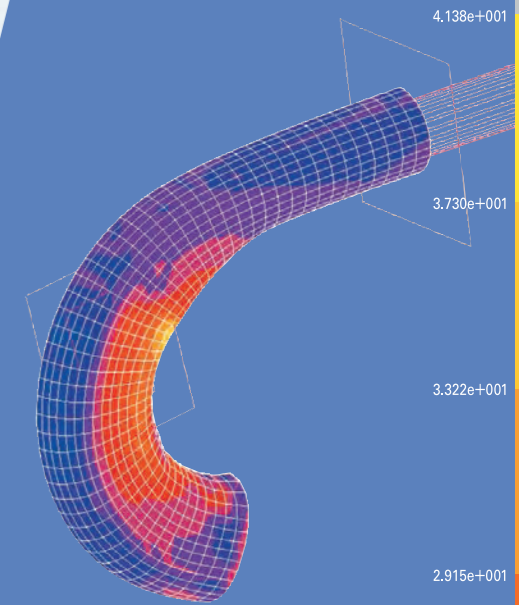


AWAJI MATERIA CO.,LTD.

BUTT-WELDING FITTINGS

CARBON & STAINLESS STEEL



Awaji

AWAJI MATERIA CO.,LTD.

URL:<http://www.awaji-materia.co.jp>

◇ **HEAD OFFICE & FACTORY**
SUMOTO LOGISTIC CENTER, TECHNICAL CENTER

4-2 KAMIGAMO,SUMOTO CITY, HYOGO PREF,
656-0015, JAPAN
TEL: 81-799-22-1731
FAX: 81-799-22-1730,1734

◇ **TOKYO OFFICE**

M&C BLDG, 2-3-13 KANDA-OGAWAMACHI,
CHIYODA-KU, TOKYO, 101-0052, JAPAN
TEL: 81-3-3295-1731
FAX: 81-3-3295-1673

◇ **TOKYO LOGISTIC CENTER**

229-10 NIREI, KOGA CITY, IBARAKI PREF, 306-0125, JAPAN
TEL: 81-280-76-0893
FAX: 81-280-76-0894

◇ **NAGOYA OFFICE**

NAGOYA NIKKO SHOKEN BUILDING 4F
3-2-3 SAKAE NAKA-KU,NAGOYA , AICHI PREF, 460-0008, JAPAN
TEL: 81-52-269-8486
FAX: 81-52-269-8487

AWAJI MATERIA (THAILAND) CO.,LTD.

81 MOO 4, PRAKASA ROAD, TAMBOL BANGMUANG,
AMPHUR MUANG, SAMUTPRAKARN 10270, THAILAND
TEL 66-2-701-5226
FAX 66-2-387-0340,388-1017

AWAJI MATERIA PITTSBURGH REPRESENTATIVE OFFICE

P.O. BOX 81846 PITTSBURGH,PENNSYLVANIA 15217, U.S.A.
TEL 1-412-361-1097



Awaji

INTRODUCTION

Awaji Materia Co.,LTD. has been established in 1944 and become one of the Japan's most mechanized manufacturers of carbon steel and stainless steel piping fittings under AWAJI brand.

In 1987, Awaji Materia (Thailand) Co.,Ltd. has been established and has contributed greatly to prevailing a good reputation of AWAJI Brand in the world markets with a monthly capacity approx.2,000metric tons.

Awaji Materia offers top quality fittings to its customers with its competitive edge.

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MAIN PRODUCTS

BUTT-WELDING FITTINGS

- CARBON STEEL
- ALLOY STEEL
- STAINLESS STEEL

ELBOWS	LONG		SHORT	
	TEES	STRAIGHT		REDUCING
REDUCERS	CONCENTRIC		ECCENTRIC	
	CAPS			



CERTIFICATE & APPROVAL

AWAJI MATERIA CO., LTD.

- ISO 9001:2008 JIS Q 9001:2008 CERTIFICATE by LLOYD'S REGISTER



AWAJI MATERIA (THAILAND) CO.,LTD.

- ISO 9001:2008 CERTIFICATE by BV
- PED 97/23/EC. Annex I. paragraph 4.3. and AD2000-Markblst W0 (Carbon Steel) by LLOYD'S REGISTER
- PED 97/23/EC. Annex I. paragraph 4.3. (Stainless Steel) by LLOYD'S REGISTER



Awaji has been approved by many international oil and gas companies such as Shell, ExxonMobil, Syncrude, Caltex, Brown & Root and others.

AWAJI BRAND BUTT-WELDING FITTINGS

1. Feature of AWAJI Brand Butt-welding Fittings

Butt-welding piping Fittings of Awaji Materia are manufactured with Carbon steel and Stainless steel pipe materials supplied by Japanese manufacturers and other first class pipe manufactures in accordance with the standards and specifications .

2. Applicable Standard of Butt-welding fittings

(1) ASME Standards

ASME B 16.9 Factory-Made Wrought Buttwelding Fittings

(2) ASTM Standards

A234 Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

A420 Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service

A403 Wrought Austenitic Stainless Steel Piping Fittings

A960 Standard Specification for Common Requirements for Wrought Steel Piping Fittings

(3) NACE Standards

NACE MR0175 / ISO 15156 Petroleum and natural gas industries—Materials for use in H2S-containing environments in oil and gas production

MR0103 Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments

3 . Material Specification for Products

Material	ASTM (Fittings)	ASTM (Pipe)
Carbon steel	A234 WPB	A106 Grade B
	A420 WPL6	A333 Grade 6
Austenitic Stainless steel	A403 WP304/304L	A312 TP304/304L
	A403 WP316/316L	A312 TP316/316L

4. Inspection

Appearance inspection is done by visual observation.

Dimensional inspection is done according to ASME B 16.9.

Inspection Certificate : according to EN 10204 type, 3.1: 2004

5. Marking

Marking on products by MSS SP-25

(1) Manufacturer's name or Trade mark

(2) Material Type

(3) Size

(4) Description

(5) Manufacturing Number

6. Coating

Carbon steel fittings are painted with clear or black coating material for WPB and brown one for WPL6.

7. Packing

Fittings are packaged in wooden cases (crate) or carton boxes.

DESIGN PROOF TEST

Lloyd's Register Certificate No: BGK 0370023
Page 1 of 1

Project: Design Proof Test.

Client: AWAJI SANGYO (THAILAND) CO., LTD.
81 Moo 4, Prakasa Road, Amphur Muang, Samut Prakarn Thailand 10270. Office: BANGKOK

Clients Order Number: Request for services dated 17 April 2003 Date: 28 May 2003
Order Status: Complete

Inspection Dates: First: 11 April 2003 Final: 20 May 2003

This certificate is issued to The Messrs of AWAJI SANGYO (THAILAND) CO., LTD., to certify that the undersigned surveyor to this society, did attend at their factory at 81 Moo 4, Prakasa Road, Amphur Muang, Samut Prakarn, Thailand, on and between the dates mentioned above for the purpose of inspecting and witnessing design proof test of carbon steel butt-welding fittings ASTM A234 WPB, ASME B16.9-2001 comprising :-

Fitting type/size: **Elbow 12" S80 90° L**
Material specification: ASTM A234 WPB
Dimension/Thickness specification: ASME B16.9-2001, ASME B16.25-1997, ASME B36.10M-2000
Manufacturing No.: 27635
Made from pipe: ASTM A106-B, Sized OD. 216.3 mm. x 18.5 mm., Heat No. J2K5328, Certificate No. WYYK7389 dated 2002-06-03.
Calculated proof test pressure: 50.4 Mpa. (Item 9.3 in the ASME B16.9-2001)
105 % of the computed proof test pressure: 52.9 Mpa.
Actual burst (rupture) pressure: 54.0 Mpa.

Scope of inspection :-

1. Randomly selected a sample fitting from the manufacturer's stock and made identification marking on the selected fitting for weld fabrication with other components before testing.
2. Made visual inspection and dimensional check in accordance with the requirement of ASME B16.9-2001, ASME B16.25-1997 and ASME B36.10M-2000.
3. Witnessed hydraulic design proof test at the pressure of 105% of the computed proof test pressure stated above.
4. Reviewed and endorsed manufacturer's inspection data sheet and test report.

We certify that the selected fitting was inspected with satisfactory result and the design proof test was satisfactorily witnessed without neither leakage nor rupture at the 105% of the computed proof test pressure stated above.

CHAMNI MOSAGUL
Surveyor to Lloyd's Register

Lloyd's Register of Shipping, registered office: 71 Fenchurch Street, London, EC3M 4BS.
Form 1123 (2002.06)

THIS DOCUMENT IS SUBJECT TO THE PROVISIONS ON THE REVERSE

MANUFACTURING



CARBON STEEL ELBOWS FORMING



TEES COLD FORMING



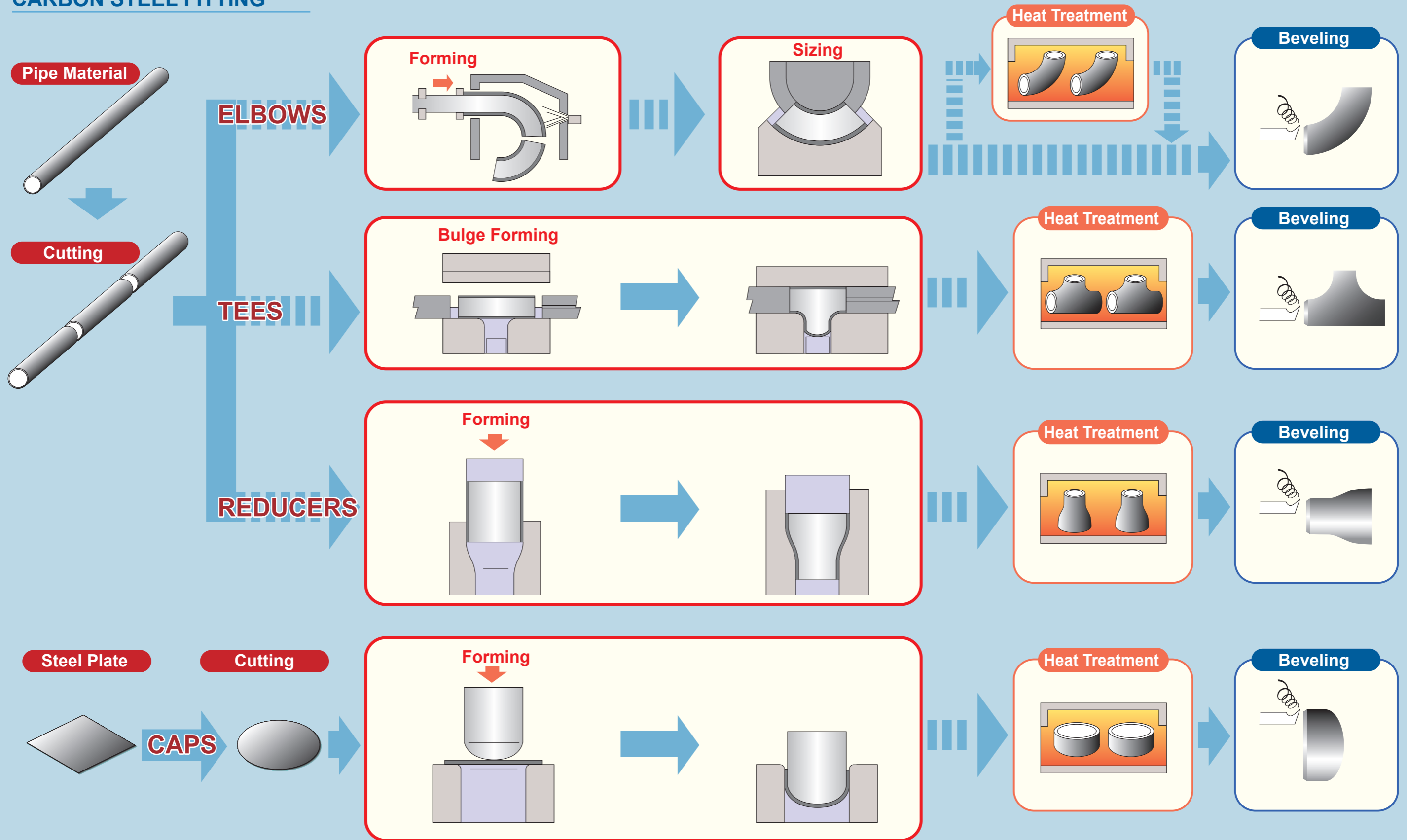
TEES END FACING (NC MACHINE)



SHOT BLASTING

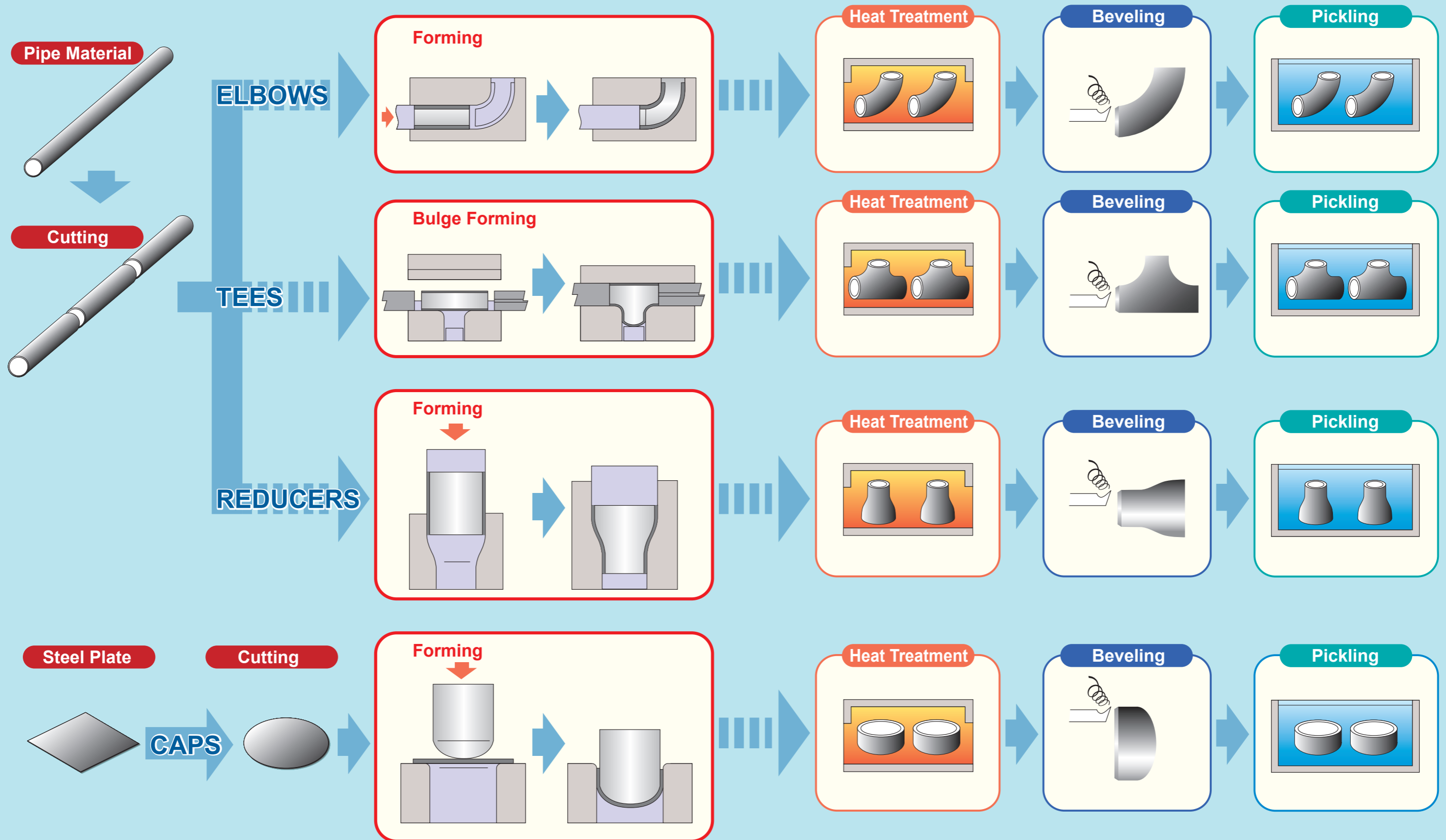
MANUFACTURING PROCESS

CARBON STEEL FITTING

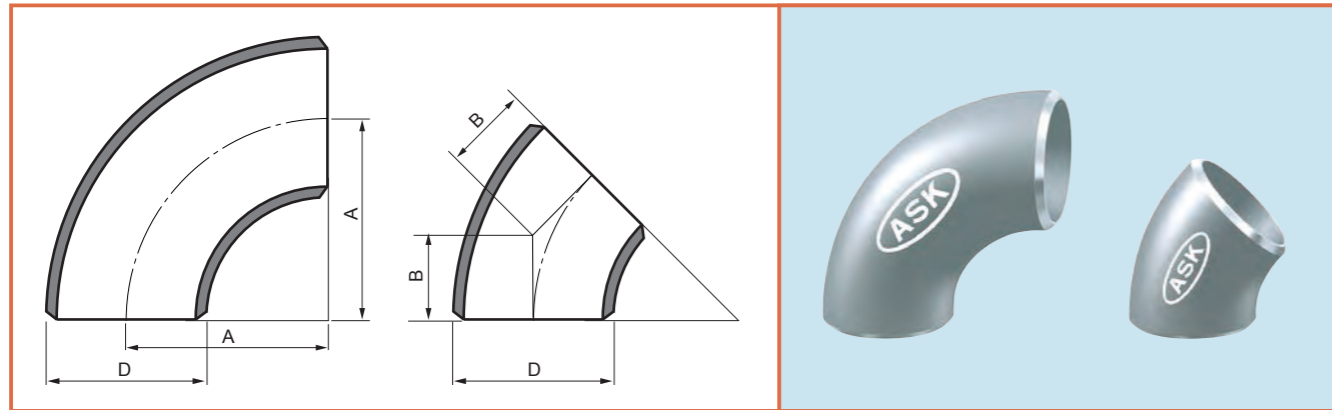


MANUFACTURING PROCESS

STAINLESS STEEL FITTING



DIMENSIONS OF LONG RADIUS ELBOWS

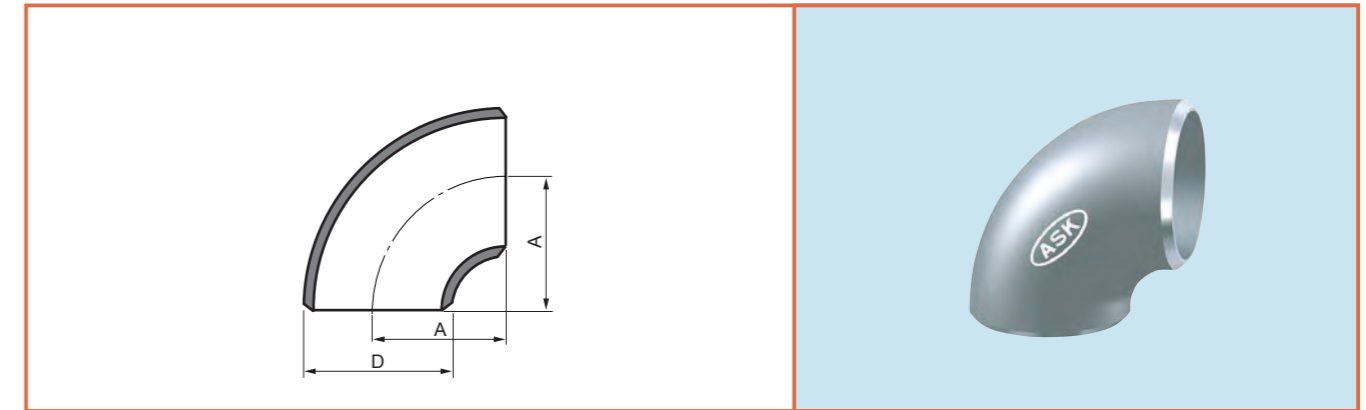


ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Center-to-End	
		90 Deg Elbows A	45 Deg Elbows B
1/2	21.3	38.1	15.7
3/4	26.7	38.1	19.1
1	33.4	38.1	22.4
1-1/4	42.2	47.8	25.4
1-1/2	48.3	57.2	28.4
2	60.3	76.2	35.1
2-1/2	73.0	95.2	44.4
3	88.9	114.3	50.8
3-1/2	101.6	133.4	57.2
4	114.3	152.4	63.5
5	141.3	190.5	79.2
6	168.3	228.6	95.2
8	219.1	304.8	127.0
10	273.0	381.0	158.8
12	323.8	457.2	190.5
14	355.6	533.4	222.2
16	406.4	609.6	254.0
18	457	685.8	285.8
20	508	762.0	317.5
22	558	838.2	342.9
24	610	914.4	381.0

DIMENSIONS OF SHORT RADIUS ELBOWS

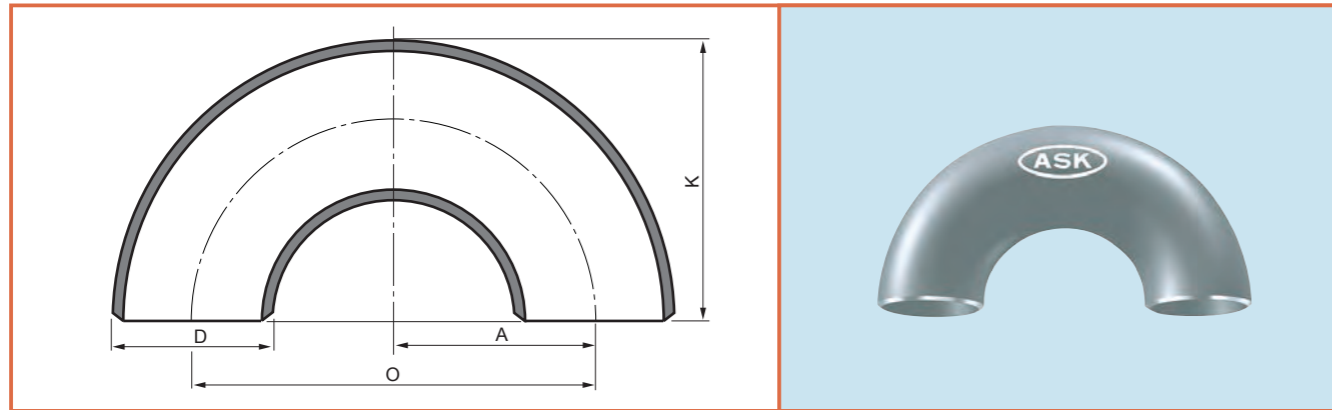


ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Center-to-End 90 Deg Elbows A
1	33.4	25.4
1-1/4	42.2	31.8
1-1/2	48.3	38.1
2	60.3	50.8
2-1/2	73.0	63.5
3	88.9	76.2
3-1/2	101.6	88.9
4	114.3	101.6
5	141.3	127.0
6	168.3	152.4
8	219.1	203.2
10	273.0	254.0
12	323.8	304.8
14	355.6	355.6
16	406.4	406.4
18	457	457.2
20	508	508.0
22	558	558.8
24	610	609.6

DIMENSIONS OF LONG RADIUS RETURNS



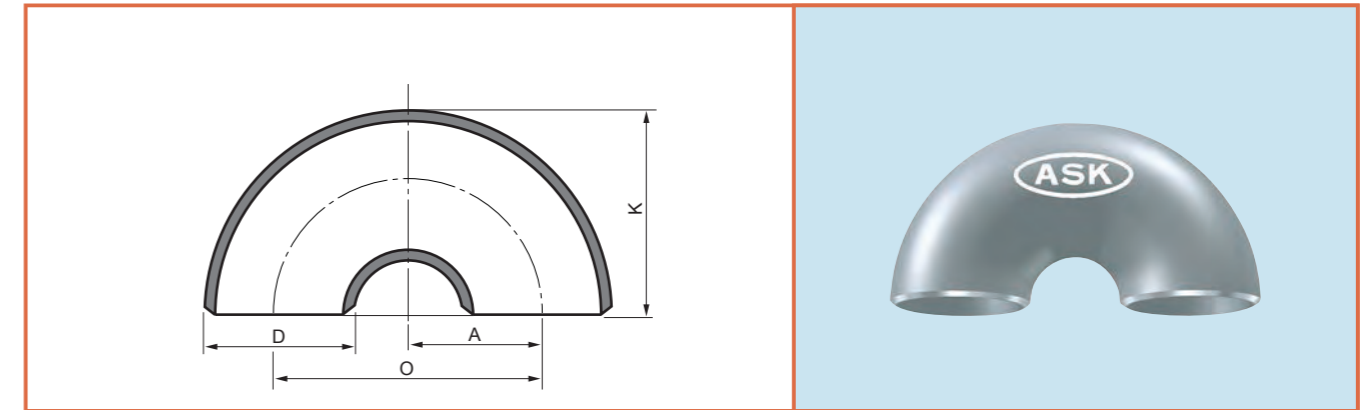
ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Center-to-Center O	Back-to-Face K
1/2	21.3	76.2	47.8
3/4	26.7	76.2	50.8
1	33.4	76.2	55.6
1-1/4	42.2	95.2	69.8
1-1/2	48.3	114.3	82.6
2	60.3	152.4	106.4
2-1/2	73.0	109.5	131.8
3	88.9	228.6	158.8
3-1/2	101.6	266.7	184.2
4	114.3	304.8	209.6
5	141.3	381.0	261.9
6	168.3	457.2	312.7
8	219.1	609.6	414.3
10	273.0	762.0	517.7
12	323.8	914.4	619.3

* Dimension A is equal to one half of dimension O.

DIMENSIONS OF SHORT RADIUS RETURNS



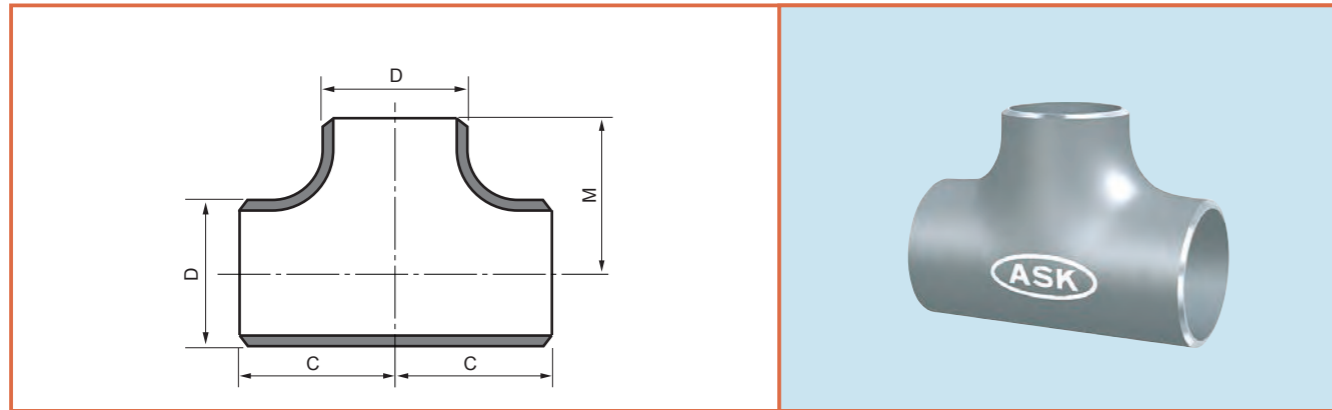
ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Center-to-Center O	Back-to-Face K
1	33.4	50.8	41.1
1-1/4	42.2	63.5	52.3
1-1/2	48.3	76.2	62.0
2	60.3	101.6	81.0
2-1/2	73.0	127.0	100.1
3	88.9	152.4	120.7
3-1/2	101.6	177.8	139.7
4	114.3	203.2	158.8
5	141.3	254.0	196.9
6	168.3	304.8	236.5
8	219.1	406.4	312.7
10	273.0	508.0	390.7
12	323.8	609.6	466.9

* Dimension A is equal to one half of dimension O.

DIMENSIONS OF STRAIGHT TEES

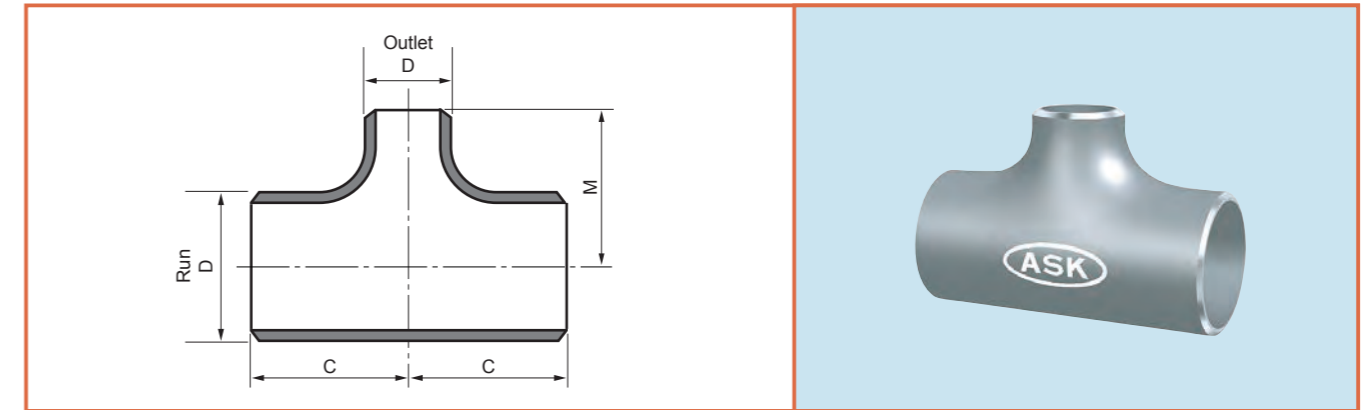


ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Center-to-End	
		Run C	Outlet M
1/2	21.3	25.4	25.4
3/4	26.7	28.4	28.4
1	33.4	38.1	38.1
1-1/4	42.2	47.8	47.8
1-1/2	48.3	57.2	57.2
2	60.3	63.5	63.5
2-1/2	73.0	76.2	76.2
3	88.9	85.9	85.9
3-1/2	101.6	95.2	95.2
4	114.3	104.6	104.6
5	141.3	124.0	124.0
6	168.3	142.7	142.7
8	219.1	177.8	177.8
10	273.0	215.9	215.9
12	323.8	254.0	254.0
14	355.6	279.4	279.4
16	406.4	304.8	304.8
18	457	342.9	342.9
20	508	381.0	381.0
22	558	419.1	419.1
24	610	431.8	431.8

DIMENSIONS OF REDUCING TEES

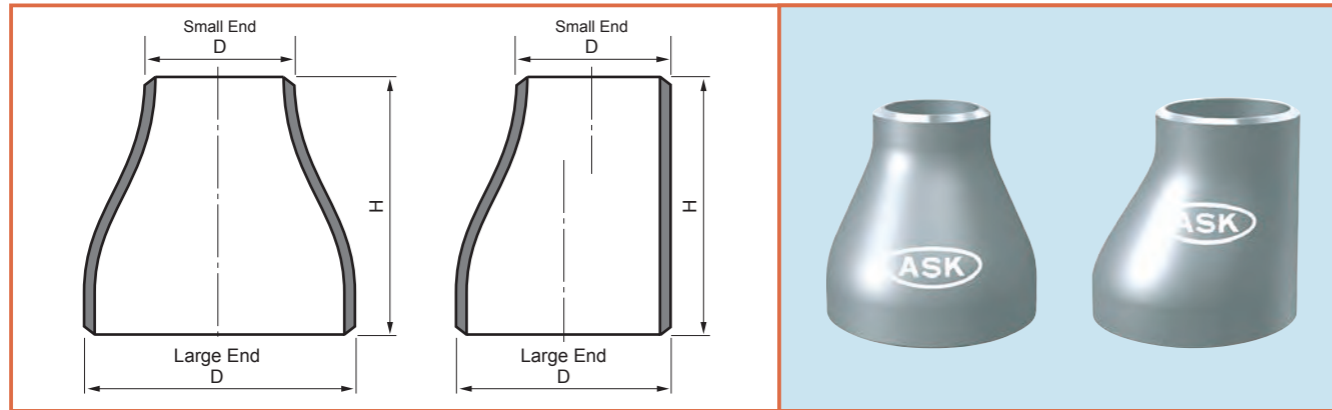


ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter		Center-to-End	
	Run D	Outlet D	Run C	Outlet M
3/4 × 1/2	26.7	21.3	28.4	28.4
1 × 3/4	33.4	26.7	38.1	38.1
1/2		21.3		38.1
1-1/4 × 1	42.2	33.4	47.8	47.8
3/4		26.7		47.8
1/2		21.3		47.8
1-1/2 × 1-1/4	48.3	42.2	57.2	57.2
1		33.4		57.2
3/4		26.7		57.2
2 × 1-1/2	60.3	48.3	63.5	60.5
1-1/4		42.2		57.2
1		33.4		50.8
3/4		26.7		44.4
2-1/2 × 2	73.0	60.3	76.2	69.8
1-1/2		48.3		66.5
1-1/4		42.2		63.5
3 × 2-1/2	88.9	73.0	85.9	82.6
2		60.3		76.2
1-1/2		48.3		73.2
1-1/4		42.2		69.8
4 × 3	114.3	88.9	104.6	98.6
2-1/2		73.0		95.2
2		60.3		88.9
1-1/2		48.3		85.9
5 × 4	141.3	114.3	124.0	117.3
3		88.9		111.3
2-1/2		73.0		108.0
2		60.3		104.6
6 × 5	168.3	141.3	142.7	136.7
4		114.3		130.0
3		88.9		124.0
8 × 6	219.1	168.3	177.8	168.1
5		141.3		162.1
4		114.3		155.4
10 × 8	273.0	218.9	215.9	203.2
6		168.3		193.5
5		141.3		190.5
12 × 10	323.8	273.0	254.0	241.3
8		219.1		228.6
6		168.3		218.9
14 × 12	355.6	323.8	279.4	269.7
10		273.0		257.0
8		219.1		247.6
16 × 14	406.4	355.6	304.8	304.8
12		323.8		295.1
10		273.0		282.4
18 × 16	457	406.4	342.9	330.2
14		355.6		330.2
12		323.8		320.5
20 × 18	508	457	381.0	368.3
16		406.4		355.6
14		355.6		355.6
22 × 20	558	508	419.1	406.4
18		457		393.7
16		406		381.0
24 × 22	610	558	431.8	431.8
20		508		431.8
18		457		419.1

DIMENSIONS OF REDUCERS



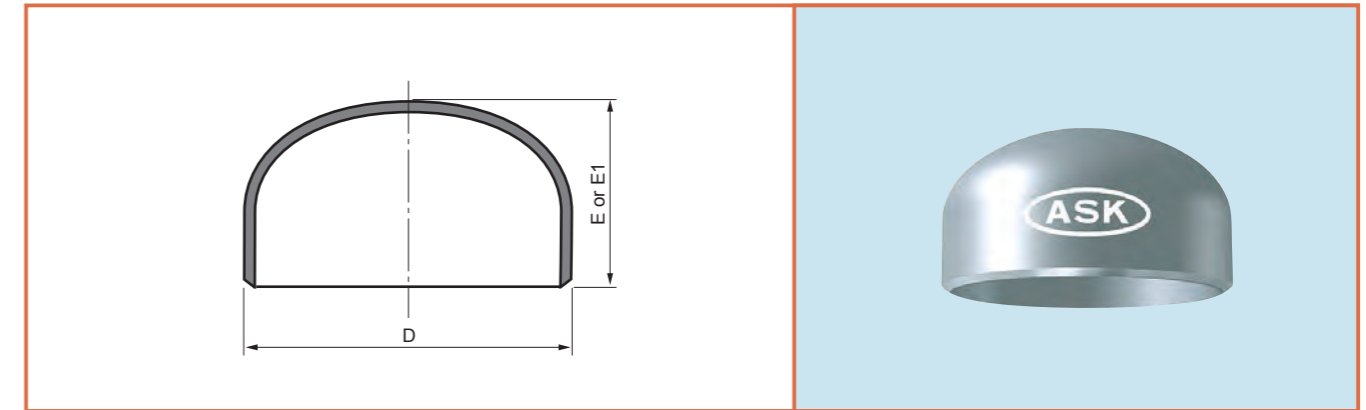
ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter		End-to-End H
	Large End D	Small End D	
3/4 × 1/2	26.7	21.3	38.1
1 × 3/4	33.4	26.7	50.8
1 × 1/2		21.3	
1-1/4 × 1	42.2	33.4	50.8
1-1/4 × 3/4		26.7	
1-1/4 × 1/2		21.3	
1-1/2 × 1-1/4	48.3	42.2	63.5
1-1/2 × 1		33.4	
1-1/2 × 3/4		26.7	
2 × 1-1/2	60.3	48.3	76.2
2 × 1-1/4		42.2	
2 × 1		33.4	
2 × 3/4		26.7	
2-1/2 × 2	73.0	60.3	88.9
2-1/2 × 1-1/2		48.3	
2-1/2 × 1-1/4		42.2	
2-1/2 × 1		33.4	
3 × 2-1/2	88.9	73.0	88.9
3 × 2		60.3	
3 × 1-1/2		48.3	
3 × 1-1/4		42.2	
3 × 1		26.7	
4 × 3	114.3	88.9	101.6
4 × 2-1/2		73.0	
4 × 2		60.3	
4 × 1-1/2		48.3	
4 × 1-1/4		42.2	
4 × 1		33.5	
5 × 4	141.3	114.3	127.0
5 × 3		88.9	
5 × 2-1/2		73.0	
5 × 2		60.3	
6 × 5	168.3	141.3	139.7
6 × 4		114.3	
6 × 3		88.9	
6 × 2-1/2		73.0	
6 × 2		60.3	

Nominal Pipe Size (NPS)	Outside Diameter		End-to-End H
	Large End D	Small End D	
8 × 6	219.1	168.3	152.4
8 × 5		141.3	
8 × 4		114.3	
8 × 3		88.9	
10 × 8	273.0	219.1	177.8
10 × 6		168.3	
10 × 5		141.3	
10 × 4		114.3	
12 × 10	323.8	273.0	203.2
12 × 8		219.1	
12 × 6		168.3	
14 × 12	355.6	323.8	330.2
14 × 10		273.0	
14 × 8		219.1	
16 × 14	406.4	355.6	355.6
16 × 12		323.8	
16 × 10		273.0	
18 × 16	457	406.4	381.0
18 × 14		355.6	
18 × 12		323.8	
20 × 18	508	457	508.0
20 × 16		406.4	
20 × 14		355.6	
22 × 20	558	508	508.0
22 × 18		457	
22 × 16		406.4	
24 × 22	610	558	508.0
24 × 20		508	
24 × 18		457	

DIMENSIONS OF CAPS



ASME B 16.9

Unit: mm

Nominal Pipe Size (NPS)	Outside Diameter at Bevel D	Length(1) E	Limiting Wall Thickness For Length E	Length(2) E1
1/2	21.3	25.4	4.57	25.4
3/4	26.7	25.4	3.81	25.4
1	33.4	38.1	4.57	38.1
1-1/4	42.2	38.1	4.83	38.1
1-1/2	48.3	38.1	5.08	38.1
2	60.3	38.1	5.59	44.4
2-1/2	73.0	38.1	7.11	50.8
3	88.9	50.8	7.62	63.5
3-1/2	101.6	63.5	8.13	76.2
4	114.3	63.5	8.64	76.2
5	141.3	76.2	9.65	88.9
6	168.3	88.9	10.92	101.6
8	219.1	101.6	12.70	127.0
10	273.0	127.0	12.70	152.4
12	323.8	152.4	12.70	177.8
14	355.6	165.1	12.70	190.5
16	406.4	177.8	12.70	203.2
18	457	203.2	12.70	228.6
20	508	228.6	12.70	254.0
22	558	254.0	12.70	254.0
24	610	266.7	12.70	304.8

NOTES:

- (1) Length E applies for thickness not exceeding that given in column "Limiting Wall Thickness for Length E".
- (2) Length E1 applies for thickness greater than that given in column "Limiting Wall Thickness" for NPS24 and smaller.

WALL THICKNESS ASME

Unit:mm

Nominal Pipe Size		Outside Diameter		Nominal Wall Thickness																Outside Diameter		Nominal Pipe Size		
				Carbon Steel & Alloy Steel												Stainless Steel								
				ASME B36.10M												ASME B36.19M								
DN	NPS	(inch)	(mm)	STD	XS	XXS	Sch10	Sch20	Sch30	Sch40	Sch60	Sch80	Sch100	Sch120	Sch140	Sch160	Sch5S	Sch10S	Sch40S	Sch80S	(inch)	(mm)	DN	NPS
15	1/2	0.840	21.3	2.77	3.73	7.47	2.11	—	2.41	2.77	—	3.73	—	—	—	4.78	1.65	2.11	2.77	3.73	0.840	21.3	15	1/2
20	3/4	1.050	26.7	2.87	3.91	7.82	2.11	—	2.41	2.87	—	3.91	—	—	—	5.56	1.65	2.11	2.87	3.91	1.050	26.7	20	3/4
25	1	1.315	33.4	3.38	4.55	9.09	2.77	—	2.90	3.38	—	4.55	—	—	—	6.35	1.65	2.77	3.38	4.55	1.315	33.4	25	1
32	1 1/4	1.660	42.2	3.56	4.85	9.70	2.77	—	2.97	3.56	—	4.85	—	—	—	6.35	2.11	2.77	3.56	4.85	1.660	42.2	32	1 1/4
40	1 1/2	1.900	48.3	3.68	5.08	10.15	2.77	—	3.18	3.68	—	5.08	—	—	—	7.14	2.11	2.77	3.68	5.08	1.900	48.3	40	1 1/2
50	2	2.375	60.3	3.91	5.54	11.07	2.77	—	3.18	3.91	—	5.54	—	—	—	8.74	2.11	2.77	3.91	5.54	2.375	60.3	50	2
65	2 1/2	2.875	73.0	5.16	7.01	14.02	3.05	—	4.78	5.16	—	7.01	—	—	—	9.53	2.11	3.05	5.16	7.01	2.875	73.0	65	2 1/2
80	3	3.500	88.9	5.49	7.62	15.24	3.05	—	4.78	5.49	—	7.62	—	—	—	11.13	2.77	3.05	5.49	7.62	3.500	88.9	80	3
90	3 1/2	4.000	101.6	5.74	8.08	—	3.05	—	4.78	5.74	—	8.08	—	—	—	—	2.77	3.05	5.74	8.08	4.000	101.6	90	3 1/2
100	4	4.500	114.3	6.02	8.56	17.12	3.05	—	4.78	6.02	—	8.56	—	11.13	—	13.49	2.77	3.05	6.02	8.56	4.500	114.3	100	4
125	5	5.563	141.3	6.55	9.53	19.05	3.40	—	—	6.55	—	9.53	—	12.70	—	15.88	3.40	3.40	6.55	9.53	5.563	141.3	125	5
150	6	6.625	168.3	7.11	10.97	21.95	3.40	—	—	7.11	—	10.97	—	14.27	—	18.26	3.96	3.40	7.11	10.97	6.625	168.3	150	6
200	8	8.625	219.1	8.18	12.70	22.23	3.76	6.35	7.04	8.18	10.31	12.70	15.09	18.26	20.62	23.01	3.96	3.76	8.18	12.70	8.625	219.1	200	8
250	10	10.750	273.0	9.27	12.70	25.40	4.19	6.35	7.80	9.27	12.70	15.09	18.26	21.44	25.40	28.58	4.19	4.19	9.27	12.70	10.750	273.0	250	10
300	12	12.750	323.8	9.53	12.70	25.40	4.57	6.35	8.38	10.31	14.27	17.48	21.44	25.40	28.58	33.32	4.19	4.57	9.53	12.70	12.750	323.8	300	12
350	14	14.000	355.6	9.53	12.70	—	6.35	7.92	9.53	11.13	15.09	19.05	23.83	27.79	31.75	35.71	4.78	4.78	—	—	14.000	355.6	350	14
400	16	16.000	406.4	9.53	12.70	—	6.35	7.92	9.53	12.70	16.66	21.44	26.19	30.96	36.53	40.49	4.78	4.78	—	—	16.000	406.4	400	16
450	18	18.000	457	9.53	12.70	—	6.35	7.92	11.13	14.27	19.05	23.83	29.36	34.93	39.67	45.24	5.54	4.78	—	—	18.000	457	450	18
500	20	20.000	508	9.53	12.70	—	6.35	9.53	12.70	15.09	20.62	26.19	32.54	38.10	44.45	50.01	4.78	5.54	—	—	20.000	508	500	20
550	22	22.000	559	9.53	12.70	—	6.35	9.53	12.70	—	22.23	28.58	34.93	41.28	47.63	53.98	4.78	5.54	—	—	22.000	559	550	22
600	24	24.000	610	9.53	12.70	—	6.35	9.53	14.27	17.48	24.61	30.96	38.89	46.02	52.37	59.54	5.54	6.35	—	—	24.000	610	600	24
650	26	26.000	660	9.53	12.70	—	7.92	12.70	—	—	—	—	—	—	—	—	—	—	—	—	26.000	660	650	26
700	28	28.000	711	9.53	12.70	—	7.92	12.70	15.88	—	—	—	—	—	—	—	—	—	—	—	28.000	711	700	28
750	30	30.000	762	9.53	12.70	—	7.92	12.70	15.88	—	—	—	—	—	—	—	6.35	7.92	—	—	30.000	762	750	30
800	32	32.000	813	9.53	12.70	—	7.92	12.70	15.88	17.48	—	—	—	—	—	—	—	—	—	—	32.000	813	800	32
850	34	34.000	864	9.53	12.70	—	7.92	12.70	15.88	17.48	—	—	—	—	—	—	—	—	—	—	34.000	864	850	34
900	36	36.000	914	9.53	12.70	—	7.92	12.70	15.88	19.05	—	—	—	—	—	—	—	—	—	—	36.000	914	900	36
950	38	38.000	965	9.53	12.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	38.000	965	950	38
1000	40	40.000	1016	9.53	12.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40.000	1016	1000	40
1050	42	42.000	1067	9.53	12.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42.000	1067	1050	42
1100	44	44.000	1118	9.53	12.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44.000	1118	1100	44
1150	46	46.000	1168	9.53	12.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	46.000	1168	1150	46
1200	48	48.000	1219	9.53	12.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48.000	1219	1200	48

TOLERANCES

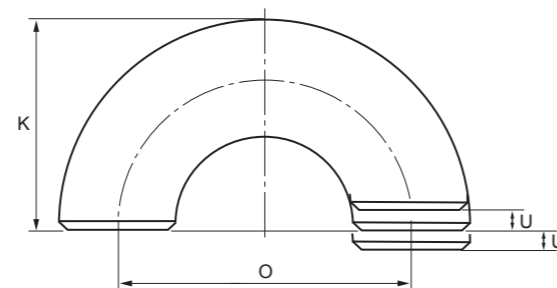
ASME B 16.9

Unit: mm

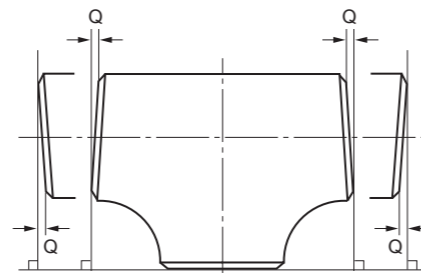
Nominal Pipe Size (NPS)	All Fittings			45 Deg Elbows 90 Deg Elbows Tees Reducers	Caps	Returns		
	Outside Diameter D	Inside Diameter	Wall Thickness T			A,B,C,M,H	E	O
1/2 to 2-1/2	+1.52 -0.76	±0.76	Not less than 87.5% of nominal thickness	±1.52	±3.05	±6.35	±6.35	±0.76
3 to 4	±1.52	±1.52						
5 to 8	+2.29 -1.52	±1.52		±2.29	±6.35	±9.65	±6.35	±1.52
10 to 18	+4.06 -3.05	±3.05						
20 to 24	+6.35 -4.83	±4.83						

Unit: mm

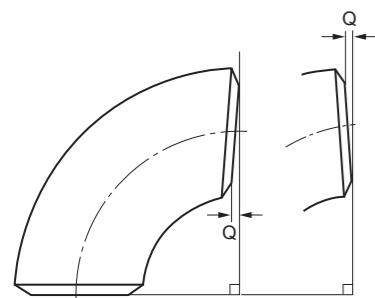
Nominal Pipe Size (NPS)	Angularities Tolerances	
	Off Angle Q	Off Plane P
1/2 to 4	0.76	1.52
5 to 8	1.52	3.05
10 to 12	2.29	4.83
14 to 16	2.29	6.35
18 to 24	3.05	9.65



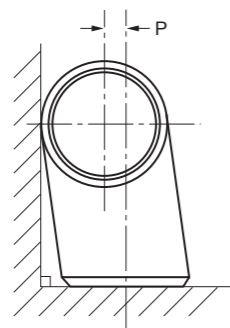
Returns



Tees



Elbows

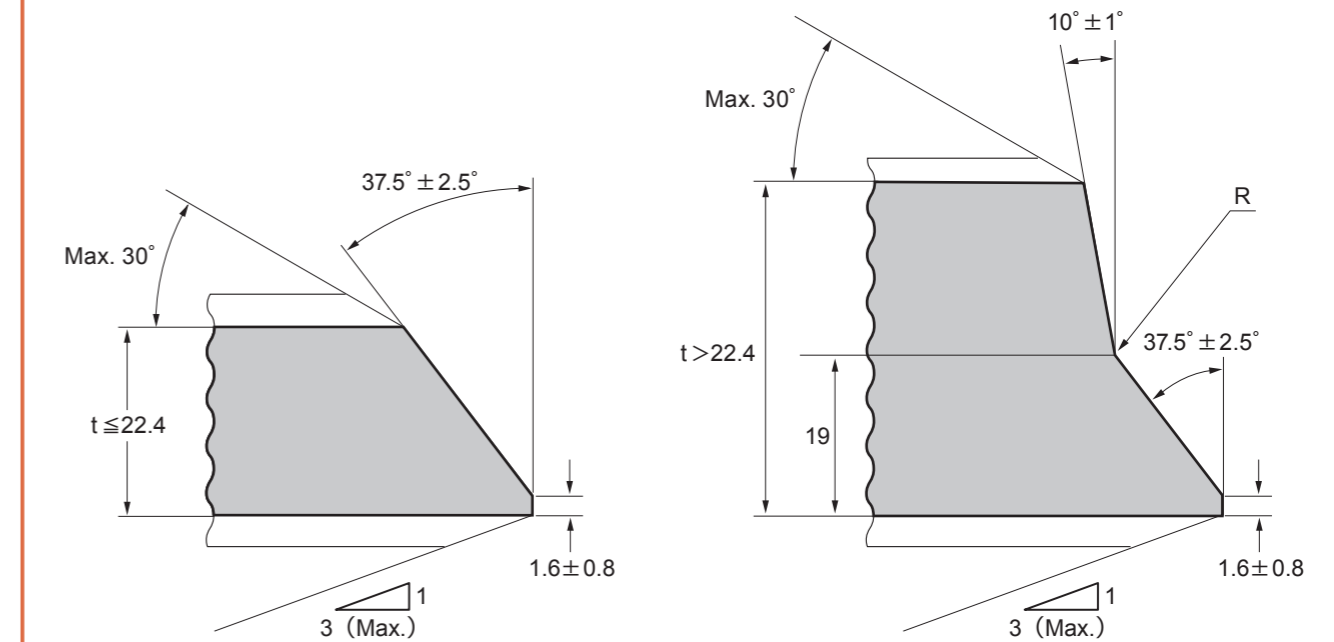


Elbows, Tees

WELDING END PREPARATION

ASME B 16.9, B16.25

Unit: mm



(a) Plain bevel

(b) Compound bevel

Nominal Pipe Wall Thickness (t)	End Preparation
Less than X*	Cut square or slightly chamfer, at manufacturer's option.
X* to 22.4mm (0.88in.) incl.	Plain bevel as in sketch (a) above
More than 22.4mm(0.88in.)	Compound bevel as in sketch (b) above

X* = 5mm for carbon steel, ferritic alloy steel or wrought iron;
3mm for austenitic alloy steel

STAINLESS STEEL

WEIGHT LIST

90° Long Radius Elbows

Unit: kg

	Stainless Steel			
	S10S	S40S	S80S	S160
1/2	0.060	0.080	0.100	0.120
3/4	0.090	0.110	0.130	0.180
1	0.130	0.160	0.200	0.255
1-1/4	0.210	0.250	0.350	0.425
1-1/2	0.300	0.390	0.500	0.658
2	0.500	0.690	0.900	1.340
2-1/2	0.800	1.340	1.750	2.250
3	1.280	2.050	2.770	3.870
3-1/2	1.620	2.870	3.950	5.890
4	2.180	3.900	5.420	8.110
5	3.960	6.580	9.300	14.80
6	5.850	10.20	15.50	24.40
8	10.30	21.60	31.20	-
10	16.80	36.60	49.20	-
12	28.60	53.50	70.70	-
14	36.60	79.90	-	-
16	72.10	180.7	-	-

45° Long Radius Elbows

Unit: kg

	Stainless Steel			
	S10S	S40S	S80S	S160
1/2	0.030	0.040	0.050	0.060
3/4	0.050	0.062	0.080	0.115
1	0.070	0.107	0.140	0.180
1-1/4	0.110	0.167	0.220	0.270
1-1/2	0.160	0.220	0.295	0.395
2	0.260	0.365	0.510	0.750
2-1/2	0.420	0.735	0.970	1.270
3	0.660	1.100	1.490	2.090
3-1/2	0.820	1.510	2.050	3.050
4	1.100	2.040	2.710	4.080
5	2.010	3.460	4.690	7.450
6	2.950	5.740	7.770	12.30
8	5.150	10.30	15.80	-
10	8.400	18.30	24.60	-
12	14.30	26.75	35.35	-
14	18.30	40.20	-	-
16	36.10	60.00	-	-

90° Short Radius Elbows

Unit: kg

	Stainless Steel			
	S10S	S40S	S80S	S160
1	0.110	0.130	0.150	0.200
1-1/4	0.180	0.250	0.260	0.280
1-1/2	0.200	0.300	0.330	0.440
2	0.400	0.450	0.600	0.890
2-1/2	0.570	0.960	1.150	1.500
3	0.800	1.400	1.840	2.580
3-1/2	1.100	2.300	2.630	3.930
4	1.400	2.800	3.600	5.400
5	2.400	4.600	6.230	9.800
6	4.100	7.000	10.30	16.40
8	6.700	13.80	20.80	-
10	11.20	24.40	32.80	-
12	17.50	35.70	47.10	-
14	24.40	53.20	-	-
16	31.90	79.50	-	-

STAINLESS STEEL

WEIGHT LIST

Straight Tees

Unit: kg

	Stainless Steel			
	S10S	S40S	S80S	S160
1/2	0.100	0.120	0.120	0.150
3/4	0.140	0.170	0.190	0.220
1	0.310	0.350	0.390	0.430
1-1/4	0.470	0.640	0.690	0.700
1-1/2	0.680	0.850	1.000	1.240
2	0.850	1.130	1.440	2.080
2-1/2	1.360	2.090	2.790	3.450
3	1.800	3.020	3.500	4.590
3-1/2	2.120	3.600	5.440	-
4	2.900	5.160	6.390	9.350
5	4.480	7.600	10.10	15.90
6	6.210	11.92	16.90	23.30
8	11.70	20.30	30.30	-
10	18.00	35.20	44.20	-
12	23.70	45.80	70.80	-
14	28.60	64.00	-	-
16	35.20	90.00	-	-

Caps

Unit: kg

	Stainless Steel			
	S10S	S40S	S80S	S160
1/2	0.078	0.100	0.150	-
3/4	0.078	0.100	0.150	-
1	0.090	0.110	0.167	-
1-1/4	0.110	0.146	0.199	-
1-1/2	0.130	0.172	0.238	-
2	0.170	0.240	0.330	1.550
2-1/2	0.245	0.420	0.565	2.840
3	0.365	0.670	0.917	3.780
4	0.591	1.180	1.680	6.780
5	0.990	1.920	2.730	10.70
6	1.370	2.850	4.380	17.95
8	2.520	5.160	7.910	-
10	3.870	9.000	13.80	-
12	6.890	13.20	19.50	-

