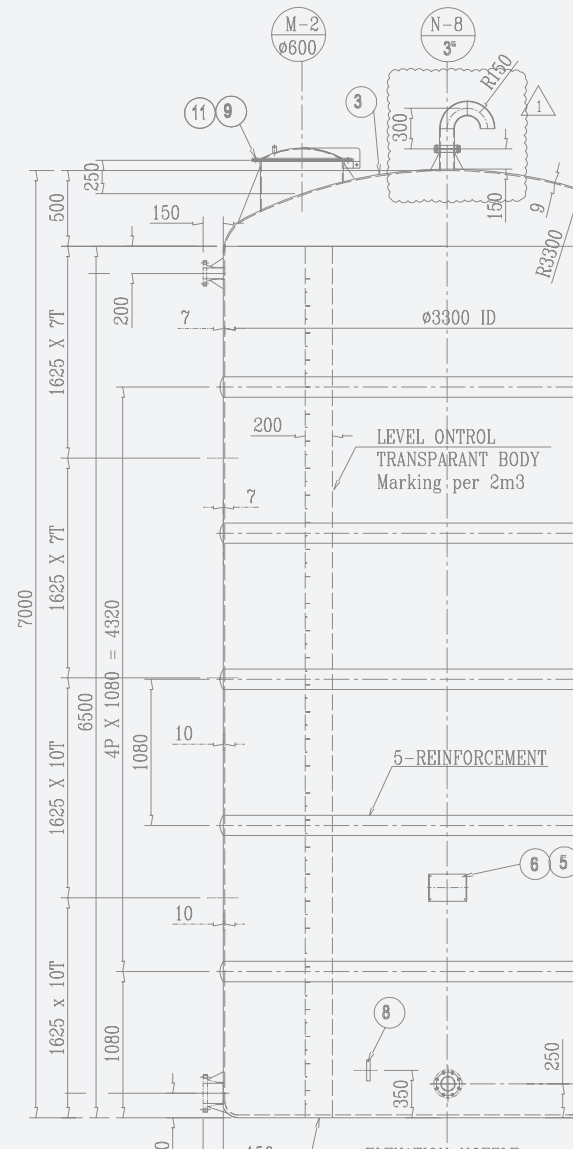
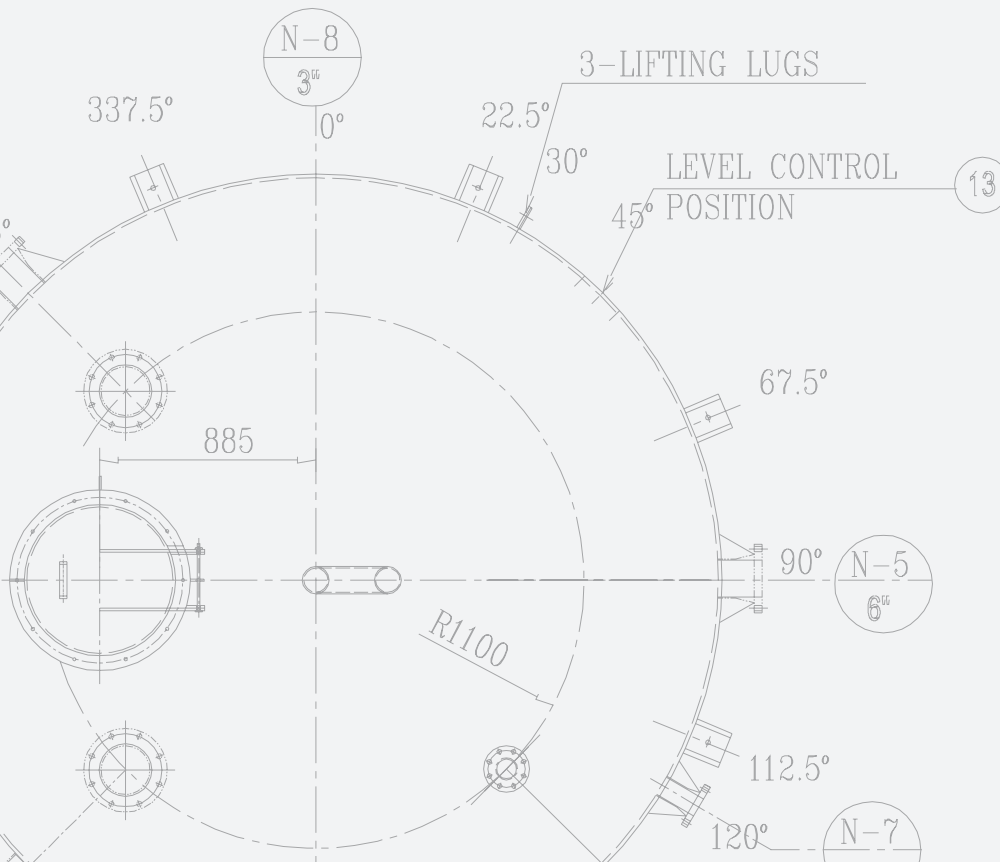
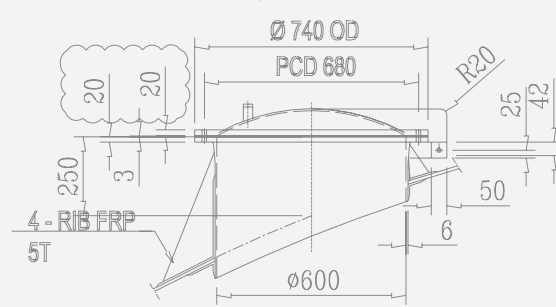


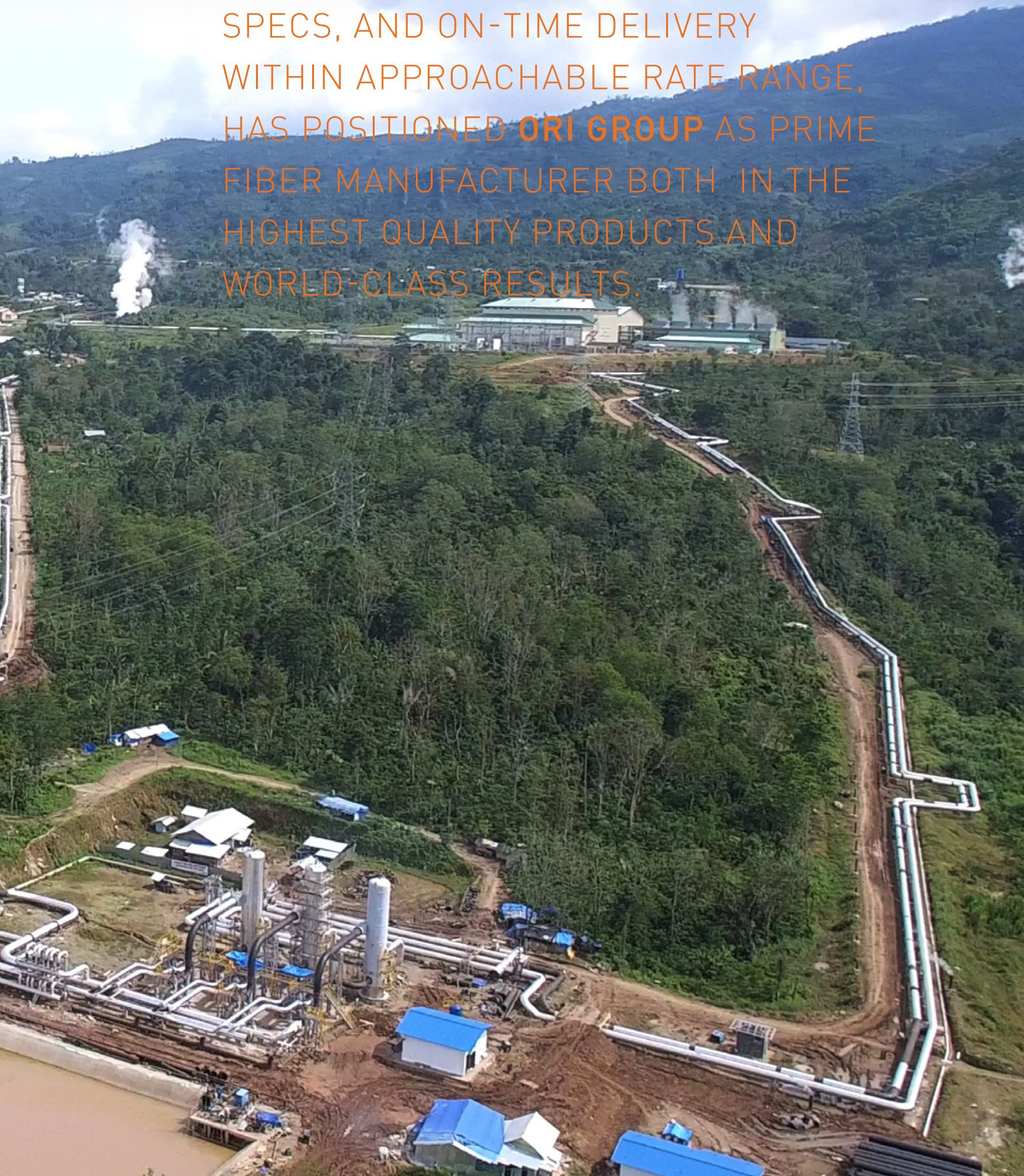


ORIPES GEOTHERMAL POWER PLANT





ORI GROUP OFFERS AN EXTENSIVE RANGE OF SERVICES. ORI GROUP'S COMMITMENT TO DELIVER BEST SPECS, AND ON-TIME DELIVERY WITHIN APPROACHABLE RATE RANGE, HAS POSITIONED **ORI GROUP** AS PRIME FIBER MANUFACTURER BOTH IN THE HIGHEST QUALITY PRODUCTS AND WORLD-CLASS RESULTS.



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ABOUT ORIPIPE

ORIPipe providing services in Engineering, Manufacturing, Design, as well as Installation the piping products. Our piping system is capable of withstanding aggressive environments including chemical and seawater applications. Thermosetting polyester, vinylester, and epoxy resins formed a durable bond to fibers that are designed to withstand the rated pressure in both pipe and fittings.

PIPE LENGTH

Manufactured length standards measured from 3 m to 12 m may also be manufactured depending on the desired length according to the project needs.

PRESSURE CATEGORIES

PN 1 bar - PN 25 bar. May also be manufactured above 25 Bar, a special design based on the Customer's needs (Standard pressure is applied for both pipe and fittings)

NOMINAL DIAMETERS

Size range is DN 12.5 mm to DN 3,000 mm (Standard diameter is applied for both pipe and fittings).

STIFFNESS CATEGORIES

Manufactured within SN 1,250, SN 2,500, SN 5,000, SN 10,000. Full vacuum series are also available, may also be manufactured in the desired values of stiffness according to the project needs.

MANUFACTURING PROCESS

ORIPipe are produced using a collaborative process between hand lay-up and helical filament winding processes. The hand lay-up process creates a chemical layer in direct contact with fluid. The Filament winding process creates a structure layer as a buffer against stress. Production process is fully operated with computer controlled machines. Fitting manufactured by a contact molded and hand layup process combined with chopped strand mat (CSM), woven roving (WR), unidirection woven roving stitch mat, and surfacing veil.

PIPE COMPOSITION

Reinforced layer

The continuous glass rovings are impregnated in the resin bath to give excellent wet out, and these continuous rovings after their impregnation travel on to a mandrel which is rotating at controlled speeds.

The continuous rovings move at fixed angles over the mandrel, and these angles are specifically chosen to ensure high mechanical strength characteristics. The thicknesses of the pipes are controlled by the continuous glass rovings winding sequence.

Chemical Barrier

Having good chemical resistance properties, special anti chemical resistance C-Veil glass & the resin matrix forms the inner liner. Liner thickness of 1.3 mm is used as standard, but thicker liners are available on request.

Top Coat

External resin-rich surface of 0.3 mm, provides excellent Ultraviolet protection. The pipes are left resin-rich on the outside surface to enhance these specific properties.

MATERIAL POINTS

RESIN

Polyester (Orthophtalic, Isophthalic, Bisphenolic),
Vinylester (ASHLAND,AOC,SHCP,SHOWA),
and Epoxy.

GLASS

E-Glass,
C-Glass,
ECR-Glass,
boron free-Glass (PFG, Owens Corning, Nitttobo).

HARDENER

Only approved catalysts are used
in the manufacturing process (MEKP, BPO).

ADDITIVES

Additives are used as promoter and
accelerator for the resin
(DMA, Cobalt-Napthenate).

BENEFIT POINTS

Reinforced from high quality material Vinylester Resin System and C-Glass, our high performance anti corrosive FRP pipes can withstand under geothermal fluids services up to 70° C in Pressure Service 1—20 Bar Full Vacuum. With overall weight only 1/4 of steel and Liner Thickness only 2.5 mm, ORI PIPES also featured Smooth Inner Surface (Hazen-Williams flow coefficient under 150).

REFERENCE CODES

ASTM 2996

Standard Specification for Filament Wound "Fiberglass" (Glass Fiber Reinforced Thermosetting Resin) Pipe

ASTM D 3517

Standard specification for glass fibre reinforced thermosetting resin pressure pipe

BS 6464

Specification for Reinforced plastics pipes, fittings and joints for process plants

BS 7159

Code of practice for Design and construction of glass reinforced plastics (GRP) piping systems for individual plants or sites

AWWA C 950

Fiberglass Pressure Pipe

AWWA M45

Fiberglass Pipe Design

ISO 14692-1

GRP – Application

ISO 14692-2

GRP – Qualification & Manufacture

ISO 14692-3

System Design

ISO 14692-4

Fabrication, Installation, & Operation

ORIPipe GEOTHERMAL POWER PLANT

Geothermal electricity is electricity generated by geothermal energy. Production well is drilled into a known geothermal reservoir. Typically, an injection well is also drilled to return used geothermal fluids to the geothermal reservoir. Hot geothermal fluids flow through pipes to a power plant for use in generating electricity.

SERVICE CHARACTERISTIC

Based on our experienced to supply ORIPipe in Geothermal Industry. We summarized that:

- + Temperature services average is 70° C.
- + Pressure service are 1 bar up to 20 bar with Full Vacuum.
- + Liner Thickness is 2.5 mm.
- + Size Range from 1/2" up to 120"
- + Supplied products using Vinylester Resin system.

AREA OF USE

1. Main cooling Water Pipe
2. SAGS (Steam Field Above Ground Pipe)
3. Auxiliary cooling water
4. Gas Extraction

RAW MATERIAL

Resin : Vinylester Resin System
Glass : High Quality C-Glass

Geothermal fluids is very corrosive due to cointaining of sulphur represent on SO_4 & H_2S gas. ORIPipe high performance anti corrosive pipe can withstand under geothermal fluids services and proved give long life services on some Geothermal Plants in Indonesia.

STANDARD LENGTH

Size		Length
mm / (in.)	in.	mm
15 - 30	1/2 - 1 1/4	3000
50 - 125	1 - 5	5850
150 - 2500	6 - 100	11890
2600 - 3000	104 - 120	11890

DESCRIPTION DETAILS

Production Process:

Filament Winding Process

Nominal diameters:

DN 15 – DN 2550 (1/2" – 105")

Pressure Number:

PN 6, PN 10, PN 12, PN 20,
PN 25, Full Vacuum

Siffness Number:

SN 1250 N/m²
SN 2500 N/m²
SN 5000 N/m²
SN 10000 N/m²

QUALITY CONTROL

ORIPipe is high performance FRP Pipe made from high quality raw material. With strong Quality Control Team, ORIPipe become excellent product to fulfill & satisfy your requirements. Our inhouse Quality Control Team also provides Custom Design Service and Periodic Maintenance to ensure our products always fulfill your requirements.

QUALITY CONTROL STANDARDS

ASTM D 638

Test Method for Tensile Properties of Plastics

ASTM D 2412

Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

ASTM D 1599

Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

ASTM D 2563

Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts

ASTM D 2583

Test Method for indentation hardness off rigid plastic by means of a barcol Impressor

PERIODIC MAINTENANCE

ORIPipe use the best raw materials from approved manufacturers. We always ensure the quality of our products in every single delivery, starting with the incoming inspection of raw materials to the completed installation. Below is the list of standard tests that are performed.

TESTS	STANDARD	PERIOD
Inspection of Resin	ORI's In-House Standard	Every Batch
Inspection of Hardener	ORI's In-House Standard	Every Batch
Inspection of Continuous Roving	ORI's In-House Standard	Every Batch
Tool Calibration	ORI's In-House Standard	Calibration every 3 to 6 months
Glass Content	ASTM D 2564	As per customer's requirement
Pressure Test (1.5 x Design Pressure)	ISO 14692	As per customer's requirement
Visual Control	ASTM D 2563	100%
Dimensional Control	ASTM D 3567	100%
Barcol Hardness	ASTM D 2583	100%
Pipe Stiffness	ASTM D 2412	As per customer's requirement
Axial Tensile	ASTM D 638	As per customer's requirement
Short-term Hydraulic Failure Pressure	ASTM D 1599	As per customer's requirement
Hoop Tensile Strength Test	ASTM D 2290	As per customer's requirement
Long-Term HDB	ASTM D 2992	As per customer's requirement

PRODUCTS CATALOGUE

055	PIPES
055	BUTT & WRAP JOINT
055	EQUAL TEE
055	END CAP For Nominal Diameter < 600 mm For Nominal Diameter > 600 mm
055	ELBOW 90 LR Radius Type For Nominal Diameter ≤ 600 mm Mitered Type For Nominal Diameter > 650 mm
055	ELBOW 90 SR Radius Type For Nominal Diameter ≤ 600 mm Mitered Type For Nominal Diameter > 650 mm
055	ELBOW 45 LR Radius Type For Nominal Diameter ≤ 600 mm Mitered Type For Nominal Diameter > 650 mm
055	ELBOW 45 SR Radius Type For Nominal Diameter ≤ 600 mm Mitered Type For Nominal Diameter > 650 mm

ORRPIPE-FPS

PROJECT : BLANZELD GEOTHEMAL POWER

DRAWING NO: ORR-L-4445-PS-00-02

SPECIAL NO: PS-03 - 02

1.015

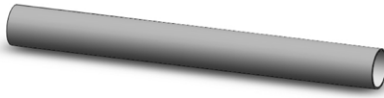
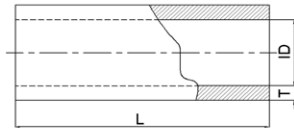
HANDLE WITH CARE



PLANT 1X11

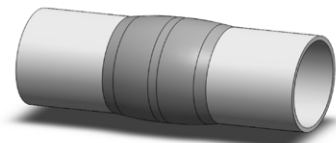
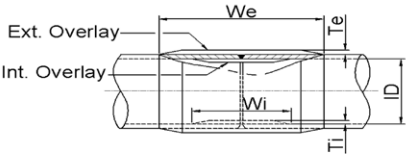


PIPES



Nominal Diameter		ID	L	Minimum Thickness			
				OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm
15	1/2	15	3,000	4.3	4.3	4.3	4.3
20	3/4	20	3,000	4.3	4.3	4.3	4.3
25	1	25	3,000	4.3	4.3	4.3	4.3
32	1 1/4	32	3,000	4.3	4.3	4.3	4.3
40	1 1/2	40	3,000	4.3	4.3	4.3	4.3
50	2	50	5,850	4.3	4.3	4.3	4.3
65	2 1/2	65	5,850	4.3	4.3	4.3	4.3
80	3	80	5,850	4.3	4.3	4.3	4.3
100	4	100	5,850	4.3	4.3	4.3	4.5
125	5	125	5,850	4.3	4.3	4.3	4.9
150	6	150	11,890	4.3	4.3	4.7	5.4
200	8	200	11,890	4.4	4.9	5.4	6.3
250	10	250	11,890	4.8	5.5	6.1	7.3
300	12	300	11,890	5.3	6.0	6.8	8.2
350	14	350	11,890	5.7	6.6	7.5	9.1
400	16	400	11,890	6.2	7.2	8.2	10.1
450	18	450	11,890	6.6	7.8	8.8	11.0
500	20	500	11,890	7.1	8.4	9.5	11.9
600	24	600	11,890	8.0	9.5	10.9	13.8
650	26	650	11,890	8.4	10.1	11.6	14.7
700	28	700	11,890	8.9	10.7	12.3	15.7
750	30	750	11,890	9.3	11.3	13.0	16.6
800	32	800	11,890	9.8	11.8	13.7	17.5
900	36	900	11,890	10.7	13.0	15.1	19.4
1,000	40	1,000	11,890	11.6	14.2	16.5	21.3
1,050	42	1,050	11,890	12.0	14.7	17.2	22.2
1,100	44	1,100	11,890	12.5	15.3	17.9	23.2
1,200	48	1,200	11,890	13.4	16.5	19.3	25.0
1,300	52	1,300	11,890	14.3	17.6	20.7	26.9
1,350	54	1,350	11,890	14.7	18.2	21.4	27.8
1,400	56	1,400	11,890	15.2	18.8	22.1	28.8
1,500	60	1,500	11,890	16.1	20.0	23.5	30.6
1,600	64	1,600	11,890	17.0	21.1	24.9	32.5
1,700	68	1,700	11,890	17.9	22.3	26.3	34.4
1,800	72	1,800	11,890	18.8	23.4	27.7	36.2
1,900	76	1,900	11,890	19.7	24.6	29.1	38.1
2,000	80	2,000	11,890	20.6	25.8	30.5	40.0
2,100	84	2,100	11,890	21.5	26.9	31.9	41.8
2,200	88	2,200	11,890	22.4	28.1	33.3	43.7
2,300	92	2,300	11,890	23.3	29.2	34.7	45.6
2,400	96	2,400	11,890	24.2	30.4	36.1	47.5
2,500	100	2,500	11,890	25.1	31.6	37.5	49.3
2,600	104	2,600	5,850	26.0	32.7	38.8	51.2
2,700	108	2,700	5,850	26.9	33.9	40.2	53.1
2,800	112	2,800	5,850	27.8	35.0	41.6	54.9
2,900	116	2,900	5,850	28.7	36.2	43.0	56.8
3,000	120	3,000	5,850	29.6	37.4	44.4	58.7

BUTT & WRAP JOINT

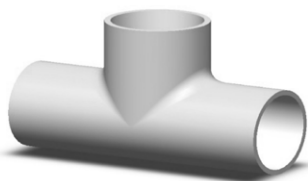
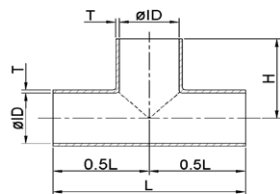


INTERNAL OVERLAY

Ti	Wi			
	OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	mm	mm	mm	mm
2.7	200	250	250	350
2.7	200	250	250	350
2.7	200	250	300	350
2.7	200	250	350	400
2.7	200	300	350	400
2.7	250	350	350	500
2.7	250	350	400	550
4.8	250	350	400	550
4.8	300	350	450	550
4.8	300	400	500	600
4.8	350	450	500	700
4.8	350	450	550	700
4.8	350	500	550	700
6.9	400	500	600	750
6.9	400	550	600	800
6.9	450	550	650	850
6.9	450	600	700	900
6.9	500	600	700	950
6.9	500	650	750	1000
6.9	550	700	800	1050
9.0	550	700	850	1050
9.0	600	700	850	1150
9.0	600	750	900	1200
9.0	650	800	950	1250
9.0	650	850	950	1300
9.0	700	850	1000	1300
9.0	700	900	1050	1400
9.0	750	900	1050	1400
9.0	750	950	1100	1450

ID	EXTERNAL OVERLAY						
	Te			We			
	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V	OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
	mm	mm	mm	mm	mm	mm	mm
15	6.5	6.5	6.5	150	150	150	150.00
20	6.5	6.5	6.5	150	150	150	150.00
25	6.5	6.5	6.5	150	150	150	150.00
32	6.5	6.5	6.5	150	150	150	150.00
40	6.5	6.5	6.5	150	150	150	150.00
50	6.5	6.5	6.5	150	150	150	150.00
65	6.5	6.5	6.5	150	150	150	150.00
80	6.5	6.5	6.5	150	150	150	150.00
100	6.5	6.5	6.8	150	150	150	150.00
125	6.5	6.5	7.4	150	150	150	207.43
150	6.5	7.1	8.1	150	150	150	207.43
200	7.4	8.1	9.5	150	207	207	233.00
250	8.3	9.2	11.0	150	207	233	302.29
300	9.0	10.2	12.3	150	233	233	302.29
350	9.9	11.3	13.7	250	233	302	371.43
400	10.8	12.3	15.2	250	302	302	440.57
450	11.7	13.2	16.5	250	302	371	466.29
500	12.6	14.3	17.9	250	371	441	535.43
600	14.3	16.4	20.7	350	441	466	605.00
650	15.2	17.4	22.1	350	441	466	673.71
700	16.1	18.5	23.6	350	466	535	699.43
750	17.0	19.5	24.9	400	466	605	768.57
800	17.7	20.6	26.3	400	535	605	768.57
900	19.5	22.7	29.1	450	605	674	906.86
1000	21.3	24.8	32.0	500	674	769	1,001.71
1050	22.1	25.8	33.3	550	674	769	1,070.86
1100	23.0	26.9	34.8	550	699	838	1,071.00
1200	24.8	29.0	37.5	600	769	907	1,165.71
1300	26.4	31.1	40.4	650	838	933	1,304.00
1350	27.3	32.1	41.7	700	838	1,002	1,304.00
1400	28.2	33.2	43.2	700	907	1,071	1,373.14
1500	30.0	35.3	45.9	750	933	1,140	1,468.00
1600	31.7	37.4	48.8	800	1,002	1,166	1,537.14
1700	33.5	39.5	51.6	850	1,071	1,235	1,632.00
1800	35.1	41.6	54.3	900	1,140	1,304	1,770.29
1900	36.9	43.7	57.2	950	1,166	1,399	1,839.43
2000	38.7	45.8	60.0	1,000	1,235	1,468	1,934.29
2100	40.4	47.9	62.7	1,050	1,304	1,537	2,072.57
2200	42.2	50.0	65.6	1,100	1,373	1,606	2,098.29
2300	43.8	52.1	68.4	1,150	1,399	1,632	2,236.57
2400	45.6	54.2	71.3	1,200	1,468	1,770	2,305.71
2500	47.4	56.3	74.0	1,250	1,537	1,839	2,401.00
2600	49.1	58.2	76.8	1,300	1,606	1,865	2,538.86
2700	50.9	60.3	79.7	1,350	1,632	1,934	2,564.57
2800	52.5	62.4	82.4	1,400	1,701	2,073	2,702.86
2900	54.3	64.5	85.2	1,450	1,770	2,098	2,772.00
3000	56.1	66.6	88.1	1,500	1,839	2,167	2,866.86

EQUAL TEE

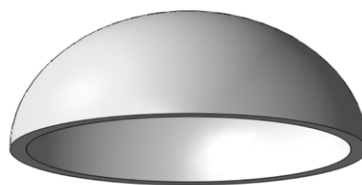
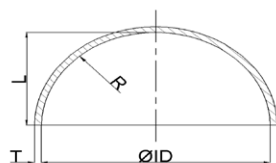


NOMINAL DIAMETER		ID	L			
			OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm
15	1/2	15	240	240	240	240
20	3/4	20	240	240	240	240
25	1	25	250	250	250	250
32	1 1/4	32	250	250	250	250
40	1 1/2	40	260	260	260	260
50	2	50	270	270	270	270
65	2 1/2	65	290	290	290	290
80	3	80	300	300	300	300
100	4	100	320	320	320	320
125	5	125	350	350	350	410
150	6	150	370	370	370	430
200	8	200	420	480	480	510
250	10	250	470	530	560	640
300	12	300	630	610	620	690
350	14	350	680	660	740	810
400	16	400	730	790	790	940
450	18	450	780	840	910	1,020
500	20	500	830	960	1,030	1,140
600	24	600	1,040	1,130	1,160	1,320
650	26	650	1,090	1,190	1,220	1,440
700	28	700	1,140	1,260	1,340	1,520
750	30	750	1,240	1,320	1,460	1,640
800	32	800	1,290	1,440	1,510	1,690
900	36	900	1,450	1,610	1,690	1,940
1,000	40	1,000	1,600	1,790	1,890	2,140
1,050	42	1,050	1,700	1,840	1,940	2,260
1,100	44	1,100	1,750	1,920	2,060	2,320
1,200	48	1,200	1,910	2,090	2,240	2,520
1,300	52	1,300	2,060	2,260	2,370	2,770
1,350	54	1,350	2,160	2,320	2,490	2,820
1,400	56	1,400	2,220	2,440	2,610	2,940
1,500	60	1,500	2,370	2,570	2,790	3,150
1,600	64	1,600	2,520	2,740	2,920	3,320
1,700	68	1,700	2,680	2,920	3,100	3,520
1,800	72	1,800	2,830	3,090	3,270	3,770
1,900	76	1,900	2,980	3,220	3,470	3,950
2,000	80	2,000	3,140	3,390	3,640	4,150
2,100	84	2,100	3,290	3,570	3,820	4,390
2,200	88	2,200	3,440	3,740	3,990	4,530
2,300	92	2,300	3,600	3,870	4,130	4,770
2,400	96	2,400	3,750	4,040	4,370	4,950
2,500	100	2,500	3,910	4,220	4,540	5,150
2,600	104	2,600	4,060	4,390	4,680	5,400
2,700	108	2,700	4,210	4,520	4,850	5,530
2,800	112	2,800	4,370	4,700	5,090	5,780
2,900	116	2,900	4,520	4,870	5,230	5,950
3,000	120	3,000	4,670	5,040	5,400	6,160

H				T			
OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V	OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	mm	mm	mm	mm	mm	mm	mm
120	120	120	120	8.6	8.6	8.6	8.6
120	120	120	120	8.6	8.6	8.6	8.6
130	130	130	130	8.6	8.6	8.6	8.6
130	130	130	130	8.6	8.6	8.6	8.6
130	130	130	130	8.6	8.6	8.6	8.6
140	140	140	140	8.6	8.6	8.6	8.6
150	150	150	150	8.6	8.6	8.6	8.6
150	150	150	150	8.6	8.6	8.6	8.6
160	160	160	160	8.6	8.6	8.6	9.0
180	180	180	210	8.6	8.6	8.6	9.8
190	190	190	220	8.6	8.6	9.4	10.8
210	240	240	260	8.8	9.8	10.8	12.6
240	270	280	320	9.6	11.0	12.2	14.6
320	310	310	350	10.6	12.0	13.6	16.4
340	330	370	410	11.4	13.2	15.0	18.2
370	400	400	470	12.4	14.4	16.4	20.2
390	420	460	510	13.2	15.6	17.6	22.0
420	480	520	570	14.2	16.8	19.0	23.8
520	570	580	660	16.0	19.0	21.8	27.6
550	600	610	720	16.8	20.2	23.2	29.4
570	630	670	760	17.8	21.4	24.6	31.4
620	660	730	820	18.6	22.6	26.0	33.2
650	720	760	850	19.6	23.6	27.4	35.0
730	810	850	970	21.4	26.0	30.2	38.8
800	900	950	1,070	23.2	28.4	33.0	42.6
850	920	970	1,130	24.0	29.4	34.4	44.4
880	960	1,030	1,160	25.0	30.6	35.8	46.4
960	1,050	1,120	1,260	26.8	33.0	38.6	50.0
1,030	1,130	1,190	1,390	28.6	35.2	41.4	53.8
1,080	1,160	1,250	1,410	29.4	36.4	42.8	55.6
1,110	1,220	1,310	1,470	30.4	37.6	44.2	57.6
1,190	1,290	1,400	1,580	32.2	40.0	47.0	61.2
1,260	1,370	1,460	1,660	34.0	42.2	49.8	65.0
1,340	1,460	1,550	1,760	35.8	44.6	52.6	68.8
1,420	1,550	1,640	1,890	37.6	46.8	55.4	72.4
1,490	1,610	1,740	1,980	39.4	49.2	58.2	76.2
1,570	1,700	1,820	2,080	41.2	51.6	61.0	80.0
1,650	1,790	1,910	2,200	43.0	53.8	63.8	83.6
1,720	1,870	2,000	2,270	44.8	56.2	66.6	87.4
1,800	1,940	2,070	2,390	46.6	58.4	69.4	91.2
1,880	2,020	2,190	2,480	48.4	60.8	72.2	95.0
1,960	2,110	2,270	2,580	50.2	63.2	75.0	98.6
2,030	2,200	2,340	2,700	52.0	65.4	77.6	102.4
2,110	2,260	2,430	2,770	53.8	67.8	80.4	106.2
2,190	2,350	2,550	2,890	55.6	70.0	83.2	109.8
2,260	2,440	2,620	2,980	57.4	72.4	86.0	113.6
2,340	2,520	2,700	3,080	59.2	74.8	88.8	117.4

END CAP

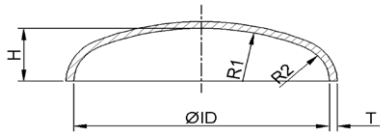
FOR NOMINAL DIAMETER < 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
15	1/2	15	7.5	7.5	6.45	6.45	6.45	6.45
20	3/4	20	10	10	6.45	6.45	6.45	6.45
25	1	25	12.5	12.5	6.45	6.45	6.45	6.45
32	1 1/4	32	16	16	6.45	6.45	6.45	6.45
40	1 1/2	40	20	20	6.45	6.45	6.45	6.45
50	2	50	25	25	6.45	6.45	6.45	6.45
65	2 1/2	65	32.5	32.5	6.45	6.45	6.45	6.45
80	3	80	40	40	6.45	6.45	6.45	6.45
100	4	100	50	50	6.45	6.45	6.45	6.75
125	5	125	62.5	62.5	6.45	6.45	6.45	7.35
150	6	150	75	75	6.45	6.45	7.05	8.10
200	8	200	100	100	6.60	7.35	8.10	9.45
250	10	250	125	125	7.20	8.25	9.15	10.95
300	12	300	150	150	7.95	9.00	10.20	12.30
350	14	350	175	175	8.55	9.90	11.25	13.65
400	16	400	200	200	9.30	10.80	12.30	15.15
450	18	450	225	225	9.90	11.70	13.20	16.50
500	20	500	250	250	10.65	12.60	14.25	17.85
600	24	600	300	300	12.00	14.25	16.35	20.70

END CAP

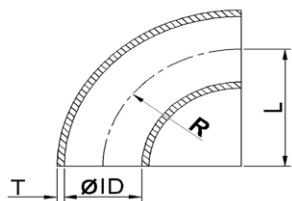
FOR NOMINAL DIAMETER > 600 MM



Normal Diameter		ID	R1	R2	H	Minimum Thickness			
						OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm	mm
650	26	650	650	108	154	12.60	15.15	17.40	22.05
700	28	700	700	117	165	13.35	16.05	18.45	23.55
750	30	750	750	125	177	13.95	16.95	19.50	24.90
800	32	800	800	133	189	14.70	17.70	20.55	26.25
900	36	900	900	150	213	16.05	19.50	22.65	29.10
1,000	40	1,000	1,000	167	236	17.40	21.30	24.75	31.95
1,050	42	1,050	1,050	175	248	18.00	22.05	25.80	33.30
1,100	44	1,100	1,100	183	260	18.75	22.95	26.85	34.80
1,200	48	1,200	1,200	200	283	20.10	24.75	28.95	37.50
1,300	52	1,300	1,300	217	307	21.45	26.40	31.05	40.35
1,350	54	1,350	1,350	225	319	22.05	27.30	32.10	41.70
1,400	56	1,400	1,400	233	331	22.80	28.20	33.15	43.20
1,500	60	1,500	1,500	250	354	24.15	30.00	35.25	45.90
1,600	64	1,600	1,600	267	378	25.50	31.65	37.35	48.75
1,700	68	1,700	1,700	283	401	26.85	33.45	39.45	51.60
1,800	72	1,800	1,800	300	425	28.20	35.10	41.55	54.30
1,900	76	1,900	1,900	317	449	29.55	36.90	43.65	57.15
2,000	80	2,000	2,000	333	471	30.90	38.70	45.75	60.00
2,100	84	2,100	2,100	350	496	32.25	40.35	47.85	62.70
2,200	88	2,200	2,200	367	520	33.60	42.15	49.95	65.55
2,300	92	2,300	2,300	383	543	34.95	43.80	52.05	68.40
2,400	96	2,400	2,400	400	567	36.30	45.60	54.15	71.25
2,500	100	2,500	2,500	417	591	37.65	47.40	56.25	73.95
2,600	104	2,600	2,600	433	614	39.00	49.05	58.20	76.80
2,700	108	2,700	2,700	450	638	40.35	50.85	60.30	79.65
2,800	112	2,800	2,800	467	662	41.70	52.50	62.40	82.35
2,900	116	2,900	2,900	483	685	43.05	54.30	64.50	85.20
3,000	120	3,000	3,000	500	709	44.40	56.10	66.60	88.05

ELBOW 90 LR

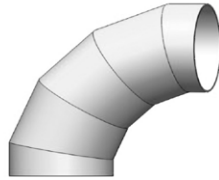
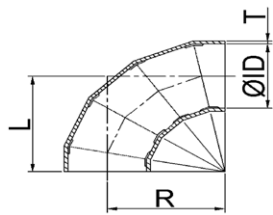
RADIUS TYPE FOR NOMINAL DIAMETER ≤ 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
15	1/2	15	22.5	22.5	6.45	6.45	6.45	6.45
20	3/4	20	30	30	6.45	6.45	6.45	6.45
25	1	25	37.5	37.5	6.45	6.45	6.45	6.45
32	1 1/4	32	48	48	6.45	6.45	6.45	6.45
40	1 1/2	40	60	60	6.45	6.45	6.45	6.45
50	2	50	75	75	6.45	6.45	6.45	6.45
65	2 1/2	65	97.5	97.5	6.45	6.45	6.45	6.45
80	3	80	120	120	6.45	6.45	6.45	6.45
100	4	100	150	150	6.45	6.45	6.45	6.75
125	5	125	187.5	187.5	6.45	6.45	6.45	7.35
150	6	150	225	225	6.45	6.45	7.05	8.10
200	8	200	300	300	6.60	7.35	8.10	9.45
250	10	250	375	375	7.20	8.25	9.15	10.95
300	12	300	450	450	7.95	9.00	10.20	12.30
350	14	350	525	525	8.55	9.90	11.25	13.65
400	16	400	600	600	9.30	10.80	12.30	15.15
450	18	450	675	675	9.90	11.70	13.20	16.50
500	20	500	750	750	10.65	12.60	14.25	17.85
600	24	600	900	900	12.00	14.25	16.35	20.70

ELBOW 90 LR

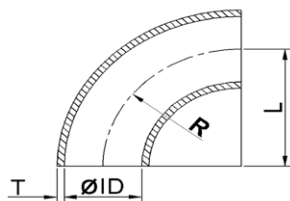
MITERED TYPE FOR NOMINAL DIAMETER > 650 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
650	26	650	975	975	12.60	15.15	17.40	22.05
700	28	700	1,050	1,050	13.35	16.05	18.45	23.55
750	30	750	1,125	1,125	13.95	16.95	19.50	24.90
800	32	800	1,200	1,200	14.70	17.70	20.55	26.25
900	36	900	1,350	1,350	16.05	19.50	22.65	29.10
1000	40	1,000	1,500	1,500	17.40	21.30	24.75	31.95
1050	42	1,050	1,575	1,575	18.00	22.05	25.80	33.30
1100	44	1,100	1,650	1,650	18.75	22.95	26.85	34.80
1200	48	1,200	1,800	1,800	20.10	24.75	28.95	37.50
1300	52	1,300	1,950	1,950	21.45	26.40	31.05	40.35
1350	54	1,350	2,025	2,025	22.05	27.30	32.10	41.70
1400	56	1,400	2,100	2,100	22.80	28.20	33.15	43.20
1500	60	1,500	2,250	2,250	24.15	30.00	35.25	45.90
1600	64	1,600	2,400	2,400	25.50	31.65	37.35	48.75
1700	68	1,700	2,550	2,550	26.85	33.45	39.45	51.60
1800	72	1,800	2,700	2,700	28.20	35.10	41.55	54.30
1900	76	1,900	2,850	2,850	29.55	36.90	43.65	57.15
2000	80	2,000	3,000	3,000	30.90	38.70	45.75	60.00
2100	84	2,100	3,150	3,150	32.25	40.35	47.85	62.70
2200	88	2,200	3,300	3,300	33.60	42.15	49.95	65.55
2300	92	2,300	3,450	3,450	34.95	43.80	52.05	68.40
2400	96	2,400	3,600	3,600	36.30	45.60	54.15	71.25
2500	100	2,500	3,750	3,750	37.65	47.40	56.25	73.95
2600	104	2,600	3,900	3,900	39.00	49.05	58.20	76.80
2700	108	2,700	4,050	4,050	40.35	50.85	60.30	79.65
2800	112	2,800	4,200	4,200	41.70	52.50	62.40	82.35
2900	116	2,900	4,350	4,350	43.05	54.30	64.50	85.20
3000	120	3,000	4,500	4,500	44.40	56.10	66.60	88.05

ELBOW 90 SR

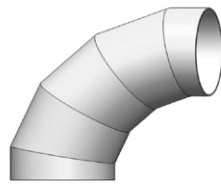
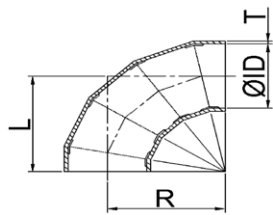
RADIUS TYPE FOR NOMINAL DIAMETER ≤ 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
15	1/2	15	15	15	6.45	6.45	6.45	6.45
20	3/4	20	20	20	6.45	6.45	6.45	6.45
25	1	25	25	25	6.45	6.45	6.45	6.45
32	1 1/4	32	32	32	6.45	6.45	6.45	6.45
40	1 1/2	40	40	40	6.45	6.45	6.45	6.45
50	2	50	50	50	6.45	6.45	6.45	6.45
65	2 1/2	65	65	65	6.45	6.45	6.45	6.45
80	3	80	80	80	6.45	6.45	6.45	6.45
100	4	100	100	100	6.45	6.45	6.45	6.75
125	5	125	125	125	6.45	6.45	6.45	7.35
150	6	150	150	150	6.45	6.45	7.05	8.10
200	8	200	200	200	6.45	7.35	8.10	9.45
250	10	250	250	250	6.45	8.25	9.15	10.95
300	12	300	300	300	6.45	9.00	10.20	12.30
350	14	350	350	350	6.75	9.90	11.25	13.65
400	16	400	400	400	7.50	10.80	12.30	15.15
450	18	450	450	450	8.10	11.70	13.20	16.50
500	20	500	500	500	8.85	12.60	14.25	17.85
600	24	600	600	600	10.20	14.25	16.35	20.70

ELBOW 90 SR

MITERED TYPE FOR NOMINAL DIAMETER > 650 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
650	26	650	650	650	10.80	15.15	17.40	22.05
700	28	700	700	700	11.55	16.05	18.45	23.55
750	30	750	750	750	12.15	16.95	19.50	24.90
800	32	800	800	800	12.90	17.70	20.55	26.25
900	36	900	900	900	14.25	19.50	22.65	29.10
1,000	40	1,000	1,000	1,000	15.60	21.30	24.75	31.95
1,050	42	1,050	1,050	1,050	16.20	22.05	25.80	33.30
1,100	44	1,100	1,100	1,100	16.95	22.95	26.85	34.80
1,200	48	1,200	1,200	1,200	18.30	24.75	28.95	37.50
1,300	52	1,300	1,300	1,300	19.65	26.40	31.05	40.35
1,350	54	1,350	1,350	1,350	20.25	27.30	32.10	41.70
1,400	56	1,400	1,400	1,400	21.00	28.20	33.15	43.20
1,500	60	1,500	1,500	1,500	22.35	30.00	35.25	45.90
1,600	64	1,600	1,600	1,600	23.70	31.65	37.35	48.75
1,700	68	1,700	1,700	1,700	25.05	33.45	39.45	51.60
1,800	72	1,800	1,800	1,800	26.40	35.10	41.55	54.30
1,900	76	1,900	1,900	1,900	27.75	36.90	43.65	57.15
2,000	80	2,000	2,000	2,000	29.10	38.70	45.75	60.00
2,100	84	2,100	2,100	2,100	30.45	40.35	47.85	62.70
2,200	88	2,200	2,200	2,200	31.80	42.15	49.95	65.55
2,300	92	2,300	2,300	2,300	33.15	43.80	52.05	68.40
2,400	96	2,400	2,400	2,400	34.50	45.60	54.15	71.25
2,500	100	2,500	2,500	2,500	35.85	47.40	56.25	73.95
2,600	104	2,600	2,600	2,600	37.20	49.05	58.20	76.80
2,700	108	2,700	2,700	2,700	38.55	50.85	60.30	79.65
2,800	112	2,800	2,800	2,800	39.90	52.50	62.40	82.35
2,900	116	2,900	2,900	2,900	41.25	54.30	64.50	85.20
3,000	120	3,000	3,000	3,000	42.60	56.10	66.60	88.05

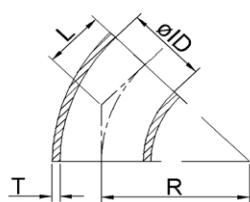


C23 10



ELBOW 45 LR

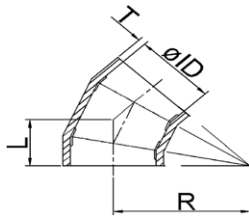
RADIUS TYPE FOR NOMINAL DIAMETER ≤ 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
mm	inch				OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
15	1/2	15	22.5	9	6.45	6.45	6.45	6.45
20	3/4	20	30	12	6.45	6.45	6.45	6.45
25	1	25	37.5	16	6.45	6.45	6.45	6.45
32	1 1/4	32	48	20	6.45	6.45	6.45	6.45
40	1 1/2	40	60	25	6.45	6.45	6.45	6.45
50	2	50	75	31	6.45	6.45	6.45	6.45
65	2 1/2	65	97.5	40	6.45	6.45	6.45	6.45
80	3	80	120	50	6.45	6.45	6.45	6.45
100	4	100	150	62	6.45	6.45	6.45	6.75
125	5	125	187.5	78	6.45	6.45	6.45	7.35
150	6	150	225	93	6.45	6.45	7.05	8.10
200	8	200	300	124	6.45	7.35	8.10	9.45
250	10	250	375	155	6.45	8.25	9.15	10.95
300	12	300	450	186	6.45	9.00	10.20	12.30
350	14	350	525	217	6.75	9.90	11.25	13.65
400	16	400	600	249	7.50	10.80	12.30	15.15
450	18	450	675	280	8.10	11.70	13.20	16.50
500	20	500	750	311	8.85	12.60	14.25	17.85
600	24	600	900	373	10.20	14.25	16.35	20.70

ELBOW 45 LR

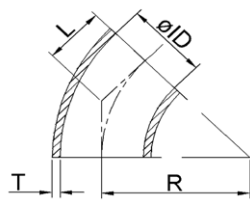
MITERED TYPE FOR NOMINAL DIAMETER > 650 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
650	26	650	975	404	10.80	15.15	17.40	22.05
700	28	700	1,050	435	11.55	16.05	18.45	23.55
750	30	750	1,125	466	12.15	16.95	19.50	24.90
800	32	800	1,200	497	12.90	17.70	20.55	26.25
900	36	900	1,350	559	14.25	19.50	22.65	29.10
1,000	40	1,000	1,500	621	15.60	21.30	24.75	31.95
1,050	42	1,050	1,575	652	16.20	22.05	25.80	33.30
1,100	44	1,100	1,650	683	16.95	22.95	26.85	34.80
1,200	48	1,200	1,800	746	18.30	24.75	28.95	37.50
1,300	52	1,300	1,950	808	19.65	26.40	31.05	40.35
1,350	54	1,350	2,025	839	20.25	27.30	32.10	41.70
1,400	56	1,400	2,100	870	21.00	28.20	33.15	43.20
1,500	60	1,500	2,250	932	22.35	30.00	35.25	45.90
1,600	64	1,600	2,400	994	23.70	31.65	37.35	48.75
1,700	68	1,700	2,550	1,056	25.05	33.45	39.45	51.60
1,800	72	1,800	2,700	1,118	26.40	35.10	41.55	54.30
1,900	76	1,900	2,850	1,181	27.75	36.90	43.65	57.15
2,000	80	2,000	3,000	1,243	29.10	38.70	45.75	60.00
2,100	84	2,100	3,150	1,305	30.45	40.35	47.85	62.70
2,200	88	2,200	3,300	1,367	31.80	42.15	49.95	65.55
2,300	92	2,300	3,450	1,429	33.15	43.80	52.05	68.40
2,400	96	2,400	3,600	1,491	34.50	45.60	54.15	71.25
2,500	100	2,500	3,750	1,553	35.85	47.40	56.25	73.95
2,600	104	2,600	3,900	1,615	37.20	49.05	58.20	76.80
2,700	108	2,700	4,050	1,678	38.55	50.85	60.30	79.65
2,800	112	2,800	4,200	1,740	39.90	52.50	62.40	82.35
2,900	116	2,900	4,350	1,802	41.25	54.30	64.50	85.20
3,000	120	3,000	4,500	1,864	42.60	56.10	66.60	88.05

ELBOW 45 SR

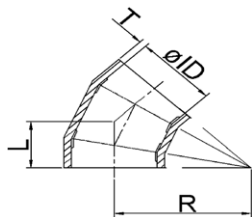
RADIUS TYPE FOR NOMINAL DIAMETER ≤ 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
15	1/2	15	15	6	6.45	6.45	6.45	6.45
20	3/4	20	20	8	6.45	6.45	6.45	6.45
25	1	25	25	10	6.45	6.45	6.45	6.45
32	1.25	32	32	13	6.45	6.45	6.45	6.45
40	1.5	40	40	17	6.45	6.45	6.45	6.45
50	2	50	50	21	6.45	6.45	6.45	6.45
65	2.5	65	65	27	6.45	6.45	6.45	6.45
80	3	80	80	33	6.45	6.45	6.45	6.45
100	4	100	100	41	6.45	6.45	6.45	6.75
125	5	125	125	52	6.45	6.45	6.45	7.35
150	6	150	150	62	6.45	6.45	7.05	8.10
200	8	200	200	83	6.45	7.35	8.10	9.45
250	10	250	250	104	6.45	8.25	9.15	10.95
300	12	300	300	124	6.45	9.00	10.20	12.30
350	14	350	350	145	6.75	9.90	11.25	13.65
400	16	400	400	166	7.50	10.80	12.30	15.15
450	18	450	450	186	8.10	11.70	13.20	16.50
500	20	500	500	207	8.85	12.60	14.25	17.85
600	24	600	600	249	10.20	14.25	16.35	20.70

ELBOW 45 SR

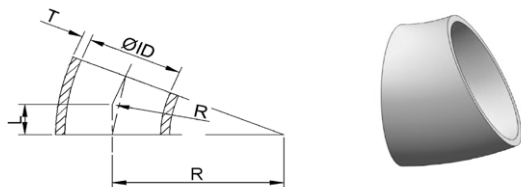
MITERED TYPE FOR NOMINAL DIAMETER > 650 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
650	26	650	650	269	10.80	15.15	17.40	22.05
700	28	700	700	290	11.55	16.05	18.45	23.55
750	30	750	750	311	12.15	16.95	19.50	24.90
800	32	800	800	331	12.90	17.70	20.55	26.25
900	36	900	900	373	14.25	19.50	22.65	29.10
1,000	40	1,000	1,000	414	15.60	21.30	24.75	31.95
1,050	42	1,050	1,050	435	16.20	22.05	25.80	33.30
1,100	44	1,100	1,100	456	16.95	22.95	26.85	34.80
1,200	48	1,200	1,200	497	18.30	24.75	28.95	37.50
1,300	52	1,300	1,300	538	19.65	26.40	31.05	40.35
1,350	54	1,350	1,350	559	20.25	27.30	32.10	41.70
1,400	56	1,400	1,400	580	21.00	28.20	33.15	43.20
1,500	60	1,500	1,500	621	22.35	30.00	35.25	45.90
1,600	64	1,600	1,600	663	23.70	31.65	37.35	48.75
1,700	68	1,700	1,700	704	25.05	33.45	39.45	51.60
1,800	72	1,800	1,800	746	26.40	35.10	41.55	54.30
1,900	76	1,900	1,900	787	27.75	36.90	43.65	57.15
2,000	80	2,000	2,000	828	29.10	38.70	45.75	60.00
2,100	84	2,100	2,100	870	30.45	40.35	47.85	62.70
2,200	88	2,200	2,200	911	31.80	42.15	49.95	65.55
2,300	92	2,300	2,300	953	33.15	43.80	52.05	68.40
2,400	96	2,400	2,400	994	34.50	45.60	54.15	71.25
2,500	100	2,500	2,500	1,036	35.85	47.40	56.25	73.95
2,600	104	2,600	2,600	1,077	37.20	49.05	58.20	76.80
2,700	108	2,700	2,700	1,118	38.55	50.85	60.30	79.65
2,800	112	2,800	2,800	1,160	39.90	52.50	62.40	82.35
2,900	116	2,900	2,900	1,201	41.25	54.30	64.50	85.20
3,000	120	3,000	3,000	1,243	42.60	56.10	66.60	88.05

ELBOW 22.5 LR

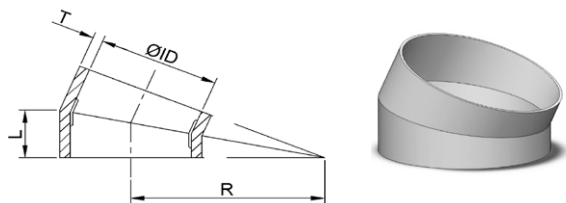
RADIUS TYPE FOR NOMINAL DIAMETER ≤ 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
15	1/2	15	22.5	4.5	6.45	6.45	6.45	6.45
20	3/4	20	30	6	6.45	6.45	6.45	6.45
25	1	25	37.5	7.5	6.45	6.45	6.45	6.45
32	1 1/4	32	48	9.5	6.45	6.45	6.45	6.45
40	1 1/2	40	60	11.9	6.45	6.45	6.45	6.45
50	2	50	75	14.9	6.45	6.45	6.45	6.45
65	2 1/2	65	97.5	19.4	6.45	6.45	6.45	6.45
80	3	80	120	23.9	6.45	6.45	6.45	6.45
100	4	100	150	29.8	6.45	6.45	6.45	6.75
125	5	125	187.5	37.3	6.45	6.45	6.45	7.35
150	6	150	225	44.8	6.45	6.45	7.05	8.10
200	8	200	300	59.7	6.45	7.35	8.10	9.45
250	10	250	375	74.6	6.45	8.25	9.15	10.95
300	12	300	450	89.5	6.45	9.00	10.20	12.30
350	14	350	525	104.4	6.75	9.90	11.25	13.65
400	16	400	600	119.3	7.50	10.80	12.30	15.15
450	18	450	675	134.3	8.10	11.70	13.20	16.50
500	20	500	750	149.2	8.85	12.60	14.25	17.85
600	24	600	900	179	10.20	14.25	16.35	20.70

ELBOW 22.5 LR

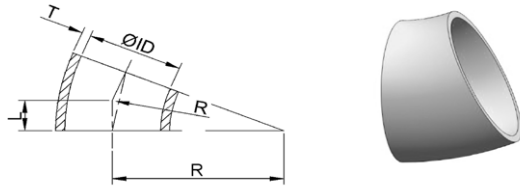
MITERED TYPE FOR NOMINAL DIAMETER > 650 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
650	26	650	975	193.9	10.80	15.15	17.40	22.05
700	28	700	1,050	208.9	11.55	16.05	18.45	23.55
750	30	750	1,125	223.8	12.15	16.95	19.50	24.90
800	32	800	1,200	238.7	12.90	17.70	20.55	26.25
900	36	900	1,350	268.5	14.25	19.50	22.65	29.10
1,000	40	1,000	1,500	298.4	15.60	21.30	24.75	31.95
1,050	42	1,050	1,575	313.3	16.20	22.05	25.80	33.30
1,100	44	1,100	1,650	328.2	16.95	22.95	26.85	34.80
1,200	48	1,200	1,800	358.0	18.30	24.75	28.95	37.50
1,300	52	1,300	1,950	387.9	19.65	26.40	31.05	40.35
1,350	54	1,350	2,025	402.8	20.25	27.30	32.10	41.70
1,400	56	1,400	2,100	417.7	21.00	28.20	33.15	43.20
1,500	60	1,500	2,250	447.6	22.35	30.00	35.25	45.90
1,600	64	1,600	2,400	477.4	23.70	31.65	37.35	48.75
1,700	68	1,700	2,550	507.2	25.05	33.45	39.45	51.60
1,800	72	1,800	2,700	537.1	26.40	35.10	41.55	54.30
1,900	76	1,900	2,850	566.9	27.75	36.90	43.65	57.15
2,000	80	2,000	3,000	596.7	29.10	38.70	45.75	60.00
2,100	84	2,100	3,150	626.6	30.45	40.35	47.85	62.70
2,200	88	2,200	3,300	656.4	31.80	42.15	49.95	65.55
2,300	92	2,300	3,450	686.2	33.15	43.80	52.05	68.40
2,400	96	2,400	3,600	716.1	34.50	45.60	54.15	71.25
2,500	100	2,500	3,750	745.9	35.85	47.40	56.25	73.95
2,600	104	2,600	3,900	775.8	37.20	49.05	58.20	76.80
2,700	108	2,700	4,050	805.6	38.55	50.85	60.30	79.65
2,800	112	2,800	4,200	835.4	39.90	52.50	62.40	82.35
2,900	116	2,900	4,350	865.3	41.25	54.30	64.50	85.20
3,000	120	3,000	4,500	895.1	42.60	56.10	66.60	88.05

ELBOW 22.5 SR

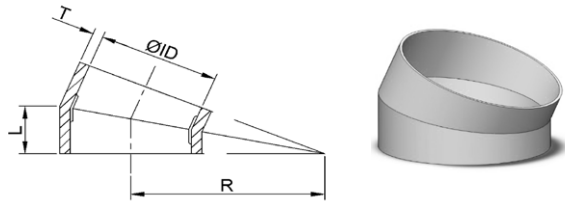
RADIUS TYPE FOR NOMINAL DIAMETER ≤ 600 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
15	1/2	15	15	3	6.45	6.45	6.45	6.45
20	3/4	20	20	4	6.45	6.45	6.45	6.45
25	1	25	25	5	6.45	6.45	6.45	6.45
32	1 1/4	32	32	6.4	6.45	6.45	6.45	6.45
40	1 1/2	40	40	8	6.45	6.45	6.45	6.45
50	2	50	50	9.9	6.45	6.45	6.45	6.45
65	2 1/2	65	65	12.9	6.45	6.45	6.45	6.45
80	3	80	80	15.9	6.45	6.45	6.45	6.45
100	4	100	100	19.9	6.45	6.45	6.45	6.75
125	5	125	125	24.9	6.45	6.45	6.45	7.35
150	6	150	150	29.8	6.45	6.45	7.05	8.10
200	8	200	200	39.8	6.45	7.35	8.10	9.45
250	10	250	250	49.7	6.45	8.25	9.15	10.95
300	12	300	300	59.7	6.45	9.00	10.20	12.30
350	14	350	350	69.6	6.75	9.90	11.25	13.65
400	16	400	400	79.6	7.50	10.80	12.30	15.15
450	18	450	450	89.5	8.10	11.70	13.20	16.50
500	20	500	500	99.5	8.85	12.60	14.25	17.85
600	24	600	600	119.3	10.20	14.25	16.35	20.70

ELBOW 22.5 SR

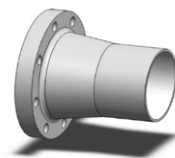
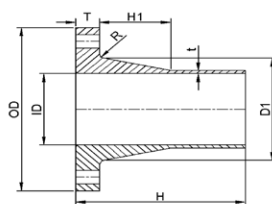
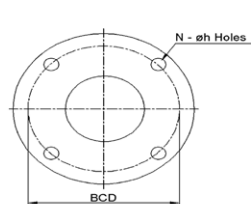
MITERED TYPE FOR NOMINAL DIAMETER > 650 MM



Normal Diameter		ID	R	L	Minimum Thickness			
					OP-PN 06-2.5 V	OP-PN 10-2.5 V	OP-PN 12-2.5 V	OP-PN 16-2.5 V
mm	inch	mm	mm	mm	mm	mm	mm	mm
650	26	650	650	129.3	10.80	15.15	17.40	22.05
700	28	700	700	139.2	11.55	16.05	18.45	23.55
750	30	750	750	149.2	12.15	16.95	19.50	24.90
800	32	800	800	159.1	12.90	17.70	20.55	26.25
900	36	900	900	179.0	14.25	19.50	22.65	29.10
1,000	40	1,000	1,000	198.9	15.60	21.30	24.75	31.95
1,050	42	1,050	1,050	208.9	16.20	22.05	25.80	33.30
1,100	44	1,100	1,100	218.8	16.95	22.95	26.85	34.80
1,200	48	1,200	1,200	238.7	18.30	24.75	28.95	37.50
1,300	52	1,300	1,300	258.6	19.65	26.40	31.05	40.35
1,350	54	1,350	1,350	268.5	20.25	27.30	32.10	41.70
1,400	56	1,400	1,400	278.5	21.00	28.20	33.15	43.20
1,500	60	1,500	1,500	298.4	22.35	30.00	35.25	45.90
1,600	64	1,600	1,600	318.3	23.70	31.65	37.35	48.75
1,700	68	1,700	1,700	338.2	25.05	33.45	39.45	51.60
1,800	72	1,800	1,800	358.0	26.40	35.10	41.55	54.30
1,900	76	1,900	1,900	377.9	27.75	36.90	43.65	57.15
2,000	80	2,000	2,000	397.8	29.10	38.70	45.75	60.00
2,100	84	2,100	2,100	417.7	30.45	40.35	47.85	62.70
2,200	88	2,200	2,200	437.6	31.80	42.15	49.95	65.55
2,300	92	2,300	2,300	457.5	33.15	43.80	52.05	68.40
2,400	96	2,400	2,400	477.4	34.50	45.60	54.15	71.25
2,500	100	2,500	2,500	497.3	35.85	47.40	56.25	73.95
2,600	104	2,600	2,600	517.2	37.20	49.05	58.20	76.80
2,700	108	2,700	2,700	537.1	38.55	50.85	60.30	79.65
2,800	112	2,800	2,800	557.0	39.90	52.50	62.40	82.35
2,900	116	2,900	2,900	576.8	41.25	54.30	64.50	85.20
3,000	120	3,000	3,000	596.7	42.60	56.10	66.60	88.05

FLANGE 150

ANSI B 16.5

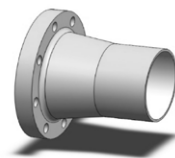
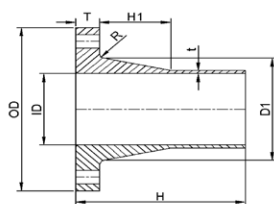
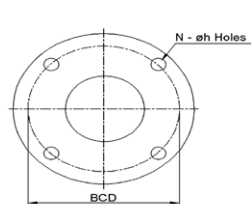


Standard	ID		OD	BCD	D1	T
	mm	inch	mm	mm	mm	mm
ANSI B 16.5	15	1/2	88.90	60.30	33.00	18
ANSI B 16.5	20	3/4	98.55	69.80	40.00	20
ANSI B 16.5	25	1	107.95	79.40	45.00	20
ANSI B 16.5	40	1.5	127.00	98.40	61.80	20
ANSI B 16.5	50	2	152.40	120.60	80.80	24
ANSI B 16.5	65	2.5	177.80	139.70	93.60	24
ANSI B 16.5	80	3	190.50	152.40	104.30	26
ANSI B 16.5	100	4	228.60	190.50	142.40	28
ANSI B 16.5	125	5	254.00	215.90	165.80	32
ANSI B 16.5	150	6	279.40	241.30	191.20	32
ANSI B 16.5	200	8	342.90	298.40	241.90	34
ANSI B 16.5	250	10	406.40	361.90	305.40	36
ANSI B 16.5	300	12	482.60	431.80	369.00	36
ANSI B 16.5	350	14	533.40	476.20	405.00	38
ANSI B 16.5	400	16	596.90	539.70	468.50	42
ANSI B 16.5	450	18	635.00	577.80	506.60	42
ANSI B 16.5	500	20	698.50	635.00	555.50	43
ANSI B 16.5	600	24	812.80	749.30	669.80	48

H1	H	N	ø h	R	t min	
					OP-PN 06-2.5 V	OP-PN 10-2.5 V
mm	mm		mm	mm	mm	mm
54	150	4	15.9	4	4.3	4.3
60	150	4	15.9	4	4.3	4.3
60	150	4	15.9	4	4.3	4.3
60	150	4	15.9	4	4.3	4.3
72	150	4	19	4	4.3	4.3
72	150	4	19	4	4.3	4.3
78	150	4	19	5	4.3	4.3
84	200	8	19	5	4.3	4.3
96	200	8	22.2	6	4.3	4.3
96	200	8	22.2	6	4.3	4.3
102	200	8	22.2	6	4.4	4.9
108	250	12	25.4	6	4.8	5.5
108	250	12	25.4	6	5.3	6
114	275	12	28.6	7	5.7	6.6
126	300	16	28.6	7	6.2	7.2
126	325	16	31.7	7	6.6	7.8
129	350	20	31.7	8	7.1	8.4
144	400	20	34.9	8	8	9.5

FLANGE 150

ANSI B16.47 SERIES A

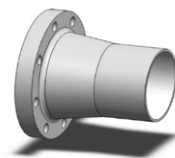
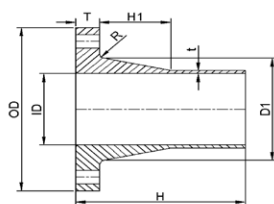
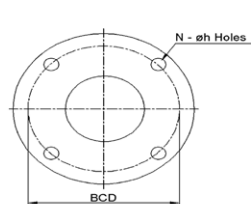


Standard	ID		OD	BCD	D1	T
	mm	inch	mm	mm	mm	mm
ANSI B16.47	650	26	869.95	806.40	726.85	68.3
ANSI B16.47	700	28	927.10	863.60	784.10	71.4
ANSI B16.47	750	30	984.25	914.40	828.55	74.7
ANSI B16.47	800	32	1,060.45	977.90	879.35	81.0
ANSI B16.47	850	34	1,111.25	1,028.70	930.15	82.6
ANSI B16.47	900	36	1,168.40	1,085.80	987.20	85.3
ANSI B16.47	950	38	1,238.25	1,149.30	1,044.35	87.4
ANSI B16.47	1,000	40	1,289.05	1,200.10	1,095.15	90.4
ANSI B16.47	1,050	42	1,346.20	1,257.30	1,152.40	97
ANSI B16.47	1,100	44	1,403.35	1,314.40	1,209.45	102
ANSI B16.47	1,150	46	1,454.15	1,365.20	1,260.25	103
ANSI B16.47	1,200	48	1,511.30	1,422.40	1,317.50	108
ANSI B16.47	1,250	50	1,568.45	1,479.50	1,374.55	111
ANSI B16.47	1,300	52	1,625.60	1,536.70	1,431.80	116
ANSI B16.47	1,350	54	1,682.75	1,593.80	1,488.85	121
ANSI B16.47	1,400	56	1,746.25	1,651.00	1,539.75	124
ANSI B16.47	1,450	58	1,803.40	1,708.10	1,596.80	129
ANSI B16.47	1,500	60	1,854.20	1,758.90	1,647.60	132

H1	H	N	ø h	R	t min	
					OP-PN 06-2.5 V	OP-PN 10-2.5 V
mm	mm		mm	mm	mm	mm
205.0	400	24	34.9	8	8.4	10.1
214.1	450	28	34.9	8	8.9	10.7
224.0	450	28	34.9	8	9.3	11.3
243.1	500	28	41.3	8	9.8	11.8
247.7	550	32	41.3	8	9	11.5
256.0	550	32	41.3	8	10.7	13
262.1	600	32	41.3	8	9.9	12.5
271.3	700	36	41.3	8	11.6	14.2
291	750	36	41.3	8	12	14.7
306	750	40	41.3	8	12.5	15.3
309	750	40	41.3	8	12.2	15.5
324	750	44	41.3	8	13.4	16.5
333	800	44	47.7	8	12.6	16
348	800	44	47.7	8	14.3	17.6
363	800	44	47.7	8	14.7	18.2
372	850	48	47.7	8	15.2	18.8
387	850	48	47.7	8	14.4	18.5
396	850	52	47.7	8	16.1	20

FLANGE 150

ANSI B16.47 SERIES B



Standard	ID		OD	BCD	D1	T
	mm	inch	mm	mm	mm	mm
ANSI B16.47	650	26	785.88	744.50	687.12	41.1
ANSI B16.47	700	28	836.68	795.30	737.92	44.5
ANSI B16.47	750	30	887.48	846.10	788.72	44.5
ANSI B16.47	800	32	941.32	900.20	843.08	46.0
ANSI B16.47	850	34	1,004.82	957.30	893.78	49.3
ANSI B16.47	900	36	1,057.15	1,009.70	946.25	52.3
ANSI B16.47	950	38	1,123.95	1,069.90	999.85	53.8
ANSI B16.47	1,000	40	1,174.75	1,120.60	1,050.45	55.6
ANSI B16.47	1,050	42	1,225.55	1,171.40	1,101.25	59
ANSI B16.47	1,100	44	1,276.35	1,222.20	1,152.05	60
ANSI B16.47	1,150	46	1,341.37	1,284.20	1,211.03	62
ANSI B16.47	1,200	48	1,392.17	1,335.00	1,261.83	65
ANSI B16.47	1,250	50	1,442.97	1,385.80	1,312.63	68
ANSI B16.47	1,300	52	1,493.77	1,436.60	1,363.43	70
ANSI B16.47	1,350	54	1,549.40	1,492.30	1,419.20	71
ANSI B16.47	1,400	56	1,600.20	1,543.10	1,470.00	73
ANSI B16.47	1,450	58	1,674.88	1,611.40	1,531.92	75
ANSI B16.47	1,500	60	1,725.68	1,662.20	1,582.72	76

H1	H	N	ø h	R	t min	
					OP-PN 06-2.5 V	OP-PN 10-2.5 V
mm	mm		mm	mm	mm	mm
123.4	400	36	22.2	8	8.4	10.1
133.4	450	40	22.2	8	8.9	10.7
133.4	450	44	22.2	8	9.3	11.3
137.9	500	48	22.2	8	9.8	11.8
147.8	550	40	25.4	8	9	11.5
157.0	550	44	25.4	8	10.7	13
161.5	600	40	28.6	8	9.9	12.5
166.9	700	44	28.6	8	11.6	14.2
177	750	48	28.6	8	12	14.7
180	750	52	28.6	8	12.5	15.3
186	750	40	31.7	8	12.2	15.5
195	750	44	31.7	8	13.4	16.5
204	800	48	31.7	8	12.6	16
210	800	52	31.7	8	14.3	17.6
213	800	56	31.7	8	14.7	18.2
219	850	60	31.7	8	15.2	18.8
225	850	48	34.9	8	14.4	18.5
228	850	52	34.9	8	16.1	20

CHEVRON GEOT DARAJAT POWER GARUT, WEST JA INDONESIA



HERMAL R STATION AVA



CHEVRON EXPANDS GEOTHERMAL OPERATIONS IN INDONESIA

110-MW Darajat III unit to provide renewable energy for approximately 700,000 additional homes.

Production from the Darajat III unit operated by Chevron's subsidiary Chevron Geothermal Indonesia, Ltd., increases the total capacity at the Darajat geothermal facility to 259 MW. The combined output from Chevron's Darajat and Salak geothermal operations now produces sufficient renew-able energy to supply approximately 3.9 million homes in Indonesia. The Darajat III unit has been approved by the United Nations as a Clean Development Mechanism (CDM) project, a market-based instrument of the UN's Kyoto Protocol to encourage implementation of cost-effective greenhouse gas reductions. Darajat III is the largest geothermal energy project to be registered under the CDM program.

source: www.chevron.com

www.chevron.com/stories/chevron-expands-geothermal-operations-in-indonesia



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COOLING WTR
(AIR PENDING)

PT. PERTAMINA GEOTHERMAL E ULUBELU, LAMP SOUTH SUMATE INDONESIA



ENERGY PUMP RA



PERTAMINA GEOTHERMAL ENERGY

DEVELOPING ADDITIONAL GEOTHERMAL OPERATIONS

Ulubelu Unit 3 dan 4 additional units with total capacity of 2 x 55 MW.

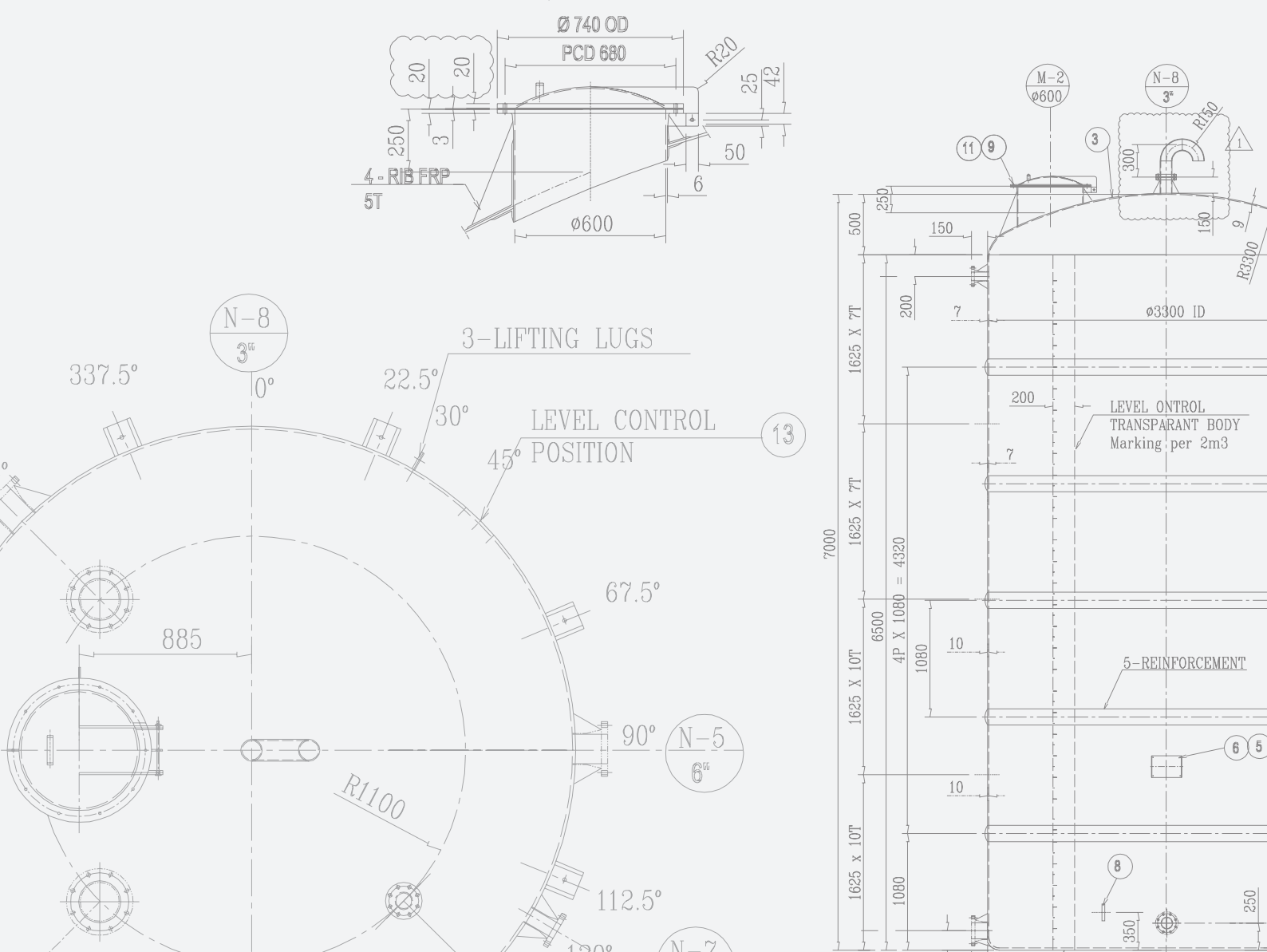
The Ulubelu II geothermal power plant, comprising two units of 55 MW each, is being developed in Ulubelu district of Lampung Province in the southern region of Sumatra Island, Indonesia, adjacent to the 110 MW Ulubelu I geothermal facility. Pertamina Geothermal Energy (PGE) is developing the project to tap into the substantial geothermal resources of the surrounding mountainous areas.

With a gross power output of 116 MW, the project is expected to generate 867 GWh a year with a load factor of 90%. The Ministry of Mining and Energy of Indonesia was awarded the Ulubelu geothermal field concession area to PGE's parent company Pertamina in October 1990. Construction of the first unit (unit 3) is expected to be complete by July 2016, while the second unit (unit 4) is due to be finished by May 2017.

source: www.power-technology.com
www.power-technology.com/projects/ulubelu-ii-geothermal-power-plant/







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