INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR FABRICATED PIPE FITTINGS** *(First Revision)*	**IPSS:1-06-020-03**
	Corresponding IS does not exist	Formerly : IPSS:1-06-020-95

0. FOREWORD

0.1 This Inter Plant Standard prepared by the Standards Committee on Pipes, Fittings, Valves and Piping Layout, IPSS 1:6 with the active participation of the representatives of all the steel plants and established manufacturers of valves, was adopted in January 2003.

0.2 This IPSS Standard was first published in year 1995. During the usage of this standard, it was felt that certain changes were necessary to increase the effectiveness of this standard. These changes have been incorporated in this revision which are based on practical experience of the plants.

1. SCOPE

1.1 This Inter Plant standard specify the details of fabricated pipe fittings viz bends upto 90°, tee equals, reducers, mitred bends and flanges for all fluids except oxygen, steam, feed water condensate, LPG, hydrogen gas and acetylene. The use of fabricated pipe fittings shall be limited to 10 kg/cm^2, working pressure. However, this standard can be adopted for water operating under low temperature condition limited to 70°C and pressure of 16 kg/cm^2.

2. GENERAL REQUIREMENTS

2.1 The fabricating fittings other than the fittings shall be made from parent pipe itself or grade B of IS 2062:1999. In no case it should be inferior to the pipe material.

2.2 The flanges shall be made as per IS 6392:1971 for pressure above 1 kg/cm^2 unless otherwise specified. For low pressure gases upto 1 kg/cm^2 the dimensions of flanges shall be as per Table-3. The flanges upto 350 mm nominal size shall have raised and machined faces.

2.3 Fittings shall either be supplied with plain ends and with loose flanges or welded flanges as per the requirement mentioned by the indentor.

2.4 The segments of the fittings shall be butt welded to give the required shape of the fabricated fittings. Prior to welding, the edges shall be suitably prepared.

2.5 In no case, the thickness of fabricated fittings shall be less than the pipe thickness.

2.6 The weld metal shall be deposited uniformly without blow holes, slag, inclusions, cracks etc.

3. DIMENSION OF FITTINGS

3.1 Dimensions of equal tees shall conform to Table-1 (page 4).

3.2 Dimensions of mitred bends shall conform to :

3.2.1 Dimensions of 90° bends for sizes upto 1000 NB shall conform to Table-2A (page 5).

3.2.2 Dimensions of 90° bends for sizes above 1000 NB shall conform to Table-2B (page 5).

3.2.3 Dimensions of 45° bends for sizes upto 1000 NB shall conform to Table-2C (page 8).

3.2.4 Dimensions of 45° bends for sizes above 1000 NB shall conform to Table-2D (page 8).

NOTE: The variation of radius of bends for those shown in the tables shall be permitted to meet the piping flexibility and/or other requirements. In such cases, the indentor will provide the dimensions.

3.3 Dimensions of flanges shall conform to:

3.3.1 The flanges for pressure upto 1 kg/cm^2 shall conform to Table-3 (page 11).

3.3.2 The flanges for pressure above 1 kg/cm^2 shall conform to IS 6392:1971.

4. TESTS

4.1 The fitting shall be tested hydraulically as specified by the indentor.

4.2 When hot paraffin kerosene, oil is poured over the weld inside, it shall not show any sign of leakage of the oil or its vapour on the outside of welded joints.

5. PROTECTIVE COATING

5.1 After testing the fitting shall be externally and internally coated with two coats of redoxide paint conforming to IS 2074:1992 or with a suitable tar based paints.

5.2 The fittings for use in coke oven gas lines shall also be painted internally with suitable anti-corrosive paint, before they are put into use to withstand the corrosive action.

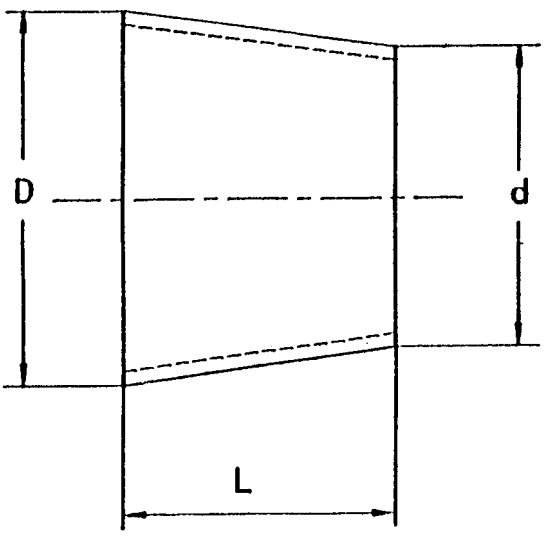
6. REDUCERS

6.1 Reducers used in pipe lines shall be of the following two types in construction as shown below. The fabrication of these reducers shall be taken up based on development plan and main dimensions fixed for a particular use.

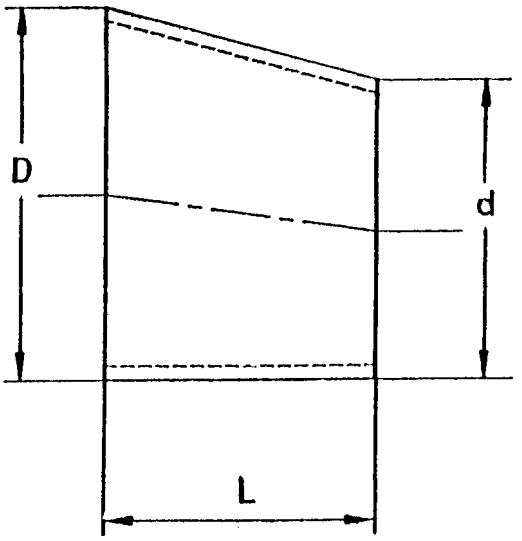
7. WORKMANSHIP & MARKING

7.1 All the pipe fittings shall be clean finished free from visible imperfections, cracks, laminations and all other defects.

7.2 The fittings shall be legibly marked with the nominal size of fittings.



CONCENTRIC REDUCER



ECCENTRIC REDUCER

$$\frac{D-d}{L} = 0.25 \text{ TO } 0.4$$

TABLE – 1 DIMENSIONS FOR EQUAL TEES

(to be read along with Fig-1A & 1B)

(All dimensions in mm)

Nominal Dia NB	Minimum Length Centre to face L	A	Wall thickness S
200	280	180	6
250	330	215	6
300	380	250	6
400	500	320	8
450	550	355	8
500	600	390	8
550	650	425	8
600	700	460	8
700	800	530	8
800	900	600	8
900	1000	670	10
1000	1100	740	10
1100	1200	810	10
1200	1300	880	10
1400	1500	1020	10
1600	1700	1160	10
1800	1900	1300	12
2000	2100	1500	12

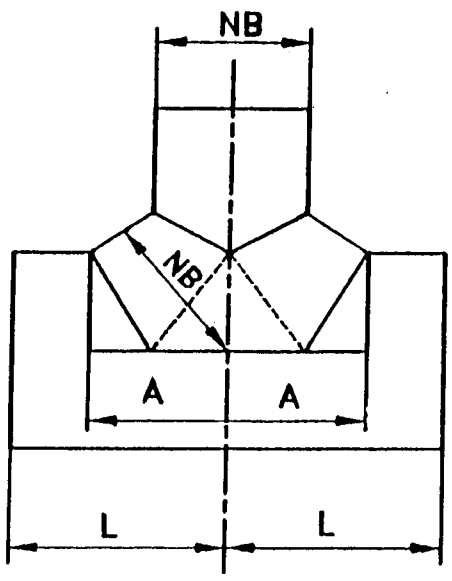


FIG 1A FOR PIPE SIZES 500 NB & ABOVE

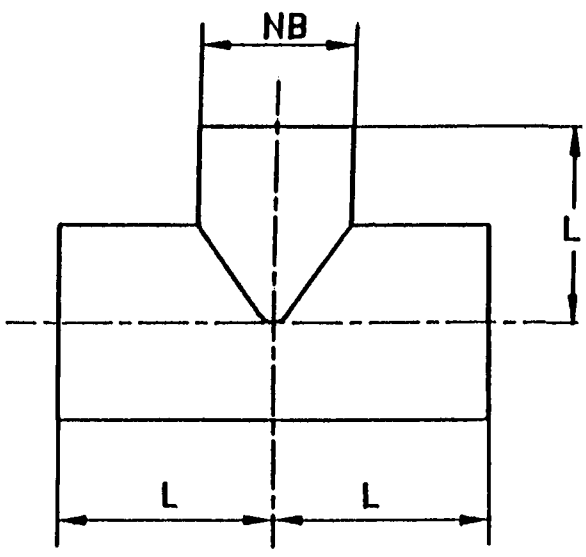


FIG 1 B FOR PIPE SIZES BELOW 500 NB

TABLE-2A

BENDS (90^{O} – 4 SEGMENTS) FOR PIPE SIZES UPTO 1000 NB

(To be read along with Fig-2A)

NB	Outside Dia-meter D	Thick-ness S	R		A	b	C	d	e	f	A
			In terms of NB	In mm							
65	76.6	4.5	2 NB	130	90.19	69.67	49.14	95.10	84.83	74.57	309.00
80	89.5	4.85	2 NB	160	109.73	85.74	61.76	104.86	92.87	80.88	357.23
100	115.0	5.4	2 NB	200	137.99	117.18	76.37	119.00	103.59	88.18	421.54
150	166.5	5.4	2 NB	300	205.38	160.77	116.16	152.69	130.38	108.08	582.31
200	219.0	6.0	2 NB	400	273.04	214.36	155.68	186.52	157.18	127.84	743.08
250	273.0	6.0	2 NB	500	341.10	267.95	194.80	220.55	183.97	147.40	903.85
300	324.0	6.0	2 NB	600	408.35	321.54	234.72	254.18	210.77	167.36	1064.62
400	406.0	8.0	1.5 NB	600	430.33	321.54	212.75	265.15	210.77	156.38	1064.62
500	508.0	8.0	1.5 NB	750	538.04	401.92	265.81	319.02	250.96	182.90	1305.77
600	610.0	8.0	1.5 NB	900	645.76	482.31	318.86	372.88	291.15	209.43	1546.93
700	711.0	8.0	1.5 NB	1050	753.21	562.69	372.18	426.60	331.35	236.09	1788.08
800	813.0	8.0	1.5 NB	1200	869.92	643.08	425.24	480.46	371.54	262.62	2029.23
900	914.0	10.0	1 NB	900	727.21	482.31	237.40	413.61	291.15	168.70	1546.93
1000	1016.0	10.0	1 NB	1000	808.13	535.90	263.66	454.07	317.95	181.83	1707.70

TABLE-2B

BENDS (90^{O} – 5 SEGMENTS) FOR PIPE SIZES ABOVE 1000 NB

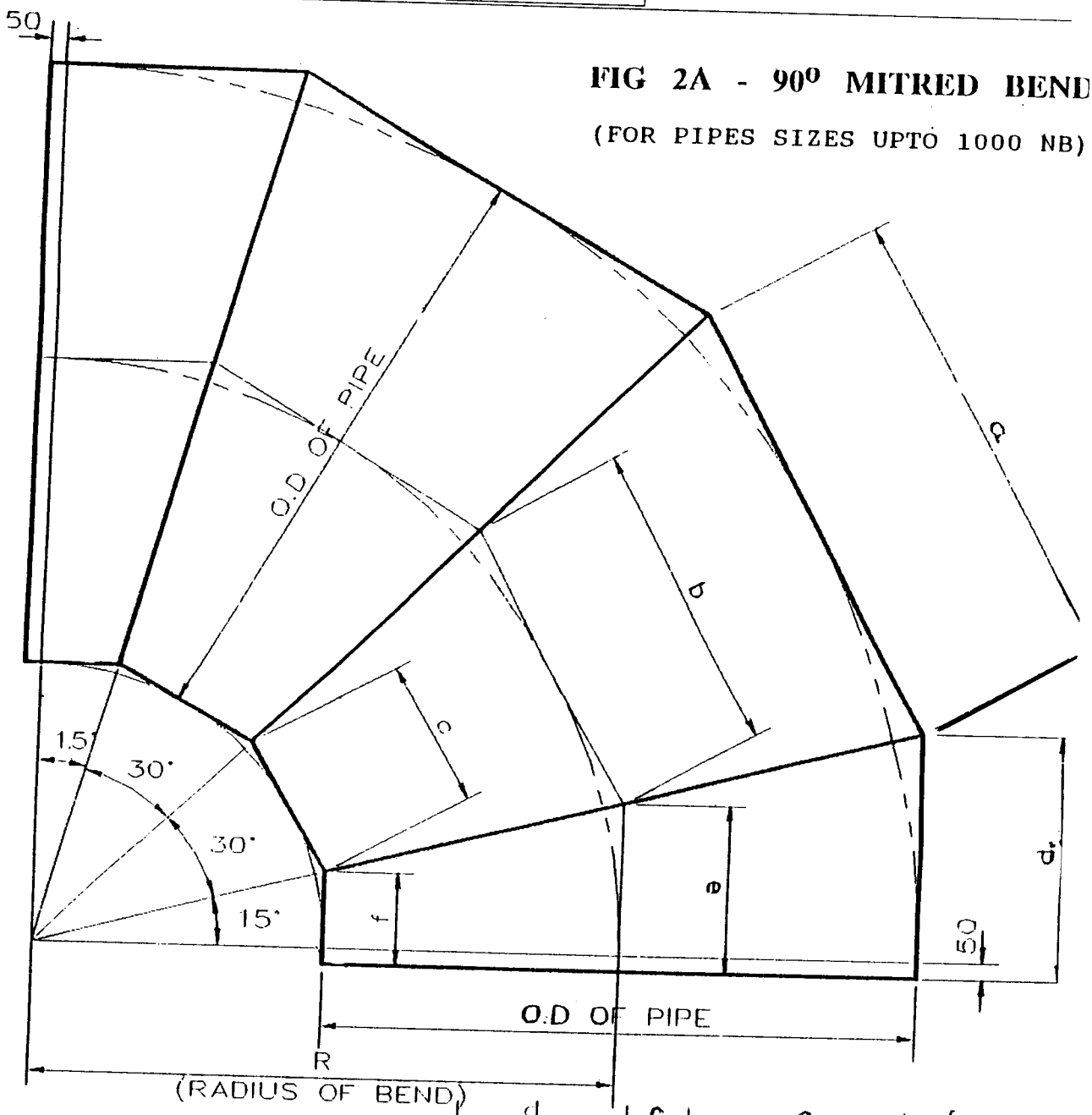
(To be read along with Fig-2B)

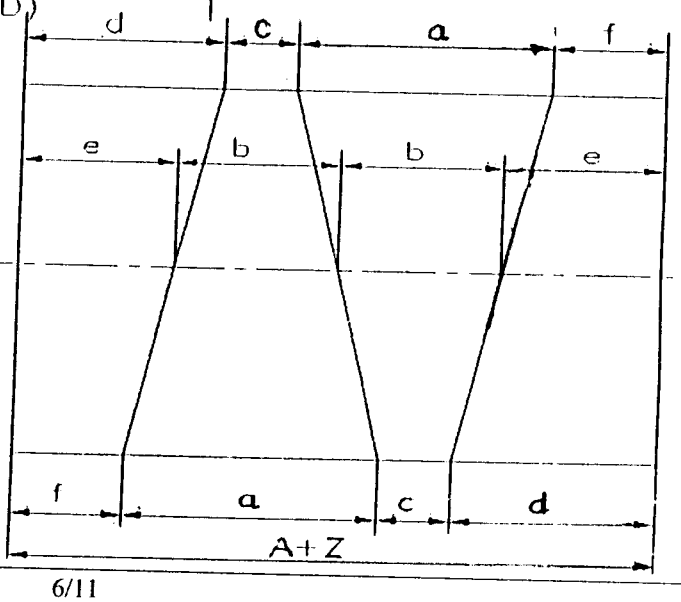
NB	Outside Dia-meter D	Thick-ness S	R		A	b	C	d	e	f	A
			In terms of NB	In mm							
1100	1118	10.0	1 NB	1100	659.99	437.61	215.22	380.00	268.80	157.61	1850.43
1200	1219	10.0	1 NB	1200	719.86	477.39	234.92	409.93	288.69	167.46	2009.56
1300	1321	10.0	1 NB	1300	779.96	517.17	254.41	439.97	308.59	177.20	2158.69
1400	1422	10.0	1 NB	1400	839.81	556.95	274.10	469.90	328.48	187.05	2327.89
1600	1626	10.0	1 NB	1600	959.95	636.52	313.09	529.98	368.06	206.54	2646.08
1800	1820	10.0	1 NB	1800	1078.11	716.08	354.06	589.05	408.04	227.03	2964.34
2000	2020	10.0	1 NB	2000	1197.45	795.65	393.85	648.73	447.82	246.92	3282.60

NOTE: The variation of radius of bends for those shown in the tables shall be permitted to meet the piping flexibility and/or other requirements. In such cases, the indentor will provide the dimensions.

FIG 2A - 90° MITRED BEND

(FOR PIPES SIZES UPTO 1000 NB)



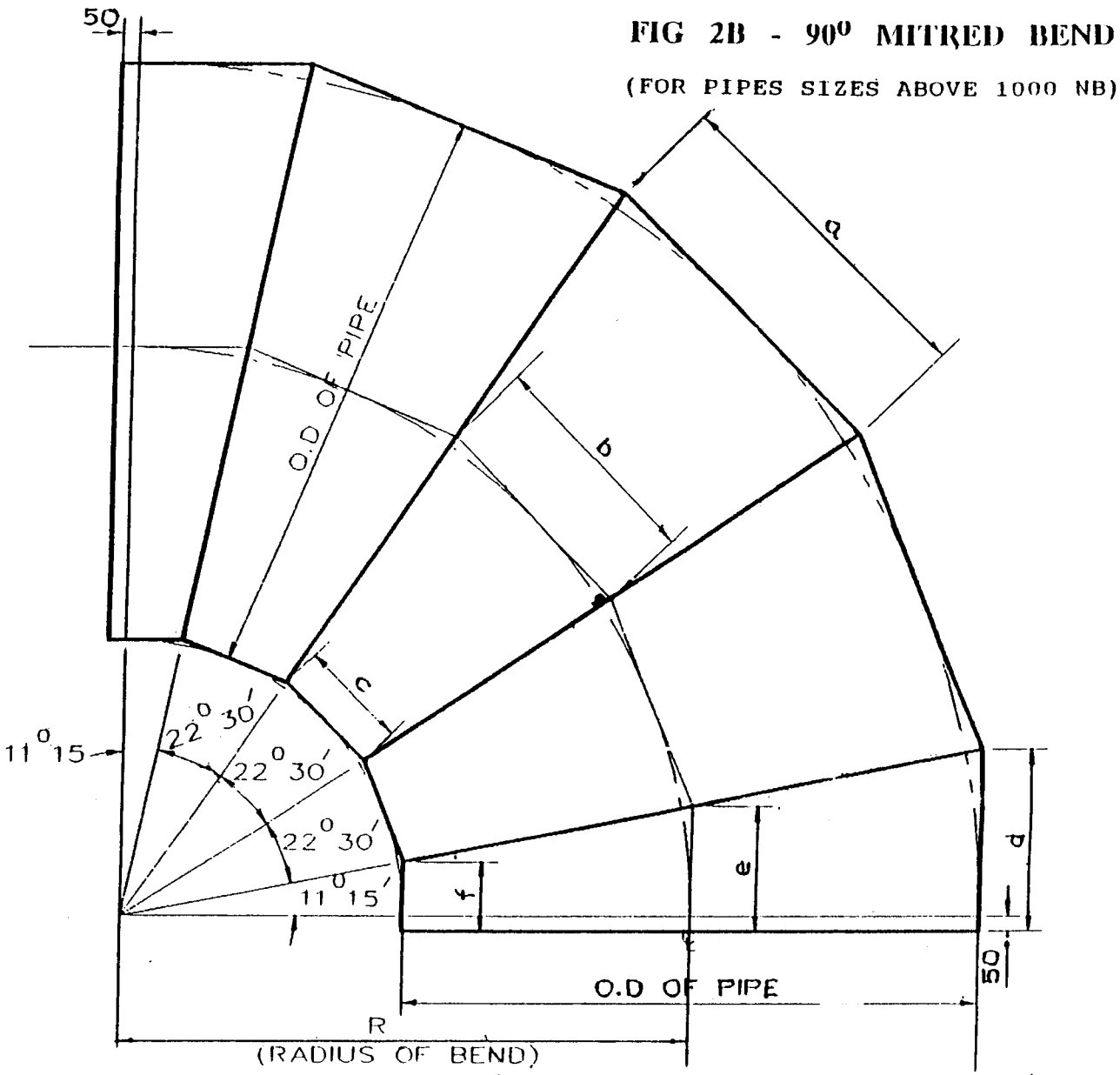


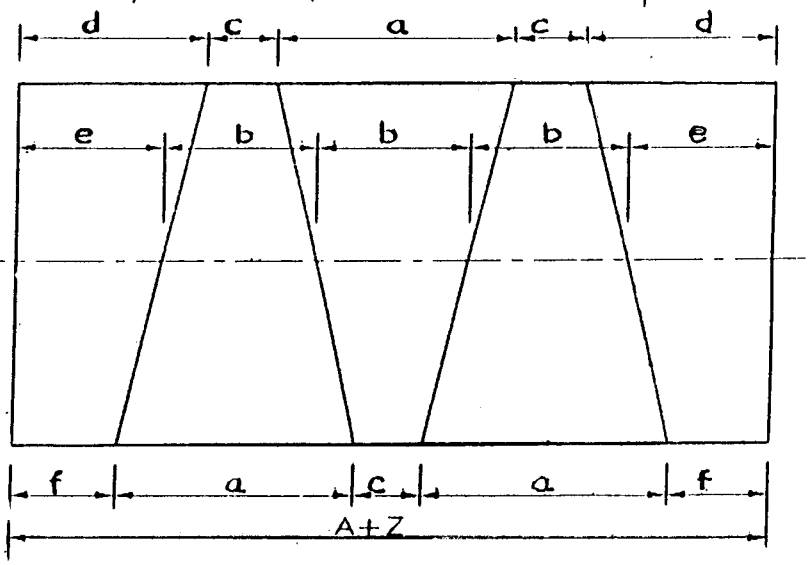
A=a+c+d+f

Z=CUTTING ALLOWANCE= 13mm

FIG 2B - 90° MITRED BEND

(FOR PIPES SIZES ABOVE 1000 NB)





A=C+2(a+f)
Z=CUTTING ALLOWANCE=
13 mm.

TABLE-2C

BENDS (45^{O} – 3 SEGMENTS) FOR PIPE SIZES UPTO 1000 NB

(To be read along with Fig-2C)

NB	Outside Dia-meter D	Thick-ness S	R		A	b	c	d	e	f	A
			In terms of NB	In mm							
65	76.6	4.5	2 NB	130	66.95	51.72	36.48	83.48	75.86	68.24	203.43
80	89.5	4.85	2 NB	160	81.45	63.65	45.85	90.73	81.83	72.92	227.30
100	115.0	5.4	2 NB	200	102.44	79.56	56.69	101.22	89.78	78.35	259.13
150	166.5	5.4	2 NB	300	152.47	119.35	86.23	126.23	109.67	93.11	338.69
200	219.0	6.0	2 NB	400	202.69	159.13	115.57	151.35	129.56	107.78	418.26
250	273.0	6.0	2 NB	500	253.22	198.91	144.61	176.61	149.46	122.30	497.82
300	324.0	6.0	2 NB	600	303.14	238.69	174.25	201.57	169.35	137.12	577.39
400	406.0	8.0	1.5 NB	600	319.45	238.69	157.94	209.73	169.35	128.97	577.39
500	508.0	8.0	1.5 NB	750	399.42	298.37	197.32	249.71	199.18	148.66	696.74
600	610.0	8.0	1.5 NB	900	479.38	358.04	236.71	289.69	229.02	168.35	816.08
700	711.0	8.0	1.5 NB	1050	559.14	417.72	276.29	329.57	258.86	188.14	935.43
800	813.0	8.0	1.5 NB	1200	639.11	477.39	315.67	369.55	288.69	207.84	1054.78
900	914.0	10.0	1 NB	900	539.85	358.04	176.24	319.92	229.02	138.12	816.08
1000	1016.0	10.0	1 NB	1000	599.92	397.82	195.73	349.96	248.91	147.86	895.65

TABLE-2D

BENDS (45^{O} – 4 SEGMENTS) FOR PIPE SIZES ABOVE 1000 NB

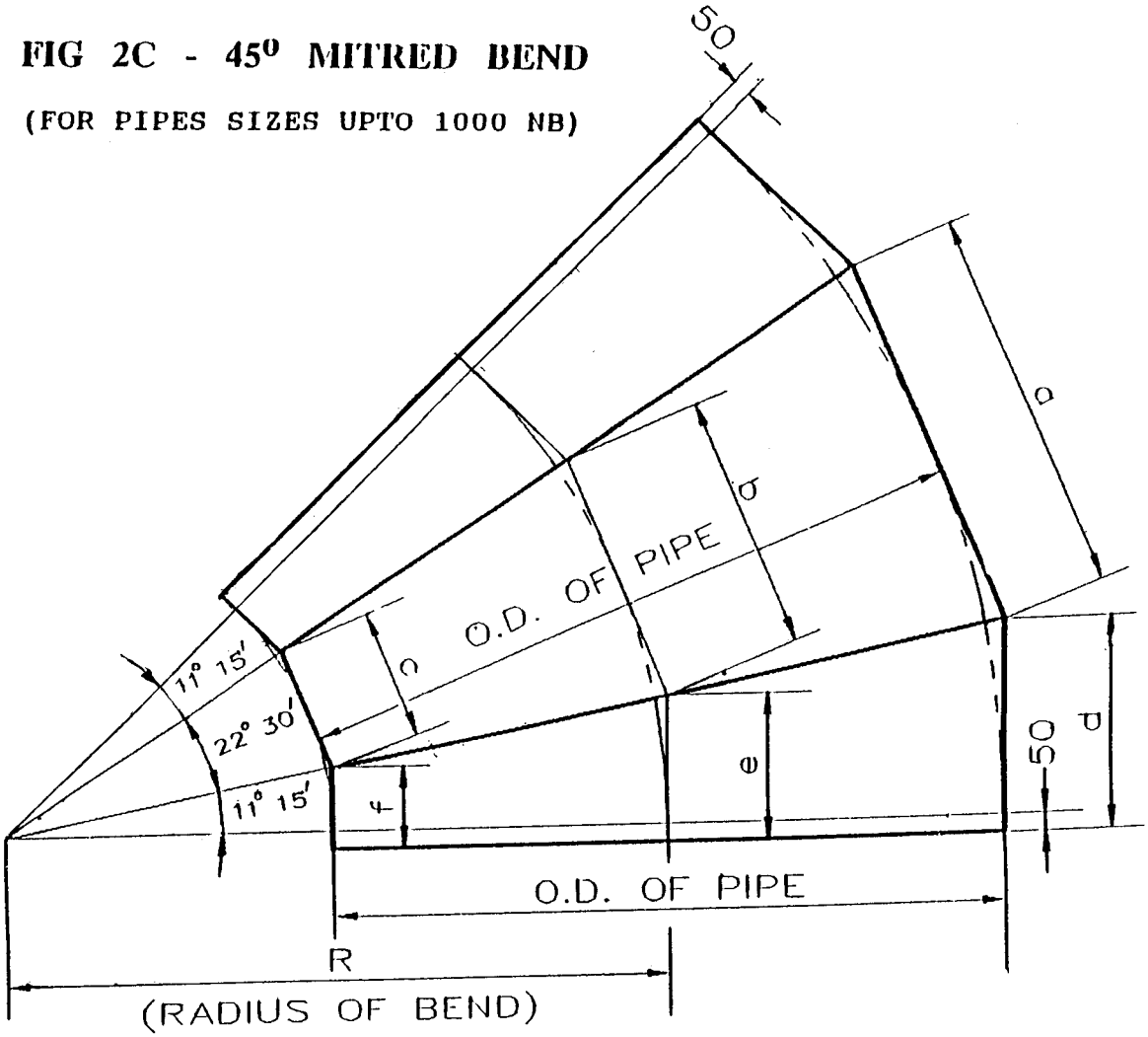
(To be read along with Fig-2D)

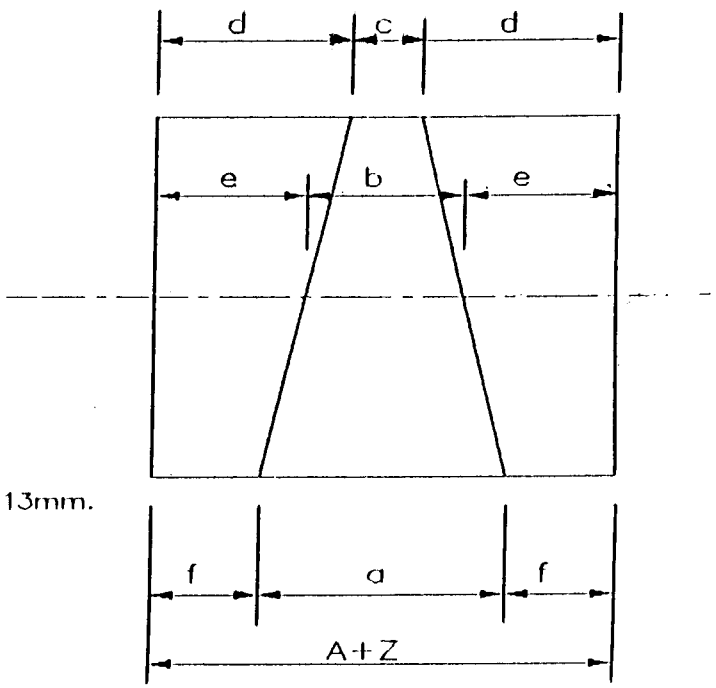
NB	Outside Dia-meter D	Thick-ness S	R		A	b	c	d	e	f	A
			In terms of NB	In mm							
1100	1118	10.0	1 NB	1100	436.82	289.64	142.45	268.41	196.82	121.22	968.91
1200	1219	10.0	1 NB	1200	476.45	315.97	155.48	288.23	207.98	127.74	1047.90
1300	1321	10.0	1 NB	1300	516.21	342.30	168.38	308.10	221.15	134.19	1126.89
1400	1422	10.0	1 NB	1400	555.84	368.63	181.42	327.92	234.31	140.71	1205.88
1600	1626	10.0	1 NB	1600	635.36	421.29	207.22	367.68	260.64	153.61	1363.86
1800	1820	10.0	1 NB	1800	713.56	473.95	234.34	406.78	286.97	167.17	1521.85
2000	2020	10.0	1 NB	2000	792.55	526.61	260.67	446.27	313.30	180.34	1679.83

NOTE: The variation of radius of bends for those shown in the tables shall be permitted to meet the piping flexibility and/or other requirements. In such cases, the indentor will provide the dimensions.

FIG 2C - 45⁰ MITRED BEND

(FOR PIPES SIZES UPTO 1000 NB)



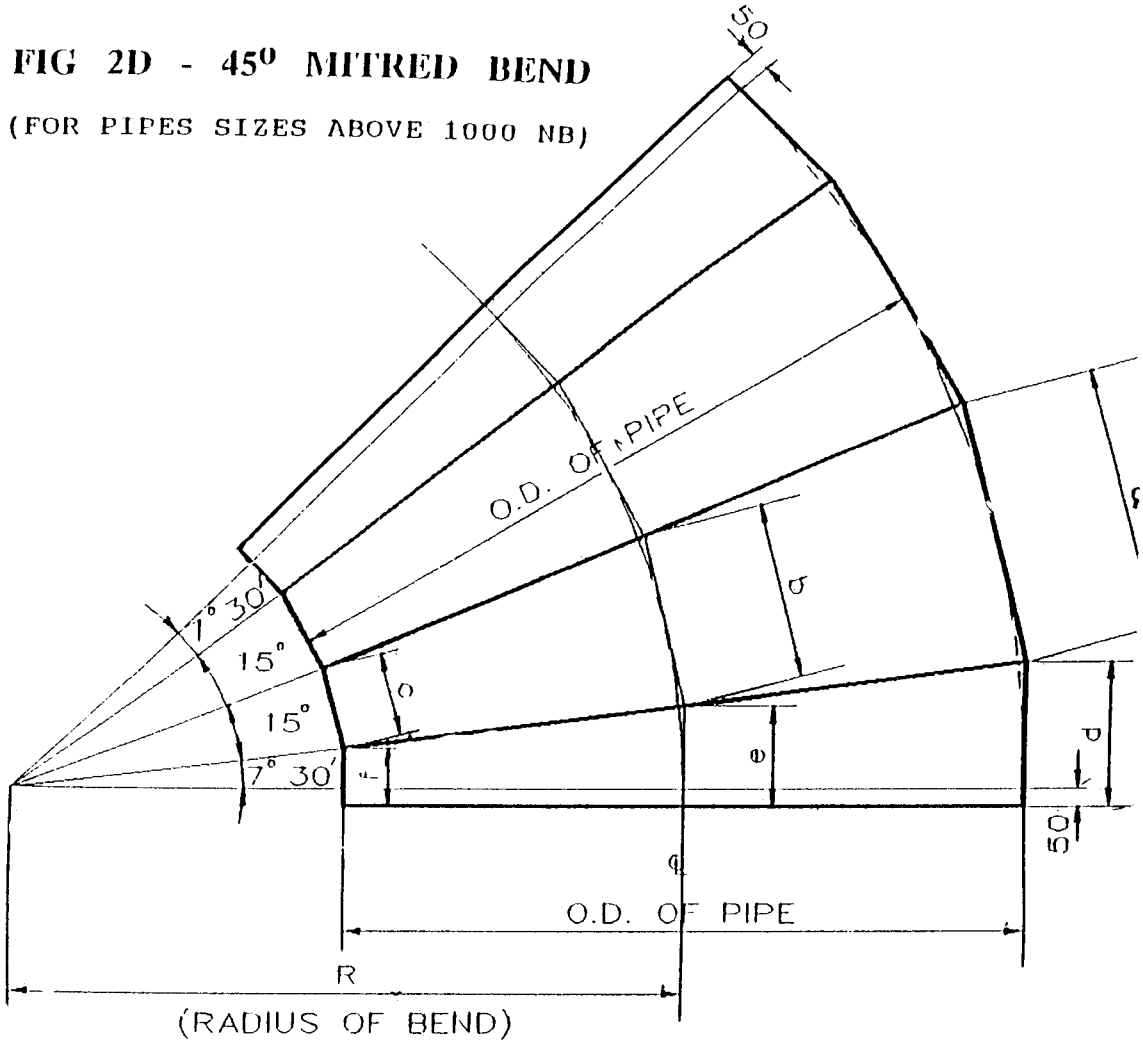


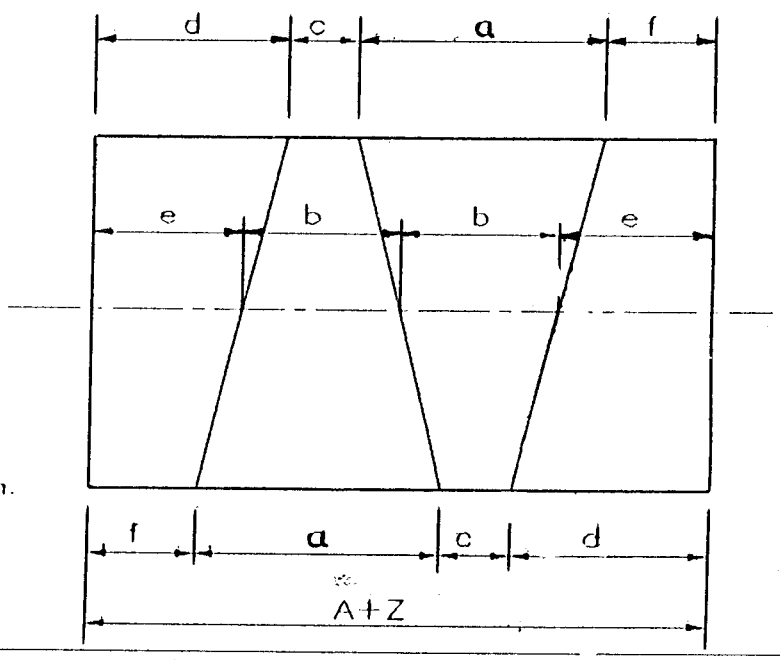
A=a+2f

Z=CUTTING ALLOWANCE=13mm.

FIG 2D - 45° MITRED BEND

(FOR PIPES SIZES ABOVE 1000 NB)





A=a+c+d+f

Z=CUTTING ALLOWANCE=13mm.

TABLE – 3

WELDED STEEL FLANGED DIMENSIONS FOR PRESSURE UPTO 1kgf/cm^2

(Based on GIPROKOHS drg for welded steel flanges for pressure < 1kgf/cm^2)

(to be read along with Fig-3)

(All dimensions in mm)

Nominal Pipe Dia NB	PCD D1	Outer Dia D	Flange thickness B	Hole Dia d	No. of Holes
200	280	320	16	18	8
250	335	375	16	18	12
300	395	440	16	23	12
400	445	480	16	23	12
450	495	540	18	23	16
500	550	595	20	23	16
550	600	645	20	23	16
600	705	755	20	25	20
700	810	850	20	25	24
800	920	975	20	30	24
900	1020	1075	20	30	24
1000	1120	1175	20	30	28
1100	1220	1275	20	30	32
1200	1320	1375	20	30	32
1300	1420	1475	20	30	32
1400	1520	1575	20	30	36
1600	1730	1790	24	30	40
1800	1930	1990	24	30	44
2000	2130	2190	24	30	48

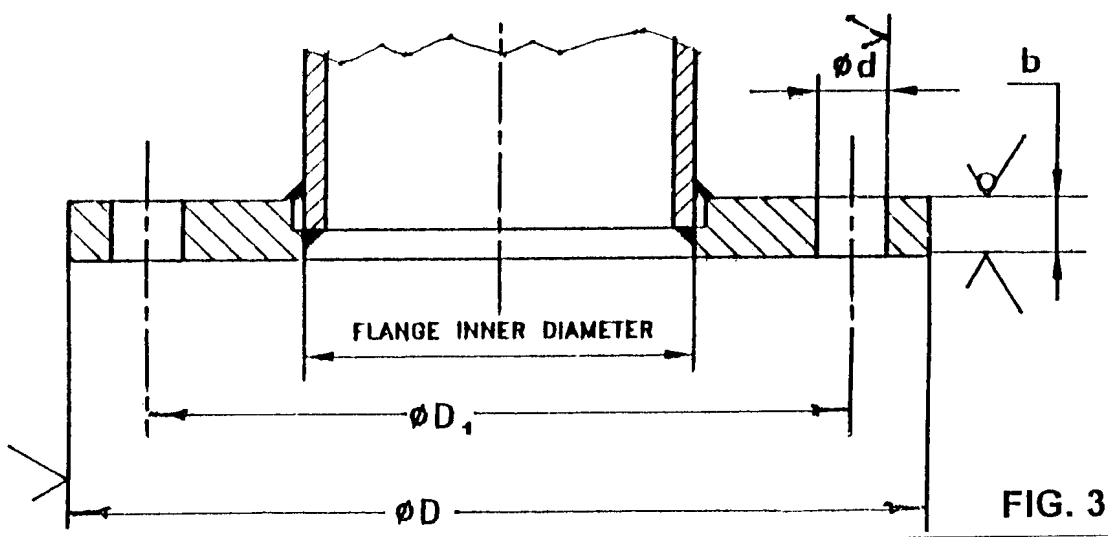


FIG. 3