	38		62,5		8,76				60	
X 2	2		61,37	16	114,30	38		52,5		6,93				60	
X 1-1/2	2		48,90	13	114,30	42		41,0		6,35				60	
X 1-1/4	2		42,80	13	114,30	43		35,0		6,07				60	

#### TOLERANCES

Laying Length A - Sizes 3/8" thru 3/4" + 1,5mm / - 0,0mm  
 Sizes 1" thru 2" + 2,0mm / - 0,0mm  
 Sizes 2-1/2" thru 4" + 2,5mm / - 0,0mm

Socket Dia, B - Sizes 1/4" thru 2" ± 0,25mm  
 Sizes 2-1/2" thru 3" + 0,40mm / - 0,25mm

Bore D - Sizes 1/4" thru 2" ± 0,8mm  
 Sizes 2-1/2" thru 3" ± 1,5mm

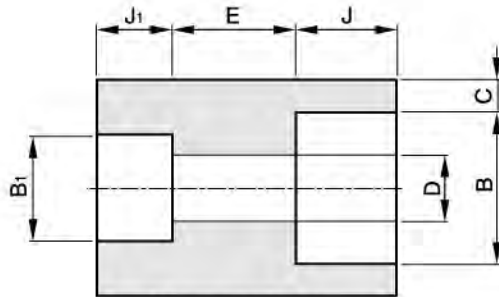
Shank Dia, SD - Sizes 3/8" thru 1-1/2" ± 0,25mm  
 Sizes 2" thru 3" ± 0,50mm  
 Sizes 4" ± 0,75mm

Shank Length SL - Sizes 3/8" thru 3/4" + 0,00mm / - 1,50mm  
 Sizes 1" thru 2" + 0,00mm / - 2,00mm  
 Sizes 2-1/2" thru 4" + 0,00mm / - 2,50mm

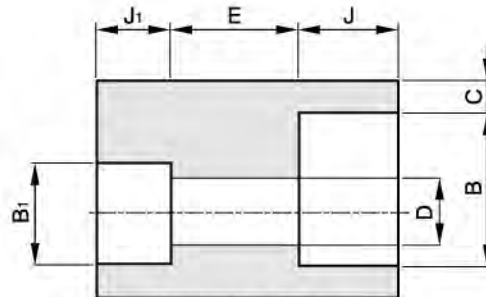


## Concentric Reducer / Eccentric Reducer

Class 3000, 6000, 9000



Concentric Reducer



Eccentric Reducer

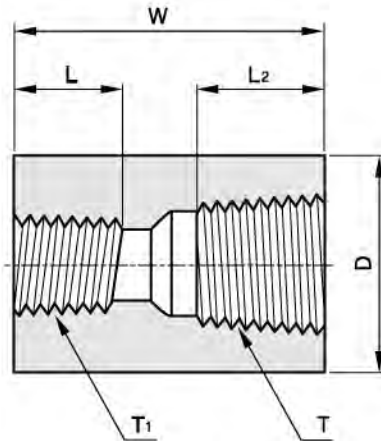
(in millimeters)

Nominal Pipe Size	Socket Bore Dia (Min) (1)		Bore Diameter of Fitting - D (1)			Socket Wall Thickness (Min) - C			Depth Min		Laying Lengths (Min) E (2)
	B	B <sub>1</sub>	3000	6000	9000	3000	6000	9000	J	J <sub>1</sub>	
1/4 X 1/8	14,2	10,8	6,8	4,0		3,30	4,01		9,5	9,5	6,5
3/8 X 1/4	17,6	14,2	9,0	6,5		3,50	4,37		9,5	9,5	6,5
1/2 X 1/4	21,8	14,2	9,0	6,5		4,09	5,18	8,18	9,5	9,5	9,5
X 3/8		17,6	12,5	9,0		4,09	5,18	8,18	9,5	9,5	9,5
3/4 X 1/4	27,2	14,2	9,0	6,5		4,27	6,04	8,56	12,5	9,5	9,5
X 3/8		17,6	12,5	9,0		4,27	6,04	8,56	12,5	9,5	9,5
X 1/2		21,8	16,0	11,5	6,4	4,27	6,04	8,56	12,5	9,5	9,5
1 X 3/8	33,9	17,6	12,5	9,0		4,98	6,93	9,96	12,5	9,5	12,5
X 1/2		21,8	16,0	11,5	6,4	4,98	6,93	9,96	12,5	9,5	12,5
X 3/4		27,2	21,0	15,5	11,0	4,98	6,93	9,96	12,5	12,5	12,5
1-1/4 X 1/2	42,7	21,8	16,0	11,5	6,4	5,28	6,93	10,62	12,5	9,5	12,5
X 3/4		27,2	21,0	15,5	11,0	5,28	6,93	10,62	12,5	12,5	12,5
X 1		33,9	26,5	20,5	15,2	5,28	6,93	10,62	12,5	12,5	12,5
1-1/2 X 3/4	48,8	27,2	21,0	15,5	11,0	5,54	7,80	11,12	12,5	12,5	12,5
X 1		33,9	26,5	20,5	15,2	5,54	7,80	11,12	12,5	12,5	12,5
X 1-1/4		42,7	35,0	29,5	22,7	5,54	7,80	11,12	12,5	12,5	12,5
2 X 1	61,2	33,9	26,5	20,5	15,2	6,04	9,50	12,12	16,0	12,5	19,0
X 1-1/4		42,7	35,0	29,5	22,7	6,04	9,50	12,12	16,0	12,5	19,0
X 1-1/2		48,8	41,0	34,0	27,9	6,04	9,50	12,12	16,0	12,5	19,0
2-1/2 X 1-1/4	73,9	42,7	35,0	29,5	22,7	7,67			16,0	12,5	19,0
X 1-1/2		48,8	41,0	34,0	27,9	7,67			16,0	12,5	19,0
X 2		61,2	52,5	43,0	38,1	7,67			16,0	16,0	19,0
3 X 1-1/2	89,9	48,8	41,0	34,0	27,9	8,30			16,0	12,5	19,0
X 2		61,2	52,5	43,0	38,1	8,30			16,0	16,0	19,0
X 2-1/2		73,9	62,5	54,1		8,30			16,0	16,0	19,0
4 X 2	115,2	61,2	52,5	43,0		9,35			19,0	16,0	19,0
X 2-1/2		73,9	62,5	54,1		9,35			19,0	16,0	19,0
X 3		89,8	78,0	66,8		9,35			19,0	16,0	19,0

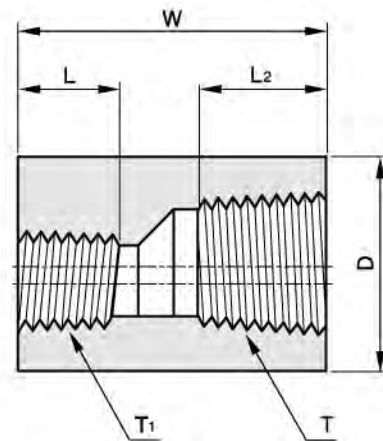
NOTE : (1) Tolerance is according to coupling at ASME B16.11

## Concentric Reducer / Eccentric Reducer

Class 3000, 6000



Concentric Reducer



Eccentric Reducer

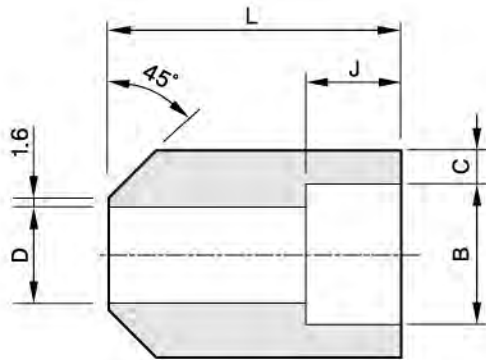
(in millimeters)

Nominal Pipe Size	Outside Diameter - D		End to End W	Length of Thread(Min)	
	3000	6000		L <sub>2</sub>	L
1/4 X 1/8	19	25	35	8.1	6.4
3/8 X 1/4	22	32	38	9.1	8.1
1/2 X 1/4	28	38	48	10.9	8.1
X 3/8	28	38	48	10.9	9.1
3/4 X 3/8	35	44	51	12.7	8.1
X 3/8	35	44	51	12.7	9.1
X 1/2	35	44	51	12.7	10.9
1 X 3/8	44	57	60	14.7	9.1
X 1/2	44	57	60	14.7	10.9
X 3/4	44	57	60	14.7	12.7
1-1/4 X 1/2	57	64	67	17.0	10.9
X 3/4	57	64	67	17.0	12.7
X 1	57	64	67	17.0	14.7
1-1/2 X 3/4	64	76	79	17.8	12.7
1-1/2 X 1	64	76	79	17.8	14.7
X 1-1/4	64	76	79	17.8	17.0
2 X 1	76	92	86	19.0	14.7
X 1-1/4	76	92	86	19.0	17.0
X 1-1/2	76	92	86	19.0	17.8
2-1/2 X 1-1/4	92	108	92	23.6	17.0
X 1-1/2	92	108	92	23.6	17.8
X 2	92	108	92	23.6	19.0
3 X 1-1/2	108	127	108	25.9	17.8
X 2	108	127	108	25.9	19.0
X 2-1/2	108	127	108	25.9	23.6
4 X 2	140	159	121	27.7	19.0
X 2-1/2	140	159	121	27.7	23.6
4 X 3	140	159	121	27.7	25.9

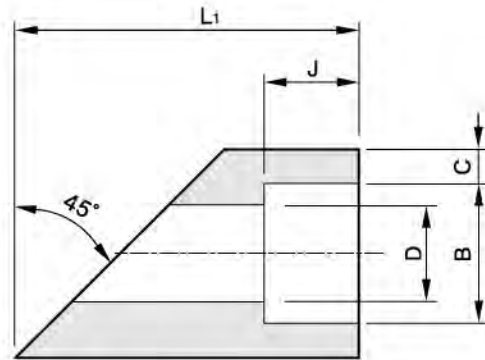
NOTE : (1) Tolerance is according to coupling at ASME B16.11

## Boss

Class 3000, 6000, 9000



Type 1



Type 2

### ASME B16.11

(in millimeters)

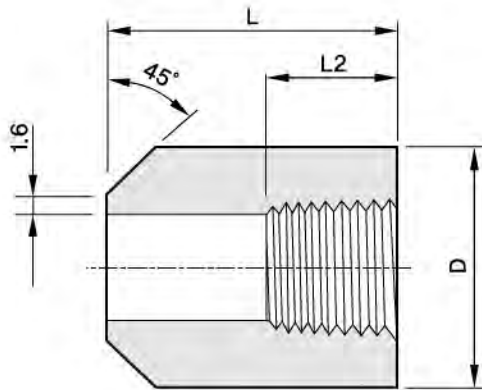
Nominal Pipe Size	Socket Bore Dia (Min) B	Bore Diameter of Fitting-D			Socket Wall Thickness Min - C			Depth Min J	End to End	
		3000	6000	9000	3000	6000	9000		L <sub>1</sub>	L (2)
1/4	14,2 ~ 14,6	8,5 ~ 10,0	5,6 ~ 7,1		3,30	4,01		9,5	25,5	62
3/8	17,6 ~ 18,0	11,8 ~ 13,3	8,4 ~ 9,9		3,50	4,37		9,5	27	66
1/2	21,8 ~ 22,2	15,0 ~ 16,6	11,0 ~ 12,5	5,6 ~ 7,2	4,09	5,18	8,18	9,5	32	82
3/4	27,2 ~ 27,6	20,2 ~ 21,7	14,8 ~ 16,3	10,3 ~ 11,8	4,27	6,04	8,56	12,5	36,5	88
1	33,9 ~ 34,3	25,9 ~ 27,4	19,9 ~ 21,5	14,4 ~ 16,0	4,98	6,93	9,96	12,5	41	96
1-1/4	42,7 ~ 43,1	34,3 ~ 35,8	28,7 ~ 30,2	22,0 ~ 23,5	5,28	6,93	10,62	12,5	42,5	105
1-1/2	48,8 ~ 49,2	40,1 ~ 41,6	33,2 ~ 34,7	27,2 ~ 28,7	5,54	7,80	11,12	12,5	44,5	112
2	61,2 ~ 61,7	51,7 ~ 53,3	42,1 ~ 43,6	37,4 ~ 38,9	6,04	9,50	12,12	16,0	57	125

NOTE : (1) Weld Connection 45° Bevel operation  
(2) Keonsae Standard

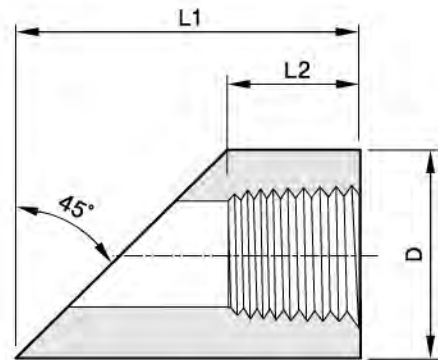


## Boss

Class 3000, 6000, 9000



Type 1



Type 2

### ASME B16.11

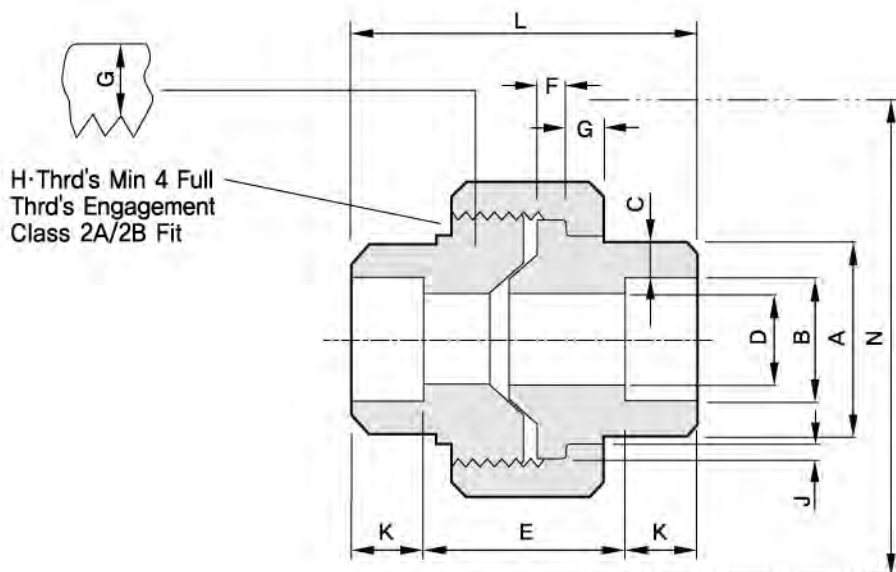
(in millimeters)

Nominal Pipe Size	Outside Diameter - D		End to End		Length of Thread L <sub>2</sub> Min (2)
	3000	6000	L	L <sub>1</sub>	
A					
1/4	19	28	17,5	62	8,1
3/8	22	32	19	66	9,1
1/2	28	38	24	82	10,9
3/4	35	44	25,5	88	12,7
1	44	54	30	96	14,7
1-1/4	57	64	33,5	105	17,0
1-1/2	64	76	39,5	112	17,8
2	76	92	43	125	19,0

NOTE : (1) Weld Connection 45° Bevel operation  
(2) Keonsae Standard

## Union

### Class 3000



### MSS SP - 83

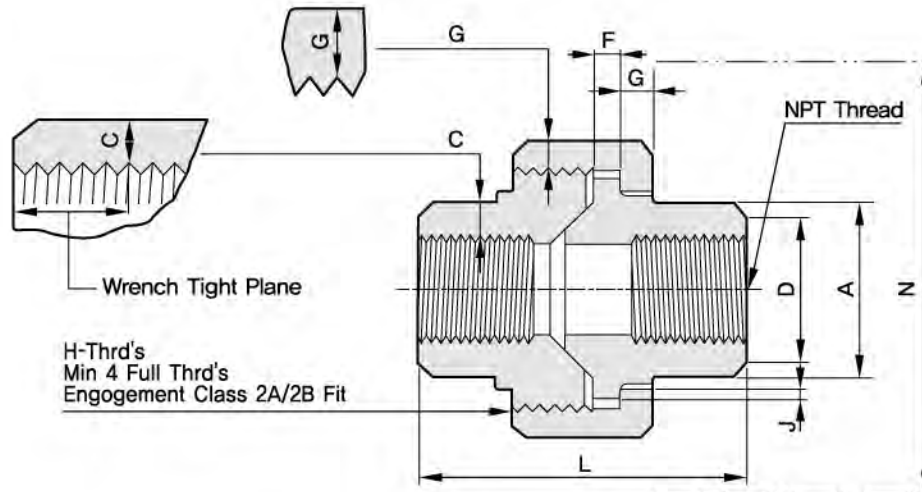
(in millimeters)

Nominal Pipe Size	Pipe End Min	Socket Bore Dia	Socket Wall Min	Water Way Bore	Laying Length	Male Flange Min	Nut Min	Threads Per 25.4mm Max	Bearing Min	Depth of Socket Min	Length Assem. Nom	Clear Assem. Nut
	A	B	C	D	E	F	G	H	J	K	L	N
1/8	21.8	10.67 ~ 10.92	3.17	6.43 ~ 6.68	19.0 ~ 22.4	3.17	3.17	16	1.24	9.6	41.4	49.0
1/4	21.8	13.97 ~ 14.22	3.30	9.45 ~ 9.85	19.0 ~ 22.4	3.17	3.17	16	1.24	9.6	41.4	49.0
3/8	25.9	17.53 ~ 17.78	3.48	13.51 ~ 13.92	20.6 ~ 26.9	3.43	3.43	14	1.37	9.6	46.0	55.0
1/2	31.2	21.59 ~ 21.84	4.06	17.07 ~ 17.47	20.6 ~ 26.9	3.68	3.68	14	1.50	9.6	49.0	57.0
3/4	37.1	26.92 ~ 27.18	4.27	21.39 ~ 21.79	25.4 ~ 31.8	4.06	4.06	11	1.68	12.7	56.9	67.0
1	45.5	33.78 ~ 34.04	4.95	27.74 ~ 28.14	26.2 ~ 34.3	4.57	4.44	11	1.85	12.7	62.0	79.0
1-1/4	54.9	42.42 ~ 42.67	5.28	35.36 ~ 35.76	32.5 ~ 40.6	5.33	5.21	11	2.13	12.7	71.1	94.0
1-1/2	61.5	48.51 ~ 48.77	5.54	41.20 ~ 41.61	34.0 ~ 42.2	5.84	5.59	10	2.31	12.7	76.5	111.0
2	75.2	61.21 ~ 61.47	6.05	52.12 ~ 52.53	37.3 ~ 45.5	6.60	6.35	10	2.69	15.8	86.1	132.0
2-1/2	91.7	73.66 ~ 74.17	7.65	64.31 ~ 64.72	52.1 ~ 61.7	7.49	7.11	8	3.07	15.8	102.4	148.0
3	109.2	89.66 ~ 90.17	8.31	77.27 ~ 77.67	53.6 ~ 63.8	8.25	8.00	8	3.53	15.8	109.0	175.0



## Union

### Class 3000



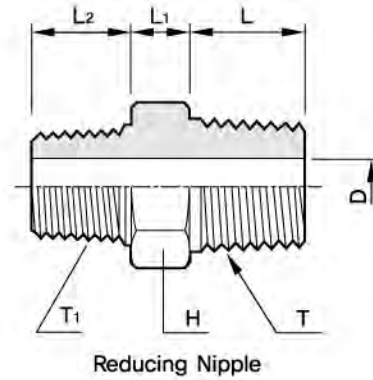
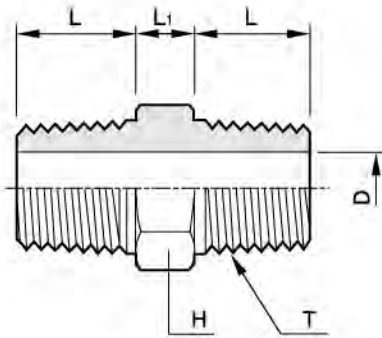
### MSS SP - 83

(in millimeters)

Nominal Pipe Size	Pipe End Min	Wall Min	Water Way Bore	Male Flange Min	Nut Min	Threads Per 25.4mm Max	Bearing Min	Length Assem. Nominal	Clear Assem. Nut
	A	C	D	F	G	H	J	L	N
1/8	14.7	2.41	6.43 ~ 6.83	3.17	3.2	16	1.24	41.4	49.0
1/4	19.0	3.02	9.45 ~ 9.85	3.17	3.2	16	1.24	41.4	49.0
3/8	22.9	3.20	13.51 ~ 13.92	3.43	3.4	14	1.37	46.0	55.0
1/2	27.7	3.73	17.07 ~ 17.47	3.68	3.7	14	1.50	49.0	57.0
3/4	33.5	3.91	21.39 ~ 21.79	4.06	4.1	11	1.68	56.9	67.0
1	41.4	4.55	27.74 ~ 28.14	4.57	4.4	11	1.85	62.0	79.0
1-1/4	50.5	4.85	35.36 ~ 35.76	5.33	5.2	11	2.13	71.1	94.0
1-1/2	57.2	5.08	41.20 ~ 41.61	5.84	5.6	10	2.31	76.4	111.0
2	70.1	5.54	52.12 ~ 52.53	6.60	6.4	10	2.69	86.1	132.0
2-1/2	85.3	7.01	64.31 ~ 64.72	7.49	7.1	8	3.07	102.4	148.0
3	102.4	7.62	77.27 ~ 77.67	8.25	8.0	8	3.53	109.0	175.0

## Nipple

Class 3000, 6000



(in millimeters)

Nominal Size T	D	H*	L	L <sub>1</sub>
1/8	4	12	10	6
1/4	7	17	14	8
3/8	9	19	15	8
1/2	12	22	19	9
3/4	16	27	21	10
1	20	35	24	11
1-1/4	28	46	27	12
1-1/2	32	50	27	14
2	40	65	31	16
2-1/2	55	80	36	18
3	65	95	39	20

H\*: Size 2" and smaller are Hexagonal Bodies, size over 2 1/2" is Octagonal body

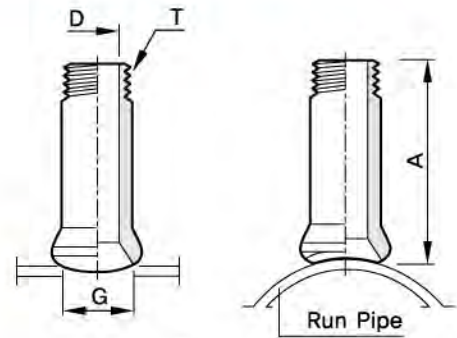
Nominal Size T	D	H*	L	L <sub>1</sub>	L <sub>2</sub>
3/8 X 1/4	7	19	15	8	14
1/2 X 1/4	7	22	19	9	14
1/2 X 3/8	9	22	19	9	15
3/4 X 1/4	7	27	21	10	14
3/4 X 3/8	9	27	21	10	15
3/4 X 1/2	12	27	21	10	19
1 X 3/8	9	35	24	11	15
1 X 1/2	12	35	24	11	19
1 X 3/4	16	35	24	11	21
1-1/4 X 1/2	12	46	27	12	19
1-1/4 X 3/4	16	46	27	12	21
1-1/4 X 1	20	46	27	12	24
1-1/2 X 3/4	16	50	27	14	21
1-1/2 X 1	20	50	27	14	24
1-1/2 X 1-1/4	28	50	27	14	27
2 X 1	20	65	31	16	24
2 X 1-1/4	28	65	31	16	27
2 X 1-1/2	32	65	31	16	27
2-1/2 X 1-1/4	28	80	36	18	27
2-1/2 X 1-1/2	32	80	36	18	27
2-1/2 X 2	40	80	36	18	31
3 X 1-1/2	32	95	39	20	27
3 X 2	40	95	39	20	31
3 X 2-1/2	55	95	39	20	36



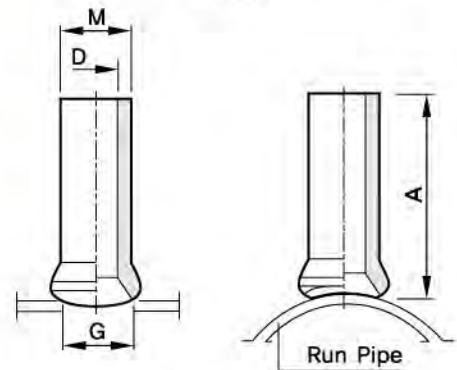
## Branch Outlet Nipple XS, XXS

### MSS SP - 95

Run Pipe Size	Outlet Size		A (mm)	D(mm)		G(mm)	
	T (Thread)	M (mm)		XS	XXS	XS	XXS
36 ~ 3/4	1/2	21	88,9	13,84	6,36	23,80	14,28
36 ~ 1	3/4	27	88,9	18,88	11,06	30,16	19,05
36 ~ 1-1/4	1	33	88,9	24,30	15,22	36,51	25,40
36 ~ 1-1/2	1-1/4	42	88,9	32,50	22,80	44,45	33,33
36 ~ 2	1-1/2	48	88,9	38,14	28,00	50,80	38,10
36 ~ 2-1/2	2	60	88,9	49,22	38,16	60,08	42,86



Threaded

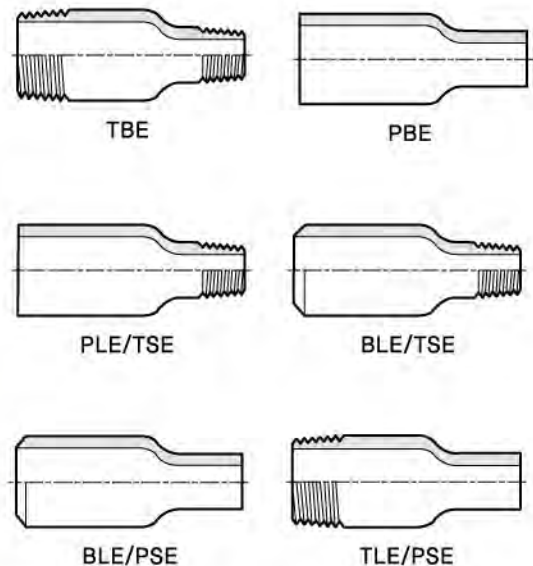


Plain End

## Swaged Nipple

### MSS SP - 95

Large end Size	Small end Size	Length (mm)
1/4	1/8 ~	57 ± 2
3/8	1/4 ~ 1/8	64 ± 2
1/2	3/8 ~ 1/8	70 ± 2
3/4	1/2 ~ 1/8	76 ± 2
1	3/4 ~ 1/8	89 ± 2
1-1/4	1 ~ 1/8	102 ± 2
1-1/2	1-1/4 ~ 1/8	114 ± 2
2	1-1/2 ~ 1/8	165 ± 2
2-1/2	2 ~ 1/8	178 ± 2
3	2-1/2 ~ 1/8	203 ± 2
3-1/2	3 ~ 1/8	203 ± 2
4	3-1/2 ~ 1/8	229 ± 2



TBE : Threaded Both End

PBE : Plain Both End

PLE / TSE : Plain Large End - Threaded Small End

BLE / TSE : Beveled Large End - Threaded Small End

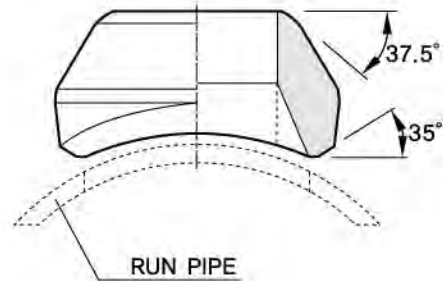
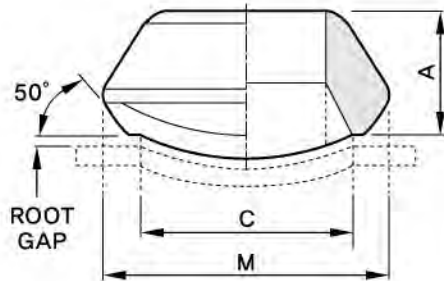
TLE / PSE : Threaded Large End - Plain Small End

BLE / PSE : Beveled Large End - Plain Small End

\* Pipe Schedule Numbers and Weight Designation is according to ASME B36. 10 & B36.19

## Branch Outlet Butt Weld

STD(Sch 40). XS(Sch 80), Sch 160, XXS



### MSS SP-97

(in millimeters)

Out Let Size	A			M			C		
	STD	XS	Sch 160-XXS	STD	XS	Sch 160-XXS	STD	XS	Sch 160-XXS
1/2	19,1	19,1	28,6	34,9	34,9	34,9	23,8	23,8	14,3
3/4	22,2	22,2	31,8	44,5	44,5	44,5	30,2	30,2	19,1
1	27,0	27,0	38,1	54,0	54,0	50,8	36,5	36,5	25,4
1-1/4	31,8	31,8	44,5	65,1	65,1	61,9	44,5	44,5	33,3
1-1/2	33,3	33,3	50,8	73,0	73,0	69,9	50,8	50,8	38,1
2	38,1	38,1	55,6	88,9	88,9	81,0	65,1	65,1	42,9
2-1/2	41,3	41,3	61,9	103,2	103,2	96,8	76,2	76,2	54,0
3	44,5	44,5	73,0	122,2	122,2	120,7	93,7	93,7	73,0
4	50,8	50,8	84,1	152,4	152,4	152,4	120,7	120,7	98,4
5	57,2	57,2	93,7	179,4	179,4	187,3	141,3	141,3	122,2
6	60,3	77,8	104,8	215,9	225,4	220,7	169,9	169,9	146,1
8	69,9	98,4	111,1	263,5	292,1	284,2	220,7	220,7	173,0
10	77,8	93,7	125,4	322,3	323,9	312,7	274,6	265,1	215,9
12	85,7	103,2		377,8	379,4		325,4	317,5	
14	88,9	100,0		409,6	431,8		357,2	350,8	
16	93,7	106,4		463,6	466,7		408,0	403,2	
18	96,8	111,1		520,7	517,5		458,8	455,6	
20	101,6	119,1		571,5	582,6		508,0	509,6	
24	115,9	139,7		689,0	708,0		614,4	614,4	
26	119,1	146,1		738,2	765,2		666,8	692,2	

\* Applicable Run Pipe Size are from Out-let Size to 36"

\* Standard Weight Fittings are the Same as Schedule 40 Fittings Until 10" and Extra Strong Fittings are the Same as Schedule 80 Until 8"

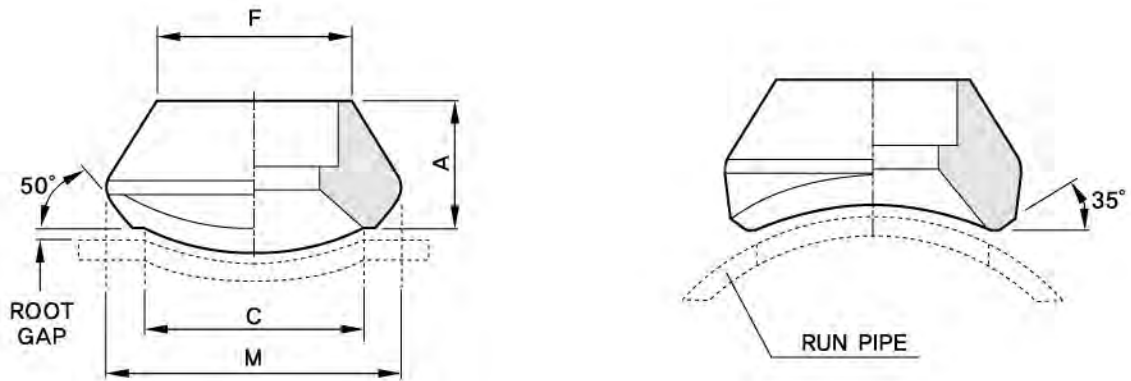
\* Pipe Schedule Numbers and Weight Designations are in Accordance with ASME B36.10 & B 36.19

\* When Ordering Branch Outlet Butt Weld, Include the Quantity, Size(Run and Outlet), Description(Weldolet, Schedule Number) and Material.

\* 12"(Sch 160, XXS) and Larger Size Available on Application and see Heavy Wall Weldolet for Dimensions

## Branch Outlet Socket Weld

Class 3000, 6000



### MSS SP-97

(in millimeters)

Out Let Size	A		B		C		F	
	3000	6000	3000	6000	3000	6000	3000	6000
1/2	25.4	31.8	35.7	43.7	23.0	19.1	31.8	39.7
3/4	27.0	36.5	43.7	49.6	29.4	25.4	36.5	45.2
1	33.3	39.7	50.8	61.9	36.5	33.3	46.0	57.2
1-1/4	33.3	41.3	65.1	69.1	44.5	38.1	55.6	65.1
1-1/2	34.9	42.9	72.2	82.6	50.8	49.2	61.9	76.2
2	38.1	52.4	88.1	102.4	65.1	69.9	74.6	92.1
2-1/2	39.7		103.2		76.2		87.3	
3	44.5		122.2		93.7		104.8	
4	47.6		151.6		120.7		130.2	

\* Applicable Run Pipe Size are from Out-let Size to 36"

\* For the 3000# and 6000# Socketlet, Inside Bore, Socket Depth Dimensions are According to ASME B16.11

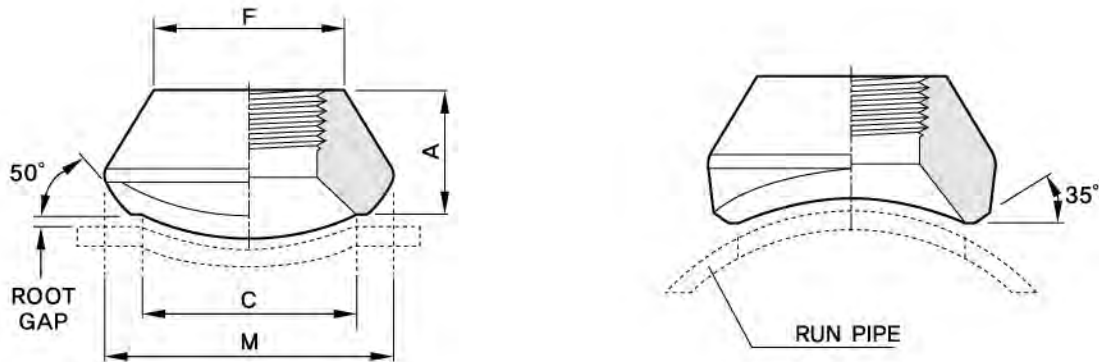
\* Pipe Schedule Numbers and Weight Designations are in Accordance with ASME B36.10 & B 36.19

\* When Ordering Socketlets and Thredolets, Include the Quantity, Run and Outlet Size Item and Rating(or Schedule Number) and Material

\* If Required 9000# by purchaser, Dimensions Will be According to 6000#

## Branch Outlet Threads

Class 3000, 6000



### MSS SP-97

(in millimeters)

Out Let Size	A		M		C		F	
	3000	6000	3000	6000	3000	6000	3000	6000
1/2	25.4	31.8	35.7	43.7	23.8	19.1	31.8	39.7
3/4	27.0	36.5	43.7	49.6	29.4	25.4	36.5	45.2
1	33.3	39.7	50.8	61.9	36.5	33.3	46.0	57.2
1-1/4	33.3	41.3	65.1	69.1	44.5	38.1	55.6	65.1
1-1/2	34.9	42.9	72.2	82.6	50.8	49.2	61.9	76.2
2	38.1	52.4	88.1	102.4	65.1	69.9	74.6	92.1
2-1/2	46.0		103.2		76.2		87.3	
3	50.8		122.2		93.7		104.8	
4	57.2		151.6		120.7		130.2	

\* Applicable Run Pipe Size are from Out-let Size to 36"

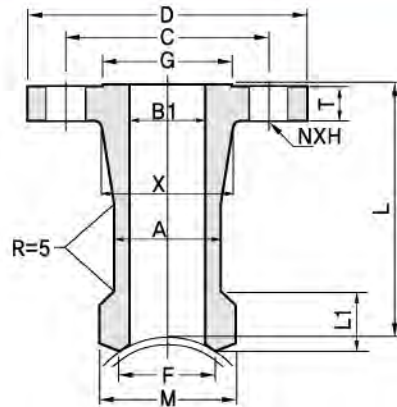
\* For the 3000# and 6000# Sockolet, Inside Bore, Socket Depth Dimensions are According to ASME B16.11

\* Pipe Schedule Numbers and Weight Designations are in Accordance with ASME B36.10 & B 36.19

\* When Ordering Sockolets and Thredolets, Include the Quantity, Run and Outlet Size Item and Rating(or Schedule Number) and Material

\* If Required 9000# by purchaser, Dimensions Will be According to 6000#

Branch Outlet Flange



Class 150

Outlet Size	L1			M			F			L				
	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	150	300	600	1500	2500
1/2"	19.1	19.1	28.6	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150
3/4"	22.2	22.2	31.8	44.5	44.5	44.5	30.2	30.2	19.1					
1"	27.0	27.0	38.1	54.0	54.0	50.8	36.5	36.5	25.4					
1-1/4"	31.8	31.8	44.5	65.1	65.1	61.9	44.5	44.5	33.3					
1-1/2"	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1					
2"	38.1	38.1	55.6	88.9	88.9	81.0	65.1	65.1	42.9					
2-1/2"	41.3	41.3	61.9	103.2	103.2	96.8	76.2	76.2	54.0					
3"	44.5	44.5	73.0	122.2	122.2	120.7	93.7	93.7	73.0					
4"	50.8	50.8	84.1	152.4	152.4	152.4	120.7	120.7	98.4	165	165			

Class 150	D	C	G	B1	X	NXH	A	T
1/2"	89.0	60.5	35.1	MATCH TO PIPE I.D	30.2	4X16	21.3	11.2
3/4"	98.0	70.0	42.9		38.1	4X16	26.7	12.7
1"	108.0	79.5	50.8		49.3	4X16	33.5	14.3
1-1/4"	117.0	89.0	63.5		58.7	4X16	42.2	15.9
1-1/2"	127.0	98.5	73.2		65.0	4X16	48.3	17.5
2"	152.0	120.5	91.9		77.8	4X19	60.5	19.1
2-1/2"	178.0	139.5	104.6		90.4	4X19	73.2	22.3
3"	190.0	152.5	127.0		108.0	4X19	88.9	23.9
4"	229.0	190.5	157.2		134.9	8X19	114.3	23.9

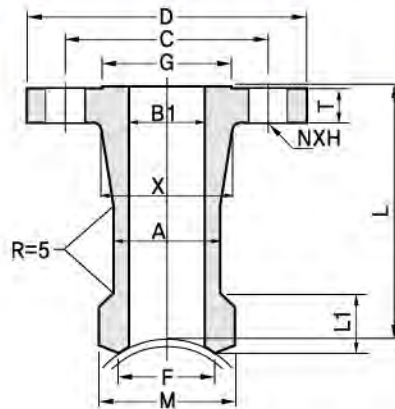
Class 300

Outlet Size	L1			M			F			L				
	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	150	300	600	1500	2500
1/2"	19.1	19.1	28.6	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150
3/4"	22.2	22.2	31.8	44.5	44.5	44.5	30.2	30.2	19.1					
1"	27.0	27.0	38.1	54.0	54.0	50.8	36.5	36.5	25.4					
1-1/4"	31.8	31.8	44.5	65.1	65.1	61.9	44.5	44.5	33.3					
1-1/2"	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1					
2"	38.1	38.1	55.6	88.9	88.9	81.0	65.1	65.1	42.9					
2-1/2"	41.3	41.3	61.9	103.2	103.2	96.8	76.2	76.2	54.0					
3"	44.5	44.5	73.0	122.2	122.2	120.7	93.7	93.7	73.0					
4"	50.8	50.8	84.1	152.4	152.4	152.4	120.7	120.7	98.4	165	165			

Class 300	D	C	G	B1	X	NXH	A	T
1/2"	95.3	66.5	35.1	MATCH TO PIPE I.D	38.1	4X16	21.3	14.3
3/4"	117.0	82.6	42.9		47.6	4X19	26.7	15.9
1"	124.0	88.9	50.8		54.0	4X19	33.5	17.5
1-1/4"	133.0	98.6	63.5		63.5	4X19	42.2	19.1
1-1/2"	156.0	114.3	73.2		69.9	4X22	48.3	20.6
2"	165.0	127.0	91.9		84.1	8X19	60.5	22.4
2-1/2"	190.0	149.4	104.6		100.0	8X22	73.2	25.4
3"	210.0	168.1	127.0		117.5	8X22	88.9	28.6
4"	254.0	200.2	157.2		146.1	8X22	114.3	31.8



## Branch Outlet Flange



### Class 600 / Class 1500

Outlet Size	L1			M			F			L				
	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	150	300	600	1500	2500
1/2"	19.1	19.1	28.6	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150
3/4"	22.2	22.2	31.8	44.5	44.5	44.5	30.2	30.2	19.1					
1"	27.0	27.0	38.1	54.0	54.0	50.8	36.5	36.5	25.4					
1-1/4"	31.8	31.8	44.5	65.1	65.1	61.9	44.5	44.5	33.3					
1-1/2"	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1					
2"	38.1	38.1	55.6	88.9	88.9	81.0	65.1	65.1	42.9					

Class 600	D	C	G	B1	X	NXH	A	T
1/2"	95.0	66.5	34.9	MATCH TO PIPE I.D	38.1	4X16	21.3	14.3
3/4"	117.0	82.6	42.9		47.8	4X19	26.7	15.9
1"	124.0	88.9	50.8		53.8	4X19	33.5	17.5
1-1/4"	133.0	98.6	63.5		63.5	4X19	42.2	20.7
1-1/2"	155.0	114.3	73.0		69.9	4X22	48.3	22.3
2"	165.0	127.0	92.1		84.1	8X19	60.5	25.4

Class 1500	D	C	G	B1	X	NXH	A	T
1/2"	121.0	82.6	34.9	MATCH TO PIPE I.D	38.1	4X23	21.3	22.4
3/4"	130.0	88.9	42.9		44.5	4X23	26.7	25.4
1"	149.0	101.6	50.8		52.3	4X26	33.5	28.6
1-1/4"	159.0	111.3	63.5		63.5	4X26	42.2	28.6
1-1/2"	178.0	124.0	73.0		69.9	4X29	48.3	31.8
2"	216.0	165.1	92.1		104.6	8X26	60.5	38.1

### Class 2500

Outlet Size	L1			M			F			L				
	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	S10-STD	S80	S160-XXS	150	300	600	1500	2500
1/2"	19.1	19.1	28.6	34.9	34.9	34.9	23.8	23.8	14.3	150	150	150	150	150
3/4"	22.2	22.2	31.8	44.5	44.5	44.5	30.2	30.2	19.1					
1"	27.0	27.0	38.1	54.0	54.0	50.8	36.5	36.5	25.4					
1-1/4"	31.8	31.8	44.5	65.1	65.1	61.9	44.5	44.5	33.3					
1-1/2"	33.3	33.3	50.8	73.0	73.0	69.9	50.8	50.8	38.1					
2"	38.1	38.1	55.6	88.9	88.9	81.0	65.1	65.1	42.9					

Class 2500	D	C	G	B1	X	NXH	A	T
1/2"	133.0	88.9	34.9	MATCH TO PIPE I.D	42.9	4X23	21.3	30.2
3/4"	140.0	95.3	42.9		50.8	4X23	26.7	31.8
1"	159.0	108.0	50.8		57.2	4X26	33.5	35.1
1-1/4"	184.0	130.0	63.5		73.2	4X29	42.2	38.1
1-1/2"	203.0	146.1	73.0		79.2	4X32	48.3	44.5
2"	235.0	171.5	92.1		95.3	8X29	60.5	50.8