



€D TK corporation



Brief History

- 1965 ESTABLISHMENT OF IRON WORKS IN BUSAN CITY
- 1973 ACQUIRED AN INVENTIVE PATENT FOR THE HOT MANDREL METHOD OF WELDING TYPE ELEBOW
- 1973 MOVED TO THE SA-SANG INDUSTRIAL GROUP
- 1975 TRADE MARK WAS CHANGED INTO TAE KWANG BEND IND. CO.
- 1977 APPROVED AS A SHIPBUILDING FITTING MAKER BY DET NORSKE VERITAS(DNV)
- 1981 APPROVED AS A SHIPBUILDING FITTING MAKER BY KOREAN REGISTER OF SHIPPING(KR)
 - 1981 AUTHORIZED TO DISPLAY KOREAN INDUSTRIAL STANDARD(KS) MARK OF STEEL BUTT-WELDING PIPE FITTINGS FOR ORDINARY USE AND FOR SPECIAL USE
 - 1982 TRADE MARK WAS CHANGED INTO THE TAE KWANG BEND IND. CO., LTD.
 - 1983 APPROVED AS A MATERIAL MANUFACTURER BY KOREA HEAVY INDUSTRIAL COMPANY(KHIC) FOR NUCLEAR POWER DIVISION
 - 1983 APPROVED BY ARAMCO FOR ZULUF AND MARJAN PROJECT
 - 1983 APPROVED BY SAUDI DAVY FOR YANBU INTERCONNECTING PIPELINES-PHASEII PROJECT AND BY BROWN & ROOT FOR MARJAN PROJECT
 - 1984 APPROVED BY BUREAU VERITAS(BV) FOR SHIPBUILDING
 - 1984 APPROVED BY ESSO, EPMI FOR GUNTONG, TABU AND PALAS PROJECT
 - 1985 APPROVED BY JBE & C FOR SAN MIGUEL, NC-41B PROJECT AND BY SSB ENG F6-A PROJECT
 - 1985 MOVED TO THE ADDRESS LOCATED AT 534 SHIN PYUNGDONG SAHAGU BUSAN
 - 1985 APPROVED BY EXXON FOR SYU PROJECT
 - 1986 APPROVED BY TEXACO FOR LOMBO PROJECT AND BY ELL FOR IP / IG / IH PROJECT
 - 1988 APPROVED BY NKK FOR ONGCICG PROJECT
 - 1988 APPROVED AS A FITTING MANUFACTURER BY KEPCO
 - (CLASS:Q, WORK SCOPE : ASME II BUTT-WELDING PIPE FITTING)
 - 1989 APPROVED AS A FITTING MANUFACTURER BY KEPCO
 - (CLASS:Q, WORK SCOPE: ASME II PIPE FITTING & FLANGE: FORGED FITTING)
 - 1992 APPROVED AS A "NPT" STAMP, "MATERIAL MANUFACTURER" & "MATERIAL SUPPLIER" BY THE AMERICAN SOCIETY MECHANICAL ENGINEERS(ASME)
 - 1993 APPROVED BY ONGC & EIC FOR SHG, SHW, C-I, NPC, NQP, ANB I-PQSU PROJECT (APP.CODE: GS-8 ANNEXURE I OF EIL)
- 1995 RENEWED AS A "NPT" STAMP
 - "MATERIAL ORGANIZATION MANUFACTURING" & "MATERIAL ORGANIZATION SUPPLYING" BY THE AMERICAN SOCIETY MECHANICAL ENGIMEERS(ASME)
- 1998 AUTHORIZED AS A "NPT" STAMP & "METERIAL ORGANIZATION" BY THE AMERICAN SOCIETY MECHANICAL ENGINEERS.
 - CERTIFIED BY HSB REGISTRATION SERVICES. THE QUALITY MANAGEMENT SYSTEM HAS BEEN ASSESSED AND FOUND TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF ISO 9001:1994
 - AUTHORIZED AS A "KEPIC-MN" BY THE KOREA ELECTRIC POWER INDUSTRY CODE.
 - SUPPLIED HIGH PRESSURE FITTING (STUDDED BLOCK ETC.) FOR CONOCO DRILL SHIP PROJECT OF R&B FALCON.
 - APPROVED BY QATAR GENERAL PETROLEUM CORPORATION (QGPC)
 - APPROVED BY KUWAIT NATIONAL PETROLEUM CORPORATION.
- 1999 SUPLIED HIGH PRESSURE FITTINGS (LONG SWEEP ELBOW & TEE, STUDDED BLOCK, ETC) FOR SAIPEM S10000 DRILL SHIP PROJECT APPROVED BY KUWAIT IOL COMPANY
- 2000 APPROVED AS A FITTING MANUFACTURER BY SHELL EASTERN PETROLEUM(PTE) LTD.
- 2001 APPROVED AS A FITTING MANUFACTURER BY ARAMCO OVERSEAS COMPANY B.V
- 2001 COMPANY NAME WAS CHANGE INTO TK CORPORATION
- 2001 AUTHORIZED AS A "PP" & "S" STAMP BY THE AMERICAN SOCIETY MECHANICAL ENGINEERS AUTHORIZED AS A PED BY HSB-RS(IDENT-NO 0871)
- 2002 AUTHORIZED AS A "JIS" MARK BY KOREAN STANDARDS ASSOCIATION
- AUTHORIZED AS A PED BY HSB-RS(IDENT-NO 1871) 2003 APPROVED BY DET NORSKE VERITAS(DNV):CERTIFICATE NO. AMM-1756
- 2003 NOMINATED AS ENVIRONMENT CONTROL CO-OPERATIVE COMPANY BY BUSAN CITY
- 2004 TK SCT R&D CENTER WAS APPROVED BY KOREA INDUSTRIAL TECHNOLOGY PROMOTION ASSOCIATION
- 2004 APPROVED BY EXXON MOBIL ASIA PACIFIC PTE LTD
- 2005. 4. 6 APPROVED AS FITTING MANUFACTURER BY GS CALTEX
- 2005. 5. 24 REGISTER A PATENT FOR FITTING MANUFACTURING (PATENT NO. 0492747
- 2005. 8, 25 JOIN INTERNATIONAL CONSTRUCTION ASSOCIATION OF KOREA AS A ASSOCIATE MEMBER
- 2005. 8. 25 REGISTER TRADE MARK(T-LOK AND TK-LOK, RCG, NO.:0629214-5)
- 2006. EXPANDED NEAR DOUBLE THE PRODUCTION CAPACITY SINCE 2005, MESTING USD 30MIL. (FROM 3,000 TON TO 5,000 TON PER A MANTH)
- 2007. APPROVED BY EXXONMOBIL IN MOVING TO ALL AREAS FROM ASIA PACIFICE AREA ADDENDUM
- 2008. 12. 12 AWARDED AS KOREAN WORLD-CLASS PRODUCT OF FITTINGS FOR PLANT IN 2008.
- 2009. 4. AUTHORIZED AS A "API MONOGRAM" BY THE AMERICAN PETROLEUM INSTITUTE
- 2009. 6.24 ASSESSED AND REGISTERED BY NQA(BJ OHSAS 18001:2007)
- 2009. 7. 22 APPROVED AS CORPORATION IN THE RESULT OF WIN-WIN APPROACH TO LABOR AND MANAGEMENT, PRACTICAL ACTION ON CONCESSION AND NEGOTIATION (LABOR OF MINISTRY)
- 20 10. BUILT 2ND FACTORY AT HWAJEON REGIONAL INDUSTRIAL PARK



TK

Main Products

Main Products

BUTT-WELDING FITTINGS : (CARBON STEEL, ALLOY STEEL AND STAINLESS STEEL) ITEM : ELBOW, TEE, REDUCER, CAP, STUB-END(LAP-JOINT)

FORGED FITTINGS : (CATBON STEEL, ALLOY STEEL AND STAINLESS STEEL) ITEM : ELBOW, TEE, REDUCER, COUPLING, CROSS, CAP, O-LET(WOL, SOL, TOL, EOL) UNION, SWAGED NIPPLE, PLUG, NIPOLETS

FLANGES : (CARBON STEEL, ALLOY STEEL AND STAINLESS STEEL) ITEM : WELDING NECK, SLIP-ON, SOCKET WELDING, BLIND.



President's Message

TK CORPORATION has been established in 1965, as korea's first fitting maker. Since then, **TK CORPORATION** has become a leading specialist in the manufacture of fittings.

TK CORPORATION fittings are complying with ANSI, JIS, BS, MSS and the other special specification and each fittings are manufactured under the best quality control system, and has been proven in the pipelines, shipbuilding, chemical industries, power plants, offshore projects and the general applications.

We firmly believe that we can meet all the requirements of our customer including prompt delivery request with reasonable prices.

Sung Duk Yoon President





TK

Applicable Standard

Applicable Standard

ASME STAN DARDS	ASME B16.9	Factory-Made Wrought steel Butt-Welding Fittings
	ASME B16.5	Steel Pipe Flanges and Flanged Fittings
	ASME B16,11	Forged Steel Fittings Socket-Welding and Threaded
MSS STANDARDS	MSS SP-43	Wrought stainless Steel Butt-Welding Fittings
	MSS SP-75	Specification for High Test Wrought Butt-Welding Fittings
	MSS SP-79	Socket-Welding Reducer Inserts
JIS STANDARDS	JIS B2311	Steel Butt-Welding Pipe Fittings for Ordinary Use
	JIS B2312	Steel Butt-Welding Pipe Fittings
	JIS B2313	Steel Plate Butt-Welding Pipe Fittings
	JIS E2316	Steel Socket Welding Pipe Fittings
BS STANDARDS	BS 1640	Steel Butt-Welding Pipe Fittings For the Petroleum Industry Part 1 Wrought Carbon and ferritie Alloy Steel Fittings
	BS 1965	Butt-Welding Pipe Fittings for Pressure Purposes. Part 1.Carbon

STM STANDARDS	ASTM A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
	ASTM A403	Wrought Austenitic Stainless Steel Piping Fittings
	ASTM A420	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low Temperature Service
	ASTM A53	Pipe, steel, Black and Hot-Dipped, Zinccoated Welded and Seamless
	ASTM A106	Seamless Carbon Steel Pipe for High Temperature Service
	ASTM A105	Forgins, Carbon Steel, For Piping Components
	ASTM A181	Forgins, Carbon Steel, For General-Purpose Piping
	ASTM A182	Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts For High-Temperature Service
	ASTM A350	Forged, Carbon and Low-Alloy Steel, Requiring Notch Toughness Testing For Piping Components
	ASTM A815	Wrought Ferritic, Ferritic/Austenitic, and Martensitic Srainless Steel Piping Fittings
	ASTM A860	Wrought High-Strength Low-Alloy steel Butt-Welding Fittings
	ASTM B366	Wrought Nickel and Nickel Alloy Fittings
	ASTM B564	Nickel Alloy Forgings
PI STANDARDS	API 5L	Seamless and Welded Steel Line-Pipe
	API 5LX	Seamless and Welded High-Test Line-Pipes



• Total Area : 56.817m² • Building Area : 29.850 m²

Manufacturing Process



















TK CORPORATION controls the entire manufacturing process, from raw materials to finishing and final inspection.

Inspection point are located in the manufacturing process to ensure that the products meet all requirements.

In such a quality control system, faults are detected at the earliest possible stage of the production process in order to eliminate the risk of rejection at final inspection.

We have made continuous efforts to reduce problems throughout total quality assurance system including traceability control so that today the quality of our products is clearly recognized by our user.

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Quality Control Activity

Quality Control Activitly



TK Corporation





ASME

Wrought Steel Butt-Weld Fittings	P16~P43
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- Stainless Steel Butt-Weld Fittings __ P44~P52
- Wrought Steel Butt-Weld Fittings ___ P53~P58

Contents

€D TK corporation

90° Elbows(l	Long)
45° Elbows(l	Long)

STD (Sch 40)





ASME B16.9 (in inches)					
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A	Center to End B
1 /	0.840	0.622	0.100	11/	5 /
72 3/	1.050	0.022	0.109	1 1/	/8
1	1.050	1.040	0.122	1 1 / 2	74
11/	1.515	1.049	0.133	172	78
1 ¹ / ₄	1,000	1.560	0.140	1 /8 2 1/	1 1/
2	2 375	2.067	0.154	3	1 ³ ⁄
2 21/	2.375	2.007	0.203	33/	1 ³ /
272	3 500	3.068	0.205	1	2
31/	4.000	3.548	0.226	5 ¹ /	2 2 ¹ /
л Л	4.500	4.026	0.220	6	2 /4 2 1/
5	5 563	5.047	0.258	71/	2 /2 3 1/
6	6.625	6.065	0.280	9	3 /8 3 3 /
8	8.625	7 981	0.322	12	5
10	10.750	10.020	0.365	15	5 61⁄
12	12 750	12 000	0.375	18	7 ¹ ∕
*12	12.750	11 938	0.406	18	7 1/2
14	14 000	13 250	0.375	21	8 ³ /
*14	14.000	13 124	0.438	21	83/
16	16.000	15 250	0.375	24	10
*16	16,000	15 000	0.500	24	10
18	18 000	17 250	0.375	27	11 ¹ ⁄⁄
*18	18 000	16.876	0.562	27	11 ¹ ⁄⁄
20	20.000	19.250	0.375	30	12½
*20	20.000	18.812	0.594	30	12 ¹ ⁄2
22	22.000	21.250	0.375	33	131⁄2
24	24.000	23.250	0.375	36	15
*24	24 000	22 624	0.688	36	15
26	26.000	25.250	0.375	39	16
20	28.000	27.250	0.375	42	171/
20	20.000	21.200	0.375	42	101
30	30.000	29.250	0.375	45	181/2

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 40

• Wall Thickness Conform to ASME B 36.10M Specifications for STD and Sch 40 Wall Pipe



90° Elbows(Long) 45° Elbows(Long)





STD (Sch 40)

ASME B16.9 (in inches)					(in inches)
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A	Center to End B
32	32.000	31.250	0.375	48	19 ³ ⁄4
*32	32.000	30.624	0.688	48	193⁄4
34	34.000	33.250	0.375	51	21
*34	34.000	32.624	0.688	51	21
36	36.000	35.250	0.375	54	22 ¹ ⁄ ₄
*36	36.000	34.500	0.750	54	22 ¹ / ₄
38	38.000	37.250	0.375	57	23 ⁵ / ₈
40	40.000	39.250	0.375	60	24 7/8
42	42.000	41.250	0.375	63	26
44	44.000	43.250	0.375	66	27 ³ ⁄ ₈
46	46.000	45.250	0.375	69	28 5/8
48	48.000	47.250	0.375	72	29 7/8
50	50.000	49.250	0.375	75	311/8
52	52.000	51.250	0.375	78	32 ¹ ⁄ ₄
54	54.000	53.250	0.375	81	331/2
56	56.000	55.250	0.375	84	34 3/4
58	58.000	57.250	0.375	87	36
60	60.000	59.250	0.375	90	37 1/4
62	62.000	61.250	0.375	93	381/2
64	64.000	63.250	0.375	96	39 3/4
66	66.000	65.250	0.375	99	41
68	68.000	67.250	0.375	102	421/4
70	70.000	69.250	0.375	105	43 ¹ ⁄ ₂
72	72.000	71.250	0.375	108	44 3/4
74	74.000	73.250	0.375	111	46
76	76.000	75.250	0.375	114	47 1/4
78	78.000	77.250	0.375	117	481/2
80	80.000	79.250	0.375	120	49 3/4
82	82.000	81.250	0.375	123	51
84	84.000	83.250	0.375	126	52 ¹ / ₄

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 40

Wall Thickness Conform to ASME B 36.10M Specifications for STD and Sch 40 Wall Pipe

90° Elbows(Long)
45° Elbows(Long)

XS (Sch 80)





ASME B16.9 (in inche					(in inches)
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A	Center to End B
$\frac{1}{2}$	0.840	0.546	0.147	1 ½	5/8
3⁄4	1.050	0.742	0.154	1 ½	3/4
1	1.315	0.957	0.179	1 ½	7/8
$1\frac{1}{4}$	1.660	1.278	0.191	1 7/8	1
$1\frac{1}{2}$	1.900	1.500	0.200	2 1/4	1 1/8
2	2.375	1.939	0.218	3	1 3/8
2 ½	2.875	2.323	0.276	3 ³ ⁄ ₄	1 3⁄4
3	3.500	2.900	0.300	4 ½	2
31/2	4.000	3.364	0.318	5 1/4	2 ¹ ⁄ ₄
4	4.500	3.826	0.337	6	2 ½
5	5.563	4.813	0.375	7 ½	3 1/8
6	6.625	5.761	0.432	9	3 ¾
8	8.625	7.625	0.500	12	5
10	10.750	9.750	0.500	15	6 1⁄4
*10	10.750	9.562	0.594	15	6 1/4
12	12.750	11.750	0.500	18	7 1/2
*12	12.750	11.374	0.688	18	7 1/2
14	14.000	13.000	0.500	21	8 3⁄4
*14	14.000	12.500	0.750	21	8 ³ ⁄ ₄
16	16.000	15.000	0.500	24	10
*16	16.000	14.312	0.844	24	10
18	18.000	17.000	0.500	27	11 ¹ ⁄ ₄
*18	18.000	16.124	0.938	27	11 1/4
20	20.000	19.000	0.500	30	12 ¹ ⁄ ₂
*20	20.000	17.938	1.031	30	12 ¹ ⁄ ₂
22	22.000	21.000	0.500	33	13 ½
*22	22.000	19.750	1.125	33	13 ½
24	24.000	23.000	0.500	36	15
*24	24.000	21.562	1.219	36	15
26	26.000	25.000	0.500	39	16

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 80

• Wall Thickness Conform to ASME B 36.10M Specifications for STD and Sch 40 Wall Pipe



90° Elbows((Long)
45° Elbows((Long)





XS (Sch 80)

ASME B16.9	9				(in inches)
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A	Center to End B
28	28.000	27.000	0.500	42	17 ½
30	30.000	29.000	0.500	45	18 ½
32	32.000	31.000	0.500	48	19 ³ ⁄ ₄
34	34.000	33.000	0.500	51	21
36	36.000	35.000	0.500	54	22 ¹ ⁄ ₄
38	38.000	37.000	0.500	57	23 1/8
40	40.000	39.000	0.500	60	24 1/8
42	42.000	41.000	0.500	63	26
44	44.000	43.000	0.500	66	27 ¾
46	46.000	45.000	0.500	69	28 5/8
48	48.000	47.000	0.500	72	29 1/8
50	50.000	49.000	0.500	75	311/8
52	52.000	51.000	0.500	78	321⁄4
54	54.000	53.000	0.500	81	331/2
56	56.000	55.000	0.500	84	34¾
58	58.000	57.000	0.500	87	36
60	60.000	59.000	0.500	90	37 1⁄4
62	62.000	61.000	0.500	93	381/2
64	64.000	63.000	0.500	96	39 ³ / ₄
66	66.000	65.000	0.500	99	41
68	68.000	67.000	0.500	102	421⁄4
70	70.000	69.000	0.500	105	431/2
72	72.000	71.000	0.500	108	44 ³ ⁄ ₄
74	74.000	73.000	0.500	111	46
76	76.000	75.000	0.500	114	47 1/4
78	78.000	77.000	0.500	117	481/2
80	80.000	79.000	0.500	120	49¾
82	82.000	81.000	0.500	123	51
84	84.000	83.000	0.500	126	52 ¹ / ₄

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 80

Wall Thickness Conform to ASME B 36.10M Specifications for STD and Sch 40 Wall Pipe

90° Elbows(Short)

STD (Sch 40)



ASME B16.9	B16.9 (in inches)					
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A		
1	1.315	1.049	0.133	1		
1¼	1.660	1.380	0.140	$1\frac{1}{4}$		
1½	1.900	1.610	0.145	$1\frac{1}{2}$		
2	2.375	2.067	0.154	2		
2½	2.875	2.469	0.203	21/2		
3	3.500	3.068	0.216	3		
3½	4.000	3.548	0.226	3½		
4	4.500	4.026	0.237	4		
5	5.563	5.047	0.258	5		
6	6.625	6.065	0.280	6		
8	8.625	7.981	0.322	8		
10	10.750	10.020	0.365	10		
12	12.750	12.000	0.375	12		
*12	12.750	11.938	0.406	12		
14	14.000	13.250	0.375	14		
*14	14.000	13.124	0.438	14		
16	16.000	15.250	0.375	16		
*16	16.000	15.000	0.500	16		
18	18.000	17.250	0.375	18		
*18	18.000	16.876	0.562	18		
20	20.000	19.250	0.375	20		
*20	20.000	18.812	0.594	20		
22	22.000	21.250	0.375	22		
24	24.000	23.250	0.375	24		
*24	24.000	22.624	0.688	24		
26	26.000	25.250	0.375	26		
28	28.000	27.250	0.375	28		
30	30.000	29.250	0.375	30		

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 40

• Wall Thickness Conform to ASME B 36.10M Specifications for STD and Sch 40 Wall Pipe



90° Elbows(Short)

STD (Sch 40)



ASME B16.9				(in inches)
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A
32	32.000	31.250	0.375	32
*32	32.000	30.624	0.688	32
34	34.000	33.250	0.375	34
*34	34.000	32.624	0.688	34
36	36.000	35.250	0.375	36
*36	36.000	34.500	0.750	36
38	38.000	37.250	0.375	38
40	40.000	39.250	0.375	40
42	42.000	41.250	0.375	42
44	44.000	43.250	0.375	44
46	46.000	45.250	0.375	46
48	48.000	47.250	0.375	48
50	50.000	49.250	0.375	50
52	52.000	51.250	0.375	52
54	54.000	53.250	0.375	54
56	56.000	55.250	0.375	56
58	58.000	57.250	0.375	58
60	60.000	59.250	0.375	60
62	62.000	61.250	0.375	62
64	64.000	63.250	0.375	64
66	66.000	65.250	0.375	66
68	68.000	67.250	0.375	68
70	70.000	69.250	0.375	70
72	72.000	71.250	0.375	72
74	74.000	73.250	0.375	74
76	76.000	75.250	0.375	76
78	78.000	77.250	0.375	78
80	80.000	79.250	0.375	80

For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 40

Wall Thickness Conform to ASME B 36.10M Specifications for STD and Sch 40 Wall Pipe

90° Elbows(Short)

XS (Sch 80)



ASME B16.9				(in inches)
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A
1	1.315	0.957	0.179	1
1 ¹ ⁄ ₄	1.660	1.278	0.191	11/4
1½	1.900	1.500	0.200	1½
2	2.375	1.939	0.218	2
2 ¹ ⁄ ₂	2.875	2.323	0.276	2 ¹ / ₂
3	3.500	2.900	0.300	3
31/2	4.000	3.364	0.318	3½
4	4.500	3.826	0.337	4
5	5.563	4.813	0.375	5
6	6.625	5.761	0.432	6
8	8.625	7.625	0.500	8
10	10.750	9.750	0.500	10
*10	10.750	9.562	0.594	10
12	12.750	11.750	0.500	12
*12	12.750	11.374	0.688	12
14	14.000	13.000	0.500	14
*14	14.000	12.500	0.750	14
16	16.000	15.000	0.500	16
*16	16.000	14.312	0.844	16
18	18.000	17.000	0.500	18
*18	18.000	16.124	0.938	18
20	20.000	19.000	0.500	20
*20	20.000	17.938	1.031	20
22	22.000	21.000	0.500	22
*22	22.000	19.750	1.125	22
24	24.000	23.000	0.500	24
*24	24.000	21.562	1.219	24
26	26.000	25.000	0.500	26

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Wall Thickness Conform to ASME B 36.10M Specifications for XS and Sch 80 Wall Pipe

Asterisks(*) Denote Sch 80



90° Elbows(Short)

XS (Sch 80)



ASME B16.9				(in inches)
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Center to End A
28	28.000	27.000	0.500	28
30	30.000	29.000	0.500	30
32	32.000	31.000	0.500	32
34	34.000	33.000	0.500	34
36	36.000	35.000	0.500	36
38	38.000	37.000	0.500	38
40	40.000	39.000	0.500	40
42	42.000	41.000	0.500	42
44	44.000	43.000	0.500	44
46	46.000	45.000	0.500	46
48	48.000	47.000	0.500	48
50	50.000	49.000	0.500	50
52	52.000	51.000	0.500	52
54	54.000	53.000	0.500	54
56	56.000	55.000	0.500	56
58	58.000	57.000	0.500	58
60	60.000	59.000	0.500	60
62	62.000	61.000	0.500	62
64	64.000	63.000	0.500	64
66	66.000	65.000	0.500	66
68	68.000	67.000	0.500	68
70	70.000	69.000	0.500	70
72	72.000	71.000	0.500	72
74	74.000	73.000	0.500	74
76	76.000	75.000	0.500	76
78	78.000	77.000	0.500	78
80	80,000	79 000	0.500	80

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Wall Thickness Conform to ASME B 36.10M Specifications for XS and Sch 80 Wall Pipe

Asterisks(*) Denote Sch 80

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

Sch20,60,100,120,140,160,XXS





ASME B16.9 (in inches)											
Nominal	Outside			Wall	Thickne	ss T			Ce	enter to En	d B
Pipe Size	Diameter OD	Sch 20	Sch 60	Sch 100	Sch 120	Sch 140	Sch 160	XXS	Long	Short	Long
$\frac{1}{2}$	0.840	_	_	_	_	_	0.188	0.294	$1\frac{1}{2}$		5/8
$\frac{3}{4}$	1.050	_	_	_	_	_	0.219	0.308	$1\frac{1}{2}$		7/16
1	1.315	-	-	-	_	-	0.250	0.358	$1\frac{1}{2}$	1	7/8
$1\frac{1}{4}$	1.660	-	-	-	_	-	0.250	0.382	11/8	$1\frac{1}{4}$	1
$1\frac{1}{2}$	1.900	-	-	-	-	-	0.281	0.400	21/4	$1\frac{1}{2}$	11/8
2	2.375	-	-	-	-	-	0.344	0.436	3	2	1 3/8
$2\frac{1}{2}$	2.875	-	-	-	-	-	0.375	0.552	3 ³ ⁄ ₄	$2\frac{1}{2}$	1 3/4
3	3.500	-	-	-	-	-	0.438	0.600	$4\frac{1}{2}$	3	2
4	4.500	-	-	-	0.438	-	0.531	0.674	6	4	$2\frac{1}{2}$
5	5.563	-	-	-	0.500	-	0.625	0.750	$7\frac{1}{2}$	5	31/8
6	6.625	-	_	_	0.562	-	0.719	0.864	9	6	3 ³ ⁄ ₄
8	8.625	0.250	0.406	0.594	0.719	0.812	0.906	0.875	12	8	5
10	10.750	0.250	0.500	0.719	0.844	1.000	1.125	1.000	15	10	61/4
12	12.750	0.250	0.562	0.844	1.000	1.125	1.312	1.000	18	12	$7\frac{1}{2}$
14	14.000	0.312	0.594	0.938	1.094	1.250	1.406	-	21	14	8 3/4
16	16.000	0.312	0.656	1.031	1.219	1.438	1.594	-	24	16	10
18	18.000	0.312	0.750	1.156	1.375	1.562	1.781	_	27	18	$11\frac{1}{4}$
20	20.000	0.375	0.812	1.281	1.500	1.750	1.969	_	30	20	$12\frac{1}{2}$
22	22.000	0.375	0.875	1.375	1.625	1.875	2.125	-	33	22	$13\frac{1}{2}$
24	24.000	0.375	0.969	1.531	1.812	2.062	2.344	_	36	24	15

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

For Approx Weight See Page 122

• Wall Thickness Conform to ASME B 36.10M Specifications



Tees (Straight)

STD (Sch 40), XS(Sch 80)



ASME B16.9						((in inches)		
Nominal	Outside	STD(S	ich 40)	XS(So	ch 80)	Center	to End		
Pipe Size	Diameter OD	ID	т	ID	т	Run C	Outlet M		
1/2	0.840	0.622	0.109	0.546	0.147	1	1		
3/4	1.050	0.824	0.113	0.742	0.154	- 1½	- 1½		
1	1.315	1.049	0.133	0.957	0.179	11/2	11/2		
1¼	1.660	1.380	0.140	1.278	0.191	1%	1%		
1%	1.900	1.610	0.145	1.500	0.200	21/4	21/4		
2	2.375	2.067	0.154	1.939	0.218	21/2	21/2		
2½	2.875	2.469	0.203	2.323	0.276	3	3		
3	3.500	3.068	0.216	2.900	0.300	3%	3%		
3½	4.000	3.548	0.226	3.364	0.318	3¾	3¾		
4	4.500	4.026	0.237	3.826	0.337	4 ¹ / ₈	41/8		
5	5.563	5.047	0.258	4.813	0.375	4 1/8	4 1/8		
6	6.625	6.065	0.280	5.761	0.432	5%	5%		
8	8.625	7.981	0.322	7.625	0.500	7	7		
10	10.750	10.020	0.365	9.750	0.500	81/2	81/2		
*10	10.750	_	_	9.562	0.594	8½	81/2		
12	12.750	12.000	0.375	11.750	0.500	10	10		
*12	12.750	11.938	0.406	11.374	0.688	10	10		
14	14.000	13.250	0.375	13.000	0.500	11	11		
*14	14.000	13.124	0.438	12.500	0.750	11	11		
16	16.000	15.250	0.375	15.000	0.500	12	12		
*16	16.000	15.000	0.500	14.312	0.844	12	12		
18	18.000	17.250	0.375	17.000	0.500	$13\frac{1}{2}$	$13\frac{1}{2}$		
*18	18.000	16.876	0.562	16.124	0.938	$13\frac{1}{2}$	$13\frac{1}{2}$		
20	20.000	19.250	0.375	19.000	0.500	15	15		
*20	20.000	18.812	0.594	17.938	1.031	15	15		
22	22.000	21.250	0.375	21.000	0.500	16½	16½		
*22	22.000	_	_	19.750	1.125	16½	16½		
24	24.000	23.250	0.375	23.000	0.500	17	17		
*24	24.000	22.624	0.688	21.562	1.219	17	17		
26	26.000	25.250	0.375	25.000	0.500	19½	19½		
28	28.000	27.250	0.375	27.000	0.500	20 ¹ / ₂	201/2		
30	30.000	29.250	0.375	29.000	0.500	22	22		
32	32.000	31.250	0.375	31.000	0.500	$23\frac{1}{2}$	23 ¹ / ₂		
*32	32.000	30.624	0.688	-	_	$23\frac{1}{2}$	$23\frac{1}{2}$		
34	34.000	33.250	0.375	33.000	0.500	25	25		
*34	34.000	32.624	0.688	-	_	25	25		
36	36.000	35.250	0.375	35.000	0.500	26 ¹ / ₂	26 ¹ / ₂		
*36	36.000	34.500	0.750	_	_	26 ¹ / ₂	26 ¹ / ₂		
38	38.000	37.250	0.375	37.000	0.500	28	28		
40	40.000	39.250	0.375	39.000	0.500	29 ¹ / ₂	29 ¹ / ₂		
42	42.000	41.250	0.375	41.000	0.500	30	28		
44	44.000	43.250	0.375	43.000	0.500	32	30		
46	46.000	45.250	0.375	45.000	0.500	33 ¹ / ₂	31 ¹ / ₂		
48	48.000	47.250	0.375	47.000	0.500	35	33		

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

For Approx Weight See Page 124

Asterisks(*) Denote Sch 40and Sch 80

Tees (Reducing)

STD (Sch 40), XS(Sch 80)

ASME B16.9							(in i	nches)
Nominal	Outside	Outside	STD(S	ch 40)	XS(So	ch 80)	Center	to End
Pipe Size	Diameter OD	Diameter OD 2	Large End T ₁	Small End T ₂	Large End T	Small End T ₂	Run C	Outlet M
$\frac{3}{4} \times \frac{3}{4} \times \frac{1}{2}$	1.050	0.840	0.113	0.109	0.154	0.147	11/8	11/8
1 \times 1 \times $^{3}\!$	1.315	1.050	0.133	0.113	0.179	0.154	$1\frac{1}{2}$	$1\frac{1}{2}$
1 \times 1 \times $\frac{1}{2}$	1.315	0.840	0.133	0.109	0.179	0.147	$1\frac{1}{2}$	$1\frac{1}{2}$
$egin{array}{rcl} 1^{1}_{4} imes & 1^{1}_{4} imes 1 \ 1^{1}_{4} imes & 1^{1}_{4} imes & 3^{1}_{4} \end{array}$	1.660 1.660	1.315 1.050	0.140 0.140	0.133 0.113	0.191 0.191	0.179 0.154	$1\frac{7}{8}$ $1\frac{7}{8}$	1½ 1%
$1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{4}$	1.900	1.660	0.145	0.140	0.200	0.191	2¼ 21⁄4	2¼ 21⁄4
$1_{1_2}^{1_2} \times 1_{1_2}^{1_2} \times 1_{1_2}^{1_2} \times 1_{1_2}^{1_2} \times 1_{1_2}^{1_2} \times 1_{1_4}^{1_4}$	1.900	1.050	0.145	0.113	0.200	0.179 0.154	$\frac{2}{4}$ $2\frac{1}{4}$	21/4 21/4
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.375 2.375	1.900 1.660	0.154 0.154	0.145 0.140	0.218 0.218	0.200	2½ 21⁄2	2¾ 2¼
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.375	1.315	0.154	0.133	0.218	0.179	21/2 21/2	2
$2\frac{1}{2} \times 2\frac{1}{2} \times 2$	2.875	2.375	0.203	0.154	0.276	0.218	3	2¾
$2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$ $2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{4}$	2.875	1.900 1.660	0.203 0.203	0.145 0.140	0.276 0.276	0.200	3	2% 2½
$3 \times 3 \times 2^{1/2}$	3.500	2.875	0.216	0.203	0.300	0.276	3 ³ / ₈	3 ¹ ⁄ ₄
$3 \times 3 \times 2$	3.500	2.375	0.216	0.154	0.300	0.218	3¾	3
$3 \times 3 \times 1^{1/2}$	3.500	1.900	0.216	0.145	0.300	0.200	3% 33/	2% 35/
$3\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}$	4.000	2.875	0.226	0.210	0.318	0.300	3¾	31/2
$3\frac{1}{2} \times 3\frac{1}{2} \times 2$	4.000	2.375	0.226	0.154	0.318	0.218	3 ¾	3 ¹ ⁄ ₄
$3\frac{1}{2} \times 3\frac{1}{2} \times 1\frac{1}{2}$	4.000	1.900	0.226	0.145	0.318	0.200	3 ³ ⁄ ₄	31/8
$4 \times 4 \times 3^{1/2}$	4.500	4.000	0.237	0.226	0.337	0.318	$4\frac{1}{8}$	4
$4 \times 4 \times 3$	4.500	3.500	0.237	0.216	0.337	0.300	4½	31/8
$4 \times 4 \times 2\frac{1}{2}$	4.500	2.875	0.237	0.203	0.337	0.276	4½ 11/	3% 21/
$5 \times 5 \times 4$	5.563	4.500	0.258	0.134	0.375	0.337	478	372 4 ⁵ /8
$5 \times 5 imes 3^{1}$	5.563	4.000	0.258	0.226	0.375	0.318	41/8	4 ¹ / ₂
$5 \times 5 \times 3$	5.563	3.500	0.258	0.216	0.375	0.300	4%	4 3/8
$5 \times 5 \times 2\frac{1}{2}$	5.563	2.875	0.258	0.203	0.375	0.276	4%	41⁄4
$6 \times 6 \times 5$ $6 \times 6 \times 4$	6.625 6.625	5.563	0.280	0.258	0.432	0.375	5% 5%	5 ³ /8 5 ¹ /
$6 \times 6 \times 3^{1/3}$	6.625	4.000	0.280	0.237	0.432	0.318	5½	5
$6 \times 6 \times 3$	6.625	3.500	0.280	0.216	0.432	0.300	5%	41%
8 × 8 ×6	8.625	6.625	0.322	0.280	0.500	0.432	7	6 %
$8 \times 8 \times 5$	8.625	5.563	0.322	0.258	0.500	0.375	7	6¾
8 X 8 X 4	8.625	4.500	0.322	0.237	0.500	0.337	1	6½ 0
$10 \times 10 \times 8$ $10 \times 10 \times 6$	10.750 10.750	8.625	0.365	0.322	0.500	0.500	8½ 8¼	8 75⁄2
10 ×10 ×5	10.750	5.563	0.365	0.258	0.500	0.375	81/2	7½
*10 ×10 ×8	10.750	8.625	-	-	0.594	0.500	81/2	8
*10 ×10 ×6	10.750	6.625	-	_	0.594	0.432	8½	7 1/8
*10 ×10 ×5	10.750	5.563	_	-	0.594	0.375	81/2	71/2

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 124

Asterisks(*) Denote Sch 40 and Sch 80





Tees (Reducing)

STD (Sch 40), XS(Sch 80)

ASME	B16.9							(in i	nches)
I	Nominal	Outside	Outside	STD(S	ich 40)	XS(So	ch 80)	Center to End	
	Pipe Size	Diameter OD	Diameter OD 2	Large End T ₁	Small End T ₂	Large End Ti	Small End T ₂	Run C	Outlet M
12 12 *12 *12 *12 *12	$\begin{array}{ccc} \times 12 & \times 10 \\ \times 12 & \times 8 \\ \times 12 & \times 6 \\ \times 12 & \times 10 \\ \times 12 & \times 8 \\ \times 12 & \times 6 \end{array}$	12.750 12.750 12.750 12.750 12.750 12.750	10.750 8.625 6.625 10.750 8.625 6.625	0.375 0.375 0.375 0.406 0.406 0.406	0.365 0.322 0.280 0.365 0.322 0.280	0.500 0.500 0.688 0.688 0.688	0.500 0.500 0.432 0.594 0.500 0.432	10 10 10 10 10 10	9½ 9 85% 9½ 9 85%
14 14 *14 *14 *14	$\begin{array}{ccc} \times 14 & \times 12 \\ \times 14 & \times 10 \\ \times 14 & \times 8 \\ \times 14 & \times 12 \\ \times 14 & \times 10 \\ \times 14 & \times 8 \end{array}$	14,000 14,000 14,000 14,000 14,000 14,000	12.750 10.750 8.625 12.750 10.750 8.625	0.375 0.375 0.375 0.438 0.438 0.438	0.375 0.365 0.322 0.406 0.365 0.322	0.500 0.500 0.500 0.750 0.750 0.750	0.500 0.500 0.688 0.594 0.500	11 11 11 11 11 11	$10^{\frac{5}{8}} \\ 10^{\frac{1}{8}} \\ 9^{\frac{3}{4}} \\ 10^{\frac{5}{8}} \\ 10^{\frac{1}{8}} \\ 9^{\frac{3}{4}} \\ 9^{\frac{3}{4}} \\ \end{array}$
16 16 *16 *16 *16	$\begin{array}{ccc} \times 16 & \times 14 \\ \times 16 & \times 12 \\ \times 16 & \times 10 \\ \times 16 & \times 14 \\ \times 16 & \times 12 \\ \times 16 & \times 10 \end{array}$	16.000 16.000 16.000 16.000 16.000 16.000	14.000 12.750 10.750 14.000 12.750 10.750	0.375 0.375 0.375 0.500 0.500 0.500	0.375 0.375 0.365 0.438 0.406 0.365	0.500 0.500 0.500 0.844 0.844 0.844	0.500 0.500 0.500 0.750 0.688 0.594	12 12 12 12 12 12 12	$12 \\ 11\frac{5}{8} \\ 11\frac{1}{8} \\ 12 \\ 11\frac{5}{8} \\ 11\frac{5}{8} \\ 11\frac{1}{8} \\ $
18 18 *18 *18 *18	×18 ×16 ×18 ×14 ×18 ×12 ×18 ×16 ×18 ×14 ×18 ×12	18.000 18.000 18.000 18.000 18.000 18.000	16.000 14.000 12.750 16.000 14.000 12.750	0.375 0.375 0.375 0.562 0.562 0.562	0.375 0.375 0.375 0.500 0.438 0.406	0.500 0.500 0.500 0.938 0.938 0.938	0.500 0.500 0.500 0.844 0.750 0.688	13½ 13½ 13½ 13½ 13½ 13½	13 13 125% 13 13 125%
20 20 *20 *20 *20	$\begin{array}{ccc} & \times 20 & \times 18 \\ & \times 20 & \times 16 \\ & \times 20 & \times 14 \\ & \times 20 & \times 18 \\ & \times 20 & \times 16 \\ & \times 20 & \times 14 \end{array}$	20.000 20.000 20.000 20.000 20.000 20.000	18.000 16.000 14.000 18.000 16.000 14.000	0.375 0.375 0.375 0.594 0.594 0.594	0.375 0.375 0.562 0.500 0.438	0.500 0.500 1.031 1.031 1.031	0.500 0.500 0.500 0.938 0.844 0.750	15 15 15 15 15 15	$ \begin{array}{c} 14\frac{1}{2} \\ 14 \\ 14 \\ 14\frac{1}{2} \\ 14 \\ 14 \\ 14 \end{array} $
22 22 *22 *22 *22 *22	$\begin{array}{ccc} \times 22 & \times 20 \\ \times 22 & \times 18 \\ \times 22 & \times 16 \\ \times 22 & \times 20 \\ \times 22 & \times 18 \\ \times 22 & \times 16 \end{array}$	22.000 22.000 22.000 22.000 22.000 22.000	20.000 18.000 16.000 20.000 18.000 16.000	0.375 0.375 0.375 – – –	0.375 0.375 0.375 - - - -	0.500 0.500 1.125 1.125 1.125	0.500 0.500 1.031 0.938 0.844	16½ 16½ 16½ 16½ 16½ 16½	$ \begin{array}{r} 16 \\ 15^{1/2} \\ 15 \\ 16 \\ 15^{1/2} \\ 15 \\ \end{array} $
24 24 *24 *24 *24 *24	$\begin{array}{ccc} \times 24 & \times 22 \\ \times 24 & \times 20 \\ \times 24 & \times 18 \\ \times 24 & \times 22 \\ \times 24 & \times 20 \\ \times 24 & \times 18 \end{array}$	24.000 24.000 24.000 24.000 24.000 24.000	22.000 20.000 18.000 22.000 20.000 18.000	0.375 0.375 0.375 - 0.688 0.688	0.375 0.375 0.375 - 0.594 0.562	0.500 0.500 1.219 1.219 1.219	0.500 0.500 0.500 1.125 1.031 0.938	17 17 17 17 17 17	17 17 16½ 17 17

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 124

Asterisks(*) Denote Sch 40 and Sch 80

Tees (Reducing)

STD (Sch 40), XS(Sch 80)

ASME B16.9



(in inches)

Nominal	Outside	Outside	STD(S	ch 40)	XS(So	ch 80)	Center to End	
Pipe	Diameter	Diameter	Large End	Small End	Large End	Small End	Run	Outlet
Size	OD	OD 2	T	T ₂	T ₁	T ₂	C	M
$26 \times 26 \times 22$ $26 \times 26 \times 18$ $26 \times 26 \times 16$	26.000	22.000	0.375	0.375	0.500	0.500	$19\frac{1}{2}$	$18\frac{1}{2}$
	26.000	18.000	0.375	0.375	0.500	0.500	$19\frac{1}{2}$	$17\frac{1}{2}$
	26.000	16.000	0.375	0.375	0.500	0.500	$19\frac{1}{2}$	17
28×28×24 28×28×20 28×28×18	28.000 28.000 28.000	24.000 20.000 18.000	0.375 0.375 0.375	0.375 0.375 0.375	0.500 0.500 0.500	0.500 0.500 0.500	$\begin{array}{c} 20\frac{1}{2} \\ 20\frac{1}{2} \\ 20\frac{1}{2} \end{array}$	$20 \\ 19 \\ 18\frac{1}{2}$
$30 \times 30 \times 26$ $30 \times 30 \times 22$ $30 \times 30 \times 20$	30.000	26.000	0.375	0.375	0.500	0.500	22	21½
	30.000	22.000	0.375	0.375	0.500	0.500	22	20½
	30.000	20.000	0.375	0.375	0.500	0.500	22	20
32×32×28	32.000	28.000	0.375	0.375	0.500	0.500	$\begin{array}{c} 23\frac{1}{2}\\ 23\frac{1}{2}\\ 23\frac{1}{2}\\ 23\frac{1}{2}\\ 23\frac{1}{2} \end{array}$	$22\frac{1}{2}$
32×32×24	32.000	24.000	0.375	0.375	0.500	0.500		22
32×32×22	32.000	22.000	0.375	0.375	0.500	0.500		21 $\frac{1}{2}$
*32×32×22	32.000	24.000	0.688	0.688	-	–		22
$\begin{array}{c} 34 \times 34 \times 30 \\ 34 \times 34 \times 26 \\ 34 \times 34 \times 22 \end{array}$	34.000 34.000 34.000	30.000 26.000 22.000	0.375 0.375 0.375	0.375 0.375 0.375	0.500 0.500 0.500	0.500 0.500 0.500	25 25 25	$\begin{array}{c} 24 \\ 23_{2}^{1\!\!\!\!/_{2}} \\ 22_{2}^{1\!\!\!\!/_{2}} \end{array}$
$36 \times 36 \times 32$ $36 \times 36 \times 28$ $36 \times 36 \times 24$ $*36 \times 36 \times 32$ $*36 \times 36 \times 24$	36.000 36.000 36.000 36.000 36.000	32.000 28.000 24.000 32.000 24.000	0.375 0.375 0.375 0.750 0.750	0.375 0.375 0.375 0.688 0.688	0.500 0.500 0.500 –	0.500 0.500 0.500 -	$\begin{array}{c} 26\frac{1}{2}\\ 26\frac{1}{2}\\ 26\frac{1}{2}\\ 26\frac{1}{2}\\ 26\frac{1}{2}\\ 26\frac{1}{2}\end{array}$	$25\frac{1}{2}$ $24\frac{1}{2}$ 24 $25\frac{1}{2}$ 24
38×38×34	38.000	34.000	0.375	0.375	0.500	0.500	28	$27\frac{1}{2}$
38×38×30	38.000	30.000	0.375	0.375	0.500	0.500	28	$26\frac{1}{2}$
38×38×26	38.000	26.000	0.375	0.375	0.500	0.500	28	$25\frac{1}{2}$
$40 \times 40 \times 36$ $40 \times 40 \times 32$ $40 \times 40 \times 28$	40.000	36.000	0.375	0.375	0.500	0.500	29½	29
	40.000	32.000	0.375	0.375	0.500	0.500	29½	28
	40.000	28.000	0.375	0.375	0.500	0.500	29½	26½
$\begin{array}{c} 42 \times 42 \times 38 \\ 42 \times 42 \times 34 \\ 42 \times 42 \times 30 \end{array}$	42.000	38.000	0.375	0.375	0.500	0.500	30	28
	42.000	34.000	0.375	0.375	0.500	0.500	30	28
	42.000	30.000	0.375	0.375	0.500	0.500	30	28
$\begin{array}{c} 44 \times 44 \times 40 \\ 44 \times 44 \times 36 \\ 44 \times 44 \times 32 \end{array}$	44.000	40.000	0.375	0.375	0.500	0.500	32	$29\frac{1}{2}$
	44.000	36.000	0.375	0.375	0.500	0.500	32	$28\frac{1}{2}$
	44.000	32.000	0.375	0.375	0.500	0.500	32	28
$\begin{array}{c} 46 \times 46 \times 42 \\ 46 \times 46 \times 38 \\ 46 \times 46 \times 34 \end{array}$	46.000	42.000	0.375	0.375	0.500	0.500	$33\frac{1}{2}$	31
	46.000	38.000	0.375	0.375	0.500	0.500	$33\frac{1}{2}$	30
	46.000	34.000	0.375	0.375	0.500	0.500	$33\frac{1}{2}$	29½
$\begin{array}{c} 48 \times 48 \times 44 \\ 48 \times 48 \times 40 \\ 48 \times 48 \times 36 \end{array}$	48.000	44.000	0.375	0.375	0.500	0.500	35	33
	48.000	40.000	0.375	0.375	0.500	0.500	35	32
	48.000	36.000	0.375	0.375	0.500	0.500	35	31

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 124

• Asterisks(*) Denote Sch 40 and Sch 80



Tees (Straight)

Sch20,60,100,120,160, XXS

ASME B16.9



Nominal	Outside			Wall Thio	ckness T			Center	to End
Pipe Size	Diameter OD	Sch 20	Sch 60	Sch 100	Sch 120	Sch 160	XXS	Run C	Outlet M
1/2	0.840	-	-	-	-	0.188	0.294	1	1
3/4	1.050	-	-	—	—	0.219	0.308	11/8	1½
1	1.315	-	-	—	-	0.250	0.358	$1^{1/2}$	$1^{1/2}$
1 ¹ ⁄ ₄	1.660	-	-	—	-	0.250	0.382	11 %	11/8
1½	1.900	-	-	—	-	0.281	0.400	2 ¹ ⁄ ₄	$2^{1}/_{4}$
2	2.375	-	-	_	-	0.344	0.436	2 ¹ / ₂	$2^{1/2}$
2 ¹ / ₂	2.875	-	-	_	-	0.375	0.552	3	3
3	3.500	-	-	_	-	0.438	0.600	3 ³ / ₈	3 ³ / ₈
4	4.500	-	-	-	0.438	0.531	0.674	41/8	41/8
5	5.563	-	-	_	0.500	0.625	0.750	41/8	41/8
6	6.625	-	-	_	0.562	0.719	0.864	5 5/8	55/8
8	8.625	0.250	0.406	0.594	0.719	0.906	0.875	7	7
10	10.750	0.250	0.500	0.719	0.844	1.125	1.000	81/2	$8^{1/2}$
12	12.750	0.250	0.562	0.844	1.000	1.132	1.000	10	10
14	14.000	0.312	0.594	0.938	1.094	1.406		11	11
16	16.000	0.312	0.656	1.031	1.219	1.594		12	12
18	18.000	0.312	0.750	1.156	1.375	1.781		$13\frac{1}{2}$	$13^{1/2}$
20	20.000	0.375	0.812	1.281	1.500	1.969		15	15
22	22.000	0.375	0.875	1.375	1.625	2.125		$16^{1/2}$	$16\frac{1}{2}$
24	24.000	0.375	0.969	1.531	1.812	2.344		17	17

• For Bevel Details See Page 115

For Dimensional Tolerances See Page 114

• For Approx Weight See Page 124

Wall Thickness Conform to ASME B 36.10M Specifications

Tees (Reducing)

Sch 120, 160, XXS

ASME B16.9				(in inches)			
Newingl	Outside	Wa	all Thickness T	, T 2	Center	to End	
Pipe Size	Diameter OD1, OD2	Sch 120	Sch 160	XXS	Run C	Outlet M	
$\frac{3}{4}$ \times $\frac{3}{4}$ \times $\frac{1}{2}$	1.050 0.840	-	0.219 0.188	0.308 0.294	11/8	11/8	
1 \times 1 \times $\frac{3}{4}$	1.315 1.050	-	0.250 0.219	0.358 0.308	1^{1}_{2}	1½	
1 \times 1 \times $\frac{1}{2}$	1.315 0.840	-	0.250 0.188	0.358 0.294	$1\frac{1}{2}$	1½	
$1\frac{1}{4} \times 1\frac{1}{4} \times 1$	1.660 1.315	—	0.250 0.250	0.382 0.358	1%	1%	
$1^{1/4} \times 1^{1/4} \times {}^{3/4}$	1.660 1.050	-	0.250 0.219	0.382 0.308	1%	11%	
$1^{1}\!/_{2}\times1^{1}\!/_{2}\times1^{1}\!/_{4}$	1.900 1.660	-	0.281 0.250	0.400 0.382	2 ¹ ⁄ ₄	2 ¹ ⁄ ₄	
$1\frac{1}{2} \times 1\frac{1}{2} \times 1$	1.900 1.315	-	0.281 0.250	0.400 0.358	2 ¹ ⁄ ₄	2 ¹ ⁄ ₄	
$1^{1/2} \times 1^{1/2} \times {}^{3/4}$	1.900 1.050	-	0.281 0.219	0.400 0.308	21/4	21⁄4	
$2 \times 2 \times 1\frac{1}{2}$	2.375	-	0.344 0.281	0.436	21/2	23%	
$2 \times 2 \times 1\frac{1}{4}$	2.375	-	0.344 0.250	0.436	2 ¹ / ₂	21⁄4	
2 ×2 ×1	2.375	-	0.344 0.250	0.436	2 ¹ / ₂	2	
$2\frac{1}{2} \times 2\frac{1}{2} \times 2$	2.875	-	0.375	0.552	3	2¾	
$2^{1/_{2}} \times 2^{1/_{2}} \times 1^{1/_{2}}$	2.875	-	0.375	0.552	3	25⁄8	
$3 \times 3 \times 2\frac{1}{2}$	2.875	-	0.438	0.600	33%	31⁄4	
3 ×3 ×2	2.375	-	0.438	0.436	33%	3	
4 ×4 ×3	3.500	-	0.438	0.600	41/8	31%	
$4 \times 4 \times 2\frac{1}{2}$	2.875	-	0.375	0.552	41/8	3¾	
4 ×4 ×2	2.375	- 0.500	0.344	0.436	41/8	3½	
5 ×5 ×4	4.500	0.438	0.531	0.674	4%	45%	
5 ×5 ×3	3.500	-	0.438	0.600	4%	43%	
5 ×5 ×2½	2.875	0.562	0.375	0.552	41/8	41/4	
6 ×6 ×5	5.563 6.625	0.500	0.625	0.750	5%	5%	
6 ×6 ×4	4.500 6.625	0.438	0.531 0.719	0.674 0.864	5%	5½	
6 ×6 ×3	3.500 8.625	- 0.719	0.438 0.906	0.600 0.875	5% 7	4 1/8	
8 ×8 ×6	6.625 8.625	0.562 0.719	0.719 0.926	0.864 0.875	(6%	
8 ×8 ×5	5.563 8.625	0.500	0.625	0.750 0.875	(63%	
8 ×8 ×4	4 500	0.438	0.531	0.674	1	61/8	

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 124

• Wall Thickness Conform to ASME B 36.10M Specifications





Tees (Reducing)

Sch 20,60,100,120,140,160,XXS



ASME B16.9									(in ind	ches)
Nominal	Outside			Wall T	hickness	T 1, T 2			Center	to End
Pipe Size	Diameter OD ₁ , OD ₂	Sch 20	Sch 60	Sch 100	Sch 120	Sch 140	Sch 160	XXS	Run C	Outlet M
10×10×8	10.750 8.625	0.250 0.250	0.500 0.406	0.719 0.594	0.844 0.719	1.000 0.812	1.125 0.906	1.000 0.875	8½	8
10×10×6	10.750 6.625	—	—	—	0.844 0.562	—	1.125 0.719	1.000 0.864	8½	75/8
10×10×5	10.750 5.563	-	-	-	0.844 0.500	-	1.125 0.625	1.000 0.750	81/2	7½
12×12×10	12.750 10.750	0.250 0.250	0.562 0.500	0.844 0.719	1.000 0.844	1.125 1.000	1.312 1.125	$1.000 \\ 1.000$	10	9½
12×12×8	12.750 8.625	0.250 0.250	0.562 0.406	0.844 0.594	1.000 0.719	1.125 0.812	1.312 0.906	1.000 0.875	10	9
12×12×6	12.750 6.625	-	-	-	1.000 0.562	-	1.312 0.719	1.000 0.864	10	85/8
14×14×12	14.000 12.750	0.312 0.250	0.594 0.562	0.938 0.844	1.094 1.000	$1.250 \\ 1.125$	1.406 1.312	_	11	105/8
14×14×10	14.000 10.750	0.312 0.250	0.594 0.500	0.938 0.719	1.094 0.844	1.125 1.000	1.406 1.125	-	11	101/8
14×14×8	14.000 8.625	0.312 0.250	0.594 0.406	0.938 0.594	1.094 0.719	1.250 0.812	1.406 0.906	-	11	9 ³ ⁄ ₄
16×16×14	16.000 14.000	0.312 0.312	0.656 0.594	1.031 0.938	1.219 1.094	1.438 1.250	1.594 1.406	-	12	12
16×16×12	16.000 12.750	0.312 0.250	0.656	1.031 0.844	1.219 1.000	1.438 1.125	1.594 1.312	-	12	115/8
16×16×10	16.000 10.750	0.312 0.250	0.656 0.500	1.031 0.719	1.219 0.844	1.438 1.000	1.594 1.125	-	12	111/8
18×18×16	18.000 16.000	0.312 0.312	0.750 0.656	1.156 1.031	1.375 1.219	1.562 1.438	1.781 1.574	-	$13^{1/2}$	13
18×18×14	18.000 14.000	0.312 0.312	0.750 0.594	1.156 0.938	1.375 1.094	$1.562 \\ 1.250$	1.781 1.406	-	$13^{1/2}_{2}$	13
18×18×12	18.000 12.750	0.312 0.250	0.750 0.562	1.156 0.844	1.375 1.000	1.562 1.125	1.781 1.312	-	$13\frac{1}{2}$	125/8
20×20×18	20.000 18.000	0.375 0.312	0.812 0.750	1.281 1.156	1.500 1.375	1.750 1.562	1.969 1.781	-	15	14½
20×20×16	20.000 16.000	0.375 0.312	0.812 0.656	1.281 1.031	0.500	1.750 1.438	1.969 1.594	-	15	14
20×20×14	20.000	0.375	0.812	1.281 0.938	1.500 1.094	1.750 1.250	1.769 1.406	-	15	14
22×22×20	22.000	0.375	0.875	1.375 1.281	1.625 1.500	1.875 1.750	2.125 1.969	-	16½	16
22×22×18	22.000 18.000	0.375	0.875	1.375	1.625 1.375	1.875 1.562	2.125 1.781	-	16½	15½
22×22×16	22.000 16.000	0.375	0.875	1.375 1.031	1.625 1.219	1.875 1.438	2.125 1.594	-	$16\frac{1}{2}$	15
24×24×22	24.000 22.000	0.375 0.375	0.969 0.875	1.531 1.375	1.812 1.625	2.062 1.875	2.344 2.125	-	17	17
24×24×20	24.000 20.000	0.375 0.375	0.969 0.812	1.531 1.281	1.812 1.500	2.062 1.750	2.344 1.969	-	17	17
24×24×18	24.000 18.000	0.375 0.312	0.969 0.750	1.531 1.156	1.812 1.375	2.062 1.562	2.344 1.781	-	17	$16^{1/2}$

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 124

• Wall Thickness Conform to ASME B 36.10M Specifications

Tees



(in inches)

N	DC		TE	TEE			
N	22	OD1	OD2	С	М		
50	50	50.00	50.00	36.50	34.50		
50	48	50.00	48.00	36.50	33.00		
50	46	50.00	46.00	36.50	32.00		
50	44	50.00	44.00	36.50	31.00		
50	42	50.00	42.00	36.50	30.00		
50	40	50.00	40.00	36.50	29.00		
50	38	50.00	38.00	36.50	29.00		
52	52	52.00	52.00	38.00	36.00		
52	50	52.00	50.00	38.00	35.00		
52	48	52.00	48.00	38.00	34.00		
52	46	52.00	46.00	38.00	33.00		
52	44	52.00	44.00	38.00	32.00		
52	42	52.00	42.00	38.00	31.00		
52	40	52.00	40.00	38.00	30.00		
52	38	52.00	38.00	38.00	30.00		
54	54	54.00	54.00	39.50	37.50		
54	52	54.00	52.00	39.50	36.00		
54	50	54.00	50.00	39.50	35.00		
54	48	54.00	48.00	39.50	34.00		
54	46	54.00	46.00	39.50	33.00		
54	44	54.00	44.00	39.50	32.00		
54	40	54.00	40.00	39.50	31.00		
54	28	54.00	28.00	39.50	31.00		
54	20	54.00	20.00	39.50	31.00		
56	56	56.00	56.00	41.00	38.00		
56	54	56.00	54.00	41.00	37.00		
56	52	56.00	52.00	41.00	36.00		
56	50	56.00	50.00	41.00	35.00		
56	48	56.00	48.00	41.00	34.00		
56	46	56.00	46.00	41.00	33.00		
56	44	56.00	44.00	41.00	32.00		
56	40	56.00	40.00	41.00	32.00		
56	28	56.00	28.00	41.00	32.00		
50	20	56.00	20.00	41.00	32.00		
58	58	58.00	58.00 E6.00	42.50	39.00		
50	50	58.00	50.00 E4.00	42.50	38.00		
50	52	58.00	54.00	42.50	37.00		
50	52	58.00	52.00	42.50	30.00		
50	50	58.00	30.00	42.50	33.00		
50	40	58.00	46.00	42.50	34.00		
50	40	58.00	40.00	42.50	33.00		
60	44 60	60.00	60.00	42.50	/0.00		
60	58	60.00	58.00	44.00	39.00		
60	56	60.00	56.00	44.00	38.00		
60	54	60.00	54 00	44.00	37.00		
60	52	60.00	52.00	44.00	36.00		
60	50	60.00	50.00	44.00	35.00		



Tees



(in inches)

N	DC	TEE								
	гJ	OD1	OD2	С	М					
60	48	60.00	48.00	44.00	34.00					
60	46	60.00	46.00	44.00	34.00					
60	40	60.00	40.00	44.00	34.00					
60	28	60.00	28.00	44.00	34.00					
60	20	60.00	20.00	44.00	34.00					
62	62	62.00	62.00	45.00	40.50					
62	60	62.00	60.00	45.00	39.00					
62	58	62.00	58.00	45.00	38.00					
62	56	62.00	56.00	45.00	37.00					
62	54	62.00	54.00	45.00	36.00					
62	52	62.00	52.00	45.00	35.00					
62	50	62.00	50.00	45.00	35.00					
64	64	64.00	64.00	46.00	41.00					
64	62	64.00	62.00	46.00	40.00					
64	60 59	64.00	60.00 E8.00	46.00	39.00					
64	56	64.00	58.00	46.00	38.00					
64	50	64.00	50.00	46.00	37.00					
64	52	64.00	52.00	40.00	36.00					
66	66	66.00	66.00	40.00	42.00					
66	64	66.00	64.00	48.00	41.00					
66	62	66.00	62.00	48.00	40.00					
66	60	66.00	60.00	48.00	39.00					
66	58	66.00	58.00	48.00	38.00					
66	56	66.00	56.00	48.00	37.00					
66	54	66.00	54.00	48.00	37.00					
68	68	68.00	68.00	49.00	43.00					
68	66	68.00	66.00	49.00	42.00					
68	64	68.00	64.00	49.00	41.00					
68	62	68.00	62.00	49.00	40.00					
68	60	68.00	60.00	49.00	39.00					
68	58	68.00	58.00	49.00	38.00					
68	56	68.00	56.00	49.00	38.00					
70	70	70.00	70.00	50.00	44.00					
70	68	70.00	68.00	50.00	43.00					
70	66	70.00	66.00	50.00	42.00					
70	64	70.00	64.00	50.00	41.00					
70	60	70.00	62.00	50.00	40.00					
70	58	70.00	58.00	50.00	39.00					
70	72	70.00	72.00	52.00	39.00 45.00					
72	70	72.00	72.00	52.00	44.00					
72	68	72.00	68.00	52.00	43.00					
72	66	72.00	66.00	52.00	42.00					
72	64	72.00	64.00	52.00	41.00					
72	62	72.00	62.00	52.00	40.00					
72	60	72.00	60.00	52.00	40.00					
74	74	74.00	74.00	53.00	46.00					
74	72	74.00	72.00	53.00	45.00					
74	70	74.00	70.00	53.00	44.00					
74	68	74.00	68.00	53.00	43.00					

Tees



(in inches)

NI	ne		TEE						
	22	OD1	OD2	С	М				
74	66	74.00	66.00	53.00	42.00				
74	64	74.00	64.00	53.00	41.00				
74	62	74.00	62.00	53.00	41.00				
76	76	76.00	76.00	54.00	47.00				
76	74	76.00	74.00	54.00	46.00				
76	72	76.00	72.00	54.00	45.00				
76	70	76.00	70.00	54.00	44.00				
76	68	76.00	68.00	54.00	43.00				
/6	66	76.00	66.00	54.00	42.00				
76	64	76.00	64.00	54.00	42.00				
78	18	78.00	78.00	55.00	48.00				
18	70	78.00	76.00	55.00 EE 00	47.00				
70	74	78.00	74.00	55.00	46.00				
70	72	78.00	72.00	55.00	45.00				
70	10	78.00	68.00	55.00	44.00				
78	66	78.00	66.00	55.00	43.00				
80	80	80.00	80.00	56.00	43.00				
80	78	80.00	78.00	56.00	48.00				
80	76	80.00	76.00	56.00	47.00				
80	74	80.00	74.00	56.00	46.00				
80	72	80.00	72.00	56.00	45.00				
80	70	80.00	70.00	56.00	44.00				
80	68	80.00	68.00	56.00	44.00				
82	82	82.00	82.00	57.00	50.00				
82	80	82.00	80.00	57.00	49.00				
82	78	82.00	78.00	57.00	48.00				
82	76	82.00	76.00	57.00	47.00				
82	74	82.00	74.00	57.00	46.00				
82	72	82.00	72.00	57.00	45.00				
82	70	82.00	70.00	57.00	45.00				
84	84	84.00	84.00	58.00	51.00				

Reducers

STD (Sch 40), XS(Sch 80)





ASME B16.9)									(j	in inches)
Nominal	Outside	Outside		STD(Sch 40)			XS(Sch 80)				
Pipe	pe Diameter Diameter		Large	e End	Smal	l End	Large	e End	Small	End	
Size	OD 1		ID ₁	T 1	ID_2	T 2	ID 1	T	ID 1	T_2	
$\frac{3}{4} \times \frac{1}{2}$	1.050	0.840	0.824	0.113	0.622	0.109	0.742	0.514	0.546	0.147	$1\frac{1}{2}$
$egin{array}{ccc} 1 & imes \ 1 & imes \end{array}$	1.315 1.315	1.050 0.840	1.049 1.049	0.133 0.133	0.824 0.622	0.113 0.109	0.957 0.957	0.179 0.179	0.742 0.546	0.154 0.147	2 2
$1^{1_{4}} \times 1$ $1^{1_{4}} \times 3^{3_{4}}$ $1^{1_{4}} \times 1^{2}$	1.660 1.660 1.660	1.315 1.050 0.840	1.380 1.380 1.380	0.140 0.140 0.140	1.049 0.824 0.622	0.133 0.113 0.109	1.278 1.278 1.278	0.191 0.191 0.191	0.957 0.742 0.546	0.179 0.154 0.147	2 2 2
$\begin{array}{c} 1^{1\!\!\!/_2}\times\!\!1^{1\!\!\!/_4}\\ 1^{1\!\!\!/_2}\times\!\!1\\ 1^{1\!\!\!/_2}\times\!\!3_4 \end{array}$	1.900 1.900 1.900	1.660 1.315 1.050	1.610 1.610 1.610	0.145 0.145 0.145	1.380 1.049 0.824	0.140 0.133 0.113	1.500 1.500 1.500	0.200 0.200 0.200	1.278 0.957 0.742	0.191 0.179 0.154	$2^{1/_{2}}$ $2^{1/_{2}}$ $2^{1/_{2}}$
$\begin{array}{cccc} 2 & \times 1^{\frac{1}{2}} \\ 2 & \times 1^{\frac{1}{4}} \\ 2 & \times 1 \\ 2 & \times 3^{\frac{3}{4}} \end{array}$	2.375 2.375 2.375 2.375 2.375	1.900 1.660 1.315 1.050	2.067 2.067 2.067 2.067	0.154 0.154 0.154 0.154	1.610 1.380 1.049 0.824	0.145 0.140 0.133 0.113	1.939 1.939 1.939 1.939	0.218 0.218 0.218 0.218	1.500 1.278 0.957 0.742	0.200 0.191 0.179 0.154	3 3 3 3
$\begin{array}{c} 2^{1}_{2} \times 2 \\ 2^{1}_{2} \times 1^{1}_{2} \\ 2^{1}_{2} \times 1^{1}_{2} \\ 2^{1}_{2} \times 1^{1}_{4} \\ 2^{1}_{2} \times 1 \end{array}$	2.875 2.875 2.875 2.875 2.875	2.375 1.900 1.660 1.315	2.469 2.469 2.469 2.469	0.203 0.203 0.203 0.203	2.067 1.610 1.380 1.049	0.154 0.145 0.140 0.133	2.323 2.323 2.323 2.323	0.276 0.276 0.276 0.276	1.939 1.500 1.278 0.957	0.218 0.200 0.191 0.179	$\begin{array}{c} 3^{1}_{2}'\\ 3^{1}_{2}'\\ 3^{1}_{2}'\\ 3^{1}_{2}'\\ 3^{1}_{2}'\end{array}$
$\begin{array}{ccc} 3 & \times 2^{\frac{1}{2}} \\ 3 & \times 2 \\ 3 & \times 1^{\frac{1}{2}} \\ 3 & \times 1^{\frac{1}{4}} \end{array}$	3.500 3.500 3.500 3.500	2.875 2.375 1.900 1.660	3.068 3.068 3.068 3.068	0.216 0.216 0.216 0.216	2.469 2.067 1.610 1.380	0.203 0.154 0.145 0.140	2.900 2.900 2.900 2.900	0.300 0.300 0.300 0.300	2.323 1.939 1.500 1.278	0.276 0.218 0.200 0.191	$\begin{array}{c} 3_{1/2}^1 \\ 3_{1/2}^{1/2} \\ 3_{1/2}^{1/2} \\ 3_{1/2}^{1/2} \end{array}$
$\begin{array}{c} 3^{1}\!$	4.000 4.000 4.000 4.000	3.500 2.875 2.375 1.900	3.548 3.548 3.548 3.548	0.226 0.226 0.226 0.226	0.368 2.469 2.067 1.610	0.216 0.203 0.154 0.145	3.364 3.364 3.364 3.364	0.318 0.318 0.318 0.318	2.900 2.323 1.939 1.500	0.300 0.276 0.218 0.200	4 4 4 4
$\begin{array}{rrrr} 4 & \times 3^{1\!/_{\!2}} \\ 4 & \times 3 \\ 4 & \times 2^{1\!/_{\!2}} \\ 4 & \times 2 \end{array}$	4.500 4.500 4.500 4.500	4.000 3.500 2.875 2.375	4.026 4.026 4.026 4.026	0.237 0.237 0.237 0.237	3.548 3.068 2.469 2.607	0.226 0.216 0.203 0.154	3.826 3.826 3.826 3.826	0.337 0.337 0.337 0.337	3.364 2.900 2.323 1.939	0.318 0.300 0.276 0.218	4 4 4 4
$\begin{array}{cccc} 5 & \times 4 \\ 5 & \times 3^{1\!\!\!/_2} \\ 5 & \times 3 \\ 5 & \times 2^{1\!\!\!/_2} \end{array}$	5.563 5.563 5.563 5.563	4.500 4.000 3.500 2.875	5.047 5.047 5.047 5.047	0.258 0.258 0.258 0.258	4.026 3.548 3.068 2.469	0.237 0.226 0.216 0.203	4.813 4.813 4.813 4.813	0.375 0.375 0.375 0.375	3.826 3.364 2.900 2.323	0.337 0.318 0.300 0.276	5 5 5 5
$\begin{array}{ccc} 6 & \times 5 \\ 6 & \times 4 \\ 6 & \times 3^{\frac{1}{2}} \\ 6 & \times 3 \\ 6 & \times 2^{\frac{1}{2}} \end{array}$	6.625 6.625 6.625 6.625 6.625	5.563 4.500 4.000 3.500 2.875	6.065 6.065 6.065 6.065 6.065	0.280 0.280 0.280 0.280 0.280	5.047 4.026 3.548 3.068 2.469	0.258 0.237 0.226 0.216 0.203	5.761 5.761 5.761 5.761 5.761	0.432 0.432 0.432 0.432 0.432	4.813 3.826 3.364 2.900 2.323	0.375 0.337 0.318 0.300 0.276	$5^{1/2}_{1/2}$ $5^{1/2}_{1/2}$ $5^{1/2}_{1/2}$ $5^{1/2}_{1/2}$
$\begin{array}{ccc} 8 & \times 6 \\ 8 & \times 5 \\ 8 & \times 4 \\ 8 & \times 3^{1/_{2}} \end{array}$	8.625 8.625 8.625 8.625	6.625 5.563 4.500 4.000	7.981 7.981 7.981 7.981	0.322 0.322 0.322 0.322	6.065 5.047 4.026 3.548	0.280 0.258 0.237 0.226	7.625 7.625 7.625 7.625	0.500 0.500 0.500 0.500	5.761 4.813 3.826 3.364	0.432 0.375 0.337 0.318	6 6 6
10 ×8 10 ×6 10 ×5 10 ×4 *10 ×8 *10 ×6 *10 ×5 *10 ×4	10.750 10.750 10.750 10.750 10.750 10.750 10.750 10.750 10.750	8.625 6.625 5.563 4.500 8.625 6.626 5.563 4.500	10.020 10.020 10.020 10.020 	0.365 0.365 0.365 0.365 - - -	7.981 6.065 5.047 4.026 	0.322 0.280 0.258 0.237 - - -	9.750 9.750 9.750 9.750 9.562 9.562 9.562 9.562	0.500 0.500 0.500 0.594 0.594 0.594 0.594	7.625 5.761 4.813 3.826 7.625 5.761 4.813 3.826	0.500 0.432 0.375 0.337 0.500 0.432 0.375 0.337	7 7 7 7 7 7 7 7 7

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 125

Asterisks(*) Denote Sch 80

Reducers

STD (Sch 40), XS(Sch 80)

ASME B16.9





(in inches)

Nominal	Outside	Outside	e STD(Sch 40)								
Pipe	Diameter	Diameter	Large	e End	Smal	End	Large	e End	Small	End	End to End
Size	OD ₁		\mathbf{D}_1	T 1	ID_2	T_2	ID ₁	T 1	ID_2	T_2	
$12 \times 10 \\ 12 \times 8 \\ 12 \times 6 \\ 12 \times 5 \\ *12 \times 10 \\ *12 \times 8 \\ *12 \times 8 \\ *12 \times 5 \\ \end{cases}$	12.750 12.750 12.750 12.750 12.750 12.750 12.750 12.750 12.750	$\begin{array}{c} 10.750 \\ 8.625 \\ 6.625 \\ 5.563 \\ 10.750 \\ 8.625 \\ 6.625 \\ 5.563 \end{array}$	12.000 12.000 12.000 11.938 11.938 11.938 11.938	0.375 0.375 0.375 0.406 0.406 0.406 0.406	$\begin{array}{c} 10.020 \\ 7.981 \\ 6.065 \\ 5.047 \\ 10.020 \\ 7.981 \\ 6.065 \\ 5.047 \end{array}$	0.365 0.322 0.280 0.258 0.365 0.322 0.280 0.258	11.750 11.750 11.750 11.750 11.374 11.374 11.374 11.374	0.500 0.500 0.500 0.688 0.688 0.688 0.688	9.750 7.625 5.761 4.813 9.562 7.625 5.761 4.813	0.500 0.500 0.432 0.375 0.594 0.500 0.432 0.375	8 8 8 8 8 8 8 8 8 8
14×12 14×10 14×8 $*14 \times 12$ $*14 \times 10$ $*14 \times 8$	$\begin{array}{c} 14.000\\ 14.000\\ 14.000\\ 14.000\\ 14.000\\ 14.000\\ 14.000\end{array}$	12.750 10.750 8.625 12.750 10.750 8.625	13.250 13.250 13.250 13.124 13.124 13.124	0.375 0.375 0.438 0.438 0.438	12.000 10.020 7.981 11.938 10.020 7.981	0.375 0.365 0.322 0.406 0.365 0.322	$\begin{array}{c} 13.000 \\ 13.000 \\ 13.000 \\ 12.500 \\ 12.500 \\ 12.500 \end{array}$	0.500 0.500 0.500 0.750 0.750 0.750	$\begin{array}{c} 11.750\\ 9.750\\ 7.625\\ 11.374\\ 9.562\\ 7.625\end{array}$	0.500 0.500 0.500 0.688 0.594 0.500	13 13 13 13 13 13 13
16×14 16×12 16×10 * 16×14 * 16×12 * 16×10	$\begin{array}{c} 16.000 \\ 16.000 \\ 16.000 \\ 16.000 \\ 16.000 \\ 16.000 \\ 16.000 \end{array}$	$\begin{array}{c} 14.000\\ 12.750\\ 10.750\\ 14.000\\ 12.750\\ 10.750\end{array}$	$\begin{array}{c} 15.250 \\ 15.250 \\ 15.250 \\ 15.000 \\ 15.000 \\ 15.000 \end{array}$	0.375 0.375 0.500 0.500 0.500	$\begin{array}{c} 13.250 \\ 12.000 \\ 10.020 \\ 13.124 \\ 11.938 \\ 10.020 \end{array}$	0.375 0.375 0.365 0.438 0.406 0.365	$\begin{array}{c} 15.000 \\ 15.000 \\ 15.000 \\ 14.312 \\ 14.312 \\ 14.312 \\ 14.312 \end{array}$	0.500 0.500 0.500 0.844 0.844 0.844	$\begin{array}{c} 13.000\\ 11.750\\ 9.750\\ 12.500\\ 11.374\\ 9.562 \end{array}$	0.500 0.500 0.500 0.750 0.688 0.594	14 14 14 14 14 14
18×16 18×14 18×12 *18 $\times 16$ *18 $\times 14$ *18 $\times 12$	18.000 18.000 18.000 18.000 18.000 18.000	$\begin{array}{c} 16.000 \\ 14.000 \\ 12.750 \\ 16.000 \\ 14.000 \\ 12.750 \end{array}$	17.250 17.250 17.250 16.876 16.876 16.876	0.375 0.375 0.375 0.562 0.562 0.562	15.250 13.250 12.000 15.000 13.124 11.938	0.375 0.375 0.375 0.500 0.438 0.406	17.000 17.000 17.000 16.124 16.124 16.124	0.500 0.500 0.938 0.938 0.938	15.000 13.000 11.750 14.312 12.500 11.374	0.500 0.500 0.500 0.844 0.750 0.688	15 15 15 15 15 15
20×18 20×16 20×14 *20×18 *20×16 *20×14	20.000 20.000 20.000 20.000 20.000 20.000	$\begin{array}{c} 18.000 \\ 16.000 \\ 14.000 \\ 18.000 \\ 16.000 \\ 14.000 \end{array}$	19.250 19.250 19.250 18.812 18.812 18.812	0.375 0.375 0.562 0.562 0.562	17.250 15.250 13.250 16.876 15.000 13.124	0.375 0.375 0.375 0.562 0.500 0.438	19.000 19.000 19.000 17.938 17.938 17.938	$0.500 \\ 0.500 \\ 1.031 \\ 1.031 \\ 1.031$	$\begin{array}{c} 17.000 \\ 15.000 \\ 13.000 \\ 16.124 \\ 14.312 \\ 12.500 \end{array}$	0.500 0.500 0.500 0.938 0.844 0.750	20 20 20 20 20 20 20
22×20 22×18 22×16 *22×20 *22×18 *22×18 *22×16	22.000 22.000 22.000 22.000 22.000 22.000	20.000 18.000 16.000 20.000 18.000 16.000	21.250 21.250 21.250 - - -	0.375 0.375 0.375 _ _ _	19.250 17.250 15.250 - - -	0.375 0.375 0.375 - - - -	21.000 21.000 21.000 19.750 19.750 19.750	$\begin{array}{c} 0.500 \\ 0.500 \\ 0.500 \\ 1.125 \\ 1.125 \\ 1.125 \\ 1.125 \end{array}$	19.000 17.000 15.000 17.938 16.124 14.312	0.500 0.500 0.500 1.031 0.938 0.844	20 20 20 20 20 20 20
24×22 24×20 24×18 *24×22 *24×20 *24×18	24.000 24.000 24.000 24.000 24.000 24.000	22.000 20.000 18.000 22.000 20.000 18.000	23.250 23.250 23.250 22.624 22.624	0.375 0.375 0.375 	21.250 19.250 17.250 - 18.812 16.876	0.375 0.375 0.375 - 0.594 0.562	23.000 23.000 23.000 21.562 21.562 21.562	$0.500 \\ 0.500 \\ 0.500 \\ 1.129 \\ 1.219 \\ 1.219 $	21.000 19.000 17.000 19.750 17.938 16.124	$\begin{array}{c} 0.500 \\ 0.500 \\ 0.500 \\ 1.125 \\ 1.031 \\ 0.938 \end{array}$	20 20 20 20 20 20 20
$26 \times 22 \\ 26 \times 18 \\ 26 \times 16$	26.000 26.000 26.000	22.000 18.000 16.000	25.250 25.250 25.250	0.375 0.375 0.375	21.250 17.250 15.250	0.375 0.375 0.375	25.000 25.000 25.000	0.500 0.500 0.500	21.000 17.000 15.000	0.500 0.500 0.500	24 24 24
28×24 28×20 28×18	28.000 28.000 28.000	24.000 20.000 18.000	27.250 27.250 27.250	0.375 0.375 0.375	23.250 19.250 17.250	0.375 0.375 0.375	27.000 27.000 27.000	0.500 0.500 0.500	23.000 19.000 17.000	0.500 0.500 0.500	24 24 24

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 125

Asterisks(*) Denote Sch 40 and Sch 80



Reducers

STD (Sch 40), XS(Sch 80)





Concentric

Coontrio	
ccentric	

ASME B16.9	ASME B16.9 (in inches)											
Nominal	Outside	Outside		STD(S	ich 40)			XS(So	ch 80)			
Pipe	Diameter	Diameter	Large	e End	Small End		Large	Large End		End	End to End	
Size	OD_1		ID ₁	T ₁	ID ₂	T_2	D 1	T 1	ID_2	T_2	F I	
$\begin{array}{c} 30 \times 26 \\ 30 \times 22 \\ 30 \times 20 \end{array}$	30.000	26.000	29.250	0.375	25.250	0.375	29.000	0.500	25.000	0.500	24	
	30.000	22.000	29.250	0.375	21.250	0.375	29.000	0.500	21.000	0.500	24	
	30.000	20.000	29.250	0.375	19.250	0.375	29.000	0.500	19.000	0.500	24	
32×28 32×24 32×22 *32×24	32.000 32.000 32.000 32.000	28.000 24.000 22.000 24.000	31.250 31.250 31.250 30.624	0.375 0.375 0.375 0.688	27.250 23.250 21.250 22.264	0.375 0.375 0.375 0.688	31.000 31.000 31.000 -	0.500 0.500 0.500 –	27.000 23.000 21.000 -	0.500 0.500 0.500 –	24 24 24 24 24	
34×30	34.000	30.000	33.250	0.375	29.250	0.375	33.000	0.500	29.000	0.500	24	
34×26	34.000	26.000	33.250	0.375	25.250	0.375	33.000	0.500	25.000	0.500	24	
34×22	34.000	22.000	33.250	0.375	21.250	0.375	33.000	0.500	21.000	0.500	24	
36×32 36×28 36×24 $*36 \times 32$ $*36 \times 24$	36.000 36.000 36.000 36.000 36.000	32.000 28.000 24.000 32.000 24.000	35.250 35.250 35.250 34.500 34.500	0.375 0.375 0.375 0.750 0.750	31.250 27.250 23.250 30.624 22.624	0.375 0.375 0.375 0.688 0.688	35.000 35.000 35.000 	0.500 0.500 0.500 –	31.000 27.000 23.000 - -	0.500 0.500 0.500 -	24 24 24 24 24	
38×34	38.000	34.000	37.250	0.375	33.250	0.375	37.000	0.500	33.000	0.500	24	
38×30	38.000	30.000	37.250	0.375	29.250	0.375	37.000	0.500	29.000	0.500	24	
38×26	38.000	26.000	37.250	0.375	29.250	0.375	37.000	0.500	25.000	0.500	24	
$\begin{array}{c} 40 \times 36 \\ 40 \times 32 \\ 40 \times 28 \end{array}$	40.000	36.000	39.250	0.375	35.250	0.375	39.000	0.500	35.000	0.500	24	
	40.000	32.000	39.250	0.375	31.250	0.375	39.000	0.500	31.000	0.500	24	
	40.000	28.000	39.250	0.375	27.250	0.375	39.000	0.500	27.000	0.500	24	
$\begin{array}{c} 42 \times 38 \\ 42 \times 34 \\ 42 \times 30 \end{array}$	42.000	38.000	41.250	0.375	37.250	0.375	41.000	0.500	37.000	0.500	24	
	42.000	34.000	41.250	0.375	33.250	0.375	41.000	0.500	33.000	0.500	24	
	42.000	30.000	41.250	0.375	29.250	0.375	41.000	0.500	29.000	0.500	24	
$\begin{array}{c} 44 \times 40 \\ 44 \times 36 \\ 44 \times 32 \end{array}$	44.000	40.000	43.250	0.375	39.250	0.375	43.000	0.500	39.000	0.500	24	
	44.000	36.000	43.250	0.375	35.250	0.375	43.000	0.500	35.000	0.500	24	
	44.000	32.000	43.250	0.375	31.250	0.375	43.000	0.500	31.000	0.500	24	
$\begin{array}{c} 46\!\times\!42\\ 46\!\times\!38\\ 46\!\times\!34 \end{array}$	46.000	42.000	45.250	0.375	41.250	0.375	45.000	0.500	41.000	0.500	28	
	46.000	38.000	45.250	0.375	37.250	0.375	45.000	0.500	37.000	0.500	28	
	46.000	34.000	45.250	0.375	33.250	0.375	45.000	0.500	33.000	0.500	28	
$\begin{array}{c} 48 \times 44 \\ 48 \times 40 \\ 48 \times 36 \end{array}$	48.000	44.000	47.250	0.375	43.250	0.375	47.000	0.500	43.000	0.500	28	
	48.000	40.000	47.250	0.375	39.250	0.375	47.000	0.500	39.000	0.500	28	
	48.000	36.000	47.250	0.375	35.250	0.375	47.000	0.500	37.000	0.500	28	

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 125

Asterisks(*) Denote Sch 40

Reducers

Sch 120, 160, XXS





ASME B16.9					(in inches)
Nominal	Outside	v	End to End		
Pipe Size	Diameter OD1, OD2	Sch 120	Sch 160	XXS	н
$\frac{3}{4} \times \frac{1}{2}$	1.050 0.840	_	0.219 0.188	0.308 0.294	$1\frac{1}{2}$
$1 \times \frac{3}{4}$	1.315 1.050	-	0.250 0.219	0.358 0.308	2
$1 \times \frac{1}{2}$	1.315 0.840	_	0.250 0.188	0.358 0.294	2
1¼×1	1.660 1.315	-	0.250 0.250	0.382 0.358	2
$1\frac{1}{4} \times \frac{3}{4}$	1.660 1.050	-	0.250 0.219	0.382 0.308	2
$1\frac{1}{2} \times 1\frac{3}{4}$	1.900 1.660	-	0.281 0.250	0.400 0.382	$2\frac{1}{2}$
1 ×1½	1.900 1.315	-	0.281 0.250	0.400 0.358	$2^{1/2}$
$1\frac{1}{2} \times \frac{3}{4}$	1.900 1.050	-	0.281 0.219	0.400 0.308	$2\frac{1}{2}$
2 ×1½	2.375 1.900	-	0.344 0.281	0.436 0.400	3
2 ×1¼	2.375 1.660	-	0.344 0.250	0.436 0.382	3
2 ×1	2.375 1.315	-	0.344 0.250	0.436 0.358	3
2½×2	2.875 2.375	-	0.375 0.344	0.552 0.436	3½
$2\frac{1}{2} \times 1\frac{1}{2}$	2.875 1.900	-	0.375 0.281	0.552 0.400	3½
$2\frac{1}{2} \times 1\frac{1}{4}$	2.875 1.660	_	0.375 0.250	0.552 0.382	3½
3 ×2½	3.500 2.875	_	0.438 0.375	0.600 0.552	3½
3 ×2	3.500 2.375	_	0.438 0.344	0.600 0.436	3½
3 ×1½	3.500 1.900	_	0.438 0.281	0.600 0.400	3½
3 ×1¼	3.500 1.660	_	0.438 0.250	0.600 0.382	3½
4 ×3	4.500 3.500	_	0.531 0.438	0.674 0.600	4
4 ×2½	4.500 2.875	_	0.531 0.375	0.674 0.552	4
4 ×2	4.500 2.375	-	0.531 0.344	0.674 0.436	4
5 ×4	5.563 4.500	0.500 0.438	0.625 0.531	0.750 0.674	5
5 ×3	5.563 3.500	_	0.625 0.438	0.750 0.600	5
5 $\times 2\frac{1}{2}$	5.563 2.875	-	0.625 0.375	0.750 0.552	5

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 125

• Wall Thickness Conform to ASME B 36.10M Specifications


Reducers

Sch20,60,100,120,140,160, XXS



OD2



ASME B16.9 (in inche										
Nominal	Outside			Wall	Thickness	T 1, T 2			End to End	
Pipe Size	Diameter OD1, OD2	Sch 20	Sch 60	Sch 100	Sch 120	Sch 140	Sch 160	Xxs	н	
6× 5	6.625 5.563	—	-	-	0.562 0.500	_	0.719 0.625	0.854 0.750	5½	
6× 4	6.625 4.500	_	_	-	0.562 0.438	_	0.719 0.531	0.864 0.674	$5\frac{1}{2}$	
6× 3	6.625 3.500	_	_	-	_	_	0.719 0.438	0.864 0.600	5½	
6× 2½	6.625 2.875	-	-	-	-	-	0.719 0.375	0.864 0.552	5½	
8× 6	8.625 6.625	-	-	-	0.719 0.562	-	0.906 0.719	0.875 0.864	6	
8× 5	8.625 5.563	-	-	-	0.719 0.500	-	0.906 0.625	0.875 0.750	6	
8× 4	8.625 4.500	-	-	-	0.719 0.438	-	0.906 0.531	0.875 0.674	6	
10× 8	10.750 8.625	0.250 0.250	0.500 0.406	0.719 0.594	0.844 0.719	1.000 0.812	1.125 0.906	1.000 0.875	7	
10× 6	10.750 6.625	-	-	-	0.844 0.562	-	1.125 0.719	1.000 0.864	7	
10× 5	10.750 5.563	-	-	-	0.844 0.500	—	1.125 0.625	1.000 0.750	7	
10× 4	10.750 4.500	-	-	-	0.844 0.438	-	1.125 0.531	1.000 0.674	7	
12×10	12.750 10.750	0.250 0.250	0.562 0.500	0.844 0.719	1.000 0.844	1.125 1.000	1.312 1.125	1.000	8	
12× 8	12.750 8.625	0.250 0.250	0.562 0.406	0.844 0.594	1.000 0.719	1.125 0.812	1.312 0.906	1.000 0.875	8	
12× 6	12.750 6.625	-	-	-	1.000 0.562	-	1.312 0.719	1.000 0.864	8	
14×12	14.000 12.750	0.312	0.594	0.938	1.094 1.000	1.250	1.406 1.312	-	13	
14×10	14.000	0.312	0.594	0.938	1.094 0.844	1.250	1.406 1.125	-	13	
14× 8	8.625	0.312	0.594	0.938	0.719	0.812	0.906	-	13	
16×14	16.000	0.312	0.656	1.031 0.938	1.219 1.094	1.438 1.250	1,594 1.406	_	14	
16×12	16.000	0.312	0.656	1.031 0.844	1.219	1.438 1.125	1.594 1.312	-	14	
16×10	16.000 10.750	0.312 0.250	0.656	1.031 0.719	1.219 0.844	1.438 1.000	1.594 1.125	-	14	
18×16	18.000 16.000	0.312 0.312	0.750 0.656	1.156 1.031	1.375 1.219	1.562 1.438	1.781 1.594	-	15	
18×14	18.000 14.000	0.312 0.312	0.750 0.594	1.156 0.938	1.375 1.094	1.562 1.250	1.781 1.406	-	15	
18×12	18.000	0.312	0.750	1.156	1.375	1.562	1.781	_	15	

• For Bevel Details See Page 115

For Dimensional Tolerances See Page 114

• For Approx Weight See Page 125

Wall Thickness Conform to ASME B 36.10M Specifications

Reducers

Sch20,60,100,120,140,160





ASME B16.9							(in :	inches)
Nominal	Outside			Wall Thick	ness T ₁ , T ₂			End to End
Pipe Size	Diameter OD1, OD2	Sch 20	Sch 60	Sch 100	Sch 120	Sch 140	Sch 160	н
20×18	20.000 18.000	0.375 0.312	0.812 0.750	1.281 1.156	1.500 1.375	1.750 1.562	1.969 1.781	20
20×16	20.000 16.000	0.375 0.312	0.812 0.656	1.281 1.031	1.500 1.219	1.750 1.438	1.969 1.594	20
20×14	20.000 14.000	0.375 0.312	0.812 0.594	1.281 0.938	1.500 1.094	1.750 1.250	1.969 1.406	20
22×20	22.000 20.000	0.375 0.375	0.875 0.812	1.375 1.281	1.625 1.500	1.875 1.750	2.125 1.969	20
22×18	22.000 18.000	0.375 0.312	0.875 0.750	1.375 1.156	1.625 1.375	1.875 1.562	2.125 1.781	20
22×16	22.000 16.000	0.375 0.312	0.875 0.656	1.375 1.031	1.625 1.219	1.875 1.438	2.125 1.594	20
24×22	24.000 22.000	0.375 0.375	0.969 0.875	1.531 1.375	1.812 1.625	2.062 1.875	2.344 2.125	20
24×20	24.000 20.000	0.375 0.375	0.969 0.812	1.531 1.281	1.812 1.500	2.062 1.750	2.344 1.969	20
24×18	24.000 18.000	0.375 0.312	0.969 0.750	1.531 1.156	1.812 1.375	2.062 1.562	2.344 1.781	20

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

For Approx Weight See Page 125
Wall Thickness Conform to ASME B 36.10M Specifications



180°Elbows(Long, Short) Caps

STD (Sch 40), XS (Sch80)





(in inches)

ASME B16.9

Pipe Size Diameter OD ID T ID T ID T Etength E Length E Length E P K P ½ 0.840 0.622 0.109 0.546 0.147 1.00 0.18 1.00 3.00 1.88 - ¾ 1.050 0.824 0.113 0.742 0.154 1.00 0.15 1.00 2.25 1.69 - 1 1.315 1.049 0.133 0.957 0.179 1.50 0.18 1.50 3.00 2.19 2.00 1¼ 1.660 1.380 0.140 1.278 0.191 1.50 0.19 1.50 3.75 2.75 2.50 1¼ 1.900 1.610 0.145 1.500 0.200 1.50 0.22 1.75 6.00 4.19 4.00 2½ 2.875 2.469 0.203 2.323 0.276 1.50 0.28 2.00 7.50 5.19 5.00 3	ort
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	к
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	—
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.62
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.06
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.44
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3.19
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3.94
3½ 4.000 3.548 0.226 3.364 0.318 2.50 0.32 3.00 10.50 7.25 7.00 4 4.500 4.026 0.237 3.826 0.337 2.50 0.34 3.00 12.00 8.25 8.00 5 5 563 5.047 0.258 4.813 0.375 3.00 0.38 3.50 15.00 10.31 10.00	4.75
4 4.500 4.026 0.237 3.826 0.337 2.50 0.34 3.00 12.00 8.25 8.00 5 5.563 5.047 0.258 4.813 0.375 3.00 0.38 3.50 15.00 10.31 10.00	5.50
	6.25
	1.15
	9.31 10.21
6 6.625 7.361 0.322 7.625 0.500 4.00 0.50 5.00 24.00 16.31 10.00	15 20
*10 10.750 9.562 0.594 5.00 0.50 6.00 30.00 20.38 20.00	15.30
12 12 750 12 000 0 375 11 750 0 500 6 00 0 500 7 00 36 00 24 38 24 00	18 38
*12 12 750 11 938 0 406 11 374 0 688 6 00 0 50 7 00 36 00 24 38 24 00	8 38
14 14 000 13 250 0 375 13 000 0 500 6 50 0 500 7 50 42 00 28 00 24.00	21.00
*14 14 000 13124 0 438 12 500 0 750 6 50 0 50 7 50 42 00 28 00 20 0	21.00
16 16,000 15,250 0.375 15,000 0.500 7,00 0.50 8,00 48,00 32,00 32,00	24.00
*16 16,000 15,000 0,500 14,312 0,844 7,00 0,50 8,00 48,00 32,00 32,00	24.00
18 18,000 17,250 0.375 17,000 0.500 8,00 0.50 9,00 54,00 36,00 36,00	27.00
*18 18.000 16.876 0.562 16.124 0.938 8.00 0.50 9.00 54.00 36.00 36.00	27.00
20 20.000 19.250 0.375 19.000 0.500 9.00 0.50 10.00 60.00 40.00 40.00	30.00
*20 20.000 18.812 0.594 17.938 1.031 9.00 0.50 10.00 60.00 40.00 40.00	30.00
22 22.000 21.250 0.375 21.000 0.500 10.00 0.50 10.00 66.00 44.00 44.00	33.00
*22 22.000 19.750 1.125 10.00 0.50 10.00 66.00 44.00 44.00	33.00
24 24.000 23.250 0.375 23.000 0.500 10.50 0.50 12.00 72.00 48.00 48.00	36.00
*24 24.000 22.624 0.688 21.562 1.219 10.50 0.50 12.00 72.00 48.00 48.00	36.00
26 26.000 25.250 0.375 25.000 0.500 10.50	-
28 28.000 27.250 0.375 27.000 0.500 10.50	-
30 30.000 29.250 0.375 29.000 0.500 10.50	-
32 32.000 31.250 0.375 31.000 0.500 10.50	-
*32 32.000 30.624 0.688 10.50	—
34 34,000 33.250 0.375 33.000 0.500 10.50	-
*34 34.000 32.624 0.688 10.50	-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-
*36 36.000 34.500 0.750 10.50	_
38 38,000 37,250 0.375 37,000 0.500 12,00	_
40 40.000 39.200 0.375 39.000 0.500 12.00	_
42 42.000 41.200 0.375 41.000 0.500 12.00	_
44 44.000 45.200 0.375 45.000 0.500 13.50	
40 40.000 43.200 0.375 43.000 0.500 13.50	_

• Length E applies for thickness not exceeding that given in column 'Limiting Wall Thickness for Length E."

• Length E1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager,

length E1 shall be by agreement between manufacturer and Purchaser.

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

Asterisks(*) Denote Sch 40 and Sch 80

180°Elbows(Long, Short) Caps

Sch20,60,100,120,140,160,XXS





ASME B16.9

ASME B1	6.9					(in iı	nches)								
Nominal	Outside			Wall ⁻	Fhickn	ess T			Length	Limiting Wall Thickness For	Length	Lo	ng	Sho	ort
Size	OD	Sch20	Sch60	Sch100	Sch120	Sch140	Sch160	xxs	Е	Length E	E	Ρ	к	Ρ	к
$\frac{1}{2}$	0.840	-	—	-	-	-	0.188	0.294	1.00	0.18	1.00	3.00	1.88	-	—
$\frac{3}{4}$	1.050	-		-	-	-	0.219	0.308	1.00	0.15	1.00	2.25	1.69	-	—
1	1.315	—	_	—	-	-	0.250	0.358	1.50	0.18	1.50	3.00	2.19	2.00	1.62
$1\frac{1}{4}$	1.660	—	_	—	-	-	0.250	0.382	1.50	0.19	1.50	3.75	2.75	2.50	2.06
$1^{1/2}$	1.900	—	_	—	-	-	0.281	0.400	1.50	0.20	1.50	4.50	3.25	3.00	2.44
2	2.375	—	_	—	-	-	0.344	0.436	1.50	0.22	1.75	6.00	4.19	4.00	3.19
$2^{1/2}$	2.875	-	-	-	-	-	0.375	0.552	1.50	0.28	2.00	7.50	5.19	5.00	3.94
3	3.500	—	—	—	-	-	0.438	0.600	2.00	0.30	2.50	9.00	6.25	6.00	4.75
4	4.500	—	—	—	0.438	-	0.531	0.674	2.50	0.34	3.00	12.00	8.25	8.00	6.25
5	5.563	—	—	—	0.500	—	0.625	0.750	3.00	0.38	3.50	15.00	10.31	10.00	7.75
6	6.625	—	—	—	0.562	-	0.719	0.864	3.50	0.43	4.00	18.00	12.31	12.00	9.31
8	8.625	0.250	0.406	0.594	0.719	0.812	0.906	0.875	4.00	0.50	5.00	24.00	16.31	16.00	12.31
10	10.750	0.250	0.500	0.719	0.844	1.000	1.125	1.000	5.00	0.50	6.00	30.00	20.38	20.00	15.38
12	12.750	0.250	0.562	0.844	1.000	1.125	1.312	1.000	6.00	0.50	7.00	36.00	24.38	24.00	18.38
14	14.000	0.312	0.594	0.938	1.094	1.250	1.406	—	6.50	0.50	7.50	42.00	28.00	28.00	21.00
16	16.000	0.312	0.656	1.031	1.219	1.438	1.594	—	7.00	0.50	8.00	48.00	32.00	32.00	24.00
18	18.000	0.312	0.750	1.156	1.375	1.562	1.781	—	8.00	0.50	9.00	54.00	36.00	36.00	27.00
20	20.000	0.375	0.812	1.281	1.500	1.750	1.969	—	9.00	0.50	10.00	60.00	40.00	40.00	30.00
22	22.000	0.375	0.875	1.375	1.625	1.875	2.125	-	10.00	0.50	10.00	66.00	44.00	44.00	33.00
24	24.000	0.375	0.969	1.531	1.812	2.062	2.344	—	10.50	0.50	12.00	72.00	48.00	48.00	36.00

• Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."

• Length E1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E_1 shall be by agreement between manufacturer and Purchaser.

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• For Approx Weight See Page 122

• Wall Thickness Conform to ASME B 36.10M Specifications



Laterals

STD, XS



oddollig

						(in inches)
Nominal	Center-to-Er	nd Dimension	S.	TD	X	S
of Run	L & E	D	ID	т	ID	т
1	$3^{1/2}$	$1\frac{3}{4}$	1.049	0,133	0.957	0.179
1 ¹ ⁄ ₄	41/4	2	1.380	0,140	1.278	0.191
$1^{1/2}$	5	$2^{1/2}$	1.610	0,145	1.500	0.200
2	6	3 ¹ ⁄ ₄	2.067	0,154	1.939	0.218
2 ¹ / ₂	7	3 ¹ ⁄ ₂	2.469	0,203	2.323	0.276
3	7 ³ ⁄ ₄	3 ³ ⁄ ₄	3.068	0,216	2.900	0.300
31/2	8 ³ / ₈	4	3.548	0,226	3.364	0.318
4	81/2	4 ¹ / ₂	4.026	0,237	3.826	0.337
5	11	43⁄4	5.047	0,258	4.813	0.375
6	12 ¹ / ₂	51/4	6.065	0,280	5.761	0.432
8	151/4	61/4	7.981	0,322	7.625	0.500
10	18	7	10.020	0,365	9.750	0.500
12	$21\frac{1}{2}$	8	12.000	0,375	11.750	0.500
14	25	10	13.250	0,375	13.000	0.500
16	$28\frac{1}{2}$	12	15.250	0,375	15.000	0.500
18	32	13	17.250	0,375	17.000	0.500
20	35	14	19.250	0,375	19.000	0.500
24	41 ¹ ⁄ ₄	16 ¹ ⁄ ₄	23.250	0,375	23.000	0.500

• Pressure-temperature ratings : Laterals are rated for either 40% of the maximun allowable working pressure for the size and weight schedule of the mating pipe, or 100% of the maximun allowable working pressure for the size and weight schedule of the mating pipe in the latter case, ASME B31.3 is used to calculate reinforcement requirements unless otherwise specified.

• Wall Thickness Conform to ASME B 36.10M Specifications

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

Sch 5S, 10S, 40S, 80S





ASME B16.9	, MSS SP-43								(in inc	ches)
Nominal	Outside	5s	10)s	40)s	80s	С	enter to E	nd
Pipe Size	Diameter	т	ID	Ŧ	ID	т	т	Lo	ng	Short
	OD	1	U	1	U	1	1	Α	В	Α
$\frac{1}{2}$	0.840	0.065	0,674	0,083	0.622	0.109	0.147	$1\frac{1}{2}$	5/8	-
3/4	1.050	0.065	0,884	0,083	0.824	0.113	0.154	$1^{1/2}$	7/16	-
1	1.315	0.065	1,097	0,109	1.049	0.133	0.179	$1^{1/2}$	7/8	1
$1\frac{1}{4}$	1.660	0.065	1,442	0,109	1.380	0.140	0.191	1%	1	$1\frac{1}{4}$
$1^{1/2}$	1.900	0.065	1,682	0,109	1.610	0.145	0.200	$2\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{1}{2}$
2	2.375	0.065	2,157	0.109	2.067	0.154	0.218	3	$1\frac{3}{8}$	2
$2\frac{1}{2}$	2.875	0.083	2,635	0,120	2.469	0.203	0.276	3 ³ ⁄ ₄	$1\frac{3}{4}$	$2\frac{1}{2}$
3	3.500	0.083	3,260	0,120	3.068	0.216	0.300	$4\frac{1}{2}$	2	3
$3\frac{1}{2}$	4.000	0.083	3,760	0,120	3.548	0.226	0.318	$5\frac{1}{4}$	2 ¹ ⁄ ₄	$3\frac{1}{2}$
4	4.500	0.083	4,260	0,120	4.026	0.237	0.337	6	$2^{1/2}$	4
5	5.563	0.109	5,295	0,134	5.047	0.258	0.375	$7\frac{1}{2}$	3 ¹ / ₈	5
6	6.625	0.109	6,357	0,134	6.065	0.280	0.432	9	3 ³ ⁄ ₄	6
8	8.625	0.109	8,329	0,148	7.981	0.322	0.500	12	5	8
10	10.750	0.134	10,420	0,165	10.020	0.365	0.500	15	6¼	10
12	12.750	0.156	12,390	0,180	12.000	0.375	0.500	18	$7\frac{1}{2}$	12
14	14.000	0.156	13,624	0,188	-	-	-	21	8 ¾	14
16	16.000	0.165	15,624	0,188	-	-	-	24	10	16
18	18.000	0.165	17,624	0.188	-	-	-	27	$11\frac{1}{4}$	18
20	20.000	0.188	19,564	0,218	-	_	-	30	$12\frac{1}{2}$	20
22	22.000	0.188	21,564	0,218	-	-	-	33	$13\frac{1}{2}$	22
24	24.000	0.218	23,500	0,250	-	-	-	36	15	24
30	30.000	0.250		_	_	_	_	45	181/	30

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114



Tees(Straight)

Sch 5S, 10S, 40S, 80S



ASME B16.9 I	MSS SP-43							(in ir	iches)
Nominal	Outside	5s	1()s	4	Os	80s	Center	to End
Pipe Size	Diameter OD	т	ID	т	ID	т	т	Run C	Outlet M
1/2	0.840	0.065	0.674	0.083	0.622	0.109	0.147	1	1
3/4	1.050	0.065	0.884	0.083	0.824	0.113	0.154	11/8	$1\frac{1}{8}$
1	1.315	0.065	1.097	0.109	1.049	0.133	0.179	$1^{1/2}$	$1\frac{1}{2}$
$1^{1}/_{4}$	1.660	0.065	1.442	0.109	1.380	0.140	0.191	11/8	11/8
1½	1.900	0.065	1.682	0.109	1.610	0.145	0.200	2 ¹ ⁄ ₄	2 ¹ ⁄ ₄
2	2.375	0.065	2.157	0.109	2.067	0.154	0.218	$2^{1/2}$	$2^{1/2}$
2 ¹ / ₂	2.875	0.083	2.635	0.120	2.469	0.203	0.276	3	3
3	3.500	0.083	3.260	0.120	3.068	0.216	0.300	3 ³ / ₈	3 ³ / ₈
3 ½	4.000	0.083	3.760	0.120	3.548	0.226	0.318	3 ³ ⁄ ₄	3 ³ ⁄ ₄
4	4.500	0.083	4.260	0.120	4.026	0.237	0.337	41/8	4 ¹ / ₈
5	5.563	0.109	5.295	0.134	5.047	0.258	0.375	41/8	41/8
6	6.625	0.109	6.357	0.134	6.065	0.280	0.432	55/8	55⁄8
8	8.625	0.109	8.329	0.148	7.981	0.322	0.500	7	7
10	10.750	0.134	10.420	0.165	10.020	0.365	0.500	$8^{1/2}$	$8\frac{1}{2}$
12	12.750	0.156	12.390	0.180	12.000	0.375	0.500	10	10
14	14.000	0.156	13.624	0.188	—	—	-	11	11
16	16.000	0.165	15.624	0.188	—	—	—	12	12
18	18.000	0.165	17.624	0.188	-	—	—	$13^{1/2}$	$13\frac{1}{2}$
20	20.000	0.188	19.564	0.218	—	—	—	15	15
22	22.000	0.188	21.564	0.218	-	-	—	$16^{1/2}$	$16^{1/2}$
24	24.000	0.218	23.500	0.250	-	—	—	17	17
30	30.000	0.250	_	_	—	_	_	22	22

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

Tees (Reducing)

Sch 5S, 10S, 40S, 80S



ASME B16.9 MSS SP-4	13										(in incl	nes)
Nominal	Outside	Outside			V	Vall Th	icknes	s T			Center	to End
Pipe	Diameter	Diameter	5	S	10)s	4)s	8)s	Run	Outlet
Size	OD 1		T 1	T_2	T 1	T_2	Ti	T_2	Ti	T 2	С	М
$\frac{3}{4} \times \frac{3}{4} \times \frac{1}{2}$	1.050	0.840	0.065	0.065	0.083	0.083	0.113	0.109	0.154	0.147	11/8	11/8
$1\frac{1}{4} \times 1 \times \frac{3}{4}$	1.315	1.050	0.065	0.065	0.109	0.083	0.133	0.113	0.179	0.154	$1\frac{1}{2}$	
$1 \times 1 \times \frac{1}{2}$	1.315	0.840	0.065	0.065	0.109	0.083	0.133	0.109	0.179	0.147	1½	1½
$1\frac{1}{4} \times 1\frac{1}{4} \times 1$	1.660	1.315	0.065	0.065	0.109	0.109	0.140	0.133	0.191	0.179	1%	
$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{9}{4}$	1.660	1.050	0.065	0.065	0.109	0.083	0.140	0.113	0.191	0.154	1%	1%
$1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{4}$	1.900	1.660	0.065	0.065	0.109	0.109	0.145	0.140	0.200	0.191	$2\frac{1}{4}$	$2\frac{1}{4}$
$1\frac{1}{2} \times 1\frac{1}{2} \times 1$	1.900	1.315	0.065	0.065	0.109	0.109	0.145	0.133	0.200	0.179	$2^{1}/_{4}$	$2^{1}/_{4}$
$1/_2 \wedge 1/_2 \wedge /_4$	1.900	1.000	0.005	0.005	0.109	0.003	0.145	0.115	0.200	0.154	2/4	Z/4
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.375	1.900	0.065	0.065	0.109	0.109	0.154	0.145	0.218	0.200	2½ 21/	2% 21/
$2 \times 2 \times 1/_4$ $2 \times 2 \times 1$	2.375	1 315	0.005	0.005	0.109	0.109	0.154	0.140	0.218	0.191	∠⁄2 2 ¹ ∕2	2/4
$2 \times 2 \times 1$	2.075	2 275	0.000	0.000	0.100	0.100	0.104	0.154	0.210	0.219	2/2	2 03/
$2/2 \wedge 2/2 \wedge 2$ $2^{1}/2 \times 2^{1}/2 \times 1^{1}/2$	2.875	1 900	0.083	0.005	0.120	0.109	0.203	0.134	0.276	0.218	3	∠⁄4 2 ⁵ ⁄
$2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$ $2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{4}$	2.875	1.660	0.083	0.065	0.120	0.109	0.200	0.140	0.276	0.191	3	2/8 21/2
$3 \times 3 \times 2^{1/2}$	3 500	2 875	0.083	0.065	0.120	0.120	0.216	0.203	0.300	0.276	3%	31/
$3 \times 3 \times 2$	3.500	2.375	0.083	0.065	0.120	0.109	0.216	0.154	0.300	0.218	3¾	3
$3 \times 3 \times 1^{\frac{1}{2}}$	3.500	1.900	0.083	0.065	0.120	0.109	0.216	0.145	0.300	0.200	3 ³ / ₈	21/8
$3\frac{1}{2} \times 3\frac{1}{2} \times 3$	4.000	3.500	0.083	0.083	0.120	0.120	0.226	0.216	0.318	0.300	3 ¾	35%
$3\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}$	4.000	2.875	0.083	0.083	0.120	0.120	0.226	0.203	0.318	0.276	3 ³ ⁄ ₄	2 ¹ / ₂
$3\frac{1}{2} \times 3\frac{1}{2} \times 2$	4.000	2.375	0.083	0.065	0.120	0.109	0.226	0.154	0.318	0.218	3 ¾	3 ¹ ⁄ ₄
$3^{1}_{2} \times 3^{1}_{2} \times 1^{1}_{2}$	4.000	1.900	0.083	0.065	0.120	0.109	0.226	0.145	0.318	0.200	3 ¾	3 ¹ / ₈
$4 \times 4 \times 3^{1/2}$	4.500	4.000	0.083	0.083	0.120	0.120	0.237	0.226	0.337	0.318	4 ¹ / ₈	4
$4 \times 4 \times 3$	4.500	3.500	0.083	0.083	0.120	0.120	0.237	0.216	0.337	0.300	4 ¹ / ₈	31%
$4 \times 4 \times 2^{\frac{1}{2}}$	4.500	2.875	0.083	0.083	0.120	0.120	0.237	0.203	0.337	0.276	41/8	3 ¾
$4 \times 4 \times 2$	4.500	2.375	0.083	0.065	0.120	0.120	0.237	0.154	0.337	0.218	41/8	$3\frac{1}{2}$
$5 \times 5 \times 4$	5.563	4.500	0.109	0.083	0.134	0.120	0.258	0.237	0.375	0.337	41/8	45/8
$5 \times 5 \times 3\frac{1}{2}$	5.563	4.000	0.109	0.083	0.134	0.120	0.258	0.226	0.375	0.318	41/8	4½
$5 \times 5 \times 3$	5.563	3.500	0.109	0.083	0.134	0.120	0.258	0.216	0.375	0.300	41/8	43%
5 \times 5 $\times 2\frac{1}{2}$	5.563	2.875	0.109	0.083	0.134	0.120	0.258	0.203	0.375	0.276	41/8	41/4
6 × 6 ×5	6.625	5.563	0.109	0.109	0.134	0.134	0.280	0.258	0.432	0.375	55/8	5%
$6 \times 6 \times 4$	6.625	4.500	0.109	0.083	0.134	1.120	0.280	0.237	0.432	0.337	5%	51/8
$6 \times 6 \times 3\frac{1}{2}$	6.625	4.000	0.109	0.083	0.134	1.120	0.280	0.226	0.432	0.318	5%	5
0 X 0 X 3	0.020	3.500	0.109	0.083	0.134	1.120	0.280	0.210	0.432	0.300	5 %	4%

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114



Tees (Reducing)

Sch 5S. 10S, 40S, 80S



ASME B16.9 MSS SP-4	13										(in incl	nes)
Nominal	Outside	Outside			W	all Thi	ckness	; T			Center	to End
Pipe	Diameter	Diameter	5	is	10)s	40)s	8	0s	Run	Outlet
Size	OD 1		T 1	T_2	T ₁	T_2	T ₁	T_2	T 1	T 2	С	М
$8 \times 8 \times 6$	8.625	6.625	0.109	0.109	0.148	0.134	0.322	0.280	0.500	0.432	7	65/8
$8 \times 8 \times 5$	8.625	5.563	0.109	0.109	0.148	0.134	0.322	0.258	0.500	0.375	7	6¾
$8 \times 8 \times 4$	8.625	4.500	0.109	0.083	0.148	0.120	0.322	0.237	0.500	0.337	7	61/8
10 $ imes$ 10 $ imes$ 8	10.750	8.625	0.134	0.109	0.165	0.148	0.365	0.322	0.500	0.500	$8\frac{1}{2}$	8
10 $ imes$ 10 $ imes$ 6	10.750	6.625	0.134	0.109	0.165	0.134	0.365	0.280	0.500	0.432	$8\frac{1}{2}$	7½
10 $ imes$ 10 $ imes$ 5	10.750	5.563	0.134	0.109	0.165	0.134	0.365	0.258	0.500	0.375	$8\frac{1}{2}$	$7\frac{1}{2}$
12 ×12 ×10	12.750	10.750	0.156	0.134	0.180	0.165	0.375	0.365	0.500	0.500	10	$9^{1/2}$
12 $ imes$ 12 $ imes$ 8	12.750	8.625	0.156	0.109	0.180	0.148	0.375	0.322	0.500	0.500	10	9
12 $ imes$ 12 $ imes$ 6	12.750	6.625	0.156	0.109	0.180	0.134	0.375	0.280	0.500	0.432	10	85/8
14 ×14 ×12	14.000	12.750	0.156	0.156	0.188	0.180	—	—	-	-	11	10 %
14 $ imes$ 14 $ imes$ 10	14.000	10.750	0.156	0.134	0.188	0.165	—	—	-	—	11	101/8
14 $ imes$ 14 $ imes$ 8	14.000	8.625	0.156	0.109	0.188	0.148	—	—	-	—	11	9 ³ ⁄ ₄
16 ×16 ×14	16.000	14.000	0.165	0.156	0.188	0.188	—	—	-	-	12	12
16 ×16 ×12	16.000	12.750	0.165	0.156	0.188	0.180	—	—	-	—	12	$11\frac{5}{8}$
16 ×16 ×10	16.000	10.750	0.165	0.134	0.188	0.165	—	—	-	—	12	$11\frac{1}{8}$
18 ×18 ×16	18.000	16.000	0.165	0.165	0.188	0.188	—	—	-	-	$13\frac{1}{2}$	13
18 ×18 ×14	18.000	14.000	0.165	0.156	0.188	0.188	—	—	-	—	$13\frac{1}{2}$	13
18 ×18 ×12	18.000	12.750	0.165	0.156	0.188	0.180	—	-	-	-	$13\frac{1}{2}$	$12\frac{3}{8}$
20 ×20 ×18	20.000	18.000	0.188	0.165	0.218	0.188	—	—	-	—	15	$14\frac{1}{2}$
20 ×20 ×16	20.000	16.000	0.188	0.165	0.218	0.188	-	—	—	-	15	14
20 ×20 ×14	20.000	14.000	0.188	0.156	0.218	0.188	—	—	-	—	15	14
22 ×22 ×20	22.000	20.000	0.188	0.188	0.218	0.218	—	—	-	—	$16\frac{1}{2}$	16
22 ×22 ×18	22.000	18.000	0.188	0.165	0.218	0.188	—	—	-	-	$16\frac{1}{2}$	$15\frac{1}{2}$
22 ×22 ×16	22.000	16.000	0.188	0.165	0.218	0.188	—	—	-	-	$16\frac{1}{2}$	15
24 ×24 ×22	24.000	22.000	0.218	0.188	0.250	0.218	-	—	-	-	17	17
24 ×24 ×20	24.000	20.000	0.218	0.188	0.250	0.218	—	—	-	—	17	17
24 ×24 ×18	24.000	18.000	0.218	0.165	0.250	0.188	-	_	-	-	17	$16^{1/2}$
30 ×30 ×24	30.000	24.000	0.250	0.218	-	-	-	_	-	_	22	21
30 ×30 ×22	30.000	22.000	0.250	0.188	-	—	-	—	-	-	22	$20\frac{1}{2}$
30 ×30 ×20	30.000	20.000	0.250	0.188	-	_	_	_	_	_	22	20

For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

Reducers

Sch 5S. 10S, 40S, 80S





ASME B16.9 MS	SS SP-43									(in	inches)
Nominal	Outside	Outside			V	Vall Thio	kness 1	Г			End to End
Pipe	Diameter	Diameter	5	s	10)s	4()s	80)s	
Size	OD 1		T 1	T 2	T 1	T_2	T	T 2	Ti	T ₂	••
$\frac{3}{4} \times \frac{1}{2}$	1.050	0.840	0.065	0.065	0.083	0.083	0.113	0.109	0.154	0.147	11/2
$\begin{array}{cccc} 1 & imes & {}^{3}\!$	$1.315 \\ 1.315$	1.050 0.840	0.065 0.065	0.065 0.065	$0.109 \\ 0.109$	0.083 0.083	0.133 0.133	$0.113 \\ 0.109$	$0.179 \\ 0.179$	0.154 0.147	2 2
$\begin{array}{c} 1^{1}\!\!\!\!/_{4} \times 1 \\ 1^{1}\!\!\!\!/_{4} \times {}^{3}\!\!\!/_{4} \\ 1^{1}\!\!\!/_{4} \times {}^{1}\!\!\!/_{2} \end{array}$	1.660 1.660 1.660	1.135 1.050 0.840	0.065 0.065 0.065	0.065 0.065 0.065	0.109 0.109 0.109	0.109 0.083 0.083	0.140 0.140 0.140	0.133 0.113 0.109	0.191 0.191 0.191	0.179 0.154 0.147	2 2 2
$\begin{array}{c} 1^{1}\!\!\!\!\!\!\!/_{2} \times 1^{1}\!\!\!\!/_{4} \\ 1^{1}\!\!\!\!\!/_{2} \times 1 \\ 1^{1}\!\!\!\!\!\!/_{2} \times 3^{3}\!\!\!\!/_{4} \\ 1^{1}\!\!\!\!/_{2} \times 3^{1}\!\!\!\!/_{2} \end{array}$	1.900 1.900 1.900 1.900	1.660 1.315 1.050 0.840	0.065 0.065 0.065 0.065	0.065 0.065 0.065 0.065	0.109 0.109 0.109 0.109	0.109 0.109 0.083 0.083	0.145 0.145 0.145 0.145	0.140 0.133 0.113 0.109	0.200 0.200 0.200 0.200	0.191 0.179 0.154 0.147	$\begin{array}{c} 2^{1}\!$
$\begin{array}{cccc} 2 & \times 1^{1} \\ 2 & \times 1^{1} \\ 2 & \times 1 \\ 2 & \times 1 \\ 2 & \times 3_{4} \end{array}$	2.375 2.375 2.375 2.375 2.375	1.900 1.660 1.315 1.050	0.065 0.065 0.065 0.065	0.065 0.065 0.065 0.065	0.109 0.109 0.109 0.109	0.109 0.109 0.109 0.083	0.154 0.154 0.154 0.154	0.145 0.140 0.133 0.113	0.218 0.218 0.218 0.218	0.200 0.191 0.179 0.154	3 3 3 3
$\begin{array}{c} 2^{1}\!\!\!\!/_{2} \times 2 \\ 2^{1}\!\!\!/_{2} \times 1^{1}\!\!\!/_{2} \\ 2^{1}\!\!\!/_{2} \times 1^{1}\!\!\!/_{4} \end{array}$	2.875 2.875 2.875	2.375 1.900 1.660	0.083 0.083 0.083	0.065 0.065 0.065	0.120 0.120 0.120	0.109 0.109 0.109	0.203 0.203 0.203	0.154 0.145 0.140	0.276 0.276 0.276	0.218 0.200 0.191	$\begin{array}{c} 3^{1}\!$
$\begin{array}{cccc} 3 & \times 2^{1} \\ 3 & \times 2 \\ 3 & \times 1^{1} \\ 3 & \times 1^{1} \\ 3 & \times 1^{1} \\ \end{array}$	3.500 3.500 3.500 3.500	2.875 2.375 1.900 1.660	0.083 0.083 0.083 0.083	0.083 0.065 0.065 0.065	0.120 0.120 0.120 0.120	0.120 0.109 0.109 0.109	0.216 0.216 0.216 0.216	0.203 0.154 0.145 0.140	0.300 0.300 0.300 0.300	0.276 0.218 0.200 0.191	$\begin{array}{c} 3^{1}\!$
$\begin{array}{c} 3^{l}_{2}\times 3\\ 3^{l}_{2}\times 2^{l}_{2}\\ 3^{l}_{2}\times 2\end{array}$	4.000 4.000 4.000	3.500 2.875 2.375	0.083 0.083 0.083	0.083 0.083 0.065	0.120 0.120 0.120	0.120 0.120 0.109	0.226 0.226 0.226	0.216 0.203 0.154	0.318 0.318 0.318	0.300 0.276 0.218	4 4 4
$\begin{array}{rrrr} 4 & \times 3^{1}\!$	4.500 4.500 4.500 4.500	4.000 3.500 2.875 2.375	0.083 0.083 0.083 0.083	0.083 0.083 0.083 0.065	0.120 0.120 0.120 0.120	0.120 0.120 0.120 0.109	0.237 0.237 0.237 0.237	0.226 0.216 0.203 0.154	0.337 0.337 0.337 0.337	0.318 0.300 0.276 0.218	4 4 4 4
$\begin{array}{cccc} 5 & \times 4 \\ 5 & \times 3^{1} \\ 5 & \times 3 \\ 5 & \times 3 \\ 5 & \times 2^{1} \\ \end{array}$	5.563 5.563 5.563 5.563	4.500 4.000 3.500 2.875	0.109 0.109 0.109 0.109	0.083 0.083 0.083 0.083	0.134 0.134 0.134 0.134	0.120 0.120 0.120 0.120	0.258 0.258 0.258 0.258	0.237 0.226 0.216 0.203	0.375 0.375 0.375 0.375	0.337 0.318 0.300 0.276	5 5 5 5
$\begin{array}{ccc} 6 & \times 5 \\ 6 & \times 4 \\ 6 & \times 3^{1/2} \\ 6 & \times 3 \end{array}$	6.625 6.625 6.625 6.625	5.563 4.500 4.000 3.500	0.109 0.109 0.109 0.109	0.109 0.083 0.083 0.083	0.134 0.134 0.134 0.134	0.134 0.120 0.120 0.120	0.280 0.280 0.280 0.280	0.258 0.237 0.226 0.216	0.432 0.432 0.432 0.432	0.375 0.337 0.318 0.300	$\begin{array}{c} 5^{1} \\ 5^{1} \\ 5^{1} \\ 5^{1} \\ 2 \\ 5^{1} \\ 2 \\ 5^{1} \\ 2 \end{array}$

For Bevel Details See Page 115
For Dimensional Tolerances See Page 114



(in inches)

End to End H

> 6 6

> 6 7 7

7

8

8 8

13 13

13 14

14

14

15 15 15

20 20 20

20 20 20

20 20

20

24

24

24

Reducers

Sch 5S, 10S, 40S, 80S





 \mathbf{T}_2

0.432 0.375 0.337

0.500

0.432 0.375

0.500

0.500

0.432

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ASM	E B16.9 MS	SS SP-43								
N	ominal	Outside	Outside			V	Vall Thio	ckness ⁻	Г	
	Pipe	Diameter	Diameter	5	S	10)s	4()s	80
	Size	OD 1		T 1	T 2	T 1	T 2	T 1	T 2	T 1
8 8 8	$\begin{array}{ccc} \times & 6 \\ \times & 5 \\ \times & 4 \end{array}$	8.625 8.625 8.625	6.625 5.563 4.500	0.109 0.109 0.109	0.109 0.109 0.083	0.148 0.148 0.148	0.134 0.134 0.120	0.322 0.322 0.322	0.280 0.258 0.237	0.500 0.500 0.500
10 10 10	$\begin{array}{ccc} \times & 8 \\ \times & 6 \\ \times & 5 \end{array}$	10.750 10.750 10.750	8.625 6.625 5.563	0.134 0.134 0.134	0.109 0.109 0.109	0.165 0.165 0.165	0.148 0.134 0.134	0.365 0.365 0.365	0.322 0.280 0.258	0.500 0.500 0.500
12 12 12	imes10 $ imes$ 8 $ imes$ 6	12.750 12.750 12.750	10.750 8.625 6.625	0.156 0.156 0.156	0.134 0.109 0.109	0.180 0.180 0.180	0.165 0.148 0.134	0.375 0.375 0.375	0.365 0.322 0.280	0.500 0.500 0.500
14 14 14	×12 ×10 × 8	14.000 14.000 14.000	12.750 10.750 8.625	0.156 0.156 0.156	0.156 0.134 0.109	0.188 0.188 0.188	0.180 0.165 0.148			
16 16 16	×14 ×12 ×10	16.000 16.000 16.000	14.000 12.750 10.750	0.165 0.165 0.165	0.156 0.156 0.134	0.188 0.188 0.188	0.188 0.180 0.165			_ _ _
18 18 18	×16 ×14 ×12	18.000 18.000 18.000	16.000 14.000 12.750	0.165 0.165 0.165	0.165 0.156 0.156	0.188 0.188 0.188	0.188 0.188 0.180		_ _ _	_ _ _
20 20 20	imes18	20.000 20.000 20.000	18.000 16.000 14.000	0.188 0.188 0.188	0.165 0.165 0.156	0.218 0.218 0.218	0.188 0.188 0.188			_ _ _
22 22 22	×20 ×18 ×16	22.000 22.000 22.000	20.000 18.000 16.000	0.188 0.188 0.188	0.188 0.165 0.165	0.218 0.218 0.218	0.218 0.188 0.188			_ _ _
24 24 24	×22 ×20 ×18	24.000 24.000 24.000	22.000 20.000 18.000	0.218 0.218 0.218	0.188 0.188 0.165	0.250 0.250 0.250	0.218 0.218 0.188			_ _ _

• For Bevel Details See Page 115

30

30

30

 $\times 24$

×22 ×20

• For Dimensional Tolerances See Page 114

• Wall Thickness Conform to ASME B 36.19M

30.000

30.000

30.000

24.000

22.000

20.000

0.250

0.250

0.250

0.218

0.188

0.188

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180°Elbows(Long, Short) Caps

Sch 5S, 10S, 40S, 80S

ID ΩD



ASME B16.9, MSS SP-43

ASME B1	6.9, MSS SP	2-43								(i	n inches	5)
Nominal	Outside	N	/all Thic	kness ⁻	Г	l ength	Limiting Wall Thickness For	l enath	Lo	ng	Sh	ort
Size	OD	5s	10s	40s	80s	E	Length E	E	Ρ	к	Ρ	к
$\frac{1}{2}$	0.840	0.065	0.083	0.109	0.147	1.00	0.18	1.00	3.00	1.88	_	_
$\frac{3}{4}$	1.050	0.065	0.083	0.113	0.154	1.00	0.15	1.00	2.25	1.69	-	-
1	1.315	0.065	0.109	0.133	0.179	1.50	0.18	1.50	3.00	2.19	2.00	1.62
1^{1}_{4}	1.660	0.065	0.109	0.140	0.191	1.50	0.19	1.50	3.75	2.75	2.50	2.06
$1^{1/2}$	1.900	0.065	0.109	0.145	0.200	1.50	0.20	1.50	4.50	3.25	3.00	2.44
2	2.375	0.065	0.109	0.154	0.218	1.50	0.22	1.75	6.00	4.19	4.00	3.19
$2^{1/2}$	2.875	0.083	0.120	0.203	0.276	1.50	0.28	2.00	7.50	5.19	5.00	3.94
3	3.500	0.083	0.120	0.216	0.300	2.00	0.30	2.50	9.00	6.25	6.00	4.75
3 ¹ / ₂	4.000	0.083	0.120	0.226	0.318	2.50	0.32	3.00	10.50	7.25	7.00	5.50
4	4.500	0.083	0.120	0.237	0.337	2.50	0.34	3.00	12.00	8.25	8.00	6.25
5	5.563	0.109	0.134	0.258	0.375	3.00	0.38	3.50	15.00	10.31	10.00	7.75
6	6.625	0.109	0.134	0.280	0.432	3.50	0.43	4.00	18.00	12.31	12.00	9.31
8	8.625	0.109	0.148	0.322	0.500	4.00	0.50	5.00	24.00	16.31	16.00	12.31
10	10.750	0.134	0.165	0.365	0.500	5.00	0.50	6.00	30.00	20.38	20.00	15.38
12	12.750	0.156	0.180	0.375	0.500	6.00	0.50	7.00	36.00	24.38	24.00	18.38
14	14.000	0.156	0.188	—	—	6.50	0.50	7.50	42.00	28.00	28.00	21.00
16	16.000	0.165	0.188	—	—	7.00	0.50	8.00	48.00	32.00	32.00	24.00
18	18.000	0.165	0.188	-	-	8.00	0.50	9.00	54.00	36.00	36.00	27.00
20	20.000	0.188	0.218	—	—	9.00	0.50	10.00	60.00	40.00	40.00	30.00
22	22.000	0.188	0.218	—	—	10.00	0.50	10.00	66.00	44.00	44.00	33.00
24	24.000	0.218	0.250	—	—	10.50	0.50	12.00	72.00	48.00	48.00	36.00
30	30.000	0.250	0.312	—	—	10.50	—	-	_	_	_	-

• Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E."

• Length E1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS 24 and smaller for NPS 26 and lager, length E1 shall be by agreement between manufacturer and Purchaser.

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114













(in inches)

			ELE	BOW		
NPS	OD	S	СН	LO	NG	SHORT
		STD	X-S	Α	В	А
50	50.0	9.5	12.7	75.00	31.07	50.00
52	52.0	9.5	12.7	78.00	32.31	52.00
54	54.0	9.5	12.7	81.00	33.55	54.00
56	56.0	9.5	12.7	84.00	34.79	56.00
58	58.0	9.5	12.7	87.00	36.04	58.00
60	60.0	9.5	12.7	90.00	37.28	60.00
62	62.0	9.5	12.7	93.00	38.52	62.00
64	64.0	9.5	12.7	96.00	39.76	64.00
66	66.0	9.5	12.7	99.00	41.01	66.00
68	68.0	9.5	12.7	102.00	42.25	68.00
70	70.0	9.5	12.7	105.00	43.49	70.00
72	72.0	9.5	12.7	108.00	44.74	72.00
74	74.0	9.5	12.7	111.00	45.98	74.00
76	76.0	9.5	12.7	114.00	47.22	76.00
78	78.0	9.5	12.7	117.00	48.46	78.00
80	80.0	9.5	12.7	120.00	49.71	80.00
82	82.0	9.5	12.7	123.00	50.95	82.00

-. REDUCER : 50" 이상 전 사양 CONICAL TYPE으로 제작 가능, "H"치수는 고객의 사양에 의거.

-. CAP : 50["] 이상 전 사양 제작 가능, "M"치수는 고객의 사양에 의거

Lap Joint(Stub Ends)

Sch 5S, 10S, 40S,



(in inches)

MSS SP-43

Nominal	Outside	Longeth	Dia. of	of Radius of Fillet Wall Thickness T Approx. Weight(kg			Wall Thickness T		nt(kg)		
Pipe Size	Diameter OD	F	Nominal & Maximum	A Nominal Max	B Max.	Sch 5s	Sch 10s	Sch 40s	Sch 5s	Sch 10s	Sch 40s
$1/_{2}$	0.84	2.00	1.38	0.12	0.03	0.065	0.083	0.109	0.049	0.062	0.079
3/4	1.05	2.00	1.69	0.12	0.03	0.065	0.083	0.113	0.064	0.081	0.101
1	1.32	2.00	2.00	0.12	0.03	0.065	0.109	0.133	0.082	0.134	0.160
$1^{1}/_{4}$	1.66	2.00	2.50	0.19	0.03	0.065	0.109	0.140	0.109	0.178	0.225
$1^{1}/_{2}$	1.90	2.00	2.88	0.25	0.03	0.065	0.109	0.145	0.129	0.213	0.279
2	2.38	2.50	3.62	0.31	0.03	0.065	0.109	0.154	0.204	0.338	0.471
2 ¹ / ₂	2.88	2.50	4.12	0.31	0.03	0.083	0.120	0.203	0.313	0.448	0.740
3	3.50	2.50	5.00	0.38	0.03	0.083	0.120	0.216	0.400	0.574	1.01
$3^{1}/_{2}$	4.00	3.00	5.50	0.38	0.03	0.083	0.120	0.226	0.522	0.150	1.38
4	4.50	3.00	6.19	0.44	0.03	0.083	0.120	0.237	0.606	0.870	1.68
5	5.56	3.00	7.31	0.44	0.06	0.109	0.134	0.258	0.985	1.21	2.28
6	6.62	3.50	8.50	0.50	0.06	0.109	0.134	0.280	1.34	1.64	3.37
8	8.62	4.00	10.62	0.50	0.06	0.109	0.148	0.322	1.96	2.65	5.67
10	10.75	5.00	12.75	0.50	0.06	0.134	0.165	0.365	3.57	4.38	9.55
12	12.75	6.00	15.00	0.50	0.06	0.156	0.180	0.375	5.85	6.74	13.8
14	14.00	6.00	16.25	0.50	0.06	0.156	0.188	×	6.42	7.73	×
16	16.00	6.00	18.50	0.50	0.06	0.165	0.188	×	7.91	9.00	×
18	18.00	6.00	21.00	0.50	0.06	0.165	0.188	×	9.24	10.5	×
20	20.00	6.00	23.00	0.50	0.06	0.188	0.218	×	11.7	13.5	×
24	24.00	6.00	27.25	0.50	0.06	0.218	0.250	×	16.5	18.9	×

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 120

• Wall Thickness Conform to ASME B 36.19M

1. Minimun Lap Thickness Shall Not Be Less Than Nominnal Wall Thickness.

2. Contact Faces of Stub Ends Shall Have a Modified Spiral or Concentric Serration.



Pipe Bend

STD (Sch 40)





ASME B16.9		(in inches)					
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T				
	0.040	0.000	0.400				
γ_2	0.840	0.622	0.109				
$\frac{3}{4}$	1.050	0.824	0.113				
1	1.315	1.049	0.133				
	1.660	1.380	0.140				
1½	1.900	1.610	0.145				
2	2.375	2.067	0.154				
21/2	2.875	2.469	0.203				
3	3.500	3.068	0.216				
3½	4.000	3.548	0.226				
4	4.500	4.026	0.237				
5	5.563	5.047	0.258				
6	6.625	6.065	0.280				
8	8.625	7.981	0.322				
10	10.750	10.020	0.365				
12	12.750	12.000	0.375				
*12	12.750	11.938	0.406				
14	14.000	13.250	0.375				
*14	14.000	13.124	0.438				
16	16.000	15.250	0.375				
*16	16.000	15.000	0.500				
18	18.000	17.250	0.375				

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• TL, R, Ø : Specified in Purchaser order

For General Bending Range See Page 58

• Asterisks(*) Denote Sch 40



AGIVIL D10.9		(III IIICIIES)					
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T				
*18	18.000	16.876	0.562				
20	20.000	19.250	0.375				
*20	20.000	18.812	0.594				
22	22.000	21.250	0.375				
24	24.000	23.250	0.375				
*24	24.000	22.624	0.688				
26	26.000	25.250	0.375				
28	28.000	27.250	0.375				
30	30.000	29.250	0.375				
32	32.000	31.250	0.375				
*32	32.000	30.624	0.688				
34	34.000	33.250	0.375				
*34	34.000	32.624	0.688				
36	36.000	35.250	0.375				
*36	36.000	34.500	0.750				
38	38.000	37.250	0.375				
40	40.000	39.250	0.375				
42	42.000	41.250	0.375				
44	44.000	43.250	0.375				
46	46.000	45.250	0.375				
48	48.000	47.250	0.375				

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• TL, R, \emptyset : Specified in Purchaser order

• For General Bending Range See Page 58

Asterisks(*) Denote Sch 40









ASME B16.9			(in inches)				
Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T				
$\frac{1}{2}$	0.840	0.546	0.147				
3/4	1.050	0.742	0.154				
1	1.315	0.957	0.179				
1¼	1.660	1.278	0.191				
$1\frac{1}{2}$	1.900	1.500	0.200				
2	2.375	1.939	0.218				
21/2	2.875	2.323	0.276				
3	3.500	2.900	0.300				
31⁄2	4.000	3.364	0.318				
4	4.500	3.826	0.337				
5	5.563	4.813	0.375				
6	6.625	5.761	0.432				
8	8.625	7.625	0.500				
10	10.750	9.750	0.500				
*10	10.750	9.562	0.594				
12	12.750	11.750	0.500				
*12	12.750	11.374	0.688				
14	14.000	13.000	0.500				
*14	14.000	12.500	0.750				
16	16.000	15.000	0.500				
*16	16.000	14.312	0.844				

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• TL, R, Ø : Specified in Purchaser order

• For General Bending Range See Page 58

Asterisks(*) Denote Sch 80



	ASME B16.9			(in inches)			
	Nominal Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T			
	18	18.000	17.000	0.500			
	*18	18.000	16.124	0.938			
	20	20.000	19.000	0.500			
	*20	20.000	17.938	1.031			
	22	22.000	21.000	0.500			
	*22	22.000	19.750	1.125			
	24	24.000	23.000	0.500			
	*24	24.000	21.562	1.219			
	26	26.000	25.000	0.500			
	28	28.000	27.000	0.500			
	30	30.000	29.000	0.500			
	32	32.000	31.000	0.500			
	34	34.000	33.000	0.500			
	36	36.000	35.000	0.500			
	38	38.000	37.000	0.500			
	40	40.000	39.000	0.500			
	42	42.000	41.000	0.500			
	44	44.000	43.000	0.500			
	46	46.000	45.000	0.500			
	48	48.000	47.000	0.500			
l							

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

• TL, R, Ø : Specified in Purchaser order

• For General Bending Range See Page 58

Asterisks(*) Denote Sch 80



Reducers

Sch20,60,100,120,140,160,XXS





(in inches)

ASME B16.9

Nominal	Outside	Wall Thickness T									
Size	OD	Sch 20	Sch 60	Sch 100	Sch 120	Sch 140	Sch 160	XXS			
$\frac{1}{2}$	0.840	_	_	_	_	_	0.188	0.294			
$\frac{3}{4}$	1.050	_	_	_	_	_	0.219	0.308			
1	1.315	_	-	_	-	_	0.250	0.358			
$1\frac{1}{4}$	1.660	_	-	_	_	_	0.250	0.382			
$1\frac{1}{2}$	1.900	_	-	_	-	_	0.281	0.400			
2	2.375	_	-	_	_	_	0.344	0.436			
2 ¹ / ₂	2.875	_	-	_	_	_	0.375	0.552			
3	3.500	_	-	_	-	-	0.438	0.600			
4	4.500	_	-	_	0.438	-	0.531	0.674			
5	5.563	_	-	_	0.500	-	0.625	0.750			
6	6.625	_	-	_	0.562	-	0.719	0.864			
8	8.625	0.250	0.406	0.594	0.719	0.812	0.906	0.875			
10	10.750	0.250	0.500	0.719	0.844	1.000	1.125	1.000			
12	12.750	0.250	0.562	0.844	1.000	1.125	1.312	1.000			
14	14.000	0.312	0.594	0.938	1.094	1.250	1.406	_			
16	16.000	0.312	0.656	1.031	1.219	1.438	1.594	_			
18	18.000	0.312	0.750	1.156	1.375	1.562	1.781	_			
20	20.000	0.375	0.812	1.281	1.500	1.750	1.969	-			
22	22.000	0.375	0.875	1.375	1.625	1.875	2.125	_			
24	24.000	0.375	0.969	1.531	1.812	2.062	2.344	-			

• For Bevel Details See Page 115

• For Dimensional Tolerances See Page 114

TL, R, Ø: Specified in Purchaser order
For General Bending Range See Page 58

Generl Bending Range



Diameter to Wall Thickness Ration (T/t)

Where :

D = Pipe Diameter in mm

t = Pipe Wall Thickness in mm

R = Bending Radius in mm

- Max. Size(O.D) : 48inch
- Max. Pipe Thickness : 50mm





KS/JIS

- Steel Butt-Weld Pipe Fittings ___ P61~P72
- Steel Plate Butt-Weld Fittings __ P73~P77
- Stainless Steel Butt-Weld Fittings __ P78~P84







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

SPP . SGP





KS B1522, JIS	B2311			(in millimeters)					
Nominal	Outside	Inside	Wall	Lo	ng	Sho	ort		
Size	OD	ID ID	T	Α	В	Α	В		
$\frac{1}{2}$	21.7	16.1	2.8	38.1	15.8	-	-		
3/4	27.2	21.6	2.8	38.1	15.8	-	-		
1	34.0	27.6	3.2	38.1	15.8	25.4	-		
1 ¹ ⁄ ₄	42.7	35.7	3.5	47.6	19.7	31.8	13.2		
$1\frac{1}{2}$	48.6	41.6	3.5	57.2	23.7	38.1	15.8		
2	60.5	52.9	38.	76.2	31.6	50.8	21.0		
2 ¹ / ₂	76.3	67.9	4.2	95.3	39.5	63.5	26.3		
3	89.1	80.7	4.2	114.3	47.3	76.2	31.6		
$3\frac{1}{2}$	101.6	93.2	4.2	133.4	55.3	88.9	36.8		
4	114.3	105.3	4.5	152.4	63.1	101.6	42.1		
5	139.8	130.8	4.5	190.5	78.9	127.0	52.6		
6	165.2	155.2	5.0	228.6	94.7	152.4	63.1		
8	216.3	204.7	5.8	304.8	126.2	203.2	84.2		
10	267.4	254.2	6.6	381.0	157.8	254.0	105.2		
12	318.5	304.7	6.9	457.2	189.4	304.8	126.2		
14	355.6	339.8	7.9	533.4	220.9	355.6	147.3		
16	406.4	390.6	7.9	609.6	252.5	406.4	168.3		
18	457.2	441.4	7.9	685.8	284.1	457.2	189.4		
20	508.0	492.2	7.9	762.0	315.6	508.0	210.4		

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

Tees

SPP . SGP

KS B1522, JIS B2311



Straight

(in millimeters)

С

M

Nominal	Run				Outlet			
Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Outside Diameter OD 2	Inside Diameter ID 2	Wall Thickness T ₂	С	М
$\frac{1}{2}$	21,7	16.1	2.8	21.7	16.1	2.8	25.4	25.4
$\frac{3}{4}$	27,2	21.6	2.8	21.2	21.6	2.8	28.6	28.6
$\frac{3}{4} \times \frac{3}{4} \times \frac{1}{2}$	27,2	21.6	2.8	21.7	16.1	2.8	28.6	28.6
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	34.0	27.6	3.2	34.0	27.6	3.2	38.1	38.1
	34.0	27.6	3.2	27.2	21.6	2.8	38.1	38.1
	34.0	27.6	3.2	21.7	16.1	2.8	38.1	38.1
$ \begin{array}{c} 1^{1}_{4} \\ 1^{1}_{4} \times 1^{1}_{4} \times 1 \\ 1^{1}_{4} \times 1^{1}_{4} \times 3_{4} \end{array} $	42.7	35.7	3.5	42.7	35.7	3.5	47.6	47.6
	42.7	35.7	3.5	34.0	27.6	3.2	47.6	47.6
	42.7	35.7	3.5	27.2	21.6	2.8	47.6	47.6
$\begin{array}{c} 1^{\frac{1}{2}} \\ 1^{\frac{1}{2}} \times 1^{\frac{1}{2}} \times 1^{\frac{1}{4}} \\ 1^{\frac{1}{2}} \times 1^{\frac{1}{2}} \times 1 \\ 1^{\frac{1}{2}} \times 1^{\frac{1}{2}} \times 1 \end{array}$	48.6	41.6	3.5	48.6	41.6	3.5	57.2	57.2
	48.6	41.6	3.5	42.7	35.7	3.5	57.2	57.2
	48.6	41.6	3.5	34.0	27.6	3.2	57.2	57.2
	48.6	41.6	3.5	27.2	21.6	2.8	57.2	57.2
$\begin{array}{cccc} & & & \\ 2 & \times 2 & \times 1\frac{1}{2} \\ 2 & \times 2 & \times 1\frac{1}{4} \\ 2 & \times 2 & \times 1 \end{array}$	60.5	52.9	3.8	60.5	52.9	3.8	63.5	63.5
	60.5	52.9	3.8	48.6	41.6	3.5	63.5	60.3
	60.5	52.9	3.8	42.7	35.7	3.5	63.5	57.2
	60.5	52.9	3.8	34.0	27.6	3.2	63.5	50.8
$\begin{array}{c} 2^{1} \frac{1}{2} \\ 2^{1} \frac{1}{2} \times 2^{1} \frac{1}{2} \times 2 \\ 2^{1} \frac{1}{2} \times 2^{1} \frac{1}{2} \times 1^{1} \frac{1}{2} \\ 2^{1} \frac{1}{2} \times 2^{1} \frac{1}{2} \times 1^{1} \frac{1}{4} \end{array}$	76.3	67.9	4.2	76.3	67.9	4.2	76.2	76.2
	76.3	67.9	4.2	60.5	52.9	3.8	76.2	69.9
	76.3	67.9	4.2	48.6	41.6	3.5	76.2	66.7
	76.3	67.9	4.2	42.7	35.7	3.5	76.2	63.5
$\begin{array}{ccc} & & & \\ 3 & \times 3 & \times 2^{1/_2} \\ 3 & \times 3 & \times 2 \\ 3 & \times 3 & \times 1^{1/_2} \end{array}$	89.1	80.7	4.2	89.1	80.7	4.2	85.7	85.7
	89.1	80.7	4.2	76.3	67.9	4.2	85.7	82.6
	89.1	80.7	4.2	60.5	52.9	3.8	85.7	76.2
	89.1	80.7	4.2	48.6	41.6	3.5	85.7	73.0
$3\frac{1}{2}$ $3\frac{1}{2} \times 3\frac{1}{2} \times 3$ $3\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}$ $3\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}$ $3\frac{1}{2} \times 3\frac{1}{2} \times 2$ $3\frac{1}{2} \times 3\frac{1}{2} \times 1\frac{1}{2}$	101.6 101.6 101.6 101.6 101.6	93.2 93.2 93.2 93.2 93.2 93.2	4.2 4.2 4.2 4.2 4.2 4.2	101.6 89.1 76.3 60.5 48.6	93.2 80.7 67.9 52.9 41.6	4.2 4.2 4.2 3.8 3.5	95.3 95.3 95.3 95.3 95.3	95.3 92.1 88.9 82.6 79.4
$\begin{array}{cccc} & & & \\ 4 & \times 4 & \times 3^{\frac{1}{2}} \\ 4 & \times 4 & \times 3 \\ 4 & \times 4 & \times 2^{\frac{1}{2}} \\ 4 & \times 4 & \times 2 \end{array}$	114.3	105.3	4.5	114.3	105.3	4.5	104.8	104.8
	114.3	105.3	4.5	101.6	93.2	4.2	104.8	101.6
	114.3	105.3	4.5	89.1	80.7	4.2	104.8	98.4
	114.3	105.3	4.5	76.3	67.9	4.2	104.8	95.3
	114.3	105.3	4.5	60.5	52.9	3.8	104.8	88.9

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116



4

KS B1522, JIS B	KS B1522, JIS B2311 (in millimeters)								
Nominal		Run			Outlet				
Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Outside Diameter OD ₂	Inside Diameter ID ₂	Wall Thickness T ₂	С	Μ	
$5 \\ 5 \times 5 \times 4 \\ 5 \times 5 \times 3^{1/2} \\ 5 \times 5 \times 3 \\ 5 \times 5 \times 2^{1/2} \\ 5 \times 5 \times 2$	139.8 139.8 139.8 139.8 139.8 139.8	130.8 130.8 130.8 130.8 130.8 130.8 130.8	4.5 4.5 4.5 4.5 4.5 4.5 4.5	139.8 114.3 101.6 89.1 76.3 60.5	130.8 105.3 93.2 80.7 67.9 52.9	4.5 4.5 4.2 4.2 4.2 3.8	123.8 123.8 123.8 123.8 123.8 123.8 123.8	123.8 117.5 114.3 111.1 108.0 104.8	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	165.2 165.2 165.2 165.2 165.2 165.2 165.2	155,2 155,2 155,2 155,2 155,2 155,2	5.0 5.0 5.0 5.0 5.0 5.0 5.0	165.2 139.8 114.3 101.6 89.1 76.3	155.2 130.8 105.3 93.2 80.7 67.9	5.0 4.5 4.5 4.2 4.2 4.2 4.2	142.9 142.9 142.9 142.9 142.9 142.9 142.9	142.9 136.5 130.2 127.0 123.8 120.7	
	216.3	204.7	5.8	216.3	204.7	5.8	177.8	177.8	
	216.3	204.7	5.8	165.2	155.2	5.0	177.8	168.3	
	216.3	204.7	5.8	139.8	130.8	4.5	177.8	161.9	
	216.3	204.7	5.8	114.3	105.3	4.5	177.8	155.6	
$ 10 10 \times 10 \times 8 10 \times 10 \times 6 10 \times 10 \times 5 $	267.4	254.2	6.6	267.4	254.2	6.6	215.9	215.9	
	267.4	254.2	6.6	216.3	204.7	5.8	215.9	203.2	
	267.4	254.2	6.6	165.2	155.2	5.0	215.9	193.7	
	267.4	254.2	6.6	139.8	130.8	4.5	215.9	190.5	
$ 12 12 \times 12 \times 10 12 \times 12 \times 8 12 \times 12 \times 6 $	318.5	304.7	6.9	318.5	304.7	6.9	254.0	254.0	
	318.5	304.7	6.9	267.4	254.2	6.6	254.0	241.3	
	318.5	304.7	6.9	216.3	204.7	5.8	254.0	228.6	
	318.5	304.7	6.9	165.2	155.2	5.0	254.0	219.1	
$14 \\ 14 \times 14 \times 12 \\ 14 \times 14 \times 10 \\ 14 \times 14 \times 8$	355.6	339.8	7.9	355.6	339.8	7.9	279.4	279.4	
	355.6	339.8	7.9	318.5	304.7	6.9	279.4	269.9	
	355.6	339.8	7.9	267.4	254.2	6.6	279.4	257.2	
	355.6	339.8	7.9	216.3	204.7	5.8	279.4	247.7	
$ 16 16 \times 16 \times 14 16 \times 16 \times 14 16 \times 16 \times 10 $	406.4	390.6	7.9	406.4	390.6	7.9	304.8	304.8	
	406.4	390.6	7.9	355.6	339.8	7.9	304.8	304.8	
	406.4	390.6	7.9	318.5	304.7	6.9	304.8	295.3	
	406.4	390.6	7.9	267.4	254.2	6.6	304.8	282.6	
18	457.2	441.4	7.9	457.2	441.4	7.9	342.9	342.9	
18×18×16	457.2	441.4	7.9	406.4	390.6	7.9	342.9	330.2	
18×18×14	457.2	441.4	7.9	355.6	339.8	7.9	342.9	330.2	
18×18×12	457.2	441.4	7.9	318.5	304.7	6.9	342.9	320.7	
20 $20 \times 20 \times 18$ $20 \times 20 \times 16$ $20 \times 20 \times 14$	508.0	492.2	7.9	508.0	492.2	7.9	381.0	381.0	
	508.0	492.2	7.9	457.2	441.4	7.9	381.0	368.0	
	508.0	492.2	7.9	406.4	390.6	7.9	381.0	355.6	
	508.0	492.2	7.9	355.6	339.8	7.9	381.0	355.6	

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

SGP





KS B1522, JIS	(in millimeters)								
Nominal		Large End			Small End				
Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Outside Diameter OD ₂	Inside Diameter ID2	Wall Thickness T ₂	Н		
$\frac{3}{4} \times \frac{1}{2}$	27.2	21.6	2.8	21.7	16.1	2.8	38.1		
$1 \times \frac{3}{4}$	34.0	27.6	3.2	27.2	21.6	2.8	50.8		
$1 \times \frac{1}{2}$	34.0	27.6	3.2	21.7	16.1	2.8	50.8		
$ \begin{array}{c} 1 \frac{1}{4} \times 1 \\ 1 \frac{1}{4} \times \frac{3}{4} \\ 1 \frac{1}{4} \times \frac{1}{2} \end{array} $	42.7	35.7	3.5	34.0	27.6	3.2	50.8		
	42.7	35.7	3.5	27.2	21.6	2.8	50.8		
	42.7	35.7	3.5	21.7	16.1	2.8	50.8		
$ \begin{array}{c} 1_{\frac{1}{2}} \times 1_{\frac{1}{4}} \\ 1_{\frac{1}{2}} \times 1 \\ 1_{\frac{1}{2}} \times 3_{\frac{1}{4}} \end{array} $	48.6	41.6	3.5	42.7	35.7	3.5	63.5		
	48.6	41.6	3.5	34.0	27.6	3.2	63.5		
	48.6	41.6	3.5	27.2	21.6	2.8	63.5		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	60.5	52.9	3.8	48.6	41.6	3.5	76.2		
	60.5	52.9	3.8	42.7	35.7	3.5	76.2		
	60.5	52.9	3.8	34.0	27.6	3.2	76.2		
	60.5	52.9	3.8	27.2	21.6	2.8	76.2		
$\begin{array}{c} 2^{1} \frac{1}{2} \times 2 \\ 2^{1} \frac{1}{2} \times 1^{1} \frac{1}{2} \\ 2^{1} \frac{1}{2} \times 1^{1} \frac{1}{4} \\ 2^{1} \frac{1}{2} \times 1 \end{array}$	76.3	67.9	4.2	60.5	52.9	3.8	88.9		
	76.3	67.9	4.2	48.6	41.6	3.5	88.9		
	76.3	67.9	4.2	42.7	35.7	3.5	88.9		
	76.3	67.9	4.2	34.0	27.6	3.2	88.9		
$\begin{array}{ccc} 3 & \times 2^{1} \\ 3 & \times 2 \\ 3 & \times 1^{1} \\ 3 & \times 1^{1} \\ \end{array}$	89.1	80.7	4.2	76.3	67.9	4.2	88.9		
	89.1	80.7	4.2	60.5	52.9	3.8	88.9		
	89.1	80.7	4.2	48.6	41.6	3.5	88.9		
	89.1	80.7	4.2	42.7	35.7	3.5	88.9		
$\begin{array}{c} 3^{1} \frac{1}{2} \times 3 \\ 3^{1} \frac{1}{2} \times 2^{1} \frac{1}{2} \\ 3^{1} \frac{1}{2} \times 2 \\ 3^{1} \frac{1}{2} \times 1^{1} \frac{1}{2} \end{array}$	101.6 101.6 101.6 101.6	93.2 93.2 93.2 93.2 93.2	4.2 4.2 4.2 4.2	89.1 76.3 60.5 48.6	80.7 67.9 52.9 41.6	4.2 4.2 3.8 3.5	101.6 101.6 101.6 101.6		
$\begin{array}{rrrr} 4 & \times 3^{1} \\ 4 & \times 3 \\ 4 & \times 2^{1} \\ 4 & \times 2 \end{array}$	114.3	105.3	4.5	101.6	93.2	4.2	101.6		
	114.3	105.3	4.5	89.1	80.7	4.2	101.6		
	114.3	105.3	4.5	76.3	67.9	4.2	101.6		
	114.3	105.3	4.5	60.5	52.9	3.8	101.6		
$\begin{array}{cccc} 5 & \times 4 \\ 5 & \times 3^{1} \\ 5 & \times 3 \\ 5 & \times 2^{1} \\ \end{array}$	139.8	130.8	4.5	114.3	105.3	4.5	127.0		
	139.8	130.8	4.5	101.6	93.2	4.2	127.0		
	139.8	130.8	4.5	89.1	80.7	4.2	127.0		
	139.8	130.8	4.5	76.3	67.9	4.2	127.0		

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116



Reducers

SPP . SGP





KS B1522, JIS B2311

KS B1522, JIS	B2311			(in millimeters)						
Nominal		Large End			Small End					
Pipe Size	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Outside Diameter OD 2	Inside Diameter ID 2	Wall Thickness T ₂	н			
6×5 6×4 $6\times3\frac{1}{2}$ 6×3 $6\times2\frac{1}{2}$	165.2	155.2	5.0	139.8	130.8	4.5	139.7			
	165.2	155.2	5.0	114.3	105.3	4.5	139.7			
	165.2	155.2	5.0	101.6	93.2	4.2	139.7			
	165.2	155.2	5.0	89.1	80.7	4.2	139.7			
	165.2	155.2	5.0	76.3	67.9	4.2	139.7			
8×6	216.3	204.7	5.8	165.2	155.2	5.0	152.4			
8×5	216.3	204.7	5.8	139.8	130.8	4.5	152.4			
8×4	216.3	204.7	5.8	114.3	105.3	4.5	152.4			
$8 \times 3^{1/2}$	216.3	204.7	5.8	101.6	93.2	4.2	152.4			
10 imes 8	267.4	254.2	6.6	216.3	204.7	5.8	177.8			
10 imes 6	267.4	254.2	6.6	165.2	155.2	5.0	177.8			
10 imes 5	267.4	254.2	6.6	139.8	130.8	4.5	177.8			
12×10 12×8 12×6 12×5	318.5	304.7	6.9	267.4	254.2	6.6	203.2			
	318.5	304.7	6.9	216.3	204.7	5.8	203.2			
	318.5	304.7	6.9	165.2	155.2	5.0	203.2			
	318.5	304.7	6.9	139.8	130.8	4.5	203.2			
14 imes12	355.6	339.8	7.9	318.5	304.7	6.9	330.2			
14 imes10	355.6	339.8	7.9	267.4	254.2	6.6	330.2			
14 imes8	355.6	339.8	7.9	216.3	204.7	5.8	330.2			
16×14	406.4	390.6	7.9	355.6	339.8	7.9	355.6			
16×12	406.4	390.6	7.9	318.5	304.7	6.9	355.6			
16×10	406.4	390.6	7.9	267.4	254.2	6.6	355.6			
18×16	457.2	441.4	7.9	406.4	390.6	7.9	381.0			
18×14	457.2	441.4	7.9	355.6	339.8	7.9	381.0			
18×12	457.2	441.4	7.9	318.5	304.7	7.9	381.0			
20×18	508.0	492.2	7.9	457.2	441.4	7.9	508.0			
20×16	508.0	492.2	7.9	406.4	390.6	7.9	508.0			
20×14	508.0	492.2	7.9	355.6	339.8	7.9	508.0			

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

180°Elbows(Long, Short) Caps

SPP . SGP





KS B1522, JI	S B2311						(in mi	illimeters)
Nominal	Outside	Inside Diamatar	Wall	_	Lo	ng	She	ort
Size	OD	ID	T	-	Р	К	Р	К
1/2	21.7	16.1	2.8	-	76.2	49.0	-	—
$\frac{3}{4}$	27.2	21.6	2.8	-	76.2	51.7	-	—
1	34.0	27.6	3.2	38.1	76.2	55.1	50.8	42.4
$1^{1}/_{4}$	42.7	35.7	3.5	38.1	95.2	69.0	63.6	53.2
$1^{1/2}$	48.6	41.6	3.5	38.1	114.4	81.5	76.2	62.4
2	60.5	52.9	3.8	38.1	152.4	106.5	101.6	81.1
2 ¹ / ₂	76.3	67.9	4.2	38.1	190.6	133.5	127.0	101.7
3	89.1	80.7	4.2	50.8	228.6	158.9	152.4	120.8
$3^{1/2}$	101.6	93.2	4.2	63.5	266.8	184.2	177.8	139.7
4	114.3	105.3	4.5	63.5	304.8	209.6	203.2	158.8
5	139.8	130.8	4.5	76.2	381.0	260.4	254.0	196.9
6	165.2	155.2	5.0	88.9	457.2	311.2	304.8	235.0
8	216.3	204.7	5.8	101.6	609.6	413.0	406.4	311.4
10	267.4	254.2	6.6	127.0	762.0	514.7	508.0	387.7
12	318.5	304.7	6.9	152.4	914.4	616.5	609.6	464.0
14	355.6	339.8	7.9	165.1	1066.8	711.2	711.2	533.4
16	406.4	390.6	7.9	177.8	1219.2	812.8	812.8	609.6
18	457.2	441.4	7.9	203.2	_	-	—	_
20	508.0	492.2	79	228.6	_	_	_	_

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116



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

Sch 40,80,120,160





KS B1541, JIS B2312 (in millimeters)											eters)		
Nominal	Outside	Scł	า 40	Sch	n 80	Sch	120	Sch	160	Lo	ong	Sh	ort
Size	OD	ID	Т	ID	Т	ID	Т	ID	Т	Α	В	Α	В
$\frac{1}{2}$	21.7	16.1	2.8	14.3	3.7	—	—	-	—	38.1	15.8	-	—
$\frac{3}{4}$	27.2	21.4	2.9	19.4	3.9	-	_	-	—	38.1	15.8	-	-
1	34.0	27.2	3.4	25.0	4.5	-	-	-	-	38.1	15.8	25.4	-
$1\frac{1}{4}$	42.7	35.5	3.6	32.9	4.9	—	—	—	—	47.6	19.7	31.8	13.2
$1^{1}/_{2}$	48.6	41.2	3.7	38.4	5.1	—	—	34.4	7.1	57.2	23.7	38.1	15.8
2	60.5	52.7	3.9	49.5	5.5	—	—	43.1	8.7	76.2	31.6	50.8	21.0
2 ¹ / ₂	76.3	65.9	5.2	62.3	7.0	—	—	57.3	9.5	95.3	39.5	63.5	26.3
3	89.1	78.1	5.5	73.9	7.6	—	—	66.9	11.1	114.3	47.3	76.2	31.6
$3^{1/2}$	101.6	90.2	5.7	85.4	8.1	—	—	76.2	12.7	133.4	55.3	88.9	36.8
4	114.3	102.3	6.0	97.1	8.6	92.1	11.1	87.3	13.5	152.4	63.1	101.6	42.1
5	139.8	126.6	6.6	120.8	9.5	114.4	12.7	108.0	15.9	190.5	78.9	127.0	52.6
6	165.2	151.0	7.1	143.2	11.0	136.6	14.3	128.8	18.2	228.6	94.7	152.4	63.1
8	216.3	199.9	8.2	190.9	12.7	179.9	18.2	170.3	23.0	304.8	126.2	203.2	84.2
10	267.4	248.8	9.3	237.2	15.1	224.6	21.4	210.2	28.6	381.0	157.8	254.0	105.2
12	318.5	297.9	10.3	283.7	17.4	267.7	25.4	251.9	33.3	457.2	189.4	304.8	126.2
14	355.6	333.4	11.1	317.6	19.0	300.0	27.8	284.2	35.7	533.4	220.9	355.6	147.3
16	406.4	381.0	12.7	363.6	21.4	344.6	30.9	325.4	40.5	609.6	252.5	406.4	168.3
18	457.2	428.6	14.3	409.6	23.8	387.4	34.9	-	-	685.8	284.1	457.2	189.4
20	508.0	477.8	15.1	455.6	26.2	431.8	38.1	-	—	762.0	315.6	508.0	210.4

For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

Tees Sch 40,80,120,160





OD

Straight

(in millimeters)

KS B1541, JIS B	2312									neters)
Nominal	Out	side			Wall Thi	ckness T				
Pipe	Dian	neter	Sch	40	Sch	n 80	Sch	160	С	М
Size	OD 1		T 1	T_2	T 1	T_2	T	T ₂		
$\frac{1}{2}$	21.7	21.7	2.8	2.8	3.7	3.7	—	—	25.4	25.4
$\frac{3}{4}$	27.2	27.2	2.9	2.9	3.9	3.9	—	—	28.6	28.6
³ ⁄ ₄ X ³ ∕ ₄ X ¹ ∕ ₂	27.2	21.7	2.9	2.8	3.9	3.7	—	_	28.0	28.6
$1 \times 1 \times \frac{3}{4}$	34.0 34.0	27.2	3.4 3.4	3.4 2.9	4.5	4.5 3.9	_	_	38.1	38.1
$1 \times 1 \times \frac{1}{2}$	34.0	21.7	3.4	2.8	4.5	3.7	_	_	38.1	38.1
11/4	42.7	42.7	3.6	3.6	4.9	4.9	—	—	47.6	47.6
$1^{1}_{4} \times 1^{1}_{4} \times 1$	42.7	34.0	3.6	3.4	4.9	4.5	—	—	47.6	47.6
$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{4}$	42.7	27.2	3.6	2.9	4.9	3.9	-	-	47.6	47.6
$1\frac{1}{2}$	48.6 48.6	48.6	3.7	3.7	5.1 5.1	5.1 4 9	/.1	7.1	57.2	57.2
$1^{1}_{2} \times 1^{1}_{2} \times 1^{1}_{4}$ $1^{1}_{2} \times 1^{1}_{2} \times 1$	48.6	34.0	3.7	3.4	5.1	4.5	_	_	57.2	57.2
$1^{1}/_{2} \times 1^{1}/_{2} \times {}^{3}/_{4}$	48.6	27.2	3.7	2.9	5.1	3.9	—	—	57.2	57.2
2	60.5	60.5	3.9	3.9	5.5	5.5	8.7	8.7	63.5	63.5
$2 \times 2 \times 1^{1/2}$	60.5	48.6	3.9	3.7	5.5	5.1	8.7	7.1	63.5	60.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	60.5	42.7	3.9	3.6	5.5	4.9	-	-	63.5	57.2
2 ~ 2 ~ 1	70.0	34.0	5.9	5.4	5.5	4.5	-	-	05.5	50.8
$2\frac{1}{2}$	76.3 76.3	76.3 60.5	5.5 5.2	5.2 3 9	7.0	7.0 5.5	9.5	9.5 8.7	76.2 76.2	76.2 69.6
$2^{1}/_{2} \times 2^{1}/_{2} \times 2^{1}/_{2}$	76.3	48.6	5.2	3.3	7.0	5.1	9.5 9.5	7.1	76.2	66.7
$2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{4}$	76.3	42.7	5.2	3.6	7.0	4.9	—	-	76.2	63.5
3	89.1	89.1	5.5	5.5	7.6	7.6	11.1	11.1	85.7	85.7
$3 \times 3 \times 2^{1/2}$	89.1	76.3	5.5	5.2	7.6	7.0	11.1	9.5	85.7	82.6
$3 \times 3 \times 2$ $3 \times 3 \times 1^{1/2}$	89.1 89.1	60.5 48.6	5.5 5.5	3.9	7.6 7.6	5.5 5.1	11.1	8. <i>1</i> 7.1	85.7 85.7	76.2 73.0
3^{1}	101.6	101.6	5.7	5.7	8.1	8.1	12.7	12.7	95.3	95.3
$3^{1}/_{2} \times 3^{1}/_{2} \times 3$	101.6	89.1	5.7	5.5	8.1	7.6	12.7	11.1	95.3	92.1
$3^{1}_{2} \times 3^{1}_{2} \times 2^{1}_{2}$	101.6	76.3	5.7	5.2	8.1	7.0	12.7	9.5	95.3	88.9
$3\frac{1}{2} \times 3\frac{1}{2} \times 2$	101.6	60.5	5.7	3.9	8.1	5.5	12.7	8.7	95.3	82.6
3½×3½×1½ 4	101.6	48.6 114.3	5.7	3.7 6.0	8.1 8.6	5.1 8.6	13.5	13.5	95.3 104.8	79.4 104.8
$4 \times 4 \times 3^{1/2}$	114.3	101.6	6.0	5.7	8.6	8.1	13.5	12.7	104.8	101.6
4 ×4 ×3	114.3	89.1	6.0	5.5	8.6	7.6	13.5	11.1	104.8	98.4
$\begin{array}{c} 4 \times 4 \times 2^{\frac{1}{2}} \\ 4 \times 4 \times 2^{\frac{1}{2}} \end{array}$	114.3	76.3	6.0	5.2	8.6	7.0	13.5	9.5	104.8	95.3
4 ×4 ×2	114.3	60.5	0.0	3.9	ð.0	5.5	13.5	ŏ./	104.8	88.9

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116



Tees

Sch 40,80,120,160



Straight

Reducing

С

M

KS B1541, JIS B	2312	12 (in millimeters)								eters)		
Nominal	Out	side			١	Wall Thi	ckness 1	Г				
Pipe	Diar	neter	Sch	40	Scl	า 80	Sch	120	Sch	160	С	М
Size	OD 1		Tı	T 2	T	T ₂	Tı	T 2	Tı	T 2		
$\begin{array}{cccc} 5 \\ 5 \times & 5 \times & 4 \\ 5 \times & 5 \times & 3^{1/_{2}} \\ 5 \times & 5 \times & 3 \\ 5 \times & 5 \times & 2^{1/_{2}} \end{array}$	139.8 139.8 139.8 139.8 139.8 139.8	139.8 114.3 101.6 89.1 76.3	6.6 6.6 6.6 6.6 6.6	6.6 6.0 5.7 5.5 5.2	9.5 9.5 9.5 9.5 9.5	9.5 8.6 8.1 7.6 7.0	12.7 12.7 _ _	12.7 11.1 _ _	15.9 15.9 15.9 15.9 15.9	15.9 13.5 12.7 11.1 9.5	123.8 123.8 123.8 123.8 123.8 123.8	123.8 117.5 114.3 111.1 108.0
$egin{array}{cccc} 6 & 6 & 5 \ 6 & 6 & 4 \ 6 & 6 & 3^{1/2} \ 6 & 6 & 3 \end{array}$	165.2 165.2 165.2 165.2 165.2	165.2 139.8 114.3 101.6 89.1	7.1 7.1 7.1 7.1 7.1	7.1 6.6 6.0 5.7 5.5	11.0 11.0 11.0 11.0 11.0	11.0 9.5 8.6 8.1 7.6	14.3 14.3 14.3 - -	14.3 12.7 11.1 –	18.2 18.2 18.2 18.2 18.2 18.2	18.2 15.9 13.5 12.7 11.1	142.9 142.9 142.9 142.9 142.9 142.9	142.9 136.5 130.2 127.0 123.8
$8 \\ 8 \times 8 \times 6 \\ 8 \times 8 \times 5 \\ 8 \times 8 \times 4$	216.3 216.3 216.3 216.3	216.3 165.2 139.8 114.3	8.2 8.2 8.2 8.2	8.2 7.1 6.6 6.0	12.7 12.7 12.7 12.7	12.7 11.0 9.5 8.6	18.2 18.2 18.2 18.2	18.2 14.3 12.7 11.1	23.0 23.0 23.0 23.0	23.0 18.2 15.9 13.5	177.8 177.8 177.8 177.8	177.8 168.3 161.9 155.6
$ \begin{array}{c} 10 \\ 10 \times 10 \times 8 \\ 10 \times 10 \times 6 \\ 10 \times 10 \times 5 \end{array} $	267.4 267.4 267.4 267.4	267.4 216.3 165.2 139.8	9.3 9.3 9.3 9.3	9.3 8.2 7.1 6.6	15.1 15.1 15.1 15.1	15.1 12.7 11.0 9.5	21.4 21.4 21.4 21.4	21.4 18.2 14.3 12.7	28.6 28.6 28.6 28.6	28.6 23.0 18.2 15.9	215.9 215.9 215.9 215.9	215.9 203.2 193.7 190.5
$12 \\ 12 \times 12 \times 10 \\ 12 \times 12 \times 8 \\ 12 \times 12 \times 6$	318.5 318.5 318.5 318.5	318.5 267.4 216.3 165.2	10.3 10.3 10.3 10.3	10.3 9.3 8.2 7.1	17.4 17.4 17.4 17.4	17.4 15.1 12.7 11.0	25.4 25.4 25.4 25.4	25.4 21.4 18.2 14.3	33.3 33.3 33.3 33.3	33.3 28.6 23.0 18.2	254.0 254.0 254.0 254.0	254.0 241.3 228.6 219.1
$14 \\ 14 \times 14 \times 12 \\ 14 \times 14 \times 10 \\ 14 \times 14 \times 8$	355.6 355.6 355.6 355.6	355.6 318.5 267.4 216.3	$11.1 \\ 11.1 \\ 11.1 \\ 11.1 \\ 11.1$	11.1 10.3 9.3 8.2	19.0 19.0 19.0 19.0	19.0 17.4 15.1 12.7	27.8 27.8 27.8 27.8	27.8 25.4 21.4 18.2	35.7 35.7 35.7 35.7	35.7 33.3 28.6 23.0	279.4 279.4 279.4 279.4	279.4 269.9 257.2 247.7
$16 \\ 16 \times 16 \times 14 \\ 16 \times 16 \times 12 \\ 16 \times 16 \times 10$	406.4 406.4 406.4 406.4	406.3 355.6 318.5 267.4	12.7 12.7 12.7 12.7	12.7 10.3 10.3 9.3	21.4 21.4 21.4 21.4	21.4 19.0 17.4 15.1	30.9 30.9 30.9 30.9	30.9 27.8 25.4 21.4	40.5 40.5 40.5 40.5	40.5 35.7 33.3 28.6	304.8 304.8 304.8 304.8	304.8 304.8 295.3 282.6
18 18×18×16 18×18×14 18×18×12	457.2 457.2 457.2 457.2	457.2 406.4 355.6 318.5	14.3 14.3 14.3 14.3	14.3 12.7 11.1 10.3	23.8 23.8 23.8 23.8	23.8 21.4 19.0 17.4	34.9 34.9 34.9 34.9	34.9 30.9 27.8 25.4			342.9 342.9 342.9 342.9	342.9 330.2 330.2 320.7
20 20×20×18 20×20×16 20×20×14	508.0 508.0 508.0 508.0	508.0 457.2 406.4 355.6	15.1 15.1 15.1 15.1	15.1 14.3 12.7 11.1	26.2 26.2 26.2 26.2	26.2 23.8 21.4 19.0	38.1 38.1 38.1 38.1	38.1 34.9 30.9 27.8	_ _ _	_ _ _	381.0 381.0 381.0 381.0	381.0 368.0 355.6 355.6

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

Reducers

Sch 40,80,160

Conc	entric



k	(S	B1	54	1,	JIS	В	231	12

(in millimeters) Wall Thickness T Outside Nominal **Diameter** Sch 160 Pipe Sch 40 **Sch 80** Н Size OD OD_2 **T**₁ \mathbf{T}_2 \mathbf{T}_1 \mathbf{T}_2 **T**₁ \mathbf{T}_2 27.2 21.7 2.8 3.9 3.7 $^{3}_{4}\times ^{1}_{2}$ 2.9 38.1 _ _ $1 \times \frac{3}{4}$ 34.0 27.2 3.4 2.9 4.5 3.9 50.8 $1 \times \frac{1}{2}$ 34.0 21.7 3.4 2.9 4.5 3.7 50.8 $1\frac{1}{4} \times 1$ 42.7 34.0 3.6 3.4 4.9 4.5 50.8 $1^{1}/_{4} \times 3^{3}/_{4}$ 42.7 27.2 3.6 2.9 4.9 3.9 50.8 $1^{1/_{4}} \times 1^{1/_{2}}$ 42.7 21.7 3.6 2.8 4.9 3.7 50.8 $1\frac{1}{2} \times 1\frac{1}{4}$ 5.1 48.6 42.7 3.7 3.6 4.9 63.5 4.5 63.5 $1\frac{1}{2} \times 1$ 48.6 34.0 3.7 3.4 5.1 $1\frac{1}{2} \times \frac{3}{4}$ 48.6 27.2 3.7 2.9 5.1 3.9 _ _ 63.5 2 $\times 1^{1/2}$ 60.5 48.6 3.9 3.7 5.5 5.1 8.7 7.1 76.2 2 $\times 1\frac{1}{4}$ 60.5 42.7 3.9 3.6 5.5 4.9 76.2 2 $\times 1$ 60.5 34.0 3.9 3.4 5.5 4.5 76.2 2 $\times \frac{3}{4}$ 60.5 27.2 3.9 2.9 5.5 3.9 76.2 ____ _ $2\frac{1}{2} \times 2$ 76.3 60.5 5.2 7.0 5.5 8.7 88.9 3.9 9.5 $2\frac{1}{2} \times 1\frac{1}{2}$ 76.3 48.6 5.2 3.7 7.0 5.1 9.5 88.9 7.1 $2^{1/_{2}} \times 1^{1/_{4}}$ 76.3 42.7 5.2 3.6 7.0 4.9 88.9 $2^{1/2} \times 1$ 76.3 34.0 5.2 3.4 7.0 4.5 _ 88.9 3 5.5 7.6 7.0 88.9 $\times 2^{1/2}$ 89.1 76.3 5.2 11.1 9.5 3 $\times 2$ 89.1 60.5 5.5 3.9 7.6 5.5 11.1 8.7 88.9 3 89.1 48.6 3.7 7.6 5.1 88.9 $\times 1\frac{1}{2}$ 5.5 11.1 7.1 3 $\times 1\frac{1}{4}$ 89.1 42.7 5.5 3.6 7.6 4.9 88.9 12.7 $3\frac{1}{2} \times 3$ 101.6 89.1 5.7 5.5 8.1 7.6 11.1 101.6 $3\frac{1}{2} \times 2\frac{1}{2}$ 101.6 76.3 5.7 5.2 8.1 7.0 12.7 9.5 101.6 $3\frac{1}{2} \times 2$ 101.6 60.5 5.7 3.9 8.1 5.5 12.7 8.7 101.6 101.6 $3\frac{1}{2} \times 1\frac{1}{2}$ 101.6 48.6 5.7 3.7 8.1 5.1 12.7 7.1 4 $\times 3^{1/2}$ 114.3 101.6 8.6 8.1 101.6 6.0 5.7 13.5 12.7 4 $\times 3$ 114.3 89.1 6.0 5.5 8.6 7.6 13.5 11.1 101.6 4 $\times 2^{1/2}$ 114.3 76.3 6.0 5.2 8.6 7.0 13.5 9.5 101.6 4 $\times 2$ 114.3 60.5 6.0 8.6 5.5 13.5 8.7 101.6 3.9 4 $\times 1^{1/2}$ 48.6 13.5 101.6 114.3 6.0 3.7 8.6 5.1 7.1

For Bevel Details See Page 118

For Dimensional Tolerances See Page 116



Reducers

Sch 40,80,120,160

Conc	entric



Eccentric

KS B1541, JIS B2312 (in millimeters)											neters)
Nominal	Out	tside		Wall	Thicknes	s T					
Pipe	Diar	neter	Sch	40	Sch	n 80	Sch	120	Sch	160	н
Size	OD 1		T 1	T 2	T 1	T 2	T 1	T ₂	T 1	T 2	
5× 4	139.8	114.3	6.6	6.0	9.5	8.6	12.7	11.1	15.9	13.5	127.0
5× 3	139.8	101.6	6.6	5.7	9.5	8.1	-	-	15.9	12.7	127.0
5× 3	139.8	89.1	6.6	5.5	9.5	7.6	-	-	15.9	11.1	127.0
5× 2	139.8	76.3	6.6	5.2	9.5	7.0	-	-	15.9	9.5	127.0
6× 5	165.2	139.8	7.1	6.6	11.0	9.5	14.3	12.7	18.2	15.9	139.7
6× 4	165.2	114.3	7.1	6.0	11.0	8.6	14.3	11.1	18.2	13.5	139.7
6× 3	165.2	101.6	7.1	5.7	11.0	8.1	-	-	18.2	12.7	139.7
6× 3	165.2	89.1	7.1	5.5	11.0	7.6	-	-	18.2	11.1	139.7
6× 2	165.2	76.3	7.1	5.2	11.0	7.0	-	-	18.2	9.5	139.7
8× 6	216.3	165.2	8.2	7.1	12.7	11.0	18.2	14.3	23.0	18.2	152.4
8× 5	216.3	139.8	8.2	6.6	12.7	9.5	18.2	12.7	23.0	15.9	152.4
8× 4	216.3	114.3	8.2	6.0	12.7	8.6	18.2	11.1	23.0	13.5	152.4
8× 3	216.3	101.6	8.2	5.7	12.7	8.1	-	-	23.0	12.7	152.4
10× 8	267.4	216.3	9.3	8.2	15.1	12.7	21.4	18.2	28.6	23.0	177.8
10× 6	267.4	165.2	9.3	7.1	15.1	11.0	21.4	14.3	28.6	18.2	177.8
10× 5	267.4	139.7	9.3	6.6	15.1	9.5	21.4	12.7	28.6	15.9	177.8
10× 4	267.4	114.3	9.3	6.0	15.1	8.6	-	-	28.6	13.5	177.8
12×10	318.5	267.4	10.3	9.3	17.4	15.1	25.4	21.4	33.3	28.6	203.2
12× 8	318.5	216.3	10.3	8.2	17.4	12.7	25.4	18.2	33.3	23.0	203.2
12× 6	318.5	165.2	10.3	7.1	17.4	11.0	25.4	14.3	33.3	18.2	203.2
12× 5	318.5	139.7	10.3	6.6	17.4	9.5	25.4	12.7	33.3	15.9	203.2
14×12	355.6	318.5	11.1	10.3	19.0	17.4	27.8	25.4	35.7	33.3	330.2
14×10	355.6	267.4	11.1	9.3	19.0	15.1	27.8	21.4	35.7	28.6	330.2
14× 8	355.6	216.3	11.1	8.2	19.0	12.7	27.8	18.2	35.7	23.0	330.2
16×14	406.4	355.6	12.7	11.1	21.4	19.0	30.9	27.8	40.5	35.7	355.6
16×12	406.4	318.5	12.7	10.3	21.4	17.4	30.9	25.4	40.5	33.3	355.6
16×10	406.4	267.4	12.7	9.3	21.4	15.1	30.9	21.4	40.5	28.6	355.6
18×16	457.2	406.4	14.3	12.7	23.8	21.4	34.9	30.9	_	_	381.0
18×14	457.2	355.6	14.3	11.1	23.8	19.0	34.9	27.8	-	-	381.0
18×12	457.2	318.5	14.3	10.3	23.8	17.4	34.9	25.4	_	-	381.0
20×18	508.0	457.2	15.1	14.3	26.2	23.8	38.1	34.9	_	_	508.0
20×16	508.0	406.4	15.1	12.7	26.2	21.4	38.1	30.9	_	_	508.0
20×14	508.0	355.6	15.1	11.1	26.2	19.0	38.1	27.8	_	_	508.0

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

180°Elbows(Long, Short) Caps

Sch 40,80,120,160





KS B1541, JIS B2312

KS B1541	KS B1541, JIS B2312 (in millimeters)											
Nominal	Outside	١	Wall Thi	ckness 1	Г	F	E.	Limited Wall	Lo	ong	Short	
Size	OD	Sch 40	Sch 80	Sch 120	Sch 160	L	E I	thickness	Р	к	Р	к
$\frac{1}{2}$	21.7	2.8	3.7	-	-	25.4	-	-	76.2	49.0	-	-
$\frac{3}{4}$	27.2	2.9	3.9	-	—	25.4	-	—	76.2	51.7	—	-
1	34.0	3.4	4.5	-	—	38.1	-	—	76.2	55.1	50.8	42.4
$1\frac{1}{4}$	42.7	3.6	4.9	-	—	38.1	-	—	95.2	69.0	63.6	53.2
$1^{1/_{2}}$	48.6	3.7	5.1	-	7.1	38.1	38.1	5.1	114.4	81.5	76.2	62.4
2	60.5	3.9	5.5	-	8.7	38.1	44.5	5.5	152.4	106.5	101.6	81.1
$2^{1/2}$	76.3	5.2	7.0	-	9.5	38.1	50.8	7.0	190.6	133.5	127.0	101.7
3	89.1	5.5	7.6	-	11.1	50.8	63.5	7.6	228.6	158.9	152.4	120.8
$3^{1}/_{2}$	101.6	5.7	8.1	-	12.7	63.5	76.2	8.1	266.8	184.2	177.8	139.7
4	114.3	6.0	8.6	11.1	13.5	63.5	76.2	8.6	304.8	209.6	203.2	158.8
5	139.8	6.6	9.5	12.7	15.9	76.2	88.9	9.5	381.0	260.4	254.0	196.9
6	165.2	7.1	11.0	14.3	18.2	88.9	101.6	11.0	457.2	311.2	304.8	235.0
8	216.3	8.2	12.7	18.2	23.0	101.6	127.0	12.7	609.6	413.0	406.4	311.4
10	267.4	9.3	15.1	21.4	28.6	127.0	152.4	12.7	762.0	514.7	508.0	387.7
12	318.5	10.3	17.4	25.4	33.3	152.4	177.8	12.7	914.4	616.5	609.6	464.1
14	355.6	11.1	19.0	27.8	35.7	165.1	190.5	12.7	1066.8	711.2	711.2	533.4
16	406.4	12.7	21.4	30.9	40.5	177.8	203.2	12.7	1219.2	812.8	812.8	609.6
18	457.2	14.3	23.8	34.9	45.2	203.2	228.6	12.7	1371.6	914.4	914.4	685.8
20	508.0	15.1	26.2	38.1	50.0	228.6	254.0	12.7	1524.0	1016.0	1016.0	762.0

• The Back-To-Face Dimension of Cap Shall Be E, If The Basic Wall Thickness is Not More Than The "Limited Wall Thickness" And E1 If It Exceeds The "Limited Wall Thickness"

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116



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

7.9T, STD, XS





KS B1522/43, 、	JIS B2311/3								1	(in millime	eters)
Nominal	Outside			Wall Thie	ckness 1	-			Center t	A millimetry Center Solution A B 355.6 147.3 406.4 168.3 405.4 168.3 457.2 189.4 508.0 210.4 558.8 231.5 609.6 252.5 660.4 273.5 711.2 294.6 762.0 315.6 812.8 336.7 914.4 378.7 965.2 - 1016.0 420.8 1066.8 -	
Pipe	Diameter	7.9	9Т	S	TD	Х	S	Lo	ong	Sh	ort
Size	OD	ID	Т	ID	Т	ID	т	Α	В	Α	В
14	355.6	339.8	7.9	336.6	9.5	330.2	12.7	533.4	220.9	355.6	147.3
16	406.4	390.6	7.9	387.4	9.5	381.0	12.7	609.6	252.5	406.4	168.3
18	457.2	441.4	7.9	438.2	9.5	431.8	12.7	685.8	284.1	457.2	189.4
20	508.0	492.2	7.9	489.0	9.5	482.6	12.7	762.0	315.6	508.0	210.4
22	558.8	543.0	7.9	539.8	9.5	533.4	12.7	838.2	347.2	558.8	231.5
24	609.6	593.8	7.9	590.6	9.5	584.2	12.7	914.4	378.7	609.6	252.5
26	660.4	644.6	7.9	641.4	9.5	635.0	12.7	990.6	410.3	660.4	273.5
28	711.2	695.4	7.9	692.2	9.5	685.8	12.7	1066.8	441.9	711.2	294.6
30	762.0	746.2	7.9	743.0	9.5	736.6	12.7	1143.0	473.4	762.0	315.6
32	812.8	797.0	7.9	793.8	9.5	787.4	12.7	1219.2	505.0	812.8	336.7
34	863.6	847.8	7.9	844.6	9.5	838.2	12.7	1295.4	536.6	863.6	357.7
36	914.4	898.6	7.9	895.4	9.5	889.0	12.7	1371.6	568.1	914.4	378.7
38	965.2	949.4	7.9	946.2	9.5	939.8	12.7	1447.8	599.7	965.2	-
40	1016.0	1000.2	7.9	997.0	9.5	990.6	12.7	1524.0	631.2	1016.0	420.8
42	1066.8	1051.0	7.9	1047.8	9.5	1041.4	12.7	1600.2	662.8	1066.8	—
44	1117.6	1101.8	7.9	1098.6	9.5	1092.2	12.7	1676.4	694.4	1117.6	462.9
46	1168.4	1152.6	7.9	1149.4	9.5	1143.0	12.7	1752.6	725.9	1168.4	-
48	1219.2	1203.4	7.9	1200.2	9.5	1193.8	12.7	1828.8	757.5	1219.2	505.0

• For Bevel Details See Page 119

• For Dimensional Tolerances See Page 117

Steel Plate Butt - Weld Fittings

Tees

7.9T, STD, XS





KS B1522/43, JIS	S B2311/3					(in r	nillimeters)
Nominal	Outside	Outside	W	all Thickness	т	-	
Size	OD OD	Diameter OD2	7.9T	STD	XS	C	IVI
16	406.4	406.4	7.9	9.5	12.7	304.8	304.8
$16 \times 16 \times 14$	406.4	355.6	7.9	9.5	12.7	304.8	304.8
$16 \times 16 \times 12$	406.4	318.5	7.9	9.5	12.7	304.8	295.3
$16 \times 16 \times 10$	406.4	267.4	7.9	9.5	12.7	304.8	282.6
18	457.2	457.2	7.9	9.5	12.7	342.9	342.9
18×18×16	457.2	406.4	7.9	9.5	12.7	342.9	330.2
18×18×14	457.2	355.6	7.9	9.5	12.7	342.9	330.2
18×18×12	457.2	318.5	7.9	9.5	12.7	342.9	330.2
20	508.0	508.0	7.9	9.5	12.7	381.0	381.0
20×20×18	508.0	457.2	7.9	9.5	12.7	381.0	368.0
20×20×16	508.0	406.4	7.9	9.5	12.7	381.0	355.6
20×20×14	508.0	355.6	7.9	9.5	12.7	381.0	355.6
22	558.8	558.8	7.9	9.5	12.7	419.1	419.1
22×22×20	558.8	508.0	7.9	9.5	12.7	419.1	406.4
22×22×18	558.8	457.2	7.9	9.5	12.7	419.1	393.7
22×22×16	558.8	406.4	7.9	9.5	12.7	419.1	381.0
$\begin{array}{c} 24\\ 24 \times 24 \times 22\\ 24 \times 24 \times 20\\ 24 \times 24 \times 18 \end{array}$	609.6	609.6	7.9	9.5	12.7	431.8	431.8
	609.6	558.8	7.9	9.5	12.7	431.8	431.8
	609.6	508.0	7.9	9.5	12.7	431.8	431.8
	609.6	457.2	7.9	9.5	12.7	431.8	419.1
26 $26 \times 26 \times 24$ $26 \times 26 \times 22$ $26 \times 26 \times 20$	660.4	660.4	7.9	9.5	12.7	495.3	495.3
	660.4	609.6	7.9	9.5	12.7	495.3	482.6
	660.4	558.8	7.9	9.5	12.7	495.3	469.9
	660.4	508.0	7.9	9.5	12.7	495.3	457.2
28	711.2	711.2	7.9	9.5	12.7	520.7	520.7
28×28×26	711.2	660.4	7.9	9.5	12.7	520.7	520.7
28×28×24	711.2	609.6	7.9	9.5	12.7	520.7	508.0
28×28×22	711.2	558.8	7.9	9.5	12.7	520.7	495.3
30 $30 \times 30 \times 28$ $30 \times 30 \times 26$ $30 \times 30 \times 24$	762.0	762.0	7.9	9.5	12.7	558.8	558.8
	762.0	711.2	7.9	9.5	12.7	558.8	546.1
	762.0	660.4	7.9	9.5	12.7	558.8	546.1
	762.0	609.6	7.9	9.5	12.7	558.8	533.4

For Bevel Details See Page 119For Dimensional Tolerances See Page 117
OD 2

D₂

-C

Straight

- C-

1 1



4

Tees

7.9T, STD, XS

KS B1522/43, JI	S B2311/3					(in r	nillimeters)
Nominal	Outside	Outside	v	/all Thickness	т	0	
Size		OD2	7.9T	STD	XS	C	IVI
32	812.8	812.8	7.9	9.5	12.7	596.9	596.9
32×32×30	812.8	762.0	7.9	9.5	12.7	596.9	584.2
32×32×28	812.8	711.2	7.9	9.5	12.7	596.9	571.5
32×32×26	812.8	660.4	7.9	9.5	12.7	596.9	571.5
34	863.6	863.6	7.9	9.5	12.7	635.0	635.0
$34 \times 34 \times 32$	803.0	812.8	7.9	9.5	10.7	635.0	622.3
$34 \times 34 \times 30$ $34 \times 34 \times 28$	863.6	702.0	7.9	9.5	12.7	635.0	596.9
36	914 4	9177	7.9	9.5	12.7	673.1	673.1
$36 \times 36 \times 34$	914.4	863.6	7.9	9.5	12.7	673.1	660.4
36×36×32	914.4	812.8	7.9	9.5	12.7	673.1	647.7
36×36×30	914.4	762.0	7.9	9.5	12.7	673.1	635.0
38	965.2	965.2	7.9	9.5	12.7	711.2	711.2
38×38×36	965.2	914.4	7.9	9.5	12.7	711.2	711.2
38×38×34	965.2	863.6	7.9	9.5	12.7	711.2	698.5
38×38×32	965.2	812.8	7.9	9.5	12.7	711.2	685.8
40	1016.0	1016.0	7.9	9.5	12.7	749.3	749.3
40×40×38	1016.0	965.2	7.9	9.5	12.7	749.3	749.3
40×40×36	1016.0	914.4	7.9	9.5	12.7	749.3	736.6
40×40×34	1016.0	863.6	7.9	9.5	12.7	749.3	723.9
42	1066.8	1066.8	7.9	9.5	12.7	762.0	711.2
$42 \times 42 \times 40$	1066.9	1016.0	7.9	9.5	12.7	762.0	711.2
$42 \times 42 \times 36$ $42 \times 42 \times 36$	1066.8	914.4	7.9	9.5	12.7	762.0	711.2
44	1117.6	1117.6	7 9	9.5	12 7	812.8	762.0
44×44×42	1117.6	1066.8	7.9	9.5	12.7	812.8	762.0
$44 \times 44 \times 40$	1117.6	1016.0	7.9	9.5	12.7	812.8	749.3
$44 \times 44 \times 38$	1117.6	965.2	7.9	9.5	12.7	812.8	736.6
46	1168.4	1168.4	7.9	9.5	12.7	850.9	800.1
$46 \times 46 \times 44$	1168.4	1117.6	7.9	9.5	12.7	850.9	800.1
46×46×42	1168.4	1066.8	7.9	9.5	12.7	850.9	787.4
46×46×40	1168.4	1016.0	7.9	9.5	12.7	850.9	774.8
48	1219.2	1219.2	7.9	9.5	12.7	889.0	838.2
48×48×46	1219.2	1168.4	7.9	9.5	12.7	889.0	838.2
$48 \times 48 \times 42$	1219.2	1066.8	7.9	9.5	12.7	889.0	812.8

• For Bevel Details See Page 119

• For Dimensional Tolerances See Page 117

• For Approx Weight See Page 124

Steel Plate Butt - Weld Fittings

Reducers

7.9T, STD, XS

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<u> </u>			
Conc	entric		



KS B1522/43, JIS B23	311/3				(in	n millimeters)
Nominal Pipe	Out Dian	side neter	١	Vall Thickness 1	Г	н
Size	OD 1		7.9T	STD	XS	
16×14	406.4	355.6	7.9	9.5	12.7	355.6
16×12	406.4	318.5	7.9	9.5	12.7	355.6
16×10	406.4	267.4	7.9	9.5	12.7	355.6
16×8	406.4	216.3	7.9	9.5	12.7	355.6
18×16	457.2	406.4	7.9	9.5	12.7	381.0
18×14	457.2	355.6	7.9	9.5	12.7	381.0
18×12	457.2	318.5	7.9	9.5	12.7	381.0
18×10	457.2	267.4	7.9	9.5	12.7	381.0
20×18 20×16 20×14 20×12	508.0 508.0 508.0 508.0	457.2 406.4 355.6 318.5	7.9 7.9 7.9 7.9 7.9	9.5 9.5 9.5 9.5	12.7 12.7 12.7 12.7	508.0 508.0 508.0 508.0
22×20	558.8	508.0	7.9	9.5	12.7	508.0
22×18	558.8	457.2	7.9	9.5	12.7	508.0
22×16	558.8	406.4	7.9	9.5	12.7	508.0
22×14	558.8	355.6	7.9	9.5	12.7	508.0
24×22	609.6	558.8	7.9	9.5	12.7	508.0
24×20	609.6	508.0	7.9	9.5	12.7	508.0
24×18	609.6	457.2	7.9	9.5	12.7	508.0
24×16	609.6	406.4	7.9	9.5	12.7	508.0
26×24	660.4	609.6	7.9	9.5	12.7	609.6
26×22	660.4	558.8	7.9	9.5	12.7	609.6
26×20	660.4	508.0	7.9	9.5	12.7	609.6
26×18	660.4	457.2	7.9	9.5	12.7	609.6
28×26	711.2	660.4	7.9	9.5	12.7	609.6
28×24	711.2	609.6	7.9	9.5	12.7	609.6
28×22	711.2	558.8	7.9	9.5	12.7	609.6
28×20	711.2	508.0	7.9	9.5	12.7	609.6
30×28	762.0	711.2	7.9	9.5	12.7	609.6
30×26	762.0	660.4	7.9	9.5	12.7	609.6
30×24	762.0	609.6	7.9	9.5	12.7	609.6
30×22	762.0	558.8	7.9	9.5	12.7	609.6

• For Bevel Details See Page 119

• For Dimensional Tolerances See Page 117

• For Approx Weight See Page 125

Steel Plate Butt - Weld Fittings



millimeters)

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609.6 711.2 711.2

Reducers

7.9T, STD, XS





			0011001		
KS B1522/43, JIS B23	311/3				(in
Nominal Pipe	Out Diar	side neter	١	Wall Thickness	г
Size	OD 1		7.9T	STD	XS
32×30 32×28 32×26 32×24	812.8 812.8 812.8 812.8 812.8	762.0 711.2 660.4 609.6	7.9 7.9 7.9 7.9	9.5 9.5 9.5 9.5	12.7 12.7 12.7 12.7
34×32	863.6	812.8	7.9	9.5	12.7
34×30	863.6	762.0	7.9	9.5	12.7
34×28	863.6	711.2	7.9	9.5	12.7
34×26	863.6	660.4	7.9	9.5	12.7
36×34	914.4	863.6	7.9	9.5	12.7
36×32	914.4	812.8	7.9	9.5	12.7
36×30	914.4	762.0	7.9	9.5	12.7
36×28	914.4	711.2	7.9	9.5	12.7
38×36	965.2	914.4	7.9	9.5	12.7
38×34	965.2	863.6	7.9	9.5	12.7
38×32	965.2	812.8	7.9	9.5	12.7
38×30	965.2	762.0	7.9	9.5	12.7
40×38	1016.0	965.2	7.9	9.5	12.7
40×36	1016.0	914.4	7.9	9.5	12.7
40×34	1016.0	863.6	7.9	9.5	12.7
40×32	1016.0	812.8	7.9	9.5	12.7
42×40 42×38 42×36 42×34	1066.8	1016.0	7.9	9.5	12.7
	1066.8	965.2	7.9	9.5	12.7
	1066.8	914.4	7.9	9.5	12.7
	1066.8	863.6	7.9	9.5	12.7
44×42 44×40 44×38 44×36	1117.6	1066.8	7.9	9.5	12.7
	1117.6	1016.0	7.9	9.5	12.7
	1117.6	965.2	7.9	9.5	12.7
	1117.6	914.4	7.9	9.5	12.7
46×44	1168.4	1117.6	7.9	9.5	12.7
46×42	1168.4	1066.8	7.9	9.5	12.7

For Bevel Details See Page 119

46×40

46×38

 $48\! imes\!46$

48×44

48×42

48×40

• For Dimensional Tolerances See Page 117

1168.4

1168.4

1219.2

1219.2

1219.2

1219.2

1016.0

965.2

1168.4

1117.6

1066.8

1016.0

7.9

7.9

7.9

7.9

7.9

7.9

9.5

9.5

9.5

9.5

9.5

9.5

12.7

12.7

12.7

12.7

12.7

12.7

• For Approx Weight See Page 125

Weld Fittings 77

711.2

711.2

711.2

711.2

711.2

711.2

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

Sch 5S, 10S, 20S





KS B1541/3, JIS B2312/3 (in millimeters)											eters)
Nominal	Outside	Sch	5S	Sch	10S	Sch	20S	Lo	ng	Sh	ort
Size	Diameter	ID	Т	ID	т	ID	Т	Α	В	Α	В
1/2	21.7	18.4	1.65	17.5	2.1	16.7	2.5	38.1	15.8	—	—
3/4	27.2	23.9	1.65	23.0	2.1	22.2	2.5	38.1	15.8	-	—
1	34.0	30.7	1.65	28.4	2.8	28.0	3.0	38.1	15.8	25.4	-
11/4	42.7	39.4	1.65	37.1	2.8	36.7	3.0	47.6	19.7	31.8	13.2
1½	48.6	45.3	1.65	43.0	2.8	42.6	3.0	57.2	23.7	38.1	15.8
2	60.5	57.2	1.65	54.9	2.8	53.5	3.5	76.2	31.6	50.8	21.0
2 ¹ / ₂	76.3	72.1	2.10	70.3	3.0	69.3	3.5	95.3	39.5	63.5	26.3
3	89.1	84.9	2.10	83.1	3.0	81.1	4.0	114.3	47.3	76.2	31.6
3 ¹ / ₂	101.6	97.4	2.10	95.6	3.0	93.6	4.0	133.4	55.3	88.9	36.8
4	114.3	110.1	2.10	108.3	3.0	106.3	4.0	152.4	63.1	101.6	42.1
5	139.8	134.2	2.80	133.0	3.4	129.8	5.0	190.5	78.9	127.0	52.6
6	165.2	159.6	2.80	158.4	3.4	155.2	5.0	228.6	94.7	152.4	63.1
8	216.3	210.7	2.80	208.3	4.0	203.3	6.5	304.8	126.2	203.2	84.2
10	267.4	260.6	3.40	259.4	4.0	254.4	6.5	381.0	157.8	254.0	105.2
12	318.5	310.5	4.00	309.5	4.5	305.5	6.5	457.2	189.4	304.8	126.2
14	355.6	347.6	4.00	346.0	4.8	339.8	7.9	533.4	220.9	355.6	147.3
16	406.4	398.0	4.20	396.8	4.8	390.6	7.9	609.6	252.5	406.4	168.3
18	457.2	448.8	4.20	447.6	4.8	441.4	7.9	685.8	284.1	457.2	189.4
20	508.0	498.4	4.80	497.0	5.5	492.2	7.9	762.0	315.6	508.0	210.4
22	558.8	549.2	4.80	547.8	5.5	-	-	838.2	347.2	558.8	231.5
24	609.6	598.6	5.50	596.8	6.4	-	-	914.4	378.7	609.6	252.5
30	762.0	749.2	6.40	746.2	7.9	_	_	1143.0	473.4	762.0	315.6

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116



Tees

Sch 5S, 10S, 20S





25.4 28.6

38.1

47.6

47.6

57.2

57.2 57.2

63.5

60.3

57.2

76.2

69.9

66.7

85.7

82.6

76.2

95.3

92.1

88.9

104.8

101.6

98.4

95.3

123.8

117.5

114.3

111.1

142.9

136.5

130.2

177.8

168.3 161.9

215.9

203.2

193.7 254.0

241.3

228.6

				-	c Straig	—c—⊨∣ jht		-	-c ∣- -c Reducing	;
KS B1541/3, JIS	B2312/3								(in millin	neters)
Nominal	Out	side			Wall Thi	ckness T				
Pipe	Dian	neter	5	S	10)S	20)S	С	М
Size	OD 1		T 1	T 2	T 1	T 2	Tı	T 2		
1/2	21.7	21.7	1.65	1.65	2.1	2.1	2.5	2.5	25.4	25
3/4	27.2	27.2	1.65	1.65	2.1	2.1	2.5	2.5	28.6	28
1	34.0	34.0	1.65	1.65	2.8	2.8	3.0	3.0	38.1	38
154	42.7	42.7	1 65	1 65	28	28	3.0	3.0	47.6	47
11/X 11/X1	42.1	34.0	1.65	1.00	2.0	2.0	3.0	3.0	47.6	47
1 /4	12.1	01.0	1.00	1.00	2.0	2.0	0.0	0.0	11.0	
1%	48.6	48.6	1.65	1.65	2.8	2.8	3.0	3.0	57.2	57
$1\frac{1}{2} \times 1\frac{1}{4}$	48.6	42.7	1.65	1.65	2.8	2.8	3.0	3.0	57.2	57
1½× 1½×1	48.6	34.0	1.65	1.65	2.8	2.8	3.0	3.0	57.2	57
2	60.5	60.5	1.65	1.65	2.8	2.8	3.5	3.5	63.5	63
$2 \times 2 \times 1^{1/2}$	60.5	48.6	1.65	1.65	2.8	2.8	3.5	3.0	63.5	60
$2 \times 2 \times 1^{1/4}$	60.5	42.7	1.65	1.65	2.8	2.8	3.5	3.0	63.5	57
21	76.3	76.3	2.10	2.10	3.0	3.0	3.5	3.5	76.2	76
2½× 2½×2	76.3	60.5	2.10	1.65	3.0	2.8	3.5	3.5	76.2	69
2 ¹ / ₂ × 2 ¹ / ₁ ×1 ¹ / ₂	76.3	48.6	2.10	1.65	3.0	2.8	3.5	3.0	76.2	66
3	89.1	89.1	2.10	2.10	3.0	3.0	4.0	4.0	85.7	85
$3 \times 3 \times 2^{1/2}$	89.1	76.3	2.10	2.10	3.0	3.0	4.0	3.5	85.7	82
$3 \times 3 \times 2$	89.1	60.5	2.10	1.65	3.0	2.8	4.0	3.5	85.7	76
31/2	101.6	101.6	2.10	2.10	3.0	3.0	4.0	4.0	95.3	95
3½× 3½×3	101.6	89.1	2.10	2.10	3.0	3.0	4.0	4.0	95.3	92
$3^{1}/_{2} \times 3^{1}/_{2} \times 2^{1}/_{2}$	101.6	76.3	2.10	2.10	3.0	3.0	4.0	3.5	95.3	88
4	114.3	114.3	2.10	2.10	3.0	3.0	4.0	4.0	104.8	104
$4 \times 4 \times 3^{1/2}$	114.3	101.6	2.10	2.10	3.0	3.0	4.0	4.0	104.8	101
$4 \times 4 \times 3$	114.3	89.1	2.10	2.10	3.0	3.0	4.0	4.0	104.8	98
$4 \times 4 \times 2^{1/2}$	114.3	76.3	2.10	2.10	3.0	3.0	4.0	3.5	104.8	95
5	139.8	139.8	2.80	2.80	3.4	3.4	5.0	5.0	123.8	123
$5 \times 5 \times 4$	139.8	114.3	2.80	2.10	3.4	3.0	5.0	4.0	123.8	117
$5 \times 5 \times 3\frac{1}{2}$	139.8	101.6	2.80	2.10	3.4	3.0	5.0	4.0	123.8	114
5 × 5 × 3	139.8	89.1	2.80	2.10	3.4	3.0	5.0	4.0	123.8	111
6	165.2	165.2	2.80	2.80	3.4	3.4	5.0	5.0	142.9	142
6 × 6 × 5	165.2	139.8	2.80	2.80	3.4	3.4	5.0	5.0	142.9	136
$6 \times 6 \times 4$	165.2	114.3	2.80	2.10	3.4	3.0	5.0	4.0	142.9	130
8	216.3	216.3	2.80	2.80	4.0	4.0	6.5	6.5	177.8	177
8 × 8 × 6	216.3	165.2	2.80	2.80	4.0	3.4	6.5	5.0	177.8	168
$8 \times 8 \times 5$	216.3	139.8	2.80	2.80	4.0	3.4	6.5	5.0	177.8	161

8 For Bevel Details See Page 118

8

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12

imes12 imes

imes12 imes10

 $\times 10$

10

10 imes10 Х 6

12

12

• For Dimensional Tolerances See Page 116

267.4

267.4

267.4

318.5

318.5

318.5

267.4

216.3

165.2

318.5

267.4

216.3

3.40

3.40

3.40

4.00

4.00

4.00

3.40

2.80

2.80

4.00

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6.5

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6.5

6.5

6.5

215.9

215.9

215.9

254.0

254.0

254.0

Weld Fittings 79

Tees

Sch 5S, 10S, 20S





KS B1541/3, JIS	S B1541/3, JIS B2312/3 (in millimeters)										
Nominal	Out	side			Wall Th	ickness T					
Pipe	Dian	neter	5	S	10)S	20)S	С	М	
Size	OD 1		T 1	T 2	Ti	T 2	Ti	T 2			
14	355.6	355.6	4.0	4.0	4.8	4.8	7.9	7.9	279.4	279.4	
$14 \times 14 \times 12$	355.6	318.5	4.0	4.0	4.8	4.5	7.9	6.5	279.4	269.9	
$14 \times 14 \times 10$	355.6	267.4	4.0	3.4	4.8	4.0	7.9	6.5	279.4	257.2	
$14 \times 14 \times 8$	355.6	216.3	4.0	2.8	4.8	4.0	7.9	6.5	279.4	247.7	
16	406.4	406.4	4.2	4.2	4.8	4.8	7.9	7.9	304.8	304.8	
$16 \times 16 \times 14$	406.4	355.6	4.2	4.0	4.8	4.8	7.9	7.9	304.8	304.8	
$16 \times 16 \times 12$	406.4	318.5	4.2	4.0	4.8	4.5	7.9	6.5	304.8	295.3	
16 imes 16 imes 10	406.4	267.4	4.2	3.4	4.8	4.0	7.9	6.5	304.8	282.6	
18	457.2	457.2	4.2	4.2	4.8	4.8	7.9	7.9	342.9	342.9	
$18 \times 18 \times 16$	457.2	406.4	4.2	4.2	4.8	4.8	7.9	7.9	342.9	330.2	
$18 \times 18 \times 14$	457.2	355.6	4.2	4.0	4.8	4.8	7.9	7.9	342.9	330.2	
$18 \times 18 \times 12$	457.2	318.5	4.2	4.0	4.8	4.5	7.9	6.5	342.9	320.7	
20	508.0	508.0	4.8	4.8	5.5	5.5	7.9	7.9	381.0	381.0	
$20 \times 20 \times 18$	508.0	457.2	4.8	4.2	5.5	4.8	7.9	7.9	381.0	368.3	
$20 \times 20 \times 16$	508.0	406.4	4.8	4.2	5.5	4.8	7.9	7.9	381.0	355.6	
$20 \times 20 \times 14$	508.0	355.6	4.8	4.0	5.5	4.8	7.9	7.9	381.0	355.6	
22	558.8	558.8	4.8	4.8	5.5	5.5	—	-	419.1	419.1	
$22 \times 22 \times 20$	558.8	508.0	4.8	4.8	5.5	5.5	—	-	419.1	406.4	
$22 \times 22 \times 18$	558.8	457.2	4.8	4.2	5.5	4.8	—	-	419.1	393.7	
$22 \times 22 \times 16$	558.8	406.4	4.8	4.2	5.5	4.8	—	—	419.1	381	
24	609.6	609.6	5.5	5.5	6.4	6.4	—	-	431.8	431.8	
$24 \times 24 \times 22$	609.6	558.8	5.5	4.8	6.4	5.5	-	-	431.8	431.8	
$24 \times 24 \times 20$	609.6	508.0	5.5	4.8	6.4	5.5	—	—	431.8	431.8	
$24 \times 24 \times 18$	609.6	457.2	5.5	4.2	6.4	4.8	—	—	431.8	419.1	
30	762.0	762.0	6.4	6.4	7.9	7.9	—	-	558.8	558.8	
30×30×24	762.0	609.6	6.4	5.5	7.9	6.4	—	_	558.8	533.4	

For Bevel Details See Page 118For Dimensional Tolerances See Page 116



Reducers

Sch 5S, 10S, 20S





KS B1541/3, JIS B2312/3 (in millimeters)										
Nominal	Out	side			Wall Thio	ckness T				
Pipe	Diar	neter	5	S	10)S	20)S	Н	
Size	OD 1		T 1	T 2	T 1	T 2	T 1	T 2		
$1 \times \frac{3}{4}$	34.0	27.2	1.65	1.65	2.8	2.1	3.0	2.5	50.8	
$1 \times \frac{1}{2}$	34.0	21.7	1.65	1.65	2.8	2.1	3.0	2.5	50.8	
$1^{1}_{4} \times 1$	42.7	34.0	1.65	1.65	2.8	2.8	3.0	3.0	50.8	
$1^{1}_{4} \times {}^{3}_{4}$	42.7	27.2	1.65	1.65	2.8	2.1	3.0	2.5	50.8	
$\begin{array}{c} 1^{1} / _{2} \times 1^{1} / _{4} \\ 1^{1} / _{2} \times 1 \\ 1^{1} / _{2} \times {}^{3} / _{4} \end{array}$	48.6	42.7	1.65	1.65	2.8	2.8	3.0	3.0	63.5	
	48.6	34.0	1.65	1.65	2.8	2.8	3.0	3.0	63.5	
	48.6	27.0	1.65	1.65	2.8	2.1	3.0	2.5	63.5	
$\begin{array}{ccc} 2 & \times 1^{1\!/_{\!2}} \\ 2 & \times 1^{1\!/_{\!4}} \\ 2 & \times 1 \end{array}$	60.5	48.6	1.65	1.65	2.8	2.8	3.5	3.0	76.2	
	60.5	42.7	1.65	1.65	2.8	2.8	3.5	3.0	76.2	
	60.5	34.0	1.65	1.65	2.8	2.8	3.5	3.0	76.2	
$\begin{array}{c} 2^{1}\!\!\!\!\!\!/_{2}\times 2\\ 2^{1}\!\!\!\!/_{2}\times 1^{1}\!\!\!\!/_{2}\\ 2^{1}\!\!\!/_{2}\times 1^{1}\!\!\!/_{4} \end{array}$	76.3	60.5	2.10	1.65	3.0	2.8	3.5	3.5	88.9	
	76.3	48.6	2.10	1.65	3.0	2.8	3.5	3.0	88.9	
	76.3	42.7	2.10	1.65	3.0	2.8	3.5	3.0	88.9	
$\begin{array}{ccc} 3 & \times 2^{1} \\ 3 & \times 2 \\ 3 & \times 1^{1} \\ \end{array}$	89.1	76.3	2.10	2.10	3.0	3.0	4.0	3.5	88.9	
	89.1	60.5	2.10	1.65	3.0	2.8	4.0	3.5	88.9	
	89.1	48.6	2.10	1.65	3.0	2.8	4.0	3.0	88.9	
$\begin{array}{c} 3^{1}\!\!\!\!\!\!\!/_{2}\times3\\ 3^{1}\!\!\!\!\!/_{2}\times2^{1}\!\!\!\!/_{2}\\ 3^{1}\!\!\!\!/_{2}\times2\end{array}$	101.6	89.1	2.10	2.10	3.0	3.0	4.0	4.0	101.6	
	101.6	76.3	2.10	2.10	3.0	3.0	4.0	3.5	101.6	
	101.6	60.5	2.10	1.65	3.0	2.8	4.0	3.5	101.6	
$\begin{array}{rrrr} 4 & \times 3^{1} \\ 4 & \times 3 \\ 4 & \times 2^{1} \\ 4 & 2 \end{array}$	114.3	101.6	2.10	2.10	3.0	3.0	4.0	4.0	101.6	
	114.3	89.1	2.10	2.10	3.0	3.0	4.0	4.0	101.6	
	114.3	76.3	2.10	2.10	3.0	3.0	4.0	3.5	101.6	
	114.3	60.5	2.10	1.65	3.0	2.8	4.0	3.5	101.6	
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	139.8	114.3	2.80	2.10	3.4	3.0	5.0	4.0	127.0	
	139.8	101.6	2.80	2.10	3.4	3.0	5.0	4.0	127.0	
	139.8	89.1	2.80	2.10	3.4	3.0	5.0	4.0	127.0	
	139.8	76.3	2.80	2.10	3.4	3.0	5.0	3.5	127.0	
$\begin{array}{ccc} 6 & \times 5 \\ 6 & \times 4 \\ 6 & \times 5 \frac{1}{2} \\ 6 & \times 3 \end{array}$	165.2	139.8	2.80	2.80	3.4	3.4	5.0	5.0	139.7	
	165.2	114.3	2.80	2.10	3.4	3.0	5.0	4.0	139.7	
	165.2	101.6	2.80	2.10	3.4	3.0	5.0	4.0	139.7	
	165.2	89.1	2.80	2.10	3.4	3.0	5.0	4.0	139.7	
8 ×6	216.3	165.2	2.80	2.80	4.0	3.4	6.5	5.0	152.4	
8 ×5	216.3	139.8	2.80	2.80	4.0	3.4	6.5	5.0	152.4	

• For Bevel Details See Page 118

8 ×4

• For Dimensional Tolerances See Page 116

216.3

114.3

2.80

2.10

4.0

3.0

6.5

4.0

152.4

Reducers

Sch 5S, 10S, 20S

		H
Conc	entric	



KS B1541/3,	JIS B2312/3							(in mill	imeters)
Nominal	Out	side			Wall Thio	ckness T			
Pipe	Dian	neter	5	S	10)S	20)S	н
Size	OD 1		T 1	T ₂	T 1	T 2	T 1	T 2	
10× 8 10× 6	267.4 267.4	216.3 165.2	3.4 3.4	2.8 2.8	4.0 4.0	4.0 3.4	6.5 6.5	6.5 5.0	177.8 177.8
$\begin{array}{c} 12 \times 10 \\ 12 \times 8 \\ 12 \times 6 \end{array}$	318.5 318.5 318.5	267.4 216.3 165.2	4.0 4.0 4.0	3.4 2.8 2.8	4.5 4.5 4.5	4.0 4.0 3.4	6.5 6.5 6.5	6.5 6.5 5.0	203.2 203.2 203.2
14 imes 12 14 imes 10 14 imes 8	355.6 355.6 355.6	318.5 267.4 216.3	4.0 4.0 4.0	4.0 3.4 2.8	4.8 4.8 4.8	4.5 4.0 4.0	7.9 7.9 7.9	6.5 6.5 6.5	330.2 330.2 330.2
16×14 16×12 16×10	406.4 406.4 406.4	355.6 318.5 267.4	4.2 4.2 4.2	4.0 4.0 3.4	4.8 4.8 4.8	4.8 4.5 4.0	7.9 7.9 7.9	7.9 6.5 6.5	355.6 355.6 355.6
18×16 18×14 18×12	457.2 457.2 457.2	406.4 355.6 318.5	4.2 4.2 4.2	4.2 4.0 4.0	4.8 4.8 4.8	4.8 4.8 4.5	7.9 7.9 7.9	7.9 7.9 6.5	381.0 381.0 381.0
20×18 20×16 20×14	508.0 508.0 508.0	457.2 406.4 355.6	4.8 4.8 4.8	4.2 4.2 4.0	5.5 5.5 5.5	4.8 4.8 4.8	7.9 7.9 7.9	7.9 7.9 7.9	508.0 508.0 508.0
$\begin{array}{c} 22 \times 20 \\ 22 \times 18 \\ 22 \times 16 \end{array}$	558.8 558.8 558.8	508.0 457.2 406.4	4.8 4.8 4.8	4.8 4.2 4.2	5.5 5.5 5.5	5.5 4.8 4.8		_ _ _	508.0 508.0 508.0
$\begin{array}{c} 24 \times 22 \\ 24 \times 20 \\ 24 \times 18 \end{array}$	609.6 609.6 609.6	558.8 508.0 457.2	5.5 5.5 5.5	4.8 4.8 4.2	6.4 6.4 6.4	5.5 5.5 4.8		_ _ _	508.0 508.0 508.0
30×24	762.0	609.0	6.4	5.5	7.9	6.4	_	-	609.0

• For Bevel Details See Page 118

For Dimensional Tolerances See Page 116



180° Elbows(Long, Short) Caps

Sch 5S, 10S, 20S





KS B154	(in millimeters)												
Nominal	Outside	Wa	II Thicknes	is T	E	E	Limited Wall	Lc	ong	Sh	ort		
Size	OD	5S	10S	20S	E	C 1	thickness	Р	к	Р	к		
1/2	21.7	1.65	2.1	2.5	25.4	-	-	76.2	49.0	-	-		
3/4	27.2	1.65	2.1	2.5	25.4	-	-	76.2	51.7	-	-		
1	34.0	1.65	2.8	3.0	38.1	-	-	76.2	55.1	50.8	42.4		
11/4	42.7	1.65	2.8	3.0	38.1	-	_	95.2	69.0	63.6	53.2		
$1^{1/2}$	48.6	1.65	2.8	3.0	38.1	38.1	5.1	114.4	81.5	76.2	62.4		
2	60.5	1.65	2.8	3.5	38.1	44.5	5.5	152.4	106.5	101.6	81.1		
2 ¹ / ₂	76.3	2.10	3.0	3.5	38.1	50.8	7.0	190.6	133.5	127.0	101.7		
3	89.1	2.10	3.0	4.0	50.8	63.5	7.6	228.6	158.9	152.4	120.8		
3 ¹ / ₂	101.6	2.10	3.0	4.0	63.5	76.2	8.1	266.8	184.2	177.8	139.7		
4	114.3	2.10	3.0	4.0	63.5	76.2	8.6	304.8	209.6	203.2	158.8		
5	139.8	2.80	3.4	5.0	76.2	88.9	9.5	381.0	260.4	254.0	196.9		
6	165.2	2.80	3.4	5.0	88.9	101.6	11.0	457.2	311.2	304.8	235.0		
8	216.3	2.80	4.0	6.5	101.6	127.0	12.7	609.6	413.0	406.4	311.4		
10	267.4	3.40	4.0	6.5	127.0	152.4	12.7	762.0	514.7	508.0	387.7		
12	318.5	4.00	4.5	6.5	152.4	177.8	12.7	914.4	616.5	609.6	464.1		
14	355.6	4.00	4.8	7.9	165.1	190.5	12.7	1066.8	711.2	711.2	533.4		
16	406.4	4.20	4.8	7.9	177.8	203.2	12.7	1219.2	812.8	812.8	609.6		
18	457.2	4.20	4.8	7.9	203.2	228.6	12.7	1371.6	914.4	914.4	685.8		
20	508.0	4.80	5.5	7.9	228.6	254.0	12.7	1524.0	1016.0	1016.0	762.0		

• The Back-To-Face Dimension of Cap Shall Be E, If The Basic Wall Thickness is Not More Than The "Limited Wall Thickness" And E1 If It Exceeds The "Limited Wall Thickness"

• For Bevel Details See Page 118

• For Dimensional Tolerances See Page 116

Lap Joint(Stub Ends)

Sch 5S, 10S, 20S



JPI - 7S - 15 - 84	JPI - /S - 15 - 84 (in millimeters)											
Nominal	Outside Diamotor	Outside Sch 5s Sch 10s Sch 20s S		Sch 40s		F	G	r.				
Size	OD	ID	t	ID	t	ID	t	ID	t		Ŭ	• 2
1/2	21.7	18.4	1.65	17.5	2.1	16.7	2.5	16.1	2.8	50	35	3.2
$3/_{4}$	27.2	23.9	1.65	23.0	2.1	22.2	2.5	21.4	2.9	50	43	3.2
1	34.0	30.7	1.65	28.4	2.8	28.0	3.0	27.2	3.4	50	51	3.2
$1\frac{1}{4}$	42.7	39.4	1.65	37.1	2.8	36.7	3.0	35.5	3.6	50	64	4.8
$1\frac{1}{2}$	48.6	45.3	1.65	43.0	2.8	42.6	3.0	41.2	3.7	50	73	6.4
2	60.5	57.2	1.65	54.9	2.8	53.5	3.5	52.7	3.9	65	92	7.9
2 ¹ / ₂	76.3	72.1	2.10	70.3	3.0	69.3	3.5	65.9	5.2	65	105	7.9
3	89.1	84.9	2.10	83.1	3.0	81.1	4.0	78.1	5.5	65	127	9.5
3 ½	101.6	97.4	2.10	95.6	3.0	93.6	4.0	90.2	5.7	75	140	9.5
4	114.3	110.1	2.10	108.3	3.0	106.3	4.0	102.3	6.0	75	157	11.1
5	139.8	134.2	2.80	133.0	3.4	129.8	5.0	126.6	6.6	75	186	11.1
6	165.2	159.6	2.80	158.4	3.4	155.2	5.0	151.0	7.1	90	216	12.7
8	216.3	210.7	2.80	208.3	3.8	203.3	6.4	199.9	8.2	100	270	12.7
10	267.4	260.6	3.40	259.4	4.2	254.4	6.4	248.8	9.3	125	324	12.7
12	318.5	310.5	4.00	309.5	4.6	305.5	6.4	297.9	9.5	150	381	12.7

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

Nominal		3011	105	3011	205	3011	405	-	<u> </u>	whh	IOX MAGIÓ	յու
Pipe Size	0.0	ID	t	ID	t	ID	t	F	G	10s	20s	40s
$\frac{1}{2}$	21.7	17.5	2.1	16.7	2.5	16.1	2.8	30	51	0.059	0.070	0.078
3/4	27.2	23.0	2.1	22.2	2.5	21.4	2.9	30	56	0.073	0.086	0.099
1	34.0	28.4	2.8	28.0	3.0	27.2	3.4	50	67	0.172	0.184	0.207
11/4	42.7	37.1	2.8	36.7	3.0	35.5	3.6	50	76	0.217	0.231	0.275
$1\frac{1}{2}$	48.6	43.0	2.8	42.6	3.0	41.2	3.7	50	81	0.242	0.258	0.316
2	60.5	54.9	2.8	53.5	3.5	52.7	3.9	50	96	0.308	0.383	0.424
2 ½	76.3	70.3	3.0	69.3	3.5	65.9	5.2	50	116	0.430	0.499	0.731
3	89.1	83.1	3.0	81.1	4.0	78.1	5.5	50	126	0.484	0.640	0.870
3 ½	101.6	95.6	3.0	93.6	4.0	90.2	5.7	50	136	0.536	0.710	1.00
4	114.3	108.3	3.0	106.3	4.0	102.3	6.0	50	151	0.614	0.814	1.21
5	139.8	133.0	3.4	129.8	5.0	126.6	6.6	50	182	0.879	1.28	1.68
6	165.2	158.4	3.4	155.2	5.0	151.0	7.1	50	212	1.07	1.57	2.21
8	216.3	208.3	4.0	203.3	6.5	199.9	8.2	65	262	1.94	3.12	3.92
10	267.4	259.4	4.0	254.4	6.5	248.8	9.3	65	324	2.53	4.08	5.80
12	318.5	309.5	4.5	305.5	6.5	297.9	10.3	65	368	3.25	4.67	7.34

• Dimensions Conform to TK Standards.

• This specification used for JIS 10K Flanges.





High Pressure Fittings

- High Pressure Maniford Fittings ___ P86~P89
- Api Flange Studded Crosses & Tees ___ P90
- Api Flange __ P91~P94



High Pressure Manifold Fittings





FULL FLOW CROSS

Sizo	ALL DIMENSIONS IN mm											
3120	D	А	В	R								
2″	60.3	406	203	150								
3″	88.9	406	203	150								
4″	114.3	560	280	210								
5″	141.3	610	305	240								
6″	168.3	762	381	305								



FULL FLOW TEE

Sizo	ALL DIMENSIONS IN mm										
3120	D	А	A B								
2″	60.3	406	203	150							
3″	88.9	406	203	150							
4″	114.3	560	280	210							
5″	141.3	610	305	240							
6″	168.3	762	381	305							





45°	LATE	RAL	TEE

Cizo	ALL DIMENSIONS IN mm										
3120	D	А	В	Н							
2″	60.3	365	115	265							
3″	88.9	365	115	265							
4 ″	114.3	510	155	365							
5″	141.3	550	165	405							
6″	168.3	670	195	505							





Size	ALL DIMENSIONS IN mm									
3120	D	В	R	TAN						
2″	60.3	119	150	56						
3″	88.9	119	150	56						
4″	114.3	162	210	75						
5″	141.3	172	240	72						
6″	168.3	203	305	76						



Sizo	A	ALL DIMENSIONS IN mm										
5120	D	А	R	TAN								
2″	60.3	203	150	53								
3″	88.9	203	150	53								
4″	114.3	280	210	70								
5″	141.3	305	240	65								
6″	168.3	381	305	76								

90° LONG SWEEP ELBOW

45° LONG SWEEP ELBOW



High Pressure Manifold Fittings

ш

TAN

R









Api Flange Studded Croasses & Tees





			Center to	Center to
			Face	Face
Rated			Vertical	Horizontal
Working	Vertical	Outlet	Run,	Run,
Pressure	Bv	Bo	HHv	HHo
(psi)	+1,-0mm	+1,-0mm	<u>+</u> 0.8mm	± 0.8 mm
2000	52	52	89.0	89.0
2000	65	52	89.0	101.5
2000	65	65	114.5	114.5
2000	78	52	114.5	114.5
2000	78	65	114.5	114.5
2000	78	78	114.5	114.5
2000	103	52	114.5	139.5
2000	103	65	114.5	139.5
2000	103	78	114.5	139.5
2000	103	103	139.5	139.5
3000	78	52	114.5	127.0
3000	78	65	127.0	127.0
3000	78	78	127.0	127.0
3000	103	52	114.5	156.0
3000	103	65	127.0	156.0
3000	103	78	127.0	156.0
3000	103	103	156.0	156.0
5000	52	52	114.5	114.5
5000	65	52	114.5	127.0
5000	65	65	127.0	127.0
5000	78	52	114.5	139.5
5000	78	65	139.5	139.5
5000	78	78	139.5	139.5
5000	103	52	114.5	165.0
5000	103	65	127.0	165.0
5000	103	78	139.5	165.0
5000	103	103	165.0	165.0
10000	46	46	111.0	111.0
10000	52	46	111.0	111.0
10000	52	52	111.0	111.0
10000	65	46	114.5	130.0
10000	65	52	114.5	130.0
10000	65	65	130.0	130.0
10000	78	46	114.5	149.0
10000	78	52	114.5	149.0
		-		

			Center to	Center to
			Face	Face
Rated			Vertical	Horizontal
Working	Vertical	Outlet	Run,	Run,
Pressure	Bv	Bo	HHv	HHo
(psi)	+1,-0mm	+1,-0mm	<u>+</u> 0.8mm	<u>+</u> 0.8mm
10000	78	65	130.0	149.0
10000	78	78	149.0	149.0
10000	103	46	114.5	174.5
10000	103	52	114.5	174.5
10000	103	65	130.0	174.5
10000	103	78	149.0	174.5
10000	103	103	174.5	174.5
15000	46	46	127.0	127.0
15000	52	46	127.0	127.0
15000	52	52	127.0	127.0
15000	65	46	139.5	139.5
15000	65	52	139.5	139.5
15000	65	65	139.5	139.5
15000	78	46	160.5	160.5
15000	78	52	160.5	160.5
15000	78	65	160.5	160.5
15000	78	78	160.5	160.5
15000	103	46	194.0	194.0
15000	103	52	194.0	194.0
15000	103	65	194.0	194.0
15000	103	78	194.0	194.0
15000	103	103	194.0	194.0
20000	46	46	164.5	164.5
20000	52	46	164.5	164.5
20000	52	52	164.5	164.5
20000	65	46	185.0	185.0
20000	65	52	185.0	185.0
20000	65	65	185.0	185.0
20000	78	46	202.5	202.5
20000	78	52	202.5	202.5
20000	78	65	202.5	202.5
20000	78	78	202.5	202.5
20000	103	46	251.5	251.5
20000	103	52	251.5	251.5
20000	103	65	251.5	251.5
20000	103	78	251.5	251.5
20000	103	103	251.5	251.5



$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		Basic Flange Dimensions												E	Bolting Dimensions				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Norminal Size		Maximum Bore	Outside Diameter of Flange	Tolerance	Maximum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub	Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Length of Stud Bolts	Ring Number
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	in.	mm	В	OD	OD	С	К	Т	J1	J2	JЗ	R	BC		in.	mm		Lssb	ВΧ
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$										10000 p	osi								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1-13/16	46	46.8	190	2	3	105	42.1	88.9	65.1	48.4	10	146.0	8	3/4	23	+2/-0.5	130	151
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2-1/16	52	53.2	200	2	З	111	44.1	100.0	74.6	51.6	10	158.8	8	³ /4	23	+2/-0.5	130	152
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2-9/16	65	65.9	230	2	3	132	51.2	120.7	92.1	57.2	10	184.2	8	7/ ₈	25	+2/-0.5	150	153
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3-1/16	78	78.6	270	2	3	152	58.4	142 .1	110.4	63.5	10	215.9	8	1	29	+2/-0.5	170	154
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4-1/16	103	104.0	315	2	З	185	70.3	182.6	146.1	73.1	10	258.8	8	1-1/8	32	+2/-0.5	200	155
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	5-1/8	130	131.0	360	2	З	221	79.4	223.8	182.6	81.0	10	300.0	12	1-1/8	32	+2/-0.5	220	169
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$7 - \frac{1}{16}$	179	180.2	479	З	6	302	103.2	301.6	254.0	95.3	16	403.2	12	1- ¹ / ₂	42	+2/-0.5	285	156
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	9	228	229.4	555	З	6	359	123.8	374.7	327.1	93.7	16	476.2	16	$1 - \frac{1}{2}$	42	+2/-0.5	330	157
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	11	279	280.2	655	З	6	429	141.3	450.9	400.1	103.2	16	565.2	16	1- ³ /4	48	+3/-0.5	380	158
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	13- ⁵ /8	346	346.9	770	З	6	518	168.3	552.5	495.3	114.3	16	673.1	20	1- ⁷ /8	51	+3/-0.5	440	159
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16- ³ /4	425	426.2	870	З	6	576	168.3	655.6	601.7	76.2	19	776.3	24	1- ⁷ /8	51	+3/-0.5	440	162
$\frac{15000 \text{ psi}}{1-\frac{13}{46} 46} 46,8 210 2 3 106 45,2 97,6 71,4 47,6 10 160,3 8 7/8 26 +2/-0.5 140 151 2-9/{16} 52 53,2 220 2 3 114 50,8 111,1 82,6 54,0 10 174,6 8 7/8 26 +2/-0.5 150 152 2-9/{16} 65 65,9 250 2 3 133 57,1 128,6 100,0 57,1 10 200,0 8 1 30 +2/-0.5 170 153 3-1/{16} 78 78,6 290 2 3 154 64,3 154,0 122,2 63,5 10 230,2 8 1-1/8 32 +2/-0.5 190 154 4-1/{16} 103 104,0 360 2 3 194 78,6 195,3 158,8 73,0 10 290,5 8 1-3/8 40 +2/-0.5 235 155 7-1/{16} 179 180,2 505 3 6 305 119,1 325,4 276,2 66,7 16 428,6 16 1-1/2 42 +2/-0.5 325 156 156 1-1/8 100,0 10,0 10,0 10,0 10,0 10,0 10,0 10$																			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										15000 p	si								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1-13/16	46	46.8	210	2	3	106	45.2	97.6	71.4	47.6	10	160.3	8	7/ ₈	26	+2/-0.5	140	151
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2-1/ ₁₆	52	53.2	220	2	З	114	50.8	111.1	82.6	54.0	10	174.6	8	7/ ₈	26	+2/-0.5	150	152
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2- ⁹ / ₁₆	65	65.9	250	2	3	133	57.1	128.6	100.0	57.1	10	200.0	8	1	30	+2/-0.5	170	153
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3-1/16	78	78.6	290	2	3	154	64.3	154.0	122.2	63.5	10	230.2	8	1- ¹ /8	32	+2/-0.5	190	154
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$4-\frac{1}{16}$	103	104.0	360	2	З	194	78.6	195.3	158.8	73.0	10	290.5	8	1- ³ /8	40	+2/-0.5	235	155
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$7 - \frac{1}{16}$	179	180.2	505	З	6	305	119.1	325.4	276.2	66.7	16	428.6	16	1- ¹ /2	42	+2/-0.5	325	156
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$																			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$										20000 p	osi								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1 - ¹³ /16	46	46.8	255	2	3	117	63.5	133.3	109.5	49.2	10	203.2	8	1	30	+2/-0.5	190	151
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2-1/ ₁₆	52	53.2	285	2	3	132	71.5	154.0	127.0	52.4	10	230.2	8	1- ¹ /8	32	+2/-0.5	210	152
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2- ⁹ / ₁₆	65	65.9	325	2	3	151	79.4	173.0	144.4	58.7	10	261.9	8	1- ¹ /4	36	+2/-0.5	235	153
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3-1/16	78	78.6	355	2	3	171	85.7	192.1	160.3	63.5	10	287.3	8	1- ³ /8	40	+2/-0.5	255	154
7-1/ ₁₆ 179 180.2 655 3 6 352 165.1 385.7 338.1 96.8 16 554.0 16 2 54 +3/-0.5 445 156	4-1/16	103	104.0	445	2	3	219	106.4	242.9	206.4	73.0	10	357.2	8	1-3/4	48	+3/-0.5	310	155
	7-1/ ₁₆	179	180.2	655	З	6	352	165.1	385.7	338.1	96.8	16	554.0	16	2	54	+3/-0.5	445	156

Api Flange - Type 6bx Weld Neck Flanges



					Basic	Flan	ge Dim	ensions	;					E	Bolting	Dimens	ions	
Norminal Size		Maximum Bore	Outside Diameter of Flange	Tolerance	Maximum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub	Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Length of Stud Bolts	Ring Number
in.	mm	В	OD	OD	С	К	Т	J1	J2	JЗ	R	BC		in.	mm		Lssb	ВX
									10000 <mark>j</mark>	osi								
1 - 13 / ₁₆	46	46.8	190	2	3	105	42.1	88.9	65.1	48.4	10	146.0	8	3/4	23	+2/-0.5	130	151
2 –1/ ₁₆	52	53.2	200	2	3	111	44.1	100.0	74.6	51.6	10	158.8	8	3/4	23	+2/-0.5	130	152
2 -9/ ₁₆	65	65.9	230	2	3	132	51.2	120.7	92.1	57.2	10	184.2	8	7/ ₈	25	+2/-0.5	150	153
3-1/ ₁₆	78	78.6	270	2	3	152	58.4	142.1	110.4	63.5	10	215.9	8	1	29	+2/-0.5	170	154
$4^{-1}/_{16}$	103	104.0	315	2	3	185	70.3	182.6	146.1	73.1	10	258.8	8	1-1/8	32	+2/-0.5	200	155
5-1/8	130	131.0	360	2	3	221	79.4	223.8	182.6	81.0	10	300.0	12	1- 1/8	32	+2/-0.5	220	169
/-'/ ₁₆	1/9	180.2	4/9	3	6	302	103.2	301.6	254.0	95.3	16	403.2	12	$1 - \frac{1}{2}$	42	+2/-0.5	285	156
9	228	229.4	555	3	6	359	123.8	3/4./	327.1	93.7	16	4/6.2	16	1-1/2	42	+2/-0.5	330	157
10 57	2/9	280.2	555	3	6	429	141.3	450.9	400.1	10.3.2	16	565.2 670.1	16	1 - 3/4	48	+3/-0.5	380	158
10 3/	346 425	346.9	770	3	b C	518	168.3	552.5 655.6	495.3	760	10	776.0	20	1 7	51	+3/-0.5	440	160
10-074	420	420.2	870	3	0	570	100.3	055.0	001.7	70.2	19	110.3	24	1-78	51	+3/-0.5	440	102
									15000 r	osi								
1 - ¹³ /16	46	46.8	210	2	3	106	45.2	97.6	71.4	47.6	10	160.3	8	7/8	26	+2/-0.5	140	151
$2 - \frac{1}{16}$	52	53.2	220	2	3	114	50.8	111.1	82.6	54.0	10	174.6	8	7/8	26	+2/-0.5	150	152
2 - ⁹ / ₁₆	65	65.9	250	2	З	133	57.1	128.6	100.0	57.1	10	200.0	8	1	30	+2/-0.5	170	153
$3 - \frac{1}{16}$	78	78.6	290	2	З	154	64.3	154.0	122.2	63.5	10	230.2	8	1-1/8	32	+2/-0.5	190	154
$4 - 1/_{16}$	103	104.0	360	2	З	194	78.6	195.3	158.8	73.0	10	290.5	8	1-3/8	40	+2/-0.5	235	155
7-1/ ₁₆	179	180.2	505	З	6	305	119.1	325.4	276.2	66.7	16	428.6	16	1-1/2	42	+2/-0.5	325	156
									20000	:								
. 10	10	10.0	0.55	-				100.0	20000 p		10		-				10.0	
1 - 13 /16	46	46.8	255	2	3	11/	63.5	133.3	109.5	49.2	10	203.2	8	1	30	+2/-0.5	190	151
2 - 1/16	52	53.2	285	2	3	132	/1.5	154.0	127.0	52.4	10	230.2	8	1-1/8	32	+2/-0.5	210	152
2 °/16 3 –17	72	78.6	355	2	3	171	79.4 85.7	1/3.0	144.4	- 58.7 63.5	10	201.9	8	1-3/	30	+2/-0.5	230	153
<i>1</i> −1/	103	104.0	445	2	3	210	1064	2/2 0	206.4	73.0	10	207.3	8	1-3/	40	+3/-0.5	200	155
4 1/16 7-1/	170	180.2	655	3	6	352	165.1	2442.9	200.4	96.8	16	554.0	16	2	40 54	+3/-0.5	445	156
′′′′16	113	100.2	000	0	0	002	100.1	000.1	000.1	50.0	10	004.0	10	<u> </u>	94	. 0, 0.0	440	100



					Basic	Flang	ge Dim	ensions	;					E	3 ol tin g	g Dimens	sions	
Norminal Size of Flance		Maximum Bore	Outside Diameter of Flange	Toler ance	Maximum Chamfer	Diameter of Raiser d Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub	Length of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Length of Stud Bolts	Ring Number
in.	mm	В	OD	OD	С	К	Т	J1	J2	JЗ	R	BC		in.	mm		Lssb	ΒХ
									10000 p	osi								
1-13/ ₁₆	46	46.8	190	2	3	105	42.1	88.9	65.1	48.4	10	146.0	8	3/4	23	+2/-0.5	130	151
$2 - 1/_{16}$	52	53.2	200	2	3	111	44.1	100.0	74.6	51.6	10	158.8	8	3/4	23	+2/-0.5	135	152
2-9/16	65	65.9	230	2	3	132	51.2	120.7	92.1	57.1	10	184.2	8	7/8	25	+2/-0.5	155	153
$3-1_{16}$	78	78.6	270	2	З	152	58.4	142.1	110.3	63.5	10	215.9	8	1	29	+2/-0.5	175	154
$4 - \frac{1}{16}$	103	104.0	315	2	3	185	70.3	182.6	146.0	73.0	10	258.8	8	1-1/8	32	+2/-0.5	205	155
									15000 p	si								
1-13/16	46	46.8	210	2	3	106	45.2	97.6	71.4	47.6	10	160.3	8	7/ ₈	26	+2/-0.5	140	151
$2 - \frac{1}{16}$	52	53.2	220	2	3	114	50.8	111.1	82.6	54.0	10	174.6	8	7/8	26	+2/-0.5	150	152
2-9/16	65	65.9	250	2	3	133	57.1	128.6	100.0	57.1	10	200.0	8	1	29	+2/-0.5	170	153
3-1/16	78	78.6	290	2	3	154	64.3	154.0	122.2	63.5	10	230.2	8	$1 - \frac{1}{8}$	32	+2/-0.5	190	154
$4-\frac{1}{16}$	103	104.0	360	2	3	194	78.6	195.3	158.8	73.0	10	290.5	8	1-3/8	39	+2/-0.5	230	155

Api Flange - Type 6bx Blind and Test Flanges



					Basic	Flan	ge Dim	ensions	;					E	Bolting	g Dimens	sions	
Norminal Size of Flance		Maximum Bore	Outside Diameter of Flange	Tolerance	Maximum Chamfer	Diameter of Raiserd Face	Tatal Thickness of Flange	Large Diameter of Hub	Small Diameter of Hub	Lenght of Hub	Radius of Hub	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Diameter of Bolt Holes	Bolt Hole Tolerance	Minimum Length of Stud Bolts	Ring Number
in.	mm	В	OD	OD	С	К	Т	J1	J2	J3	R	BC		in,	mm		Lssb	ВX
								:	20000 p	osi								
1 - 13 / ₁₆	46	46.8	255	2	3	117	63.5	133.4	109.5	49.2	10	203.2	8	1	29	+2/-0.5	190	151
2 -1/ ₁₆	52	53.2	290	2	З	132	71.4	154.0	127.0	52.4	10	230.2	8	1-1/8	32	+2/-0.5	210	152
2 - ⁹ / ₁₆	65	65.9	325	2	З	151	79.4	173.0	144.5	58.7	10	261.9	8	1-1/4	34	+2/-0.5	235	153
$3 - \frac{1}{16}$	78	78.6	355	2	З	171	85.7	192.0	160.3	63.5	10	287.3	8	1- ³ /8	38	+2/-0.5	255	154
$4 - \frac{1}{16}$	103	104.0	445	2	3	219	106.4	242.9	206.4	73.0	10	357.2	8	1- ³ /4	48	+3/-0.5	310	155





- **Forged Steel Pipe Fittings**
- Forged Steel Socket Weld Fittings ___ P96 ~ P102
- Forged Steel Threaded Fittings ___ P103 ~ P108
- Forged Steel Outlet Fittings ___ P109 ~ P112



90°Elbows, 45°Elbows, Tee, Cross, Coupling

3000# 6000# 9000#











F



Half Coupling

ASME B16.11

ASME	B16.11											(in mill	imeters)
Nom	Socket	Bore D	iameter o	f Fitting		Sock	et Wall	Thickn	less-C		Body	Wall Thickr	ness-G
Pine	Bore	_	D		I	Pressu	re Clas	s Desi	gnatior	1	Pressur	e Class Des	signation
Size	Dia	Pressure	Class De	signation	30	00	60	00	90	00	3000	6000	9000
	D	3000	6000	9000	Ave.	Min.	Ave.	Min.	Ave.	Min.	Min.	Min.	Min.
1/8	11.2 10.8	7.6 6.1	4.8 3.2		3.18	3.18	3.96	3.43			2.41	3.15	
$\frac{1}{4}$	14.6 14.2	10.0 8.5	7.1 5.6		3.78	3.30	4.60	4.01			3.02	3.68	
3/8	18.0 17.6	13.3 11.8	9.9 8.4		4.01	3.50	5.03	4.37			3.20	4.01	
1/2	22.2 21.8	16.6 15.0	12.5 11.0	7.2 5.6	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47
3⁄4	27.6 27.2	21.7 20.2	16.3 14.8	11.8 10.3	4.90	4.27	6.96	6.04	9.78	8.56	3.91	5.56	7.82
1	34.3 33.9	27.4 25.9	21.5 19.9	16.0 14.5	5.69	4.98	7.92	6.93	11.38	9.96	4.55	6.35	9.09
11/4	43.1 42.7	35.8 34.3	30.2 28.7	23.5 22.0	6.07	5.28	7.92	6.93	12.14	10.62	4.85	6.35	9.70
$1^{1/2}$	49.2 48.8	41.7 40.1	34.7 33.2	28.7 27.2	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15
2	61.7 61.2	53.5 51.7	43.6 42.1	38.9 37.4	6.93	6.04	10.92	9.50	13.84	12.12	5.54	8.74	11.07
2 ¹ / ₂	74.4 73.9	64.2 61.2			8.76	7.67					7.01		
3	90.3 89.8	79.5 76.4			9.52	8.30					7.62		
4	115.7 115.2	103.8 100.7			10.69	9.35					8.56		

• For Approx Weight See Page 127

90°Elbows, 45°Elbows, Tee, Cross, Coupling

3000# 6000# 9000#





Coupling





Half Coupling

ASME B	16.11							(in mi	llimeters)
News	Depth		Ce	nter To Bott	om of Sock	et-A		Laying I	_engths
Nom. Pino	of	90° Elbow	/s, Tees, and	d Crosses		45° Elbows			Half
Size	Socket	Pressur	e Class Desi	gnation	Pressu	re Class Desi	ignation	Couplings	Couplings
0.20	winJ	3000	6000	9000	3000	6000	9000	E	F
1/8	9.5	12 10	12 10		9 7	9 7		8 5	17 15
1/4	9.5	12 10	14.5 12.5		9 7	9 7		8 5	17 15
3/8	9.5	15 12	17 14		9.5 6.5	12.5 9.5		9.5 3.5	19 16
$\frac{1}{2}$	9.5	17 14	20.5 17.5	27 24	12.5 9.5	14 11	17 14	12.5 6.5	24 21
3⁄4	12.5	21 18	24 21	30 27	14.5 11.5	15.5 12.5	20.5 17.5	12.5 6.5	25.5 22.5
1	12.5	24.5 20.5	29 25	34 30	16 12	19.5 15.5	22.5 18.5	16.5 8.5	30.5 26.5
1 ¹ ⁄ ₄	12.5	29 25	34 30	37 33	19.5 15.5	22.5 18.5	24.5 20.5	16.5 8.5	32 28
$1\frac{1}{2}$	12.5	34 30	40 36	40 36	22.5 18.5	27.5 23.5	27.5 23.5	16.5 8.5	34 30
2	16	40 36	43 39	56 52	27.5 23.5	30.5 26.5	30.5 26.5	23 15	43 39
2 ¹ / ₂	16	43.5 38.5			31 26			24 14	45.5 40.5
3	16	59.5 54.5			34.5 29.5			24 14	47 42
4	19	69 64			43.5 38.5			24 14	50.5 45.5

Union

3000#



MSS SP	-83										(in millim	eters)
Nom. Pipe Size	Pipe End Min.	Socket Bore Dia.	Socket Wall Min.	Water Way Bore	Laying Length	Male Flange Min.	Nut Min.	Thrds. Per 25.4 Max.	Bearing Min.	Depth of Socket Min.	Length Assem. Nominal	Clear Assem. Nut
0120	Α	В	С	D	E	F	G	Н	J	K	L	Ν
1/8	21.8	10.92 10.67	3.17	6.83 6.43	22.4 19.0	3.17	3.17	16	1.24	9.6	41.1	49.0
$\frac{1}{4}$	21.8	14.22 13.97	3.30	9.85 9.45	22.4 19.0	3.17	3.17	16	1.24	9.6	41.4	49.0
3/8	25.9	17.78 17.53	3.48	13.92 13.51	26.9 20.6	3.43	3.43	14	1.37	9.6	46.0	55.0
$\frac{1}{2}$	31.2	21.84 21.59	4.06	17.47 17.07	26.9 20.6	3.68	3.68	14	1.50	9.6	49.0	57.0
3/4	37.1	27.18 26.92	4.27	21.79 21.39	31.8 25.4	4.06	4.06	11	1.68	12.7	56.9	67.0
1	45.5	34.04 33.78	4.95	28.14 27.74	34.3 26.2	4.57	4.44	11	1.85	12.7	62.0	79.0
1 ¹ ⁄ ₄	54.9	42.67 42.42	5.28	35.76 35.36	40.6 32.5	5.33	5.21	11	2.13	12.7	71.1	94.0
$1\frac{1}{2}$	61.5	48.77 48.51	5.54	41.61 41.20	42.2 34.0	5.84	5.59	10	2.31	12.7	76.5	111.0
2	75.2	61.47 61.21	6.05	52.53 52.12	45.5 37.3	6.60	6.35	10	2.69	15.8	86.1	132.0
2 ¹ / ₂	91.7	74.17 73.66	7.65	64.72 64.31	61.7 52.1	7.49	7.11	8	3.07	15.8	102.4	148.0
3	109.2	90.17 89.66	8.31	77.67 77.27	63.8 53.6	8.25	8.00	8	3.53	15.8	109.0	175.0



(in millimeters)





MSS SP-83

Nom. Pipe	,	4	I	כ	E	=	I	=	ł	4	J(F	lat)	Uı wei (k	nit ght g)
Size	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000
$\frac{1}{4}$	45	51	9.5	9.5	21	24.5	14.3	14.3	7.8	6.5	32	38	0.23	0.25
3/8	51	54	9.5	9.5	24.5	31.5	17.8	17.8	10.9	9	38	46	0.35	0.42
$\frac{1}{2}$	54	57	9.5	9.5	31.5	41.5	22.2	22.2	14.3	12.3	46	51	0.40	0.85
3/4	57	64	13	13	37.5	41.5	27.7	27.7	19.4	16.2	51	60	0.50	1.00
1	64	81	13	13	44.5	48.8	34.5	34.5	25.0	21.2	60	72	0.70	1.30
$1^{1}/_{4}$	72	80	13	13	54	56	43.2	43.2	32.9	29.9	72	77	1.20	2.00
$1^{1}/_{2}$	80	89	13	13	61.5	69	49.1	49.1	38.4	34.4	80	94	1.50	3.80
2	89	110	16	16	74.5	90	61.1	61.1	49.5	43.1	94	120	2.58	6.40

Union(O-Ring Type)



(in millimeters)
	IN .

Nom Size	d ₁	d ₂	\mathbf{D}_1	\mathbf{D}_2	L_1	L_2	L ₃	L	Ν	Н	O-RING
1/4	10	14.3	22	24	10	10	18	38	21	35HEX	P18
3/8	12	17.8	27	30	10	10	18	38	26	41HEX	P20
$\frac{1}{2}$	16	22.2	32	35	12	12	20	44	32	46HEX	G25
3⁄4	20	27.7	37	41	12	12	26	50	38	54HEX	G30
1	25	34.5	44	48	15	15	26	56	44	63HEX	G35
1^{1}_{4}	32	43.2	54	58	15	15	30	60	54	75HEX	G45
$1^{1/2}$	38	49.1	63	65	18	18	36	72	60	800CT	G50
2	48	61.1	76	80	18	18	36	72	75	950CT	G65

Rating Pressure:210kg/cm² Temperature:120 ° Max

Reducer Insert

3000# 6000#







Type 2(1)

MSS SP-79	MSS SP-79 (in millimeters)													ers)	
Nom			Soc	ket	Shank	Lay	ing	Bo	ore	W	all		Lengt	h Min.	
Pipe	Ту	ре	Dia.	Depth Min.	Snank Dia SD	Len A	gth	[5	Mi	n. C	S	L	R	L
0120	3M	6M	D	K	30	3M	6M	3M	6M	3M	6M	3M	6M	3M	6M
$\frac{3}{8} \times \frac{1}{4}$	1	1	14.22	9.52	17.14	19.0	20.6	9.14	6.35	3.78	4.60	14.22	15.75		
$\frac{1}{2} \times \frac{3}{8}$	1	1	17.65	9.52	21.34	20.6	22.2	12.45	9.14	4.01	5.03	15.75	17.27		
\times $\frac{1}{4}$	2	1	14.22	9.52	21.34	15.8	20.6	9.14	6.35	3.78	4.60	17.27	17.27		
$\frac{3}{4} \times \frac{1}{2}$	1	1	21.84	9.52	26.67	22.2	25.4	15.75	11.68	4.67	5.97	17.53	19.05		
\times $\frac{3}{8}$	2	1	17.65	9.52	26.67	15.8	22.2	12.45	9.14	4.01	5.03		19.05	26.92	
$\times \frac{1}{4}$	2	2	14.22	9.52	26.67	17.5	22.2	9.14	6.35	3.78	4.60			26.92	29.97
$1 \times \frac{3}{4}$	1	1	27.18	12.70	33.35	23.8	28.5	20.83	15.49	4.90	6.96	19.05	20.57		
$\times \frac{1}{2}$	2	2	21.84	9.52	33.35	15.8	20.6	15.75	11.68	4.67	5.97		20.57	28.45	
\times $\frac{3}{8}$	2	2	17.65	9.52	33.35	17.5	22.2	12.45	9.14	4.01	5.03			28.45	33.27
$\times \frac{1}{4}$	2	2	14.22	9.52	33.35	19.0	23.8	9.14	6.35	3.78	4.60			28.45	33.27
$1\frac{1}{4} \times 1$	1	1	33.86	12.70	42.16	25.4	30.2	26.67	20.57	5.69	7.92	20.57	22.35		
\times $\frac{3}{4}$	2	2	27.18	12.70	42.16	17.5	20.6	20.88	15.49	4.90	6.96			31.75	34.80
$\times \frac{1}{2}$	2	2	21.84	9.52	42.16	19.0	22.2	15.75	11.68	4.67	5.97			31.75	34.80
× 3/8	2	2	17.65	9.52	42.16	20.6	23.8	12.45	9.14	4.01	5.03			31.75	34.80
$\times \frac{1}{4}$	2	2	14.22	9.52	42.16	22.2	25.4	9.14	6.35	3.78	4.60			31.75	34.80
$1\frac{1}{2} \times 1\frac{1}{4}$	1	1	42.67	12.70	48.26	28.5	35.1	35.05	29.46	6.07	7.92	22.22	25.40		
×1	2	1	33.86	12.70	48.26	17.5	28.5	26.67	20.57	5.69	7.92		25.40	33.27	~~~~~
X %	2	2	27.18	12.70	48.26	19.0	25.4	20.83	15.49	4.90	6.96			33.27	39.62
$\times \frac{1}{2}$	2	2	21.84	9.52	48.26	20.6	26.9	15.75	11.68	4.67	5.97			33.27	39.62
	2	2	17.65	9.52	48.26	22.2	28.5	12.45	9.14	4.01	5.03	05 40	20.00	33.27	39.62
$2 \times 1^{1/2}$	1	1	48.77	12.70	60.32	31.7	46.0	40.89	34.04	6.35	8.91	25.40	39.62	20.10	45.07
$\times 1^{1/4}$	2	2	42.07	12.70	60.32	20.6	23.8	34.92	29.40	5.07	7.92			38.10	45.97
	2	2	33.91 27.19	12.70	60.32	22.2	20.4	20.07	20.03	1.09	6.06			20.10	45.97
× 1/4	2	2	21.10	9.52	60.32	23.0	20.9	20.03	11 68	4.90	5.90			38.10	45.97
∧ / ₂	2	2	21.04	9.02	00.52	20.4	20.0	10.01	11.08	4.07	5.97			30.10	40.97



Reducer Insert

3000# 6000#





Type 2(1)

MS	S SP-79													(in n	nillimete	ers)
	Nom			Soc	cket	<u>.</u>	Lay	ing	Pa	aro	W	all		Lengt	h Min.	
	Pipe	Ту	ре	Dia.	Depth Min.	Shank Dia	Len A	gth	[)	M	in. C	S	SL.	R	L
	Size	3M	6M	В	K	5D	3M	6M	3M	6M	3M	6M	3M	6M	3M	6M
	$2\frac{1}{2} \times 2$	1	1	61.24	15.87	73.02	46.0	42.8	52.58	42.92	6.93	10.92	38.10	31.75		
	$ imes$ 1 $\frac{1}{2}$	2	2	48.77	12.70	73.02	34.9	Х	40.89	Х	6.35	Х			53.85	Х
	$ imes$ 1 $\frac{1}{4}$	2	2	42.67	12.70	73.02	36.5	Х	34.92	Х	6.07	Х			53.85	Х
	×1	2	2	33.91	12.70	73.02	38.1	Х	26.67	Х	5.69	Х			53.85	Х
	\times $\frac{3}{4}$	2	2	27.18	12.70	73.02	39.6	Х	20.83	Х	4.90	Х			53.85	Х
	$3 \times 2^{1/2}$	1	Х	74.01	15.87	88.90	38.1	Х	62.74	Х	8.76	Х	31.75	Х		
	×2	2	Х	61.24	15.87	88.90	25.4	Х	52.58	Х	6.93	Х			47.50	Х
	$ imes$ 1 $\frac{1}{2}$	2	Х	48.77	12.70	88.90	28.5	Х	40.89	Х	6.35	Х			47.50	Х
	$ imes$ 1 $\frac{1}{4}$	2	Х	42.67	12.70	88.90	30.1	Х	34.92	Х	6.07	Х			47.50	Х
	imes1	2	Х	33.91	12.70	88.90	31.7	Х	26.67	Х	5.69	Х			47.50	Х
	4 ×3	2	Х	89.99	15.87	114.30	33.2	Х	77.99	Х	9.52	Х			60.32	Х
	$ imes 2^{1}/_{2}$	2	Х	74.01	15.87	114.30	38.1	Х	62.74	Х	8.76	Х			60.32	Х
	×2	2	Х	61.24	15.87	114.30	38.1	Х	52.58	Х	6.93	Х			60.32	Х
	$ imes$ 1 $\frac{1}{2}$	2	Х	48.77	12.70	114.30	41.2	Х	40.89	Х	6.35	Х			60.32	Х
	$ imes$ 1 $lash_4$	2	Х	42.67	12.70	114.30	42.8	Х	34.92	Х	6.07	Х			60.32	Х

(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.

TOLERANCES

Laying Lenght A-	Sizes ¾" thru¾"	+or-1.52mm	Bore D-	% " thru 2"	+or-0.76mm
	Sizes 1 " thru 2 "	+or-2.03mm		Sizes 2½" thru 4"	+or-1.52mm
	Sizes 2½" thru 4 "	+or-2.54mm	Shank Dia. SD-	Sizes ¼" thru 1½"	+or-0.25mm
Socket Dia. B-	Sizes ¾" thru 2 "	+or-0.13mm		Sizes 2 " thru 3 "	+or-0.51mm
	Sizes 2½ " thru 4 "	+or-0.20mm		Sizes 4 "	+or-0.76mm





									(in millin	neters)
Nom. Pipe	Ļ	A	I	E	F	=	[)	Uı wei (k	nit ight g)
Size	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000
1/4	16	18	22	23	14.3	14.3	9.5	9.5	0.04	0.04
3/8	16	18	25.5	26.5	17.8	17.8	9.5	9.5	0.05	0.06
1/2	17.5	25.5	31.5	34	22.2	22.2	9.5	9.5	0.07	0.15
3/4	22.5	32	37	41	27.7	27.7	13	13	0.13	0.27
1	29	35.5	45.5	50	34.5	34.5	13	13	0.21	0.45
11/4	29	39	55	58.5	43.2	43.2	13	13	0.37	0.67
$1^{1/2}$	32	40	61.5	66.5	49.1	49.1	13	13	0.60	0.89
2	42	50	75	83	61.1	61.1	16	16	0.99	1.75
2 ¹ ⁄ ₂	42	55	91.5	98	77.1	77.1	16	16	1.50	2.66
3	42	60	109	118	90.1	90.1	16	16	2.30	4.33
4	50	70	138	149	115.3	115.3	20	20	4.00	7.91



ASME B16.11

Nominal Pipe	Cer Elbows	nter to E 5 Tees C A	End Prosses	Ce 45	nter to 5° Elbov C	End vs	Outs	ide Diar of Banc H	neter I	Mir T	himum V hicknes G	Wall SS	Leng Thr M	gth of ead, lin
Size	2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	В	L_2
1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
$\frac{1}{4}$	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	277	33.0

• For Approx Weight See Page 122

Coupling, Half Coupling, Cap 6000#

3000#





Å



(in millimeters)

ASME B16.11

Nominal Pipe Sizo	End to End Couplings W	End to End Caps P		Outside Diameter D		End Wall Thickness G Min.		Length of Thread, Min	
Size	3000 & 6000	3000	6000	3000	6000	3000	6000	В	L_2
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
11/4	67	44	46	57	64	9.7	11.2	17.0	18.0
$1\frac{1}{2}$	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

D

• For Approx Weight See Page 122

Forged Steel Threaded Fittings

Plug, Bushing







Spuare Head Plug

Hex Head Plug





Hex Head Bushing



Plug

1	7	
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Flush Bushing

ASME 816 11

ASME B16.1	ASME B16.11 (in millimeters)									
		Plugs Squ	uare Head	Plugs Ro	und Gead	Hex F	Plugs & Bush	nings		
Nominal	al Length	Height of	Width	Nominal	Longth	Width Flats (Nominal) F	Hex Hei	ght Min.		
Pipe Size	A	Square (Minimum) B	Flats (Minimum) C	Diameter of Head E	(Minimum) D		Bushing G	Plug H		
1/8	10.0	6	7.0	10	35	11.0		6		
$\frac{1}{4}$	11.0	6	10.0	14	41	16.0	3	6		
3/8	13.0	8	11.0	18	41	18.0	4	8		
1/2	14.0	10	14.0	21	44	22.0	5	8		
3/4	16.0	11	16.0	27	44	27.0	6	10		
1	19.0	13	21.0	33	51	36.0	6	10		
$1\frac{1}{4}$	21.0	14	24.0	43	51	46.0	7	14		
$1^{1/2}$	21.0	16	28.0	48	51	50.0	8	16		
2	22.0	18	32.0	60	64	65.0	9	18		
$2^{1/2}$	27.0	19	36.0	73	70	75.0	10	19		
3	28.0	21	41.0	89	70	90.0	10	21		
4	32.0	25	65.0	114	76	115.0	13	25		

• For Approx Weight See Page 126





MSS SP-83

MSS SP-83								(in mil	limeters)
Nom. Pipe Size	Pipe End Mln.	Wall Min.	Water Way Bore	Male Flange Min.	Nut Min.	Thrds. Per 25.4 Max.	Bearing Min.	Length Assem. Nominal	Clear Assem. Nut
OILC	Α	С	D	F	G	н	J	L	N
1/8	21.8	3.18	6.83 6.43	3.17	3.2	16	1.24	41.4	49.0
1/4	21.8	3.30	9.85 9.45	3.17	3.2	16	1.24	41.4	49.0
3/8	25.9	3.50	13.92 13.51	3.43	3.4	14	1.37	46.0	55.0
1/2	31.2	4.09	17.47 17.07	3.68	3.7	14	1.50	49.0	57.0
3/4	37.1	4.27	21.79 21.39	4.06	4.1	11	1.68	56.9	67.0
1	45.4	4.99	28.14 27.74	4.57	4.4	11	1.85	62.0	79.0
	54.9	5.28	35.76 35.36	5.33	5.2	11	2.13	71.1	94.0
1½	61.5	5.54	41.61 41.20	5.84	5.6	10	2.31	76.4	111.0
2	75.2	6.05	52.53 52.12	6.60	6.4	10	2.69	86.1	132.0
2 ¹ / ₂	91.7	7.68	64.72 64.31	7.49	7.1	8	3.07	102.4	148.0
3	109.2	8.31	77.67 77.27	8.25	8.0	8	3.53	109.0	175.0

Forged Steel Threaded Fittings

Union(O-Ring Type)



(in millimeters)

Nom Size (PT)	D	L	L ₂	L	Ν	н	O-Ring
1/4	22	10	18	38	19	35 HEX	P18
3/8	27	10	18	38	23	41 HEX	P20
$\frac{1}{2}$	32	12	20	44	29	46 HEX	G25
3/4	38	12	26	50	34	54 HEX	G30
1	47	15	26	56	41	63 HEX	G35
$1^{1/4}$	56	15	30	60	51	75 HEX	G45
$1\frac{1}{2}$	63	18	36	72	60	80 OCT	G50
2	76	18	36	72	71	95 OCT	G65

Rating Pressure:201kg/cm² Temperature:120°C Max.

106 TK_corporation

Forged Steel Threaded Fittings



3000# 6000#

	(in millimeters)							
Nom Size T × Tı	d	н	L	L	L 2	Unit Weight (kg)		
3/8×1/4	7.1	19	14	8	14	0.05		
$1/2 \times 1/4$	7.1	24	19	9	14	0.09		
1/2×3/8	8.9	24	19	9	14	0.09		
3/4×1/4	7.1	30	19	10	14	0.15		
3/4×3/8	8.9	30	19	10	14	0.15		
3/4×1/2	11.9	30	19	10	19	0.15		
1×3/8	8.9	36	24	11	14	0.27		
1×1/2	11.9	36	24	11	19	0.27		
1×3/4	16.0	36	24	11	19	0.27		
1-1/4×1/2	11.9	46	24	12	19	0.45		
1-1/4×3/4	16.0	46	24	12	19	0.45		
1-1/4×1	20.1	46	24	12	24	0.45		
1-1/2×3/4	16.0	50	25	14	19	0.62		
1-1/2×1	20.1	50	25	14	24	0.62		
1-1/2×1-1/4	27.9	50	25	14	24	0.62		
2×1	20.1	65	26	16	24	1.03		
2×1-1/4	27.9	65	26	16	24	1.03		
2×1-1/2	32.0	65	26	16	25	1.03		
2-1/2×1-1/4	27.9	80	38	18	24	1.51		
2-1/2×1-1/2	32.0	80	38	18	25	1.51		
2-1/2×2	39.9	80	38	18	26	1.51		
3×1-1/2	32.0	95	40	20	25	2.22		
3×2	39.9	95	40	20	26	2.22		
3×2-1/2	55.1	95	40	20	38	.2.22		





Nom. Size T	d	н	L	L	Unit Weight (kg)
1/8	4.1	12	10	6	0.03
1/4	7.1	17	14	8	0.04
3/8	8.9	19	14	8	0.05
1/2	11.9	24	19	9	0.09
3/4	16.0	30	19	10	0.15
1	20.1	36	24	11	0.27
1-1/4	27.9	46	24	12	0.45
1-1/2	32.0	50	25	14	0.62
2	39.9	65	26	16	1.03
2-1/2	55.1	80	38	18	1.51
3	65.0	95	40	20	2.22

Nipple Outlet

3000#

		(in millimeters)								
Nom. Pipe Size	d	н	L	L1	L ₂	Unit Weight (kg)				
36- ³ ⁄ ₄	$\frac{1}{2}$	88.9	23.9	14.0	21.3	0.36				
36-1	$\frac{3}{4}$	88.9	30.2	18.8	26.7	0.56				
36-1 ¹ ⁄ ₄	1	88.9	36.6	24.4	33.3	0.84				
36-1 ¹ / ₂	$1^{1}/_{4}$	88.9	44.5	32.5	42.2	1.22				
36-2	$1^{1/2}$	88.9	50.8	38.1	48.3	2.00				
36-2 ¹ / ₂	2	88.9	65.0	49.3	60.5	3.12				



Swaged Nipple

Large end Size	Small end Size	Length (mm)
$\frac{1}{2}$	$\frac{3}{8} - \frac{1}{8}$	70
3/4	$\frac{1}{2} - \frac{1}{8}$	76
1	$\frac{3}{4} - \frac{1}{8}$	89
11/4	1 ⁻¹ / ₈	102
$1\frac{1}{2}$	$1^{1/4} - \frac{1}{8}$	114
2	$1^{1/2} - \frac{1}{8}$	165
2 ¹ / ₂	2 -1/8	178
3	$2^{1/2} - \frac{1}{8}$	203
3 ¹ ⁄ ₂	3 -1/8	203
4	$3\frac{1}{2} - \frac{1}{8}$	229
TBE	Threaded both end	

 IBE
 I hreaded both end

 PBE
 Plain both end

 PLE/TSE
 Plain large end-Threaded small end

 BLE/TSE
 Beveled large end-Threaded small end

 BLE/PSE
 Beveled large end-Plain small end

 TLE/PSE
 Threaded large end-Plain small end











BLE/PSE





STD(Sch 40), XS(Sch 80)





Outlet	А		В		С		APP'Weight(kg)	
Size	STD	XS	STD	XS	STD	XS	STD	XS
1/2	19.1	19.1	34.9	34.9	23.8	23.8	0.08	0.09
3⁄4	22.2	22.2	44.5	44.5	30.2	30.2	0.11	0.14
1	27.0	27.0	54.0	54.0	36.5	36.5	0.23	0.21
11/4	31.8	31.8	65.1	65.1	44.5	44.5	0.36	0.41
$1^{1/2}$	33.3	33.3	73.0	73.0	50.8	50.8	0.45	0.5
2	38.1	38.1	88.9	88.9	65.1	65.1	0.80	0.80
2 ¹ / ₂	41.3	41.3	103.2	103.2	76.2	76.2	1.14	1.2
3	44.5	44.5	122.2	122.2	93.7	93.7	1.82	1.9
4	50.8	50.8	152.4	152.4	120.7	120.7	2.86	2.9
5	57.2	57.2	179.4	179.4	141.3	141.3	4.66	4.7
6	60.3	77.8	215.9	225.4	169.9	169.9	6.45	10.5
8	69.9	98.5	263.5	292.1	220.7	220.7	10.68	16.8
10	77.8	93.7	322.3	323.9	274.7	265.1	17.73	20.9
12	85.7	103.2	377.8	379.4	325.4	317.5	26.82	27.7
14	88.9	100.0	409.6	431.8	357.2	350.8	30.0	31.8
16	93.7	106.4	463.6	466.7	408.0	403.2	34.1	46.4
18	96.8	111.1	520.7	523.9	458.8	455.6	44.1	59.1
20	101.6	119.1	571.5	582.6	508.0	509.6	53.6	71.8
24	115.9	139.7	689.0	708.0	614.4	638.2	100.0	131.8
26	119.1	146.1	738.2	765.2	666.8	692.2	120.5	159.1

• Applicable Run Pipe Sizes 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 B36.10M

• When Ordering Weld-outlets, Include the Quantity, Size(Run and Out-let), Description(Weld-outlets, Schedule Number) and Material

Weld-outlets

Sch 160, XXS





Outlet	А		В		С		APP'Weight(kg)	
Size	Sch160	XXS	Sch160	XXS	Sch160	XXS	Sch160	XXS
1/2	28.6	28.6	34.9	34.9	14.3	14.3	0.11	0.11
3/4	31.8	31.8	44.5	44.5	19.1	19.1	0.32	0.32
1	38.1	38.1	50.8	50.8	25.4	25.4	0.38	0.38
11/4	44.5	44.5	61.9	61.9	33.3	33.3	0.57	0.57
11/2	50.8	50.8	69.9	69.9	38.1	38.1	0.8	0.8
2	55.6	55.6	81.0	81.0	42.9	42.9	1.0	1.0
2 ¹ / ₂	61.9	61.9	96.8	96.8	54.0	54.0	1.54	1.54
3	73.0	73.0	120.7	120.7	73.0	73.0	2.9	2.9
4	84.1	84.1	152.4	152.4	98.4	98.4	4.8	4.8
5	93.7	93.7	187.3	187.3	122.2	122.2	6.5	6.5
6	104.8	104.8	220.7	220.7	146.1	146.1	12.7	12.7
8	111.1	111.1	284.2	284.2	173.1	173.1	20.5	20.5
10	125.4	125.4	312.7	312.7	215.9	215.9	38.6	38.6

• Applicable Run Pipe Sizes are From out-Let Size to 36"

• Pipe Schedule Numbers and Weight Designations are in Accordance With ASME B36.10M

• When Ordering Weld-outlets, Include the Quantity, Size(Run and Out-let), Description(Weld-outlets, Schedule Number) and Material


Socket-outlets

3000# 6000#





Outlet	А		В		(C	I	F	APP'Weight(kg)		
Size	3000#	6000#	3000#	6000#	3000#	3000# 6000#		6000#	3000#	6000#	
$\frac{1}{2}$	25.4	31.8	34.9	44.5	23.8	19.1	31.8	39.7	0.14	0.23	
3⁄4	27.0	36.5	44.5	50.8	30.2	25.4	36.5	45.2	0.15	0.36	
1	33.3	39.7	54.0	61.9	36.5	33.3	46.0	57.2	0.27	0.59	
11/4	33.3	41.3	65.1	69.9	44.5	38.1	55.6	65.1	0.39	0.73	
$1\frac{1}{2}$	34.9	42.9	73.0	82.6	50.8	49.2	61.9	76.2	0.47	0.91	
2	38.1	58.7	88.9	103.2	65.1	58.7	74.6	92.1	0.73	2.33	
$2^{1/2}$	46.0	-	103.2	-	76.2	-	87.3	-	1.25	-	
3	50.8	-	122.2	-	93.7	-	104.8	-	1.73	-	
4	57.2	-	152.4	-	120.7	-	130.2	-	3.3	-	

Applicable Run Pipe Sizes are From out-Let Size to 36"

 For the 3000# and 6000# Socket-outlets and Thread-outlets, Inside Bore, Thread, Socket Bore and Socket Depth Dimensions are According to ASME B16.11

• Pipe Schedule Numbers and Weight Designations are in Accordance With ASME B36.10M

• When Ordering Weld-outlets, Include the Quantity, Size(Run and Out-let), Description(Weld-outlets, Schedule Number) and Material

Thread-outlets

3000# 6000#





Out let	Out let A		E	3	()	F	-	APP'Weight(kg)		
Size	3000#	6000#	3000#	6000#	3000#	6000#	3000#	6000#	3000#	6000#	
$\frac{1}{2}$	25.4	31.8	34.9	44.5	23.8	19.1	31.8	39.7	0.11	0.20	
3/4	27.0	36.5	44.5	50.8	30.2	25.4	36.5	46.0	0.16	0.34	
1	33.3	39.7	54.0	61.9	36.5	33.3	46.0	57.2	0.28	0.56	
11/4	33.3	41.3	65.1	69.9	44.5	38.1	55.6	65.1	0.41	0.71	
$1\frac{1}{2}$	34.9	42.9	73.0	82.6	50.8	49.2	61.9	76.2	0.45	0.89	
2	38.1	52.4	88.9	103.2	65.1	69.9	74.6	92.1	0.8	2.30	
$2\frac{1}{2}$	46.0	-	103.2	-	76.2	-	87.3	-	1.36	-	
3	50.8	-	122.2	-	93.7	-	104.8	-	1.98	-	
4	57.2	-	152.4	-	120.7	-	130.2	-	3.22	-	

• Applicable Run Pipe Sizes are From out-Let Size to 36"

 For the 3000# and 6000# Socket-outlets and Thread-outlets, Inside Bore, Thread, Socket Bore and Socket Depth Dimensions are According to ASME B16.11

• Pipe Schedule Numbers and Weight Designations are in Accordance With ASME B36.10M

. When Ordering Weld-outlets, Include the Quantity, Size(Run and Out-let), Description(Weld-outlets, Schedule Number) and Material





Dimension Tolerance

- ANSI Dimensional Tolerance __ P114
- ANSI Welding End Preparation ___ P115
- JIS/KS Dimensional Tolerance __ P116 ~ P117
- JIS/KS Welding End Preparations ___ P118 ~ P119
- MSS SP-43 Dimensional Tolerance ____ P120



Applicable Dimensional Toleranc for ASME Fittings IN ACCORDANCE WITH ASME B16.9 - LATEST EDITION

	All Fi	ttings		90° and 45° Elbows Tees Stub Ends Caps				1	180° Returns			
Nominal Pipe Size	Outside Diameter at Bevel OD	Inside Diameter at End ID	Wall Thick- ness T	Center- to-End Dimension A, B	Center- to-End Dimension C, M	Over- all Length H	Over- all Length E	Center- to-Center Dimension P K		Align- ment of Ends U		
¹ / ₂ ~2 ¹ / ₂	+ 1.6 - 0.8	±0.8					+30					
3~4	±1.6	+1.0					_0.0	±6.0		±1.0		
5~8	+ 2.4 - 1.6	Ξ1.6		±2.0	±2.0	±2.0			±6.0			
10~18	+ 4.0 - 3.2	±3.2					±6.0	+10.0		+2.0		
20~24			Not less					±10.0		_2.0		
26~30	+ 6.4 - 4.8	±4.8	than 87:5%	±3.0	±3.0	+5.0	+10.0					
32~48			of nominal	±5.0	±5.0	±0.0	±10.0					
*50~60	CIRCUMFERENTIAL		thick- ness	±9.5	±9.5	±9.5						
*62~70	LENGTH OF OD IN BEVEL			±12.7	±12.7	±12.7	±15.0	-	-	—		
*72~80	0.7% OF OD			±15.9	±15.9	±15.9						
*82~100	CIRCUMFERENTIAL LENGTH OF OD IN			±20.2	±20.0	±20.0	±20.0					
*102~	BEVEL END(S) : = 0.5% OF OD			±25.0	±25.0	±25.0	±25.0					

NOTES : (1) Asterisk(*) to indicate TK CORP.'S maker STD. (2) All fittings including fabricated type product.

GENERAL NOTE : Dimensions are in mm.

NOTES :

- (1) Out-of-round is the sum of absolute values of plus and minus tolerance.
- (2) This tolerance may be exceeded in localized areas of formed fittings where
- increased wall thickness is required to meet design requirements of para 2.2
- (3) The inside diameter and the nominal wall thicknesses at ends are to be specifide by the purchaser
- (4) Unless otherwise specified by the purchaser, these tolerances apply to the nominal inside diameter, which equals the difference between the nominal outside diameter and twice the nominal wall thickness.



Angularity off Angle



Off Plane



(in inches)

Nominal Pipe Wall Thickness(t)	End Preparation
Less than x*	Cut Square or slightly chamfer, at Mfr's option
x*to 7/8 incl.	Plain bevel as in sketch "a" above
more than 7/8	Compound bevel as in sketch "b" above
*x=3/16 for carbon	steel, ferritic alloy steel or wrought iron; 3 for austenitic alloy steel

Notes : 1. End preparations are in accordance with ASME B16.9

2. End preparations conforming to customer specifications will be specially manufactured upon consultation.

ASME B 16.9 ; $P=\frac{2St}{D}$

where, P=Computed proof of test pressure

S=Actual tensile strength of the test fitting (determined on a specimen) representative of the test fitting)

t=Nominal pipe wall thickness of the pipe that the fitting marking identifies D=Specified outside diameter of pipe

JIS/KS Dimensional Tolerance



SteelButt-Welding Pipe Fittings For Ordinary Use

KS B1522 JIS B2311

(in millimeters)

(in millimeters)

T (D)		Nominal Diameter									
Type of Pipe Fitting	l.	¹ ⁄2 -2 ¹ ⁄2	3-4	5-8	10-18	20					
J				Tolerance							
	(OD)	±2	±2.5	±3.5	+5 -4.5	+6.4 -4.8					
All Pino Fitting	(ID)	±2	±2.5	±3.5	± 4.5	±4.8					
All Fipe Fitting	(T)										
90°Elbow 45°Elbow	(A, B)	±:	2.0		±3.2						
	(P)	± 0	6.4	± 9	9.5	-					
180°Elbow	(K)		± 0	6.4		-					
	(U)	1	.6	3	.2	-					
Reducer	(H)	±:	2.0		± 3.2						
TEE	(C,E)	±2	2.0	± 3.2							
CAP	(M)	±:	3.2	± 6.4							

SteelButt-Welding Pipe Fittings For Special Use

KS B1541 JIS B2312

	Nominal Diameter									
Type of Pipe Fitting)	¹ ⁄2 -2 ¹ ⁄2	3-4	5-8	10-18	20				
				Tolerance						
	(OD)	$\pm 1.6 \\ -0.8$	±1.6	$\pm 2.4 \\ -1.6$	+4 -3.2	+6.4 -4.8				
All Dipo Fitting	(ID)	\pm 0.8	<u>±</u>	1.6	±4.8					
All Fipe Fitting	(T)									
90 ° Elbow 45 ° Elbow	(A, B)		±1.6		±2.4					
	(P)		±6.4		±	9.5				
180°Elbow	(K)			±6.4						
	(U)		1.6		3	.2				
Reducer	(H)		±1.6		±	2.4				
TEE	(C,E)		\pm 1.6	±1.6 ±2.4						
CAP	(M)	±.	3.2		±6.4					

Steel Plate Butt-Welding Pipe Fittings

KS B1543 / JIS B2313 (in millimeters) **Nominal Diameter Type of Pipe** ¹/₂-2¹/₂ 3-4 5-8 10-18 20-24 26-30 32-48 Fitting Tolerance ±1.6 -0.8 +6.4 -4.8 ± 2.4 +4 (0D) ± 1.6 -3.2 -1.6 ±0.8 ±1.6 ±3.2 ±4.8 (ID) All Pipe Fitting +Not specified (T) -12.5% 90°Elbow ±1.6 ± 2.4 ±3.2 ±4.8 (A, B) 45°Elbow (P) ±6.4 ±9.5 180°Elbow (K) ±6.4 (U) 1.6 3.2 Reducer (H) ±1.6 ±2.4 ± 4.8 ±2.4 TEE (C, E) ± 1.6 ±3.2 ±4.8 Outside of end Peripheral ±0.5% length

Right Angle For Shaft-Center of Pipe Fittings

								(in mill	imeters)				
	T (D)				Nominal	Diameter							
ITEM	Type of Pipe Fitting	1∕₂-4	5-8	10-12	14-16	18-24	26-30	32-48	44-48				
	Ŭ		Tolerance										
Off Angle (X)	All Pipe	0.8	1.6	2.	.4	3.2		4.8					
Off Plane (Y)	Fitting	1.6	3.2	4.8	6.4	9	.5	12.7	19.1				
×		v											





Steel Butt-Welding Pipe Fittings For Ordinary Use



Steel Butt-Welding Pipe Fittings For Special Use

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



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



Where t :nominal wall thickness Dc:diameter of machining bore C :length of machining bore B: In the Case Where t Is Over 22.4mm







Remarks

- 1. Dimeter(Dc) and length(C) of machining bore and dimensional toleraneces shall be agreed between parties concerned.
- 2. Relieving of machining bore may be performed by poviding an inclination of 14° or less from the end face to the limits of 1.5times the wall thickness, or after cutting to the cylidrical surface to the length of machining bore, providing an inclination of 14° or less to the limits above-indicated, and beyond that portion machining with an inclination of 45° or less.



For Types A and B Bevel Shape



In the figure, t: nominal wall thickness

For Types C and D Bevel Shape



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

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



In the figure, t: nominal wall thickness

Steel Plate Butt-Welding Pipe Fittings





	(in i											
Nominal		ittings	90° Elbows 45° Elbows Tees	Reducers Lap Joint Stub Ends		180 [°] Returms		Caps				
Pipe Size	Outside(1) Diameter at	Wall	Center-to- End	Overall Length	Center-to- Center	Back-to Face	Alignment of Ends	Overall Length				
	Welding End	THICKNESS	A,B,C,M	F,H	O	K	U	Е				
$\frac{1}{2}$ -1 $\frac{1}{2}$	±0.03		±0.06	±0.06	±0.25	±0.25	±0.03	±0.12				
2-3 ¹ / ₂	±0.03	Not	±0.06	±0.06	±0.25	±0.25	±0.03	±0.12				
4	±0.03	less than 87½%	±0.06	±0.06	±0.25	±0.25	±0.03	±0.12				
5-8	+0.06 - 0.03	of nominal thicknoss	±0.06	±0.06	±0.25	±0.25	±0.03	±0.25				
10-18	+0.09 - 0.03	UNICKI 1855	±0.09	±0.09	±0.38	±0.25	±0.06	±0.25				
20-24	+0.12 - 0.03		±0.09	± 0.09	±0.38	±0.25	±0.06	±0.25				

				(in inches)		
	All Fi	ttings	Lap . (Stub	Joint Ends)		
Nominal Pipe Size	Outside(1) Diameter at Welding End	Wall Thickness	Fillet(2) Radius of Lap A	Outside Diameter of Lap G		
½-1½	±0.03		+0 -0.03	+0 -0.03		
2-3 ¹ ⁄ ₂	2-3½ ±0.03	Not	+0 -0.03	+0 -0.03		
4	±0.03	less than 87½%	+0 -0.06	+0 -0.03		
5-8	+0.06 ±0.03	of nominal	+0 -0.06	+0 -0.03		
10-18	+0.09 ±0.03	UNCKIESS	+0 -0.06	+0 -0.06		
20-24	+0.12 ±0.03		+0 -0.06	+0 -0.06		

• Notes:

(1) Out of roundness is the vector sum of the plus and minus tolerance.

(2) Fillet B radius is the maximum.

Approx Weight Estimate Equation



90° Elbow



AW=3.8699×A×T×(OD-T)×10⁻⁵ AW:Approx Weight(Unit:kgs) T:Wall Thickness(mm) OD:Outside Diameter(mm) A:Radius(mm)





AW=1.9350×A×T×(OD-T)×10⁻⁵ AW:Approx Weight(Unit:kgs) T:Wall Thickness(mm) OD:Outside Diameter(mm) A:Radius(mm)





Tee

 $\begin{array}{l} \text{AW=2.4649} \{ 2\text{CT}_1(\text{OD}_1-\text{T}) + \\ \text{T}_2(\text{OD}_1-\text{T}_2) \ (\text{M}-\frac{\text{OD}_1}{2}) \} \times 10^{-5} \\ \text{AW:Approx Weight} (\text{Unit:kgs}) \\ \text{T}_1: \text{Wall Thickness} (\text{mm}) \\ \text{OD}_1: \text{Outside Diameter} (\text{mm}) \\ \text{T}_2: \text{Wall Thickness} (\text{mm}) \\ \text{OD}_2: \text{Outside Diameter} (\text{mm}) \\ \text{C:Center to End Diameter} (\text{mm}) \\ \text{M:Center to End Diameter} (\text{mm}) \end{array}$





Reducer

AW=2.4649×H×T× ($\frac{OD_1+OD_2}{2}$ -T)×10⁻⁵ AW:Approx Weight(Unit:kgs) T:Wall Thickness(mm) OD1:Outside Diameter(mm) OD2:Outside Diameter(mm) H:Length(mm) **Butt Welding Fittings Approx Weight List**

90° Elbows

	LONG							SHORT								
Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160	SGP	STD	S40	XS	S80	XXS	S160	Nominal Pipe Size	
1/2	0.08	0.08	0.08	0.10	0.10	—	—	—	—	—	—	—	—	—	$\frac{1}{2}$	
3/4	0.10	0.11	0.11	0.14	0.14	—	—	—	—	—	—	—	—	—	$\frac{3}{4}$	
1	0.15	0.16	0.16	0.20	0.20	0.36	0.25	0.10	0.11	0.11	0.14	0.14	—	—	1	
11/4	0.26	0.26	0.26	0.35	0.35	0.64	0.42	0.17	0.18	0.18	0.23	0.23	—	—	$1\frac{1}{4}$	
11/2	0.35	0.37	0.37	0.50	0.50	0.93	0.65	0.24	0.25	0.25	0.33	0.33	—	—	$1\frac{1}{2}$	
2	0.64	0.66	0.66	0.90	0.90	1.69	1.33	0.43	0.44	0.44	0.60	0.60	1.13	0.89	2	
2 ¹ / ₂	1.12	1.37	1.37	1.79	1.79	3.43	2.33	0.75	0.91	0.91	1.19	1.19	2.19	1.49	$2^{1/2}$	
3	1.58	2.04	2.04	2.74	2.74	5.25	3.83	1.05	1.36	1.36	1.83	1.83	3.49	2.55	3	
4	2.91	3.84	3.84	5.36	5.36	10.2	8.02	1.94	2.56	2.56	3.58	3.58	6.79	2.35	4	
5	4.49	6.48	6.48	9.13	9.13	17.6	14.7	2.99	4.32	4.32	6.09	6.09	11.8	9.79	5	
6	7.09	9.94	9.94	15.0	15.0	29.1	24.2	4.73	6.63	6.63	10.0	10.0	19.5	16.2	6	
8	14.4	20.1	20.1	30.5	30.5	51.4	53.2	9.61	13.4	13.4	20.3	20.3	34.3	35.5	8	
10	25.4	35.4	35.4	47.7	57.0	82.0	103	16.9	23.6	23.6	31.8	38.0	61.0	68.6	10	
12	38.1	52.0	57.0	68.7	94.0	130	171	25.4	34.6	38.0	45.8	63.0	87.0	114	12	
14	56.7	67.9	79.1	89.9	133	—	236	37.8	45.3	53.0	60.0	89.0	—	158	14	
16	74.3	89.0	118	118	195	_	350	49.5	59.1	79.0	78.3	130	—	234	16	
18	94.2	113	169	150	275	_	495	62.8	75.3	113	99.9	183	—	330	18	
20	116	140	220	186	373	_	676	77.7	93.1	147	124	249	_	451	20	
22	141	169	_	225	493	_	886	94.1	113		150	329	_	591	22	
24	168	202	366	268	636		1160	112	135	244	1/9	424	—	773	24	
26	198	237		315			_	132	158		210	—	—	—	26	
28	230	276	_	367	_	_	_	154	184	_	245	_	_	_	28	
30	264	316		421		_	_	176	211		281	_	_	_	30	
32	301	361	654	480		_	_	201	241	436	320	_	_	_	32	
34	340	408	739	543			_	227	272	493	362	—	—	—	34	
36	380	457	904	608	—	—	—	253	304	603	405	—	—	—	36	
38	425	510	_	679	_	_		283	340	_	453	_	_	_	38	
40	4/1	565	_	753		_		314	3//	_	502	_	_	_	40	
42	518	622	_	828	_	_		346	416	_	554	_	_	_	42	
44	570	684	—	912	—	—	—	380	456	—	608	—	—	—	44	
46	623	748	—	997	—	—	—	415	499	—	665	—	_	—	46	
48	677	814	—	1085	—	_	—	452	543	—	724	—	—	—	48	

180° Elbows

	LONG							SHORT								
Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160	SGP	STD	S40	XS	S80	XXS	S160	Nominal Pipe Size	
$\frac{1}{2}$ $\frac{3}{4}$	0.16 0.21	0.16 0.22	0.16 0.22	0.20 0.28	0.20 0.28			_	_				_	_	1/2 3/4	
1 1¼ 1¼	0.30	0.32	0.32	0.40	0.40	0.72	0.50 0.84 1.30	0.20	0.22	0.22	0.28 0.46	0.28 0.46	_	_	1 1 ¹ ⁄4 1 ¹ ∕	
2 2 2 ¹ ⁄ ₂	1.28 2.24	1.32 2.74	1.32 2.74	1.80 3.58	1.80 3.58	3.38 6.86	2.66 4.66	0.48 0.86 1.50	0.30 0.88 1.82	0.30 0.88 1.82	1.20 2.38	1.20 2.38	2.26 4.38	1.78 2.98	2 2 2 ¹ ⁄ ₂	
3 4	3.16 5.83	4.08 7.68	4.08 7.68	5.48 10.7	5.48 10.7	10.5 20.4	7.66 16.1	2.10 3.88	2.72 5.12	2.72 5.12	3.66 7.16	3.66 7.16	6.98 13.6	5.10 10.7	3 4	
5 6	8.98 14.2	13.0 19.9	13.0 19.9	18.3 30.0	18.3 30.0	35.2 58.2	29.4 48.4	5.98 9.46	8.64 13.3	8.64 13.3	12.2 20.2	12.2 20.2	23.5 39.0	19.6 32.4	5 6	
8 10 12	28.8 50.8 76.2	40.2 70.8 104	40.2 70.8 114	95.4 1.37	114 188	103 164 260	206 342	19.2 33.8 50.8	20.8 47.2 69.2	20.8 47.2 76.0	40.6 63.6 91.6	40.6 76.0 126	08.0 122 174	138 228	8 10 12	
14 16	114 149	136 178	158 236	180 236	266 390		472 700	75.6 99.0	90.6 118	106 158	120 156	178 260	_	316 468	14 16	
18 20	189 232	226 280	338 440	300 372	550 746	_	990 1352	125 155	150 186	226 294	199 248	366 498	_	660 902	18 20	
22 24	282 336	338 404	732	450 536	986 1272	_	1772 2320	188 224	226 270	488	300 358	658 848	_	1182 1546	22 24	

45° Elbows

LONG						SHORT									(UNIT : Kgs)			
Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160	SGP	STD	S40	XS	S80	XXS	S160	Nominal Pipe Size			
$\frac{1}{2}$	0.04	0.04	0.04	0.05	0.05	—	—	—	—	—	—	—	—	—	$\frac{1}{2}$			
3/4	0.05	0.06	0.06	0.07	0.07								—	—	3/4			
1	0.08	0.08	0.08	0.10	0.10	0.18	0.13	0.05	0.06	0.06	0.07	0.07	—	—	1			
11/4	0.13	0.13	0.13	0.18	0.18	0.32	0.21	0.09	0.09	0.09	0.12	0.12	—	—				
	0.18	0.19	0.19	0.25	0.25	0.47	0.33	0.12	0.13	0.13	0.17	0.17						
2	0.32	0.33	0.33	0.45	0.45	0.85	0.67	0.22	0.22	0.22	0.30	0.30	0.57	0.45	2			
$2^{1/2}$	0.60	0.69	0.69	0.90	0.90	1.72	1.17	0.38	0.46	0.46	0.60	0.60	1.10	0.75	$2\frac{1}{2}$			
3	0.79	1.02	1.02	1.37	1.37	2.63	1.92	0.53	0.68	0.68	0.92	0.92	1.75	1.28	3			
4	1.46	1.92	1.92	2.68	2.68	5.09	4.01	0.97	1.28	1.28	1.79	1.79	3.40	2.68	4			
5	2.25	3.24	3.24	4.57	4.57	8.80 14 E	1.35	1.50	2.10	2.10	3.05	3.05	5.88 0.75	4.90	5			
0	3.55	4.97	4.97	1.50	1.50	14.5	12.1	2.30	3.3Z	3.3Z	5.00	5.00	9.75	0.10	0			
10	1.20	177	177	10.3	10.3	25.7	20.0 51 5	4.80	0./L 11.0	0.71	15.0	10.2	20.5	11.0 24.2	10			
10	10.0	26.0	11.1 20 5	23.9	20.0	41.0	91.5 95 5	0.40	17.2	10.0	10.9	19.0 21 E	30.5 42 E	54.5	10			
1/	28.0	20.0	20.5	34.4 15 0	47.0 66.5	05.0	118	18.0	22.6	26.5	22.9	31.5 11.5	43.5	79.0	1/			
16	20.4	11 5	40.1 59.0	40.0 59.0	00.5 97 5	_	175	24.0	22.0	20.0	30.0	44.J 65.0	_	117	16			
18	Δ7 1	56.5	84.5	75.0	138	_	247	31.0	37.6	56.5	50.0	91 5		165	18			
20	58.3	70.0	110	93.0	187	_	338	38.0	46.6	73.5	62.0	124		225	20			
22	70.5	84.5		113	257	_	443	47.0	56.5		75.0	164	_	295	22			
24	84.1	101	183	134	318	_	580	56.0	67.3	122	89.5	212		386	24			
26	99.0	119		158	_	—	_	66.0	79.1		105			_	26			
28	115	138		184	—	—	—	77.0	92.0	—	122	—	—	—	28			
30	132	158	—	211		—	_	87.0	105		140		—	—	30			
32	150	180	327	240	—	—		101	120	218	160	—	—		32			
34	170	204	369	272	—	—	—	114	136	246	181	—	—	—	34			
36	190	228	452	304	—	—	—	127	152	301	202	—	—	—	36			
38	212	255	—	339	—	—	—	142	170	—	226	—	—	—	38			
40	235	282	—	376	—	—	—	157	189	—	251	—	—	—	40			
42	259	311		414	—	—	—	173	208	—	277	—	—	—	42			
44	285	342	—	456	—	—	—	190	228	—	304	—	—	—	44			
46	312	374		498	—	—	—	208	250	—	332	—	—	—	46			
48	339	407	—	542	—	—	—	226	272	—	362	—	—	—	48			

CAPS (UNIT : Kgs)													gs)		
Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160	Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160
1/2	0.03	0.04	0.04	0.05	0.05	—	—	18	21.2	25.5	41.5	34.1	69.0	—	131
3/4	0.04	0.05	0.05	0.07	0.07	—	—	20	26.4	31.8	54.1	42.5	93.7	—	179
1	0.08	0.11	0.11	0.15	0.15	—	—	22	31.5	38.8		51.7	116	—	219
11/4	0.11	0.14	0.14	0.20	0.20	—	—	24	36.6	45.1	90.1	60.1	160	—	307
1½	0.15	0.17	0.17	0.24	0.24	0.50	0.35	26	41.0	50.5	—	67.3	—	—	—
2	0.23	0.24	0.24	0.33	0.33	0.68	0.54	28	45.5	56.2	—	74.9	—	—	—
2 ¹ / ₂	0.34	0.42	0.42	0.57	0.57	1.13	0.77	30	50.3	62.1	—	82.8	—	—	—
3	0.51	0.67	0.67	0.92	0.92	1.92	1.40	32	55.4	68.4	126	91.2	—	—	—
4	0.88	1.17	1.17	1.68	1.68	3.51	2.76	34	60.8	75.0	138	100	—	—	—
5	1.29	1.90	1.90	2.73	2.73	5.82	4.85	36	66.4	81.9	164	109	—	—	—
6	1.99	2.83	2.83	4.38	4.38	9.38	7.81	38	76.8	94.7	—	126	—	—	—
8	3.61	5.11	5.11	7.91	7.91	14.7	1.52	40	83.0	102	—	137	—	—	—
10	6.33	8.92	8.92	12.2	16.4	25.7	28.9	42	90.0	110	—	147	—	—	—
12	9.43	13.1	13.1	17.4	26.4	36.4	47.7	44	103	126	—	167	—	—	—
14	13.2	15.9	18.6	21.2	34.9	—	61.2	46	109	134	—	179	—	—	—
16	16.6	20.0	26.7	26.7	49.0	—	130	48	116	143	—	191	—	—	—

TEES

TEES													(UN	IIT : Kg	gs)
Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160	Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160
$\frac{1}{2} \times \frac{1}{2}$	0.09	0.09	0.09	0.11	0.11	_	_	20×20	86.6	104	204	138	353	_	631
$\gamma_4 \wedge \gamma_4$ $1/2$	0.13	0.13	0.13	0.17	0.17	_	_	18	82.1	98.4	181	134	294	_	508
1 ×1	0.24	0.25	0.25	0.32	0.32	-	—	14	81.1	97.2	178	129	289	-	491
3/4 1/	0.23	0.24	0.24	0.30	0.30	_	_	22×22	106	126 123	_	167 163	453 386	_	835 740
$1^{1}/_{4} \times 1^{1}/_{4}$	0.22	0.23	0.23	0.25	0.25	_	-	18	103	120	_	159	373	_	696
1	0.39	0.40	0.40	0.53	0.53	-	-	16	98.9	117	_	156	354	-	656
$1\frac{1}{2} \times 1\frac{1}{2}$	0.58	0.61	0.61	0.81	0.81	_	_	24×24 22	116 115	139 138	299	185 183	548 503	_	1012 922
1	0.53	0.56	0.56	0.74	0.74	-	-	20	114	136	268	181	467	-	843
3/4	0.51	0.53	0.53	0.70	0.70	-	—	18	111	133	249	177	418	—	769
	0.86	0.88	0.88	1.20	1.20	_	_	26×26 24	147	176	_	234	_	_	_
1 ¹ / ₄	0.77	0.79	0.79	1.09	1.07	-	-	22	141	169	_	225	-	-	-
1	0.73	0.75	0.75	1.01	1.01	-	-	20	138	166	-	211	-	-	-
$2^{1/2} \times 2^{1/2}$	1.42	1.74	1.74	2.28	2.28	4.20	3.63	28×28 26	161 157	192 189	_	256 251	_	_	_
1½	1.25	1.51	1.51	1.98	1.98	3.40	3.40	24	153	184	—	244	—	—	-
	1.22	1.48	1.48	1.94	1.94	-	_ E 07	22	151	182	-	242	-	-	-
3×3 $2^{1}/_{2}$	1.79	2.41	2.41	3.25 3.07	3.25 3.07	7.00 9.49	5.87 5.45	30×30	188	228 226	_	304 301	_	_	_
2	1.68	2.12	2.12	2.85	2.85	5.17	5.17	26	185	222	—	296	—	—	-
	1.62	2.06	2.06	2.77	2.77	-	-	24	182	218		291	—	-	-
4 × 4 3	3.13 2.92	4.12 3.83	4.12	5.33	5.33	12.8	9.76	32×32 30	208	259 244	_	331	_	_	_
2 ¹ / ₂	2.84	3.71	3.71	5.15	5.15	11.3	7.74	28	200	240	—	319	—	—	-
2	2.72	3.53	3.53	4.94	4.94	9.01	7.30	26	199	138	-	317	-	-	-
5 × 5 4	4.53	6.13	6.13	9.20 8.63	9.20 8.63	20.2 19.0	22.2 15.3	34×34 32	246 243	295 292	_	393 389	_	_	_
3	4.08	5.83	5.83	8.19	8.19	17.9	14.7	30	238	290	—	380	—	—	-
	4.00	5.71	5.71	8.01	8.01	-	14.3	28	236	288	-	377	-	-	-
6 ×6 5	6.45	9.08 9.08	9.08	14.5 13.6	14.5 13.5	28.4 27.1	31.4 24.3	30×30 34	276	329	_	441	_	_	_
4	6.23	8.67	8.67	13.0	13.0	25.8	23.2	31	269	326	-	431	-	-	-
3	6.01	8.38	8.38	12.6	12.6	23.7	22.5	30 20√20	264	323	_	422	_	_	_
° ^° 6	12.8	17.9 16.6	17.9 16.6	27.1	27.1	48.1	47.6	30×30 36	306	367	_	493 489	_	_	_
5	11.5	16.1	16.1	24.3	24.3	46.8	46.1	34	302	362	-	481	-	-	-
4 10 × 10	11.3	15.7	15.7	23.7	23.7	45.6	45.0	32	298	357	-	476	-	-	-
10 × 10	21.8	30.4 28.5	30.4 28.5	41.0 38.9	51.9	90.7 89.7	90.7 89.7	40×40 38	342 340	411 408	_	547 543	_	_	_
6	19.5	27.2	27.2	37.0	50.0	80.9	80.9	36	335	402	-	536	-	-	-
5	19.2	26.8	26.8	36.2	49.2	79.6 155	79.6 155	34 42×42	331	397	_	529	_	_	_
12 ~ 12	30.4	43.0 41.6	41.6	55.2	90.8 90.5	146	146	42×42	352	422		559	_	_	_
8	29.0	39.7	39.7	53.1	77.1	139	139	38	348	418	-	557	-	-	-
6	28.1	38.4	38.4	51.2	75.2	136	136	36	346	416	-	554		—	-
14 × 14	44.7	55.5 51.9	60.1	70.9 68.8	129	_	192	44×44 42	396 394	473	_	630	_	_	_
10	41.2	49.9	49.9	66.3	108	—	184	40	389	467	—	623	—	-	-
8 16 × 16	40.0	48.2	48.2	64.5	103	—	178	38	385	462	-	616	_	—	—
10 × 16 14	55.2 54.2	64.9	86.1	86.1	158	_	334 280	40×40 44	434	521	_	695 691	_	_	_
12	52.7	63.1	83.6	83.6	152	—	263	42	427	513	—	683	_	—	-
10 18 × 18	51.2	61.3	81.2	81.2	147 252	_	255	40	423	507	_	676 750	_	_	_
18×18 16	67.9	83.9 81.4	135	108	203 228	_	416	48×48 46	474	569 566	_	755	_	_	_
14	66.9	20.2	132	106	223	—	375	44	470	564	—	751	—	-	-
12	65.4	78.3	128	104	217	—	368	42	462	555	—	739	—	—	—

REDUCERS

REDUCE	RS										(U	JNIT : K	gs)
Nominal Pipe Size	SGP	STD	S40	XS	S80	XXS	S160	Nominal Pipe Size	SGP	STD	S40	XS	S80
$\frac{3}{4} \times \frac{1}{2}$	0.06	0.06	0.06	0.08	0.08	-	—	22×20	52.1	62.4	-	82.9	181
$1 \times \frac{3}{4}$	0.11	0.12	0.12	0.15	0.15	0.25	0.19	18	49.5	59.4	-	78.9	172
1/2	0.10	0.11	0.11	0.14	0.14	0.22	0.17	16	47.0	56.4	—	74.8	164
$1^{1}/_{4} \times 1$	0.16	0.16	0.16	0.21	0.21	0.35	0.25	24×22	57.1	68.4	-	91.0	215
3/4	0.15	0.15	0.15	0.19	0.19	0.31	0.23	20	54.8	65.7	119	87.3	206
1/2	0.13	0.14	0.14	0.18	0.18	-	_	18	52.6	63.0	114	83.8	197
$1\frac{1}{2} \times 1\frac{1}{4}$	0.24	0.25	0.25	0.33	0.33	0.57	0.43	26×24	74.5	89.4	_	119	_
L 3/	0.21	0.22	0.22	0.30	0.30	0.50	0.38	22	71.5 69 5	80.8 90.1	_	100	_
2 × 1 ¹ / ₂	0.20	0.21	0.21	0.27	0.27	0.45	0.35	20 28 ⊻ 26	80.6	02.1 06.6	_	129	_
	0.35	0.36	0.36	0.31	0.31	0.85	0.70	20 \ 20	77.5	93.0	_	123	_
1	0.31	0.33	0.33	0.44	0.44	0.77	0.64	22	74.5	89.4	_	119	_
$2\frac{1}{2} \times 2$	0.60	0.73	0.73	0.95	0.95	1.68	1.20	30×28	86.6	104	_	138	-
11/2	0.55	0.67	0.67	0.87	0.87	1.51	1.08	26	83.6	100	_	133	_
1 ¹ ⁄ ₄	0.52	0.64	0.64	0.83	0.83	1.42	1.02	24	80.6	96.6	-	129	-
3 ×2½	0.73	0.94	0.94	1.25	1.25	2.25	1.71	32×30	92.6	111	-	148	—
2	0.66	0.85	0.85	1.13	1.13	2.01	1.57	28	89.6	108	-	143	—
	0.62	0.79	0.79	1.04	1.04	1.83	1.44	26	86.6	104	-	138	-
4 ×3	1.10	1.45	1.45	2.01	2.02	3.65	3.00	34×32	98.7	118	—	158	
21/2	1.04	1.37	1.37	1.90	1.90	3.41	2.76	30	95.6	115	_	153	_
5 × 1	0.97	1.27	1.27	1.70	1.70	3.11 6.47	2.58	28 26 \ 24	92.6	126	_	167	_
3	1.74	2.50	2.50	3.52	3.52	5.78	5.30	30 \\$4	102	120	_	163	_
2 ¹ /2	1.50	2.27	2.27	3.02	3.02	5.46	4 70	30	98.7	118	_	158	_
6 ×5	2.55	3.57	3.57	5.38	5.38	9.89	8.63	38×36	112	133	_	177	_
4	2.36	3.30	3.30	4.96	4.96	8.98	7.88	34	108	129	_	172	_
3	2.18	3.04	3.04	4.56	4.56	8.21	7.21	32	105	126	-	167	-
8 ×6	4.17	5.71	5.71	8.63	8.63	14.3	15.0	40×38	117	140	—	187	—
5	3.87	5.40	5.40	8.14	8.14	13.4	14.0	36	114	137	-	182	—
4	3.67	5.10	5.10	7.68	7.68	12.6	13.1	34	111	133	-	177	-
10 ×8	6.87	9.58	9.58	12.9	15.4	24.3	27.5	42×40	123	14/	—	196	
6	6.32	8.78	8.78	11.8	14.2	22.1	25.1	38	120	144	_	192	_
12×10	0.00	0.42	0.4Z 177	12.0	24.8	24.2	23.9 116	14×12	120	140	_	206	_
8	9.29	12.0	137	16.0	24.0	34.5	44.0	44 \ 42	125	151	_	200	_
6	8.69	11.8	12.8	15.6	21.4	29.4	38.0	38	123	147	_	196	_
14 ×12	21.2	25.4	29.5	33.6	49.8		88.5	46×44	157	189	_	252	_
10	19.7	23.6	27.4	31.2	46.1	_	81.6	42	154	185	_	246	_
8	18.3	21.8	25.4	28.9	42.2	—	74.7	40	150	180	-	241	-
16 ×14	25.9	31.0	41.1	41.1	67.7	—	121	48×46	164	197	-	263	—
12	24.1	29.6	39.2	39.2	65.0	—	116	44	161	193	—	257	-
10	22.4	27.8	36.8	36.8	60.8	—	108	42	157	189	—	252	—
18 ×16	31.5	37.8	56.2	50.1	91.4	—	165						
14	29.8	35.7	53.0	47.4	86.4	—	155						
12	21.1	53.2 56.4	0.1C	44.0	83.0 150	_	149						
20 × 16	47.0	53.4	00.4 83.0	74.9	1/2	_	_						
14	42.4	50.8	79.6	67.4	1.36		_						
7.4	72.7	00.0	10.0	01.4	100								

						(UNIT : Kgs)
Rating	Nominal Pipe Size	90° Elbow	45° Elbow	Тее	Cross	Union
	1/8	0.11	0.06	0.11	0.23	-
	$\frac{1}{4}$	0.11	0.06	0.11	0.23	0.15
	3/8	0.14	0.11	0.14	0.23	0.22
	$\frac{1}{2}$	0.25	0.20	0.25	0.40	0.31
	3/4	0.31	0.29	0.43	0.51	0.54
2000	1	0.51	0.43	0.65	0.77	0.76
CLASS	1 ¹ ⁄ ₄	0.77	0.63	0.91	1.13	1.15
	$1\frac{1}{2}$	1.02	0.74	1.25	1.45	1.51
	2	1.59	1.22	2.10	2.38	2.40
	$2^{1/2}$	2.95	3.35	3.94	7.46	—
	3	4.76	5.13	5.98	8.85	-
	4	10.3	8.65	12.4	14.5	_

						(UNIT : Kgs)
Rating	Nominal Pipe Size	90° Elbow	45° Elbow	Тее	Cross	Union
	1/8	0.11	0.11	0.11	0.20	0.10
	$\frac{1}{4}$	0.17	0.11	0.13	0.17	0.19
	3/8	0.29	0.23	0.37	0.45	0.25
	$\frac{1}{2}$	0.59	0.34	0.54	0.68	0.43
	3/4	0.63	0.54	0.85	1.13	0.62
3000	1	1.02	0.85	1.13	1.61	1.03
CLASS	$1\frac{1}{4}$	1.25	0.97	1.42	1.87	1.15
	$1^{1/2}$	1.59	1.36	2.27	2.95	1.54
	2	2.47	1.93	3.06	3.69	3.05
	$2^{1/2}$	4.85	3.52	5.96	7.60	5.14
	3	6.55	4.76	9.24	8.96	7.12
	4	13.8	8.68	17.9	14.8	12.40

(UNIT : Kgs)

Rating	Nominal Pipe Size	Coupling	Half Coupling	Square Head plug	Hexagon Head Plug	Hexagon Head Bushing	Flush Bushing
	1/8	0.06	0.03	0.01	0.03	-	—
	$\frac{1}{4}$	0.06	0.03	0.01	0.03	0.03	0.03
3000	3/8	0.11	0.09	0.03	0.06	0.03	0.03
CLASS	$\frac{1}{2}$	0.11	0.09	0.06	0.09	0.03	0.03
and Square	3/4	0.20	0.11	0.09	0.14	0.09	0.06
Head Plugs	1	0.29	0.14	0.14	0.23	0.09	0.06
6000	$1\frac{1}{4}$	0.71	0.34	0.25	0.51	0.17	0.06
	$1\frac{1}{2}$	0.99	0.51	0.40	0.63	0.31	0.09
Plugs Couplings	2	1.42	0.71	0.68	1.02	0.74	0.17
and Bushings	2 ¹ / ₂	1.81	0.91	1.02	1.76	1.08	0.29
Ŭ	3	3.06	1.53	1.31	2.67	1.59	0.45
	4	7.60	3.80	3.26	5.90	3.77	0.91

Rating	Nominal Pipe Size	90° Elbow	45° Elbow	TEE	Coupling	Half Coupling	САР
	$\frac{1}{4}$	0.12	_	0.10	0.06	0.06	0.04
	3/8	0.11	0.18	0.16	0.06	0.08	0.05
	$\frac{1}{2}$	0.20	0.17	0.28	0.11	0.14	0.07
	3/4	0.28	0.23	0.37	0.17	0.20	0.13
2000	1	0.46	0.35	0.57	0.27	0.34	0.21
	$1\frac{1}{4}$	0.65	0.65	0.87	0.35	0.48	0.37
ULAUU	$1^{1/2}$	0.96	0.80	1.28	0.43	0.51	0.60
	2	1.50	1.20	1.80	0.72	1.00	0.99
	$2^{1/2}$	2.25	1.85	2.85	1.13	1.55	1.50
	3	4.00	-	5.50	1.50	2.13	2.30
	4	—	—	—	2.50	3.65	4.00

						(U	NIT : Kgs)
Rating	Nominal Pipe Size	90° Elbow	45° Elbow	TEE	Coupling	Half Coupling	САР
	$\frac{1}{4}$	0.14	—	0.19	0.06	0.07	-
	3/8	0.12	0.19	0.17	0.07	0.08	-
	$\frac{1}{2}$	0.23	0.18	0.31	0.14	0.30	0.22
	3/4	0.60	0.50	0.86	0.25	0.43	0.35
0000	1	1.05	0.88	1.45	0.36	0.69	0.55
0000 CLASS	$1\frac{1}{4}$	1.40	0.69	1.03	0.46	0.96	0.89
CLASS	$1^{1/2}$	2.40	1.85	3.04	0.58	1.20	1.15
	2	3.65	2.93	4.44	1.20	2.05	2.05
	$2^{1}/_{2}$	6.55	-	9.40	1.60	3.25	3.75
	3	8.60	—	13.2	2.18	4.33	5.10
	4	-	-	-	3.95	6.45	8.20

(UNIT : Kgs)

Carbon Steel Pipe

Maria	0:			Nominal Wall Thickness												
NOM	.Size		S	ch 40	S	ch 60	S	ch 80	Sc	h 100	Sc	h 120	Sc	h 140	Sc	h 160
Α	В	0.0	т	Weight kg/m	т	Weight kg/m	Т	Weight kg/m	т	Weight kg/m	т	Weight kg/m	т	Weight kg/m	Т	Weight kg/m
6	$\frac{1}{8}$	10.5	1.7	0.369	-	-	2.4	0.479	-	-	—	-	-	-	-	-
8	$\frac{1}{4}$	13.8	2.2	0.629	-	-	3.0	0.799	-	-	-	-	-	-	-	-
10	3/8	17.3	2.3	0.851	-	-	3.2	1.11	-	-	—	—	—	-	-	-
15	$\frac{1}{2}$	21.7	2.8	1.31	-	-	3.7	1.64	-	-	—	—	-	-	4.7	1.97
20	$\frac{3}{4}$	27.2	2.9	1.74	—	—	3.9	2.24	-	-	—	—	—	-	3.5	2.94
25	1	34.0	3.4	2.57	-	-	4.5	3.27	-	-	—	—	-	-	6.4	4.36
32	$1^{1}/_{4}$	42.7	3.6	3.47	-	-	4.9	4.57	-	-	—	—	—	-	6.4	5.73
40	$1^{1/2}$	48.6	3.7	4.10	-	-	5.1	5.47	-	-	—	—	-	-	7.1	7.27
50	2	60.5	3.9	5.44	-	-	5.5	7.46	-	-	—	—	—	-	8.7	11.1
65	$2^{1/2}$	76.3	5.2	9.12	-	—	7.0	12.0	-	-	—	_	-	-	9.5	15.6
80	3	89.1	5.5	11.3	-	-	7.6	15.3	-	-	-	-	-	-	11.1	21.4
90	$3^{1/2}$	101.6	5.7	13.5	-	—	8.1	18.7	-	-	—	_	-	-	12.7	27.8
100	4	114.3	6.0	16.0	-	-	8.6	22.4	-	-	11.1	28.2	-	-	13.5	33.6
125	5	139.8	6.6	21.7	-	-	9.5	30.5	-	-	12.7	39.8	-	-	15.9	48.6
150	6	165.2	7.1	27.7	-	-	11.0	41.8	-	-	14.3	53.2	-	-	18.2	66.0
200	8	216.3	8.2	42.1	10.3	52.3	12.7	63.8	15.1	74.9	18.2	88.9	20.6	99.4	23.0	110
250	10	267.4	9.3	59.2	12.7	79.8	15.1	93.9	18.2	112	21.4	130	25.4	152	28.6	168
300	12	318.5	10.3	78.3	14.3	107	17.4	129	21.4	157	25.4	184	28.6	204	33.3	234
350	14	355.6	11.1	94.3	15.1	127	19.0	158	23.8	195	27.8	225	31.8	254	35.7	282
400	16	406.4	12.7	123	16.7	160	21.4	203	26.2	246	30.9	286	36.5	333	40.5	365
450	18	457.2	14.3	156	19.0	205	23.8	254	29.4	310	34.9	363	39.7	409	45.2	459
500	20	508.0	15.1	184	20.6	248	26.2	311	32.5	381	38.1	441	44.4	508	50.0	565
550	22	558.8	15.9	213	22.2	294	28.6	374	34.9	451	41.3	527	47.6	600	54.0	672
600	24	609.6	17.5	256	24.6	355	31.0	442	38.9	547	46.0	639	52.4	720	59.5	807
650	26	660.4	18.9	299	26.4	413	34.0	525	41.6	635	49.1	740	56.6	843	64.2	944

Stainless Steel Pipe-

Nom	Sizo		Nominal Wall Thickness													
NOM	.Size		S	ch 5s	Sc	h 10s	Sc	ch 20s	Sc	ch 40	S	ch 80	Sc	h 120	Sc	h 160
Α	в	0.0	т	Weight kg/m	т	Weight kg/m	т	Weight kg/m	т	Weight kg/m	т	Weight kg/m	т	Weight kg/m	т	Weight kg/m
6	$\frac{1}{8}$	10.5	1.0	0.234	1.2	0.275	1.5	0.333	1.7	0.369	2.4	0.479	-	-	—	-
8	$\frac{1}{4}$	13.8	1.2	0.373	1.65	0.494	2.0	0.582	2.2	0.629	3.0	0.799	-	-	—	—
10	3/8	17.3	1.2	0.476	1.65	0.637	2.0	0.755	2.3	0.851	3.2	1.11	—	-	—	—
15	$\frac{1}{2}$	21.7	1.65	0.816	2.1	1.02	2.5	1.18	2.8	1.31	3.7	1.64	—	-	4.7	1.97
20	$\frac{3}{4}$	27.2	1.65	1.04	2.1	1.30	2.5	1.52	2.9	1.74	3.9	2.24	—	—	5.5	2.94
25	1	34.0	1.65	1.32	2.8	2.15	3.0	2.29	3.4	2.57	4.5	3.27	—	—	6.4	4.36
32	$1^{1}/_{4}$	42.7	1.65	1.67	2.8	2.76	3.0	2.94	3.6	3.47	4.9	4.57	—	—	6.4	5.73
40	$1^{1/2}$	48.6	1.65	1.91	2.8	3.16	3.0	3.37	3.7	4.10	5.1	5.47	-	-	7.1	7.29
50	2	60.5	1.65	2.39	2.8	3.98	3.5	4.92	3.9	5.44	5.5	7.46	-	-	8.7	11.1
65	$2^{1/2}$	76.3	2.1	3.84	3.0	5.42	3.5	6.28	5.2	9.12	7.0	12.0	-	-	9.5	15.6
80	3	89.1	2.1	4.51	3.0	6.37	4.0	8.39	5.5	11.3	7.6	15.3	-	-	11.1	21.4
90	$3^{1/2}$	101.6	2.1	5.15	3.0	7.29	4.0	9.63	5.7	13.5	8.1	18.7	—	-	12.7	27.8
100	4	114.3	2.1	5.81	3.0	8.23	4.0	10.9	6.0	16.0	8.6	22.4	11.1	28.2	13.5	33.6
125	5	139.8	2.8	9.46	3.4	11.4	5.0	16.6	6.6	21.7	9.5	30.5	12.7	39.8	15.9	48.6
150	6	165.2	2.8	11.2	3.4	13.6	5.0	19.8	7.1	27.7	11.0	41.8	14.3	53.2	18.2	66.0
200	8	216.3	2.8	14.7	4.0	20.9	6.5	33.6	8.2	42.1	12.7	63.8	18.2	88.9	23.0	110
250	10	267.4	3.4	23.1	4.0	26.0	6.5	41.8	9.3	59.2	15.1	93.9	21.4	130	28.6	168
300	12	318.5	4.0	31.0	4.5	34.8	6.5	50.0	10.3	78.3	17.4	129	25.4	184	33.3	234

Taper Pipe Threads









JIS B0203

(in millimeters)

		Screw Thread		Basic Diameter		Posi I	tion of E Diamete	lasic r		Effe	ective Th (M	iread Lei in.)	ngth				
					Exte	rnal Thre	ead	Exte Thr	ernal read	Internal Thread	Toleran-	External Thread	Inte	ernal Thr	ead	Nom	ninal
Nominal Size	Number of Threads per Inch	Pitch	Height of Thread	Roun- ding	Major Diame- ter d	Pitch Diame- ter d₂	Minor Diame- ter d	Fror End c	n the of Pipe	The End of Pipe	ces on Basic Diame- ters of Internal Parallel	Fitting	When is Incon thr or N	there an plete ead lore	When there is no Incom- plate Thread	Pipe (For Ref	Size ference)
					Inte	ernal Thr	ead		Tolora	raialler Thread a- Tolera- nce ilv Axiailv	ance	Internal	Internal	Internal Taper			
			h		Major Diame- ter	Pitch Diame- ter	Minor Diame- ter	Basic Length	nce Axiaily	nce Axiaily			Taper Thread	Parallel Thread	and Parallel Thread	Ouside- Diame ter	Wall thic- kness
	n	р	h	r	D	D ₂	D	а	±b	±c	±	f	1	I 1	f		
PT ½	14	1.8143	1.162	0.25	20.955	19 793	18 631		4.04		0 1 4 2	F 0	40.7				28
PT 3/4	14					10.100	10.031	8.16	1.81	2.27	0.142	5.0	12.7	15.0	9.1	21.7	2.0
DT4		1.8143	1.162	0.25	26.441	25.279	24.117	8.16 9.53	1.81 1.81	2.27 2.27	0.142	5.0 5.6	12.7 14.1	15.0 16.3	9.1 10.2	21.7 27.2	2.8
PIL	11	1.8143 2.3091	1.162 1.479	0.25 0.32	26.441 33.249	25.279 31.770	24.117 30.291	8.16 9.53 10.39	1.81 1.81 2.31	2.27 2.27 2.89	0.142 0.142 0.180	5.0 5.6 6.4	12.7 14.1 16.2	15.0 16.3 19.0	9.1 10.2 11.5	21.7 27.2 34.0	2.8 3.2
	11 11	1.8143 2.3091 2.3091	1.162 1.479 1.479	0.25 0.32 0.32	26.441 33.249 41.910	25.279 31.770 40.431	24.117 30.291 38.952	8.16 9.53 10.39 12.70	1.81 1.81 2.31 2.31	2.27 2.27 2.89 2.89	0.142 0.142 0.180 0.180	5.0 5.6 6.4 6.4	12.7 14.1 16.2 18.5	15.0 16.3 19.0 21.4	9.1 10.2 11.5 13.4	21.7 27.2 34.0 42.7	2.8 3.2 3.5
PT1 PT1 ¹ / ₄ PT1 ¹ / ₂	11 11 11	1.8143 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479	0.25 0.32 0.32 0.32	26.441 33.249 41.910 47.803	25.279 31.770 40.431 46.324	24.117 30.291 38.952 44.845	8.16 9.53 10.39 12.70 12.70	1.81 1.81 2.31 2.31 2.31	2.27 2.27 2.89 2.89 2.89	0.142 0.142 0.180 0.180 0.180	5.0 5.6 6.4 6.4 6.4	12.7 14.1 16.2 18.5 18.5	15.0 16.3 19.0 21.4 21.4	9.1 10.2 11.5 13.4 13.4	21.7 27.2 34.0 42.7 48.6	2.8 2.8 3.2 3.5 3.5
PT1 PT1 ¹ / ₄ PT1 ¹ / ₂ PT2	11 11 11 11	1.8143 2.3091 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479 1.479	0.25 0.32 0.32 0.32 0.32	26.441 33.249 41.910 47.803 59.614	25.279 31.770 40.431 46.324 58.135	24.117 30.291 38.952 44.845 56.656	8.16 9.53 10.39 12.70 12.70 15.88	1.81 1.81 2.31 2.31 2.31 2.31	2.27 2.27 2.89 2.89 2.89 2.89 2.89	0.142 0.142 0.180 0.180 0.180 0.180	5.0 5.6 6.4 6.4 6.4 7.5	12.7 14.1 16.2 18.5 18.5 22.8	15.0 16.3 19.0 21.4 21.4 25.7	9.1 10.2 11.5 13.4 13.4 16.9	21.7 27.2 34.0 42.7 48.6 60.5	2.8 3.2 3.5 3.5 3.8
PT1 PT1 ¹ / ₄ PT1 ¹ / ₂ PT2 PT2 ¹ / ₂	11 11 11 11 11	1.8143 2.3091 2.3091 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479 1.479 1.479	0.25 0.32 0.32 0.32 0.32 0.32	26.441 33.249 41.910 47.803 59.614 75.184	25.279 31.770 40.431 46.324 58.135 73.705	24.117 30.291 38.952 44.845 56.656 72.226	8.16 9.53 10.39 12.70 12.70 15.88 17.46	1.81 1.81 2.31 2.31 2.31 2.31 3.56	2.27 2.27 2.89 2.89 2.89 2.89 2.89 3.46	0.142 0.142 0.180 0.180 0.180 0.180 0.217	5.0 5.6 6.4 6.4 6.4 7.5 9.22	12.7 14.1 16.2 18.5 18.5 22.8 26.7	15.0 16.3 19.0 21.4 21.4 25.7 30.2	9.1 10.2 11.5 13.4 13.4 16.9 18.6	21.7 27.2 34.0 42.7 48.6 60.5 76.3	2.8 2.8 3.2 3.5 3.5 3.8 4.2
PT1 PT1¼ PT1½ PT2 PT2½ PT3	11 11 11 11 11 11	1.8143 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479 1.479 1.479 1.479	0.25 0.32 0.32 0.32 0.32 0.32 0.32	26.441 33.249 41.910 47.803 59.614 75.184 87.884	25.279 31.770 40.431 46.324 58.135 73.705 86.405	24.117 30.291 38.952 44.845 56.656 72.226 84.926	8.16 9.53 10.39 12.70 12.70 15.88 17.46 20.64	1.81 1.81 2.31 2.31 2.31 2.31 3.56 3.46	2.27 2.27 2.89 2.89 2.89 2.89 3.46 3.46	0.142 0.142 0.180 0.180 0.180 0.180 0.217 0.217	5.0 5.6 6.4 6.4 6.4 7.5 9.22 9.22	12.7 14.1 16.2 18.5 18.5 22.8 26.7 29.9	15.0 16.3 19.0 21.4 21.4 25.7 30.2 33.3	9.1 10.2 11.5 13.4 13.4 16.9 18.6 21.1	21.7 27.2 34.0 42.7 48.6 60.5 76.3 89.1	2.8 2.8 3.2 3.5 3.5 3.8 4.2 4.2
PT1 PT1¼ PT1½ PT2 PT2½ PT3 PT3½	11 11 11 11 11 11 11	1.8143 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479 1.479 1.479 1.479 1.479	0.25 0.32 0.32 0.32 0.32 0.32 0.32 0.32	26.441 33.249 41.910 47.803 59.614 75.184 87.884 100.330	25.279 31.770 40.431 46.324 58.135 73.705 86.405 98.851	24.117 30.291 38.952 44.845 56.656 72.226 84.926 97.372	8.16 9.53 10.39 12.70 12.70 15.88 17.46 20.64 22.23	1.81 1.81 2.31 2.31 2.31 2.31 3.56 3.46 3.46	2.27 2.27 2.89 2.89 2.89 2.89 3.46 3.46 3.46	0.142 0.142 0.180 0.180 0.180 0.180 0.217 0.217	5.0 5.6 6.4 6.4 7.5 9.22 9.22 9.3	12.7 14.1 16.2 18.5 18.5 22.8 26.7 29.9 31.5	15.0 16.3 19.0 21.4 25.7 30.2 33.3 34.9	9.1 10.2 11.5 13.4 13.4 16.9 18.6 21.1 22.4	21.7 27.2 34.0 42.7 48.6 60.5 76.3 89.1 101.6	2.8 2.8 3.2 3.5 3.5 3.8 4.2 4.2 4.2
PT1 PT1 ¹ / ₄ PT1 ¹ / ₂ PT2 PT2 ¹ / ₂ PT3 PT3 ¹ / ₂ PT4	11 11 11 11 11 11 11 11	1.8143 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479 1.479 1.479 1.479 1.479 1.479	0.25 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	26.441 33.249 41.910 47.803 59.614 75.184 87.884 100.330 113.030	25.279 31.770 40.431 46.324 58.135 73.705 86.405 98.851 111.551	24.117 30.291 38.952 44.845 56.656 72.226 84.926 97.372 110.072	8.16 9.53 10.39 12.70 15.88 17.46 20.64 22.23 25.40	1.81 1.81 2.31 2.31 2.31 3.56 3.46 3.46 3.46	2.27 2.27 2.89 2.89 2.89 2.89 3.46 3.46 3.46 3.46 3.46	0.142 0.142 0.180 0.180 0.180 0.217 0.217 0.217 0.217	5.0 5.6 6.4 6.4 7.5 9.22 9.22 9.3 10.4	12.7 14.1 16.2 18.5 18.5 22.8 26.7 29.9 31.5 35.9	15.0 16.3 19.0 21.4 21.4 25.7 30.2 33.3 34.9 39.3	9.1 10.2 11.5 13.4 13.4 16.9 18.6 21.1 22.4 25.9	21.7 27.2 34.0 42.7 48.6 60.5 76.3 89.1 101.6 114.3	2.8 2.8 3.2 3.5 3.5 3.8 4.2 4.2 4.2 4.2 4.5
PT1 PT1 ¹ / ₄ PT1 ¹ / ₂ PT2 PT2 ¹ / ₂ PT3 PT3 ¹ / ₂ PT4 PT5	11 11 11 11 11 11 11 11 11	1.8143 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091 2.3091	1.162 1.479 1.479 1.479 1.479 1.479 1.479 1.479 1.479 1.479	0.25 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	26.441 33.249 41.910 47.803 59.614 75.184 87.884 100.330 113.030 138.430	25.279 31.770 40.431 46.324 58.135 73.705 86.405 98.851 111.551 136.952	24.117 30.291 38.952 44.845 56.656 72.226 84.926 97.372 110.072 135.472	8.16 9.53 10.39 12.70 12.70 15.88 17.46 20.64 22.23 25.40 25.58	1.81 1.81 2.31 2.31 2.31 3.56 3.46 3.46 3.46 3.46	2.27 2.27 2.89 2.89 2.89 3.46 3.46 3.46 3.46 3.46 3.46	0.142 0.142 0.180 0.180 0.180 0.217 0.217 0.217 0.217	5.0 5.6 6.4 6.4 6.4 7.5 9.22 9.22 9.3 10.4 11.4	12.7 14.1 16.2 18.5 18.5 22.8 26.7 29.9 31.5 35.9 40.1	15.0 16.3 19.0 21.4 25.7 30.2 33.3 34.9 39.3 43.6	9.1 10.2 11.5 13.4 13.4 16.9 18.6 21.1 22.4 25.9 29.3	21.7 27.2 34.0 42.7 48.6 60.5 76.3 89.1 101.6 114.3 139.8	2.8 2.8 3.2 3.5 3.5 3.8 4.2 4.2 4.2 4.5 4.5



For all dimensions see corresponding reference letters in table. Angle between sides of thread is 60 degrees. Taper of thread, on diameter, is % inch per foot. Angle of taper with centerline is I° 47'. The basic maximum thread height, h, of the truncated thread is 0.8×pitch of thread. The crest and root are truncated a minimum of 0.033×pitch for all pitches.For maximum depth of truncation see Table I.

ASME B1.20.1

Nominal	Outside Diam.	Threads	Pithc	Pitch Diameter at	Hand Engag	tight ement	Effective Exte	e Thread, ernal
Pipe Size	of Pipe, D	per Inch, n	от Thread, р	of External Thread,	Length, ² L ₁	Diam, ³	Length, ⁴ L ₂	Diam.,
	2			Eo	ln.		In.	L 2
1/16	0.3125	27	0.03704	0.27118	0.160	0.28118	0.2611	0.28750
1/8	0.405	27	0.03704	0.36351	0.1615	0.37360	0.2639	0.38000
$\frac{1}{4}$	0.540	18	0.05556	0.47739	0.2278	0.49163	0.4018	0.50250
3/8	0.675	18	0.05556	0.61201	0.240	0.62701	0.4078	0.63750
$\frac{1}{2}$	0.840	14	0.07143	0.75843	0.320	0.77843	0.5337	0.79179
3⁄4	1.050	14	0.07143	0.96768	0.339	0.98887	0.5457	1.00179
1	1.315	$11^{1/2}$	0.08696	1.21363	0.400	1.23863	0.6828	1.25630
$1^{1}/_{4}$	1.660	$11^{1/2}$	0.08696	1.55713	0.420	1.58338	0.7068	1.60130
$1^{1/2}$	1.900	$11^{1/2}$	0.08696	1.79609	0.420	1.82234	0.7235	1.84130
2	2.375	$11^{1/2}$	0.08696	2.26902	0.436	2.29627	0.7565	2.31630
$2^{1}/_{2}$	2.875	8	0.12500	2.71953	0.682	2.76216	1.1375	2.79062
3	3.500	8	0.12500	3.34062	0.766	3.38850	1.2000	3.41562
$3^{1}/_{2}$	4.000	8	0.12500	3.83750	0.821	3.88881	1.2500	3.91562
4	4.500	8	0.12500	4.33438	0.844	4.38712	1.3000	4.41562
5	5.563	8	0.12500	5.39073	0.937	5.44929	1.4063	5.47862
6	6.625	8	0.12500	6.44609	0.958	6.50597	1.5125	6.54062

All dimensions given in inches.

¹The basic dimensions of the ANSI Standard Taper Pipe Thread are Given in inches to four of five decimal places While this implies a greater degree of preci-sion than is ordinarily attained, these dimensions are the basis of gage dimensions and are so expressed for the purpose of eliminating errors in computations. ²Also length of thin ring gage and length from gaging notch to small end of plug gage.

³Also pitch diameter at gaging notch (handtight plane).

Nominal Pipe	Wrench Makeup Length for Internal Thread		Vanish Thread, (3.47 thds.),	Overall Length External	Nomina Exte Thre	l Perfect ernal eads⁵	Height of Thread	Basic Minor Diam. at Small End of
Size	Length, ⁷ L ₃	Diam., E₃	` V ″	Inread, L4	Length L₅	Diam., E₅	h h	Pipe, K ₀
1/16	0.1111	0.26424	0.1285	0.3896	0.1870	0.28287	0.02963	0.2416
1/8	0.1111	0.35656	0.1285	0.3924	0.1898	0.37537	0.02963	0.3339
1/4	0.1667	0.46697	0.1928	0.5946	0.2907	0.49556	0.04444	0.4329
3/8	0.1667	0.60160	0.1928	0.6006	0.2967	0.63056	0.04444	0.5676
1/2	0.2143	0.74504	0.2478	0.7815	0.3909	0.78286	0.05714	0.7013
3/4	0.2143	0.95429	0.2478	0.7935	0.4029	0.99286	0.05714	0.9105
1	0.2609	1.19733	0.3017	0.9845	0.5089	1.24543	0.06957	1.1441
1^{1}_{4}	0.2609	1.54083	0.3017	0.0085	0.5329	1.59043	0.06957	1.4876
1½	0.2609	1.77978	0.3017	1.0252	0.5496	1.83043	0.06957	1.7205
2	0.2609	2.25272	0.3017	1.0582	0.5826	2.30543	0.06957	2.1995
2 ¹ / ₂	0.2500 ⁸	2.70391	0.3017	1.5712	0.8875	2.77500	0.100000	2.6195
3	0.2500 ⁸	3.32500	0.4337	1.6337	0.9500	3.40000	0.100000	3.2406
3 ¹ / ₂	0.2500	3.82188	0.4337	1.6837	1.0000	3.90000	0.100000	3.7375
4	0.2500	4.31875	0.4337	1.7337	1.0500	4.40000	0.100000	4.2344
5	0.2500	5.37511	0.4337	1.8400	1.1563	5.46300	0.100000	5.2907
6	0.2500	6.43047	0.4337	1.9462	1.2625	6.52500	0.100000	6.3461

⁴Also length of plug gage.

⁵ The Length L_5 from the end of the pipe determines the plane beyond which the thread form is imperfect at the crest. The next two threads are perfect at the root. At this plane the cone formed by the crests of the thread intersects the cylinder forming the external surface of the pipe. $L_5=L_2-2p$.

⁶Given as information for use in selecting tap drills.

⁷Three threads for 2-inch size and smailer:two threads for larger sizes.

^sMilitary Specification MIL-P-7105 gives the wrench makeup as three threads for 3in. and smaller. The E_s dimensions are then as follows: Size $2\frac{1}{2}$ in., 2.69609 and size 3 in., 3.31719.

Increase in diameter per thread is equal to 0.0625/n

Approximate Hardness Conversion Numbers For Nonaustenitic Steels ^A(Rockwell B to Other Hardness Numbers)

							Rockwe	ardness		
Rockwell B SCALE, 100- kgf Load in(1.588- mm) Ball	Vickers Hardness Number	Brinell Indentation Diameter, mm	Brinell Hardness 3000-kgf Load, 10-mm Ball	Knoop Hardness 500-gf Load and Over	Rockwell A Scale, 60-kgf Load, Dia mond Penetrator	Rockwell F Scale, 60-kgf Load, -in. (1.588-mm) Ball	15T Scale, 15- kgf Load, -In. (1.588-mm) Ball	30T Scale, 30- kgf Load, -In. (1.588-mm) Ball	45T Scale, 45- kgf Load, -In. (1.588-mm) Ball	Approximate Tensile Strength ksl(MPa)
100	240	3.91	240	251	61.5		93.1	83.1	72.9	116(800)
99	234	3.96	234	246	60.9		92.8	82.5	71.9	114(785)
98	228	4.01	228	241	60.2		92.5	81.8	70.9	109(750)
97	222	4.06	222	236	59.5		92.1	81.1	69.9	104(715)
96	216	4.11	216	231	58.9		91.8	80.4	68.9	102(705)
95	210	4.17	210	226	58.3		91.5	79.8	67.9	100(690)
94	205	4.21	205	221	57.6		91.2	79.1	66.9	98(675)
93	200	4.26	200	216	57.0	•••	90.8	78.4	65.9	94(650)
92	195	4.32	195	211	56.4		90.5	77.8	64.8	92(635)
91	190	4.37	190	206	55.8		90.2	77.1	63.8	90(620)
90	185	4.43	185	201	55.2		89.9	76.4	62.8	89(615)
89	180	4.48	180	196	54.6		89.5	75.8	61.8	88(605)
88	176	4.53	176	192	54.0		89.2	75.1	60.8	86(590)
87	160	4.58	160	188	53.4		88.9	74.4	59.8 E0.0	84(580)
00 85	165	4.62	165	180	52.0		00.0	73.0	57.9	82(565)
84	162	4.07	162	176	51.7		87.0	73.1	56.8	81(560)
83	159	4 75	159	173	51.1		87.6	71.8	55.8	80(550)
82	156	4.79	156	170	50.6		87.3	71.1	54.8	77(530)
81	153	4.84	153	167	50.0		86.9	70.4	53.8	73(505)
80	150	4.88	150	164	49.5		86.6	69.7	52.8	72(495)
79	147	4.93	147	161	48.9		86.3	69.1	51.8	70(485)
78	144	4.98	144	158	48.4		86.0	68.4	50.8	69(475)
77	141	5.02	141	155	47.9		85.6	67.7	49.8	68(470)
76	139	5.06	139	152	47.3	•••	85.3	67.1	48.8	67(460)
75	137	5.10	137	150	46.8	99.6	85.0	66.4	47.8	66(455)
74	135	5.13	135	147	46.3	99.1	84.7	65.7	46.8	65(450)
73	132	5.18	132	145	45.8	98.5	84.3	65.1	45.8	64(440)
72	130	5.22	130	143	45.3	98.0	84.0	64.4	44.8	63(435)
71	127	5.27	127	141	44.8	97.4	83.7	63.7	43.8	62(425)
70	125	5.32	125	139	44.3	96.8	83.4	63.1	42.8	61(420) 60(415)
69	123	5.30	123	125	43.0	90.2	83.0	61.7	41.0	50(415) 50(405)
67	119	5 44	119	133	43.3	95.0	82.7	61.0	39.8	58(400)
66	117	5.48	117	131	42.3	94.5	82.1	60.4	38.7	57(395)
65	116	5.51	116	129	41.8	93.9	81.8	59.7	37.7	56(385)
64	114	5.54	114	127	41.4	93.4	81.4	59.0	36.7	
63	112	5.58	112	125	40.9	92.8	81.1	58.4	35.7	
62	110	5.63	110	124	40.4	92.2	80.8	57.7	34.7	
61	108	5.68	108	122	40.0	91.7	80.5	57.0	33.7	
60	107	5.70	107	120	39.5	91.1	80.1	56.4	32.7	
59	106	5.73	106	118	39.0	90.5	79.8	55.7	31.7	
58	104	5.77	104	11/	38.6	90.0	79.5	55.0	30.7	
57	103	5.81	103	115	38.1	89.4	79.2	54.4	29.7	
50 55	101	5.85	101	112	31.1	00.0	78.8	53.7	28.7	
50	100	5.67	100	111	36.8	87 7	78.0	53.0	21.1	
53				110	36.3	86.5	77.9	51.7	25.7	
52				109	35.9	86.0	77.5	51.0	24.7	
51				108	35.5	85.4	77.2	50.3	23.7	
50				107	35.0	84.8	76.9	49.7	22.7	
49				106	34.6	84.3	76.6	49.0	21.7	
48				105	34.0	83.7	76.2	48.3	20.7	
47				104	33.7	83.1	75.9	47.7	19.7	
46				103	33.3		75.6	47.0	18.7	
45				102	32.9	82.6	75.3	46.3	17.7	
44				101	32.4	82.0	74.9	45.7	16.7	
43				100	32.0	81.4	74.0	45.0	10.7	
42				99	31.0	80.3	74.5	44.5	13.6	
40				97	30.7	79.7	73.6	43.0	12.6	
39				96	30.3	79.1	73.3	42.3	11.6	
38				95	29.9	78.6	73.0	41.6	10.6	
37				94	29.5	78.0	72.7	41.0	9.6	
36				93	29.1	77.4	72.3	40.3	8.6	
35				92	28.7	76.9	72.0	39.6	7.6	
34				91	28.2	76.3	71.7	39.0	6.6	
33				90	27.8	75.7	71.4	38.3	5.6	
32				89	27.4	75.2	71.0	37.6	4.6	
31				88	2.70	74.6	/0./	37.0	3.6	
30				87	26.6	74.0	70.4	36.3	2.6	

^AThis table gives the approximate interrelationships of hardness values and approximate tensile strength of steels. It is possible that steels of various compositions and processing histories will deviate in hardness-tensile strength relationship from the data presented in this table. The data in this table should not be used for austenitic stainless steels but have been shown to be applicable for ferritic and martensitic stainless steels. Where more precise conversions are required, they should be developed specially for each steel composition, heat treatment, and part.

Approximate Hardness Conversion Numbers For Nonaustenitic Steels^A (Rockwell C to Other Hardness Numbers)

Rockwell		Drinell	Drinell	Knoop	Rockwell		Rockwell Superficia		al Hardness		
D Sale, 50-kgf Load, Diamond Penetrator	Vickers Hardness Number	Indentation Diameter, mm	Hardness 30009-kgf Load, 10-mm Ball	Hardness 500-gf Load and Over	A Scale, 60-kgf Load, Diamond Penetrator	15N Scale, 15-kgf Load, Diamond Penetrator	30N Scale 30-kgf Load, Diamond Penetrator	45N Scale, 45-kgf Load, Diamond Penetrator	Approximate Tensile Strength, ksi(MP a)		
68	940			920	85.6	93.2	84.4	75.4			
67	900			895	85.0	92.9	83.6	74.2			
66	865			870	84.5	92.5	82.8	73.3			
65	832	2.26	739	846	83.9	92.2	81.9	72.0			
64	800	2.28	722	822	83.4	91.8	81.1	71.0			
63	772	2.31	706	799	82.8	91.4	80.1	69.9			
62	746	2.34	688	776	82.3	91.1	79.3	68.8			
61	720	2.37	670	754	81.8	90.7	78.4	67.7			
60	697	.2.40	654	732	81.2	90.2	77.5	66.6			
59	674	2.44	634	710	80.7	89.8	76.6	65.5	351(2420)		
58	653	2.47	615	690	80.1	89.3	75.7	64.3	338(2330)		
57	633	2.51	595	670	79.6	88.9	74.8	63.2	325(2240)		
56	613	2.55	577	650	79.0	88.3	73.9	62.0	313(2160)		
55	595	2.59	560	630	78.5	87.9	73.0	60.9	301(2070)		
54	577	2.63	543	612	78.0	87.4	72.0	59.8	292(2010)		
53	560	.2.67	525	594	77.4	86.9	71.2	58.6	283(1950)		
52	544	2.70	512	576	76.8	86.4	70.2	57.4	273(1880)		
51	528	2.75	496	558	76.3	85.9	69.4	56.1	264(1820)		
50	513	2.79	482	542	75.9	85.5	68.5	55.0	255(1760)		
49	498	2.83	468	526	75.2	85.0	67.6	53.8	246(1700)		
48	484	2.87	455	510	74.7	84.5	66.7	52.5	238(1640)		
47	471	2.91	442	495	74.1	83.9	65.8	51.4	229(1580)		
46	458	2.94	432	480	73.6	83.5	64.8	50.3	221(1520)		
45	446	2.98	421	466	73.1	83.0	64.0	49.0	215(1480)		
44	434	3.02	409	452	72.5	82.5	63.1	47.8	208(1430)		
43	423	3.05	400	438	72.0	82.0	62.2	46.7	201(1390)		
42	412	3.09	390	426	71.5	81.5	61.3	45.5	194(1340)		
41	402	3.13	381	414	70.9	80.9	60.4	44.3	188(1300)		
40	392	3.17	371	402	70.4	80.4	59.5	43.1	182(1250)		
39	382	3.21	362	391	69.9	79.9	58.6	41.9	177(1220)		
38	372	3.24	353	380	69.4	79.4	57.7	40.8	171(1180)		
37	363	3.28	344	370	68.9	78.8	56.8	39.6	166(1140)		
30	354	3.32	330	360	68.4	78.3	55.9	38.4	161(1110)		
30	340	3.30	327	301	67.9	77.0	55.0	37.2	150(1060)		
34	207	3.41	319	342	66.9	76.6	52.2	30.1	140(1030)		
33	321	3.40	311	334	66.2	70.0	50.5	34.9	149(1030)		
J∠ 21	310	3.50	301	320	65.9	70.1	52.1 51.2	33.7	140(1010)		
30	300	3.54	294	211	65.2	75.0	51.5	32.0	128(050)		
30	302	3.59	200	204	64.6	73.0	10.5	31.3	125(950)		
29	294	3.04	279	207	64.0	73.0	49.5	28.0	131(900)		
20	200	3.09	271	291	62.9	73.9	40.0	20.9	129(900)		
26	273	3.75	258	284	63.3	72.8	46.8	26.7	125(860)		
20	212	3.11	253	204	62.8	72.0	40.8	20.7	123(850)		
23	260	3.86	233	270	62.4	71.6	45.0	20.0	119(820)		
24	254	3.89	247	266	62.4	71.0	44.0	24.5	117(810)		
20	2/8	3 03	243	261	61.5	70.5	43.0	22.1	115(790)		
22	243	3.98	231	256	61.0	69.9	42.3	20.7	112(770)		
20	238	4 02	226	251	60.5	69.4	41.5	19.6	110(760)		
20	200	7.02	220	201	00.0	00.4	41.0	10.0	110(100)		

^AThis table gives the approximate interrelationships of hardness valus and approximate tensile strength of steels. It is possible that steels of various compositions and processing histories will deviate in hardness-tensile strength relationship from the data presented in this table. The data in this table should not be used for austenitic stainless steels but have been shown to be applicable for ferritic and martensitic stainless steels. Where more precise conversions are required, they should be developed specially for each steel composition, heat treatment, and part.

ASTM	A234	A403	A420	A815	and	A860
AO I M	$\pi 207$	A700,	A720,	7010	anu	7000

			Chemical Composition(percent)									
Marking Symbols	Materiais	5		Ma	ax. or Range(U	Inless otherwis	se indicat	ed)				
Oymbols	Grage	Thick.	Form	С	Si	Mn	Р	S	Ni			
	A106 Gr. B	0.05	Р	-	0.10min	0.29-1.06	0.048	0.058	-			
WPB	A515 Gr. 65	0~25mm 26~50 50~100	PL	0.28 0.31 0.33	0.13-0.45	0.90	0.035	0.040				
	A515 Gr. 70	0~25mm 26~50 50~100	PL	0.31 33 0.35	0.13-0.45	1.30	0.035	0.040	-			
WPC	A106 Gr. C	30~100	Р	0.35	0.10min	0.29-1.06	0.048	0.058	-			
WP1	A335 Gr. P1 A204 Gr. B		P	0.10-0.20	0.10-0.50 0.13-0.45	0.30-0.80	0.045	0.045	_			
WP12	A335 Gr. P12		P	0.15	0.50	0.30-0.61	0.045	0.045	-			
WP11	A335 Gr. P11		P	0.15	0.50-1.00	0.30-0.60	0.030	0.030	-			
WP22	A387 Gr. 11 A335 Gr. P22		PL P	0.17	0.44-0.86	0.35-0.73	0.035	0.040	-			
WFZZ	A387 Gr.22		PL	0.15-0.17	0.50	0.25-0.66	0.035	0.035	-			
WP23	A335 P23		Ρ	0.04-0.10	0.50	0.10-0.60	0.030	0.010	-			
WP5	A335 Gr. P5		P	0.15	0.50	0.30-0.60	0.030	0.030	_			
WP9	A335 P9		P	0.15	0.25-1.00	0.30-0.60	0.025	0.025	-			
	A387 Gr.9		PL	0.15	1.00	0.30-0.60	0.030	0.030	-			
WP91	A335 P91 A387 Gr. 91		P PL	0.08-0.12	0.20-0.50	0.30-0.60	0.020	0.010	0.40			
WP92	A335 P92		Ρ	0.07-0.13	0.50	0.30-0.60	0.020	0.010	0.40			
WP304	A312 Gr. TP304 A240 Type 304		P PL	0.08 0.08	0.75 1.00	2.00 2.00	0.040 0.045	0.030 0.030	8.00-11.00 8.00-10.50			
WP304H	A312 Gr. TP304H A240 Type 304H*		P	0.04-0.10	0.75	2.00	0.040	0.030	8.00-11.00			
WP304L	A312 Gr TP304L†		P	0.035	0.75	2.00	0.040	0.030	8.00-13.00			
WP309	A312 Gr. TP309		PL	0.15	0.75	2.00	0.040	0.030	12.00-15.00			
WP310	A312Gr. TP310		PL P	0.08	0.75	2.00	0.045	0.030	19.00-15.00			
WD047	A240 Type 310S A312 Gr. TP347		PL P	0.08	1.00 0.75	2.00	0.045	0.030	19.00-22.00 9.00-13.00			
WP347	A240 Type347		PL P	0.08	1.00	2.00	0.045	0.030	9.00-13.00			
WP316	A312 GL 17310 A240 Type316		PL	0.08	1.00	2.00	0.040	0.030	10.00-14.00			
WP316H	A312 Gr. TP316H A240 Type 316H*		P PL	0.04-0.10 0.40-1.10	1.00	2.00	0.040 0.045	0.030	11.00-14.00 10.00-14.00			
WP316L	A312 Gr. TP316L A240 Type 316L†		P PL	0.035 0.030	0.75 1.00	2.00 2.00	0.040 0.045	0.030 0.030	10.00-15.00 10.00-14.00			
WP321	A312 Gr. TP321 A240 Type 321		P PL	0.08 0.08	0.75 1.00	2.00 2.00	0.040 0.045	0.030 0.030	9.00-13.00 9.00-12.00			
WP321H	A312 Gr. TP321H		P	0.04-0.10	0.75	2.00	0.040	0.030	9.00-13.00			
WP347H	A312 Gr. TP347H		P	0.04-0.10	0.75	2.00	0.040	0.030	9.00-13.00			
WP S31254	A312 S31254		P	0.020	0.80	1.00	0.040	0.010	17.5-18.5			
	A333 end A334 Gr. 6	0. 25mm	PL	0.30	0.10min	0.29-1.06	0.048	0.058	-			
WPL6	A516 Gr. 60	26~50 50~100	PL	0.21 0.23 0.25	0.13-0.45	0.60-1.30	0.035	0.040	-			
WPL3	A333 and A334 Gr. 3 A203 Gr. D	0~50mm	P Pl	0.19 0.17	0.18-0.37 0.13-0.45	0.31-0.64 0.70-0.80	0.050 0.035	0.050 0.040	3.18-3.82 3.18-3.82			
WPL9	A333 and A334 Gr.8 A203 – Gr.A	00 100	P	0.20 0.17	0.15-0.40	0.40-1.06 0.70	0.025 0.035	0.025 0.040	1.60-2.24 2.10-2.50			
S31803	A790 S31803 A240 S31803		P PL	0.030	1.0	2,0	0.030	0.020	4.50-6.50			
S32750	A790 S32750 A240 S32750		P PL	0.030	0.8	1.2	0.035	0.020	6.0-8.0			
S32760	A790 S32760 A240 S32760		P PL	0.05 0.030	1.00	1.00	0.030	0.010	6.00-8.00			
WPHY42	AP15L Gr.X42 A572 Gr.42		P PL	0.28	Ξ	1.25	0.04	0.05				
WPHY60	AP15L Gr.X60 A572 Gr.60		P PL	0.26		1.35	0.04	0.05	_			
WPHY65	AP15L Gr.X65 A572 Gr.65		P PL	0.26		1.40	0.04	0.05				

Asterisks(*) denote that the carbon content shall be 0.04 to 0.10%
 Daggers(†) denote that the minimum tensile strength shall be 65,000 psi(450 MPa) and that the minimum yield strength shall be 25,000 psi(170 MPa)

• The yield strength shall be determined by the offset method at 0.2% limiting permanent set in accordance with ASTM A370 Specification An alternative method of determining yield strength may be based on a total extension under load of 0.5%

• The basic minimum elongation for walls 3/16"(7.94mm) and over in thickness shall be determined according to strip tests: all small sizes are tested in their full section

• P-denotes Pipe, PL Plate

			Tensile F	Requirement	S		
				Tensile Strength	Yield	Longitudinal	Marking
Cr	Mo	Ti	Other Element	Min. or Range	Min.	in 2_in.(50mm)	Symbols
	WO			KSI(Mpa)	Ksi(Mpa)	Min%	
-	-	-	—	60 (415)	35 (240)	30	
-	=	=	_	65-85(450-585)	35 (240)	23	WDP
	_	_					WPD
	_	_		70-90(485-620)	38 (260)	21	
-	-	-	-	70 (485)	40 (275)	30	WPC
-	0.44-0.65	-	-	55 (380)	30(205)	30	WP1
0.80.1.25	0.41-0.64	_	_	70-90(485-620)	40(275)	21	
0.74-1.21	0.40-0.65	-	-	65-85(450-585)	40 (275)	22	WP12
1.00-1.50	0.44-0.65	-	-	60 (415)	30 (205)	30	WP11
0.94-1.56	0.40-0.70	-	_	70-100(515-690)	45 (310)	22	
1.88-2.62	0.85-1.15	-	-	75-100(515-690)	45(310)	18	WP22
1.90-2.60	0.05-0.30	-	V :0.20-0.30 Cb:0.02-0.08 B :0.0005-0.006 N :0.030 AI :0.030 W :1.451.75	74	58	20	WP23
4.00-6.00	0.45-0.65	_	-	60 (415) 75 100(515 600)	30 (205)	30	WP5
4.00-0.00	0.40-0.70			60	30	30	14/50
8.00-10.00	0.90-1.10	-	-	60-85	30	18	WP9
8.00-9.50	0.85-1.05	-	V :0.18-0.25 Cb:0.06-0.10 N :0.0300.70 Al :0.04	85 85-110	60 60	20 18	WP91
8.50-9.50	0.30-0.60	-	V :0.15-0.25 Cb:0.04-0.09 B :0.001-0.006 N :0.03-0.07 AI :0.04 W :1.50-2.00	90	64	20	WP92
18.00-20.00	_	_	-	75 (515)	30 (205)	35	WP304
18.00-20.00	_	-	-	75 (515)	30 (205)	35	14/200411
18.00-20.00	-	-	-	75 (515)	30 (205)	40	WP304H
18.00-20.00	_	_	-	70 (485) 70 (485)	25 (170) 25 (170)	35 40	WP304L
22.00-24.00	_	-	_	75 (515)	30 (205)	35	WD200
22.00-24.00	-	-	-	75 (515)	30 (205)	40	WP309
24.00-26.00	_			75 (515) 75 (515)	30 (205)	35 40	WP310
17.00-20.00	-	-	Cb+Ta10×C-1.00	75 (515)	30 (205)	35	W/D247
17.00-19.00	_	-	Cb+Ta10×C-1.10	75 (515)	30 (205)	40	WF347
16.00-18.00	2.00-3.00	_		75 (515) 75 (515)	30 (205) 30 (205)	35 40	WP316
16.00-18.00	2.00-3.00	-	-	75 (515)	30 (205)	35	WP316H
16.00-18.00	2.00-3.00	-	-	75 (515)	30 (205)	40	WISION
16.00-18.00	2.00-3.00	_	_	70 (485) 70 (485)	25 (170) 25 (170)	35 40	WP316L
17.00-20.00	-	5×C-0.60	-	75 (515)	30 (205)	35	WP321
17.00-19.00	_	5×C=0.70	-	75 (515) 75 (515)	30 (205)	40	
17.00-20.00	-	4×C-0.70	_	75 (515)	30 (205)	40	WP321H
17.00-20.00	-	-	Cb+Ta8×C-1.0	75 (515) 75 (515)	30 (205)	35	WP347H
17.00-19.00	_	-	CD+188×C-1.0	75 (515)	30 (205)	40	
19.5-20.5	6.00-6.50	-	N:0.18-0.22 Cu:0.50-1.00	94(650)	44(300)	35	\$31254
-	-	-	-	60 (414)	35 (241)	30	WPL6
-	-	-	-	60-80(415-550)	32 (220)	25	WI LO
-	-	-	-	65 (448)	35 (241)	30	W/PL 3
-	-	-	-	65-85(450-585)	37 (255)	23	WIES
		_	Cu-0.75-1.25	63 (435) 65-85(450-585)	46(315) 37(255)	28 23	WPL9
21 0 22 0	2 50 2 50	-	N-0.08.0.20	00 (620)	65(450)	25	\$21902
21.0-23.0	2.00-3.00	-	11.0.00-0.20	30 (020)	00(400)	20	331003
24.0-26.0	3.0-5.0	_	N:0.24-0.32 Cu:0.5	116 (795)	80(550)	15	S32750
24.00-26.00	3.00-4.00	N:0.20-0.30	Cu:0.50-1.00 W:0.50-1.00	108 (750)	80(550)	25	S32760
_	_	-		T03-T30(130-033)	10/000	_	WDLN 40
-	-	-	-	60 (414)	42(289)	24	WPHY42
-	_	0.03 Min.	Cb:0.005min. V:0.02min.	75 (517)	60(413)	- 18	WPHY60
-	-	-	ChiQ 005min ViQ 02min	77(530)	65(119)	-	WDUVEE
-	-	-	60.0.005mm. V.0.02mm.	80(550)	00(446)	17	WFHT05

Comparison of ASTM Specification and Similar Standards

Steel Composition		ASTM Specifica	tionin and Grade	•	KS Specification
Steel Composition	Marking Symbol	Pipe	Plate	Forgings	Pipe
Carbon Steel	-	A120	A283-A	-	SPP
Carbon Steel	-	A53-B	A242	-	SPPS38
Carbon Steel	-	A53-B	A242	-	SPPS42
Carbon Steel	WPB	A106-B	A515-65 or 70	A181-2and A105	SPHT42
Carbon Steel	WPC	A106-C	-	-	SPHT49
Carbon Steel	WPL6	A333 and A334-6	A516-60	A350-LF2	SPLT39
31/2 % Ni Steel	WPL3	A333and A334-3	A203-D	A350-LF3	-
2%Ni-1% Cu Steel	WPL9	A333and A334-9	A203-A	A350-LF9	-
Carbon-Molybdenum Steel	WP1	A335-P1	A204-B	A182-F1	SPA12
1% Cr-1/2% Molybdenum Steel	WP12	A335-P12	A387-12	A182-F12	SPA22
1¼% Cr-½% Molybdenum Steel	WP11	A335-P11	A387-11	A182-F11	SPA23
2 ¹ / ₄ Cr-1% Molybdenum Steel	WP22	A335-P22	A387-22	A182-F22	SPA24
5% Cr-1/2% Molybdenum Steel	WP5	A335-P5	A387-5	A182-F5	SPA25
7% Cr-½% Molybdenum Steel	WP7	A335-P7	-	A182-F7	-
9% Cr-1% Molybdenum Steel	WP9	A335-P9	-	A182-F9	—
9% Cr-1% Mo-0.2%V+Cb+N	WP91	A335-P91	A387-91	A182-F91	_
18% Cr-8% Ni Steel	WP304	A312-TP304	A240-Type304	A182-F304	STS304TP
18% Cr-8% Ni-(0.04-0.10)% C Steel	WP304H	A312-TP304H	A240-Type304H	A182-F304H	—
18% Cr-8% Ni-0.035% C Steel	WP304L	A312-TP304L	A240-Type304L	A182-F304L	STS304LTP
22% Cr-12% Ni Steel	WP309	A312-TP309	A240-Type309S	-	STS309STP
25% Cr-20% Ni Steel	WP310	A312-TP310	A240-Type310S	A182-F310	STS310STP
18% Cr-8% Ni-Cb+ Ta Steel	WP347	A312-TP347	A240-Type 347	A182-F347	STS347TP
18% Cr-8% Ni-Mo Steel	WP316	A312-TP316	A240-Type316	A182-F316	STS316TP
18% Cr-8% Ni-Mo-(0.04-0.10)% C Steel	WP316H	A312-TP316H	A240-Type316H	A182-F316H	STS316HTP
18% Cr-8% Ni-Mo-0.035% C Steel	WP316L	A312-TP316L	A240-Type316L	A182-F316L	STS316LTP
18% Cr-8% Ni-Ti Steel	WP321	A312-TP321	A240-Type321	A182-F321	STS321TP
18% Cr-8% Ni-Ti-(0.04-0.10)% C Steel	WP321H	A312-TP321H	A240-Type321H	A182-F321H	-
18% Cr-8% Ni-Cb+Ta-(0.04-0.10)% C Steel	WP347H	A312-TP347H	A240-Type347H	A182-F347H	STS347HTP

Comparison of ASTM Specification and Similar Standards

KS Specification and Grade	JIS Grade		B.S. DIN Specification and Grade and Grade		Steel Composition
Plate	Pipe	Plate	Pipe	Pipe	
SB41	SGP	SS41	1378-M	2440-ST33-1	Carbon Steel
SWS41B	STPG370	SM41B	3602-ERW23	1626-ST37	Carbon Steel
SWS41B	STPG410	SM41B	3602-ERW27	—	Carbon Steel
SBB42	STPT410	SB42	3602-Steel 27	17175-St 45.8	Carbon Steel
SBB49	STPT480	SB49	3602-Steel 35	-	Carbon Steel
SLAL39	STPL380	-	3603-Steel 27 LT30	-	Carbon Steel
-	STPL450	-	3603-Steel 503 LT100	-	3½% Ni Steel
-	STPL690	-	-	-	2% Ni-1% Cu Steel
SBB46M	STPA12	-	-	17175-15 Mo3	Carbon-Molybdenum Steel
SCMV2	STPA22	-	3604-HF620	17175- 13CrMo44	1% Cr-1/2 Molybdenum Steel
SCMV3	STPA23	-	3604-HF621	_	$1^{1/4}_{4}$ % Cr- $^{1/2}_{2}$ % Molybdenum Steel
SCMV4	STPA24	-	3604-HF622, 27	17175- 10CrMo910	21/4 % Cr-1%Molybdenum Steel
SCMV6	STPA25	-	3604-HF625	-	5% Cr-1/2% Molybdenum Steel
-	-	_	-	-	7% Cr-½% Molybdenum Steel
-	STPA26	-	-	-	9% Cr-1% Molybdenum Steel
-	_	-	-	-	9% Cr-1% Mo-0.2%V+Cb+N
STS304	SUS304TP	SUS304	3605-801	17440- X5CrNi189	18% Cr-8% Ni Steel
—	SUS304HTP	-	3605-811	-	18% Cr-8% Ni-(0.04-0.10)% C Steel
STS304L	SUS304LTP	SUS304L	3605-811L	17440- X2CrNi189	18% Cr-8% Ni-0.035% C Steel
STS309S	SUS309STP	SUS309S	-	-	22% Cr-12% Ni Steel
STS310S	SUS310STP	SUS310S	3605-805S	-	25% Cr-20% Ni Steel
STS347	SUS347TP	SUS347	3605-822 Nb	17440- X 0CrNiNb189	18% Cr-8% Ni-Cb+Ta Steel
STS316	SUS316TP	SUS316	3605-845	17440- X5CrNiMo1810	18% Cr-8% Ni-Mo Steel
-	SUS316HTP	-	3605-855	-	18% Cr-8% Ni-Mo-(0.04-0.10)% C Steel
STS316L	SUS321LTP	SUS316L	3605-845L	17440- X2CrNiMo1810	18% Cr-8% Ni-Mo-0.035% C Steel
STS321	SUS321TP	SUS321	3605-822Ti	17440-X10Cr NiTi89	18% Cr-8% Ni-Ti Steel
_	SUS321HTP	-	3605-832Ti	-	18% Cr-8% Ni-Ti-(0.04-0.10)% C Steel
-	SUS347HTP	-	3605-832Nb	_	18% Cr-8% Ni-Cb+Ta-(0.04-0.10)% C Steel

Dimensions of Welded and Seamless Pipe Carbon, Alloy and Stainless Steel

ASME B36.1	.10M, B36.19M (in millimeters)										
Nominal Pipe Size	Outside				Nomina	al Wall Thi	ckness				
(in inches)	Diameter	Sch 5S	Sch 10S	Sch 10	Sch 20	Sch 30	Sch 40S	STD	Sch 40	Sch 60	
1/8	10.29	_	1.24	_	-	-	1.73	1.73	1.73	-	
1/4	13.72	_	1.65	_	—	-	1.73	1.73	2.24	-	
3/8	17.14	_	1.65	_	-	-	2.31	2.31	2.31	-	
1/2	21.34	1.65	2.11	_	-	-	2.77	2.77	2.77	-	
3/4	26.67	1.65	2.11	2.11	-	-	2.87	2.87	2.87	-	
1	33.40	1.65	2.77	2.77	—	-	3.38	3.38	3.38	-	
1¼	42.16	1.65	2.77	2.77	-	-	3.56	3.56	3.56	-	
$1\frac{1}{2}$	48.26	1.65	2.77	2.77	-	-	3.68	3.68	3.68	-	
2	60.32	1.65	2.77	2.77	-	-	3.91	3.91	3.91	-	
$2^{1/2}$	73.02	2.11	3.05	3.05	-	-	5.16	5.16	5.16	-	
3	88.90	2.11	3.05	3.05	-	-	5.49	5.49	5.49	-	
3 ¹ ⁄ ₂	101.60	2.11	3.05	3.05	—	-	5.74	5.74	5.74	-	
4	114.30	2.11	3.05	3.05	—	-	6.02	6.02	6.02	-	
5	141.30	2.77	3.40	3.40	-	-	6.55	6.55	6.55	-	
6	168.28	2.77	3.40	-	-	-	7.11	7.11	7.11	-	
8	219.08	2.77	3.76	-	6.35	7.04	8.18	8.18	8.18	10.31	
10	273.05	3.40	4.19	-	6.35	7.80	9.27	9.27	9.27	12.70	
12	323.85	3.96	4.57	-	6.35	8.38	9.52	9.52	10.31	14.27	
14	355.60	3.96	4.78	6.35	7.92	9.52	-	9.52	11.13	15.06	
16	406.40	4.19	4.78	6.35	7.92	9.52	-	9.52	12.70	16.66	
18	457.20	4.19	4.78	6.35	7.92	11.12	-	9.52	14.27	19.05	
20	508.00	4.78	5.54	6.35	9.52	12.70	-	9.52	15.06	20.62	
22	558.8	4.78	5.54	6.35	9.52	12.70	-	9.52	15.87	22.22	
24	609.6	5.54	6.35	6.35	9.52	14.27	—	9.52	17.48	24.61	
26	660.4	-	-	7.92	12.70	-	-	9.52	-	-	
28	711.2	-	-	7.92	12.70	15.88	-	9.52	-	-	
30	762.0	6.35	7.92	7.92	12.70	15.88	—	9.52	-	-	
32	812.8	-	-	7.92	12.70	15.88	-	9.52	17.48	-	
34	863.6	-	-	7.92	12.70	15.88	-	9.52	17.48	-	
36	914.4	-	-	7.92	12.70	15.88	-	9.52	19.05	-	
38	965.2	-	-	-	-	-	-	9.52	-	-	
40	1016.0	-	_	-	-	-	—	9.52	-	-	
42	1066.8	-	_	-	-	-	—	9.52	-	-	
44	1117.6	-	_	-	-	-	-	9.52	-	-	
46	1168.4	-	_	-	-	-	-	9.52	-	-	
48	1219.2	-	—	-	-	-	—	9.52	-	-	

Dimensions of Welded and Seamless Pipe Carbon, Alloy and Stainless Steel

ASME B36.10M, B36.19M	

		No	ominal Wa	II Thickne	ess			Outside	Nominal
Sch 80S	XS	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XXS	Diameter	(in inches)
2.41	2.41	2.41	-	_	_	_	-	10.29	1/8
3.02	3.02	3.02	_	_	_	_	-	13.72	$\frac{1}{4}$
3.20	3.20	3.20	_	_	_	_	-	17.14	3/8
3.73	3.73	3.73	—	-	-	4.75	7.47	21.34	$\frac{1}{2}$
3.91	3.91	3.91	—	-	-	5.54	7.82	26.67	3⁄4
4.55	4.55	4.55	—	-	-	6.35	9.09	33.40	1
4.85	4.85	4.85	—	-	-	6.35	9.70	42.16	$1\frac{1}{4}$
5.08	5.08	5.08	—	-	-	7.14	10.16	48.26	$1^{1/2}$
5.54	5.54	5.54	—	-	-	8.71	11.07	60.32	2
7.01	7.01	7.01	_	-	-	9.52	14.02	73.02	$2^{1/2}$
7.62	7.62	7.62	—	-	-	11.13	15.24	88.90	3
8.08	8.08	8.08	_	-	-	_	16.15	101.60	$3\frac{1}{2}$
8.56	8.56	8.56	—	11.13	-	13.49	17.12	114.30	4
9.53	9.53	9.53	—	12.70	-	15.88	19.05	141.30	5
10.97	10.97	10.97	—	14.27	-	18.24	21.95	168.28	6
12.70	12.70	12.70	15.06	18.26	20.62	23.01	22.22	219.08	8
12.70	12.70	15.06	18.26	21.44	25.40	28.58	25.40	273.05	10
12.70	12.70	17.48	21.44	25.40	28.58	33.32	25.40	323.85	12
	12.70	19.05	23.83	27.79	31.75	35.71	-	355.60	14
	12.70	21.44	26.19	30.96	36.52	40.46	-	406.40	16
	12.70	23.82	29.36	34.92	39.67	45.24	-	457.20	18
	12.70	26.19	32.54	38.10	44.45	49.99	-	508.00	20
	12.70	28.58	34.92	41.28	47.62	53.98	-	558.8	22
	12.70	30.93	38.89	46.02	52.37	59.51	-	609.6	24
	12.70	—	-	-	-	—	-	660.4	26
	12.70	—	-	-	-	—	-	711.2	28
	12.70	—	-	-	-	—	-	762.0	30
	12.70	—	-	-	-	—	-	812.8	32
	12.70	—	-	-	-	—	—	863.6	34
	12.70	—	-	-	-	—	-	914.4	36
	12.70	-	-	-	-	-	-	965.2	38
	12.70	-	-	-	-	-	-	1016.0	40
	12.70	—	-	-	-	—	—	1066.8	42
	12.70	—	-	—	-	—	—	1117.6	44
	12.70	-	-	-	-	-	-	1168.4	46
	12.70	-	-	-	-	-	-	1219.2	48

(in millimeters)







E TK corporation

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