طرح نگهداشت و افزایش تولید 27 مخزن

STANDARD DETAIL DRAWING FOR PRESSURE VESSELS AND HEAT EXCHANGERS

نگهداشت و افزایش تولید میدان نفتی بینک

D02	DEC.2022	FI	H.Adineh	M.Fakharian	M.Mehrshad	
D01	AUG. 2022	IFI	H.Adineh	M.Fakharian	M.Mehrshad	
D00	AUG. 2021	IFI	M.Asgharnejad	M.Fakharian	Sh.Ghalikar	
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Class: 3 | **CLIENT Doc. Number: F2C-707123**

Status:

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built –Approved

REVISION RECORD SHEET

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1.0 INTRODUCTION

Binak oilfield in Bushehr province, a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
GENERAL CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

The purpose of this document is to provide the standard drawings for the all accessories of press ure vessels and heat exchangers used in this project.

It shall be used in conjunction with data/requisition sheets for present document subject.

3.0 NORMATIVE REFERENCES

The latest edition of following codes & standards are applicable in this project (unless otherwise mentioned):

3.1 LOCAL CODES AND STANDARDS

- IPS-G-ME-150 — Iranian Petroleum Standard– Engineering & Material Standard for Towers , Reactors, Pressure vessels & Internals
- IPS-M-PI-130 — Iranian Petroleum Standard–Material & Equipment Standard for Pig Launching & Receiving Traps
- IPS-E-PI-240 — Iranian Petroleum Standard– Engineering Standard for Plant Piping Systems
- IPS-G-GN-210 — Iranian Petroleum Standard–General Standard for Packing & Packages
- IPS-E-CE-210 — Iranian Petroleum Standard–Engineering Standard for Steel Structures
- IPS Standard Drawings
  - IPS-D-ME-002 — Lifting Lug to Lift Vessels Up to 60 Tons
  - IPS-D-ME-003 — Lifting Lug to Lift Vessels Up to 200 Tons
  - IPS-D-ME-010 — Vertical Vessels Support Skirt
  - IPS-D-ME-011 — Support Leg and Base
  - IPS-D-ME-030 — Vortex Breaker
  - IPS-D-ME-031 — Baffle for Column and Drum
  - IPS-D-ME-042 — Hinge & Davit Details Manholes
  - IPS-D-ME-100 — Nameplate for Pressure Vessels
  - IPS-D-ME-101 — Nameplate & Name Plate Holder for Heat Exchanger
  - IPS-D-ME-104 — Saddle Details for Horizontal Vessels
  - IPS-D-ME-200 — Typical Details Vessels Ladders & Platforms

3.2 INTERNATIONAL CODES AND STANDARDS

- ASME — American Society of Mechanical Engineers
  - Sec .VIII — Rules for Construction of Pressure Vessels-Design
  - B 31.3 — Chemical Plant and Petroleum Refinery Piping
  - B 31.8 — Gas Transportation & Distribution Piping Systems
  - B 31.8 — Gas Transportation & Distribution Piping Systems

- B 16.5 Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24
- B 16.9 Steel Butt Welding Fitting
- B 16.11 Forged Steel Fittings
- B 16.20 Metallic Gaskets for Pipe Flanges – Ring Joint Gaskets, Spiral Wound and Jacketed
- B 16.21 Non- Metallic Gasket for Pipe Flanges
- B 16.47 Large Diameter Steel Flanges NPS 26 Through NPS 60
- B 1.20.1 Pipe Threads, General Purpose

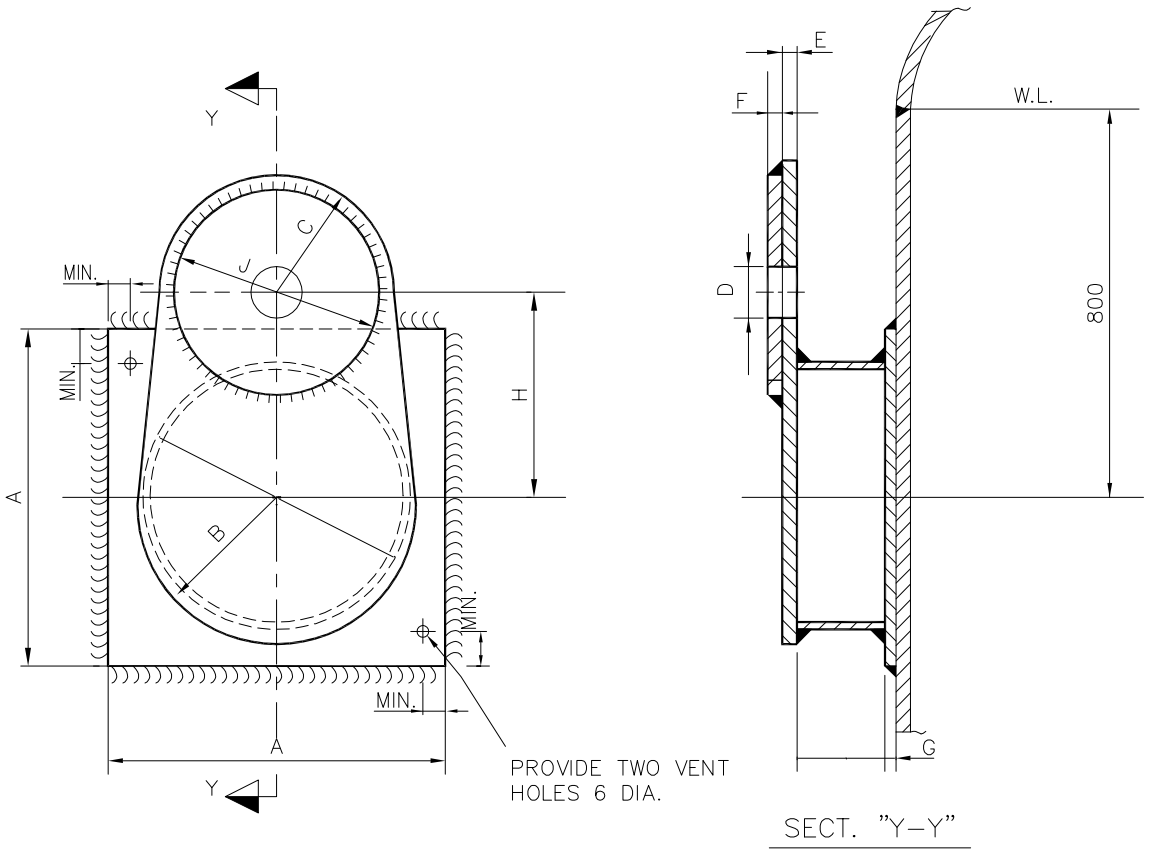
- API 5L Specification for Line Pipes
- AISC Manual of Steel Construction

3.3 THE PROJECT DOCUMENTS

- BK-GNRAL-PEDCO-000-ME-SP-0001 Specification for Pressure Vessels
- BK-GNRAL-PEDCO-000-PI-SP-0001 Specification for Insulation
- BK-GNRAL-PEDCO-000-PI-SP-0004 Specification for Metallic Pipes
- BK-GNRAL-PEDCO-000-PI-SP-0005 Specification for Fittings, Flanges, Gaskets and Bolts
- BK-GNRAL-PEDCO-000-PI-SP-0006 Specification for Painting

4 .0 STANDARD DRAWINGS

4.1 LIFTING LUG TO LIFT VERTICAL VESSEL UP TO 60 TONES

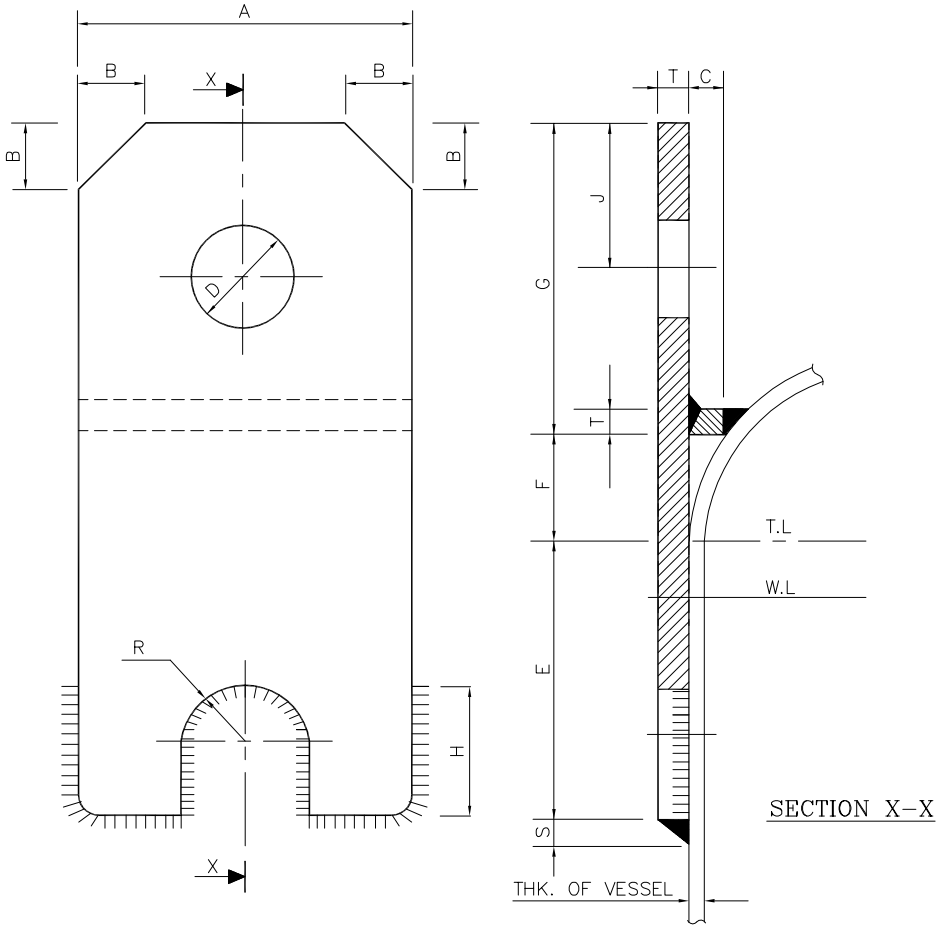


(SEE NOTE 8) LIFTING LUG LIFTING CAPACITY	PIPE			PLATES								
	DN	THK.MIN.	L	A	B	C	D	E	F	G	H	J
≦ 5	150	7.11	60	*	100	55	27	8	–	*	130	–
> 5 ≦ 10	200	8.18	85	*	125	85	38	10	–	*	170	–
> 10 ≦ 20	200	8.18	85	*	125	100	44	10	9	*	180	180
> 20 ≦ 25	250	9.27	100	*	150	120	54	12	9	*	210	220
> 25 ≦ 30	300	8.38	110	*	175	160	60	12	9	*	250	300

NOTES:

1. All dimensions are in millimeters unless otherwise indicated.
2. In case of conflict between this standard and the vessel drawing the latter shall govern.
3. For positioning of lifting lug see equipment drawing.
4. Welding size to be 0.7 of the thickness.
5. Lifting lug materials–plates as per vessel material or equivalent, when carbon steel vessel, the minimum required is ASTM–A 516, GR. 70.
6. Pipe materials, A 106, GR. B or equivalent.
7. The plate welded to shell for alloy steel equipment shall be same material of side to which it is welded.
8. Two lifting lugs are required.
9. A and g are width and thickness of the reinforcing plate, which are not mentioned in this table.

4.2 LIFTING LUG TO LIFT VERTICAL VESSEL UP TO 200 TONES



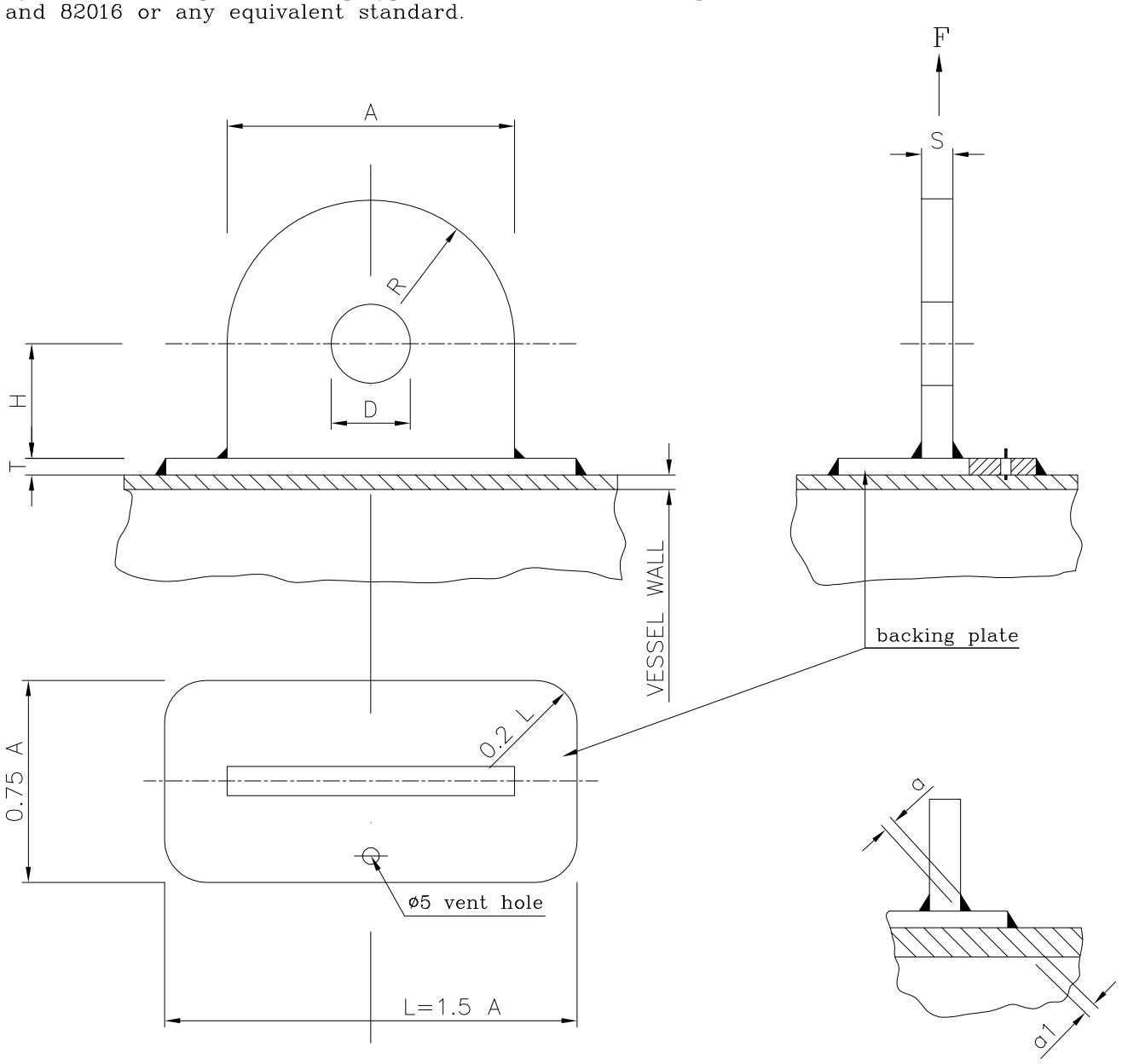
MAX. WEIGHT OF VESSEL (TON)	A	B	C	D	E	F	G	H	J	K	R	S	T
10	180	25	25	65	160	SEE NOTE 2	160	80	90	40	40	10	12
25	230	40	40	75	230		230	130	90	40	40	16	25
50	300	50	50	75	280		300	150	115	50	50	22	40
100	400	70	70	100	360		400	200	150	75	75	32	50
150	500	90	80	130	410		500	250	180	90	90	40	70
200	600	100	100	150	490		600	300	230	100	100	45	80

NOTES:

1. All dimensions are in millimeters unless otherwise specified.
2. Dimension "F" to be determined by the shape of head in conjunction with dimension "C".
3. Fillet weld size "S" shall not exceed shell thickness.
4. Material shall be ASTM-A516 Gr. 70 or equivalent for carbon steel vessels.
5. Lifting lug material for alloy steel vessel shall be the same as material of the vessel.
6. Two lifting lugs shall be considered for each vessel.
7. In case of conflict between vessel drawing and this drawing, vessel drawing shall govern.

4.3 LIFTING LUG TO LIFT HORIZONTAL VESSEL

Eyelets are the preferred lug type and shall be used together with shackles acc. to DIN 82101 and 82016 or any equivalent standard.



Dimension see table 1.

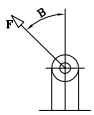
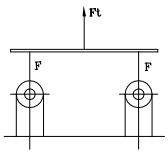
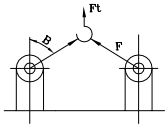
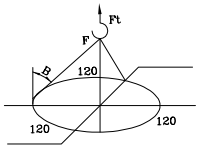
Allowable force see table 2.

a= 0.7 x T
a1= 0.7 x vessel wall
(max. a1=a)

Lug size	Shackle size		A	H*)	R	S	T	D
	DIN 82016	DIN 82101	mm	mm	mm	mm	mm	mm
A1, B1	-	5	110	55	55	10	8	38
A2, B2	-	5	142	60	71	15	8	38
A3, B3	10	10	210	75	105	15	10	50
A4, B4	16	16	260	95	130	20	14	62
A5, B5	25	25	310	115	155	25	16	74

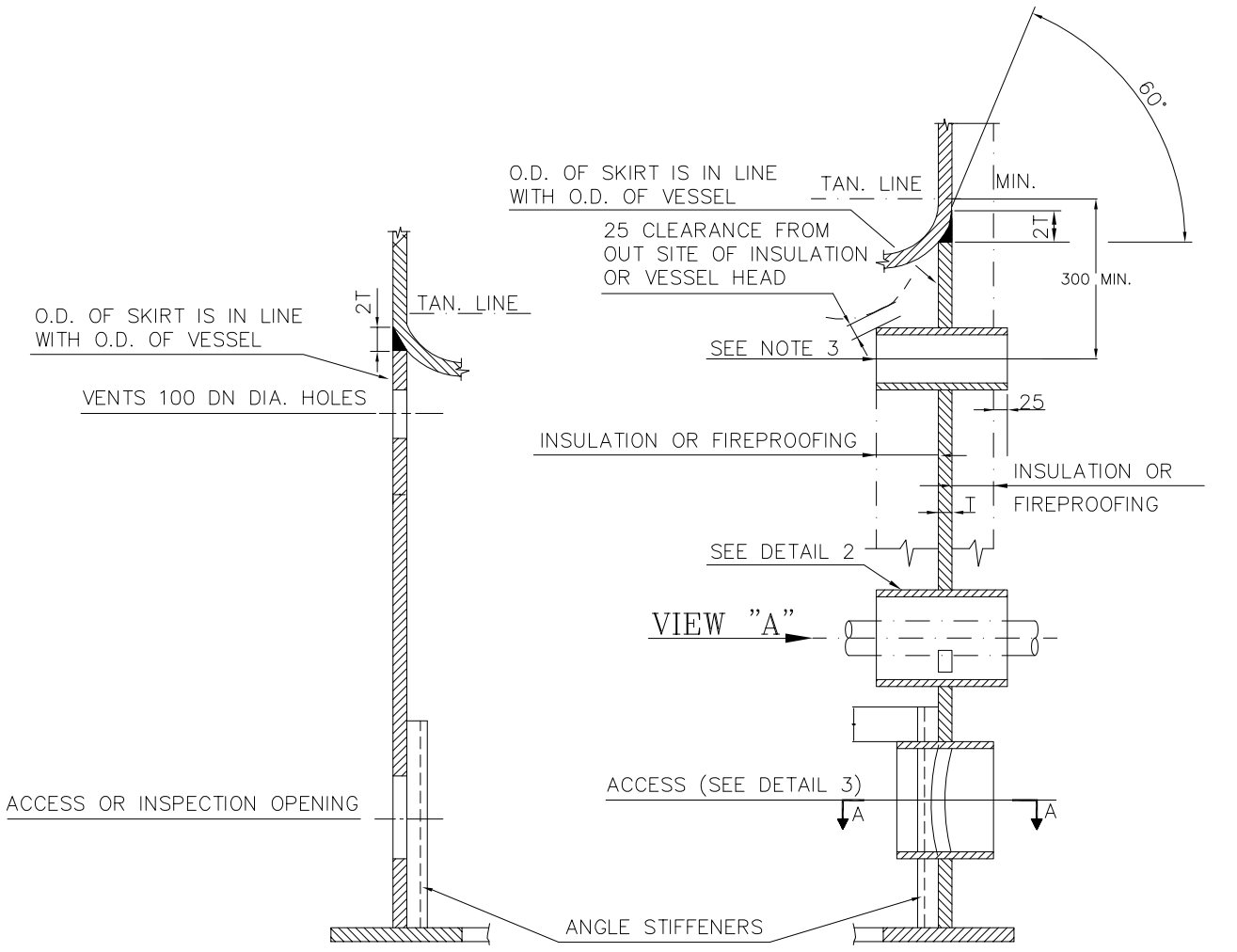
*) Dimension H min. Is determined to fit shackles size due to curved or inclined surface of vessel. In case dimension H has to be increased stress calculation shall be performed so as to check lugs and relevant welding seams.

Table 2: Eyelets, Allowable Forces

		Angle of inclination B **)	A1,B1	A2,B2	A3,B3	A4,B4	A5,B5
Allowable force F for single lug		0-60°	Allowable force F in kN				
			25	50	100	160	250
Total allowable force Ft for two lugs and traverse		0°	Total Allowable force Ft in kN				
			50	100	200	320	500
Total allowable force Ft for two lugs		0-15°	48	96	193	309	482
		15-30°	43	86	173	277	433
		30-45°	35	70	141	226	353
		45-60°	25	50	100	160	250
Total allowable force Ft for three lugs		0-15°	72	144	289	463	724
		15-30°	64	129	259	415	649
		30-45°	53	106	212	339	530
		45-60°	37	75	150	240	375

**) Angle of inclination ß as defined above shall never be greater than 60°.

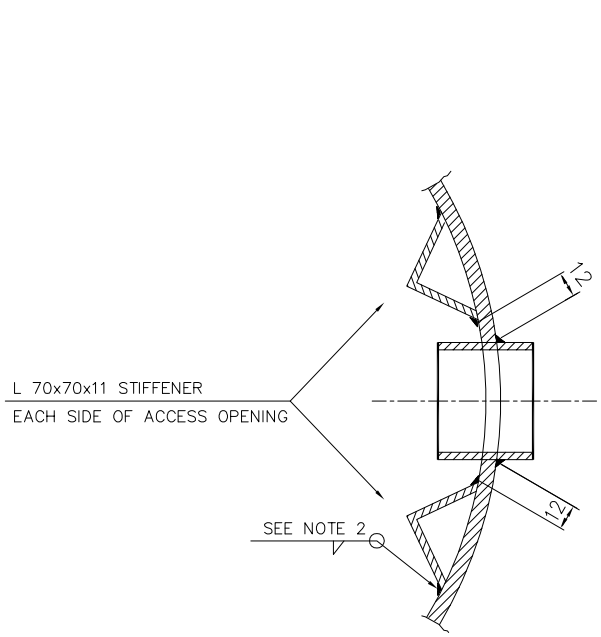
4.4 VERTICAL VESSEL SUPPORT SKIRT OPENING DETAILS



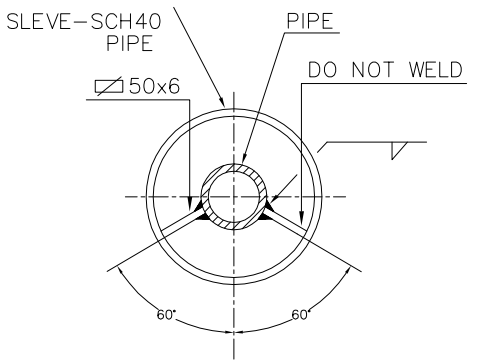
OPENINGS

SLEEVED OPENINGS

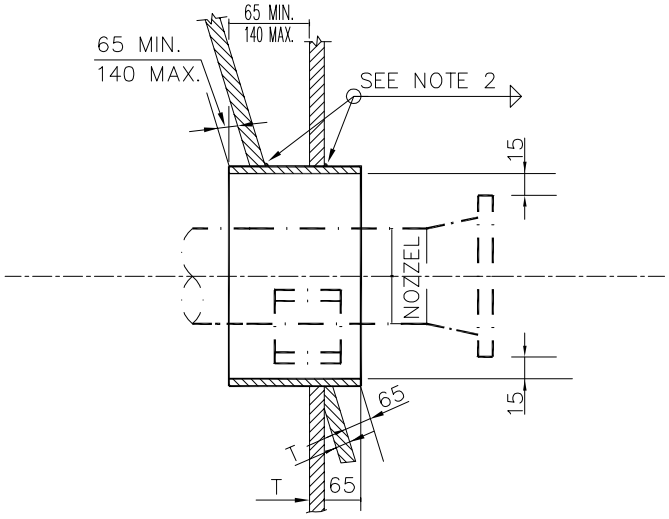
USED WHEN SKIRT IS INSULATED OR FIREPROOFED



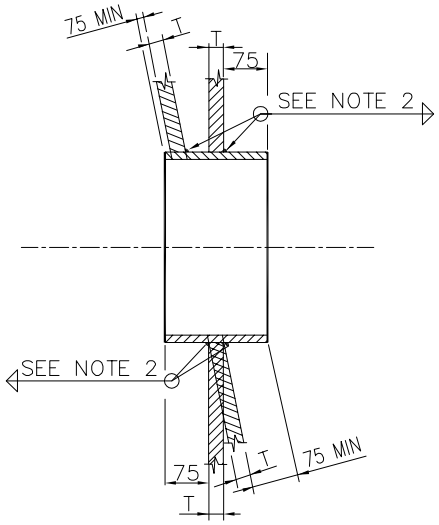
TYPICAL ANGLE STIFFENERS
SECTION A-A



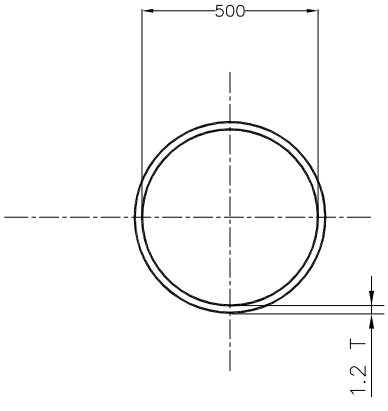
VIEW "A"



TYP. PIPE OPENING

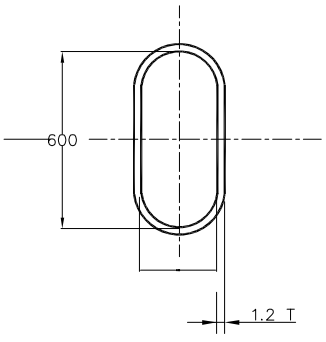


DETAIL 3
ACCESS AND INSPECTION OPENING



TYPE "A"

DETAIL 2



TYPE "B"

SKIRT VENT REQUIREMENTS

SKIRT O.D.	No. OF VENTS
915 AND SMALLER	2
916 THRU 1830	4
1831 THRU 2745	6
2746 TRHU 3660	8
3661 THRU 4575	10
4576 THRU 5490	12

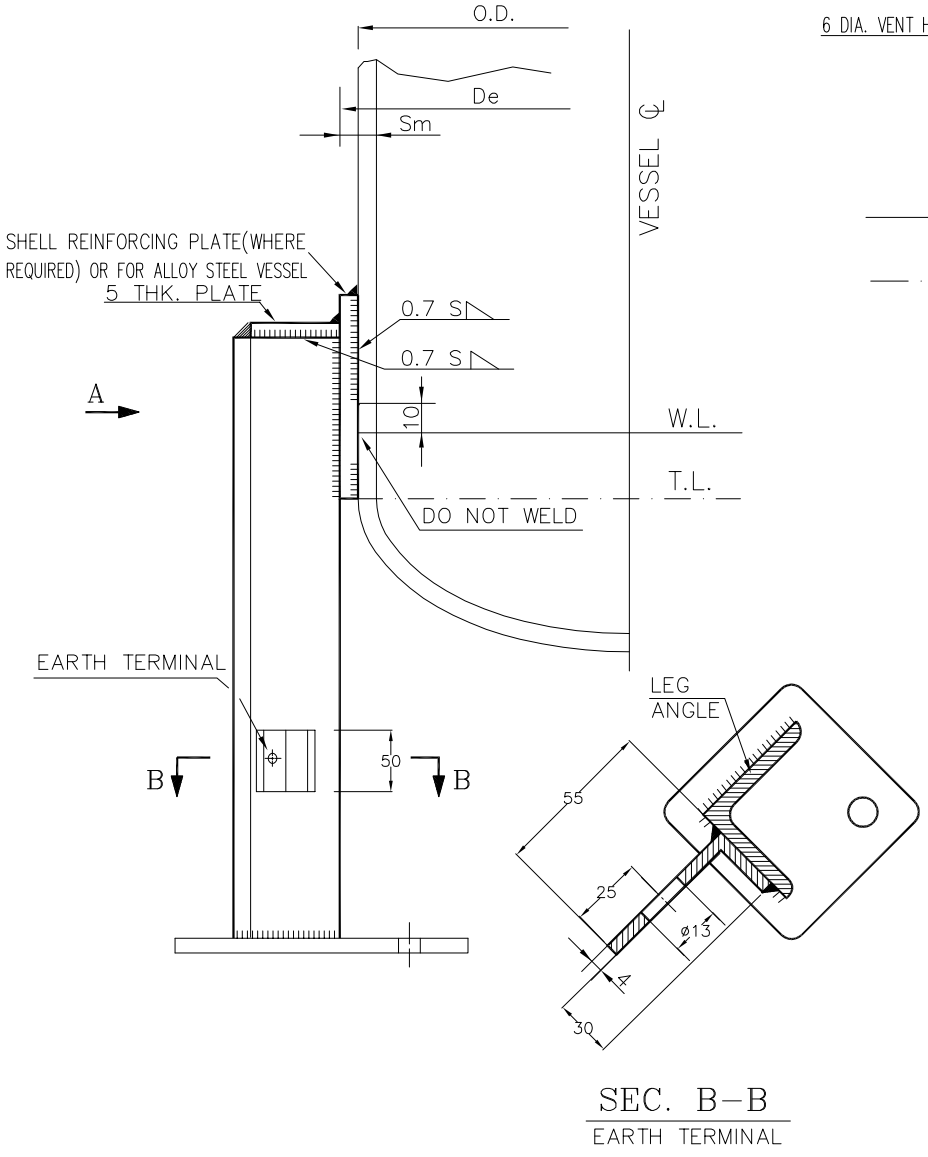
SKIRT ACCESS OR INSPECTION OPENING REQ.

SKIRT O.D.	No.	TYPE
⩽ 850	1	TYPE "B"
851 THRU 950	1	TYPE "A"
951 THRU 1500	1	TYPE "A"
>1500	2	TYPE "A"

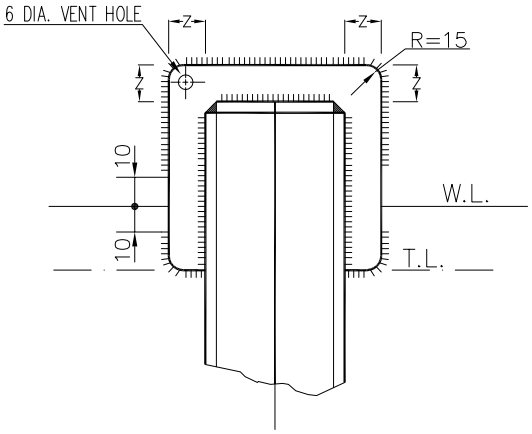
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND PIPE SIZES ARE DN.
2. ALL WELDINGS SHALL BE OF CONTINUOUS FILLET TYPE WITH DIMENSIONS THE THINNER OF THE WELDED PARTS, UNLESS OTHERWISE SPECIFIED.
3. 3-VENTS SHALL BE 100 DN, 6.02 THK. AND SHALL BE EQUALLY SPACED ABOUT THE CIRCUMFERENCE.

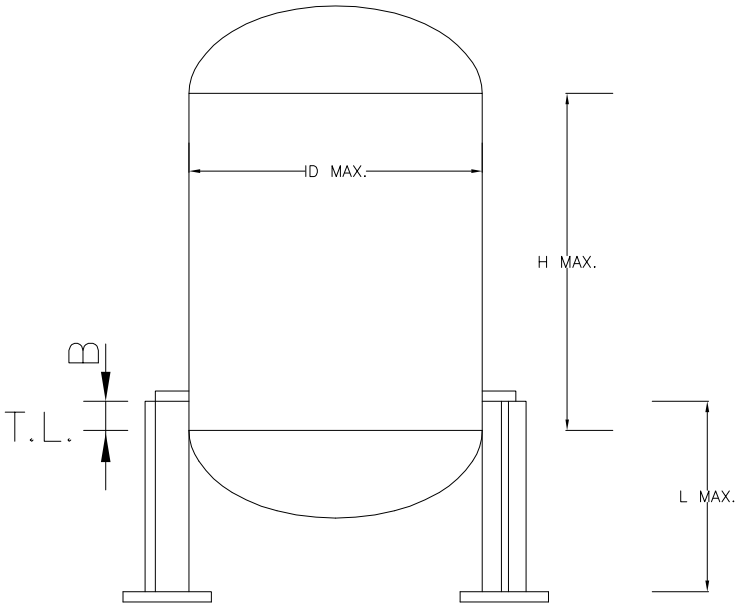
4.5 SUPPORT LEG AND BASE PLATE DETAILS

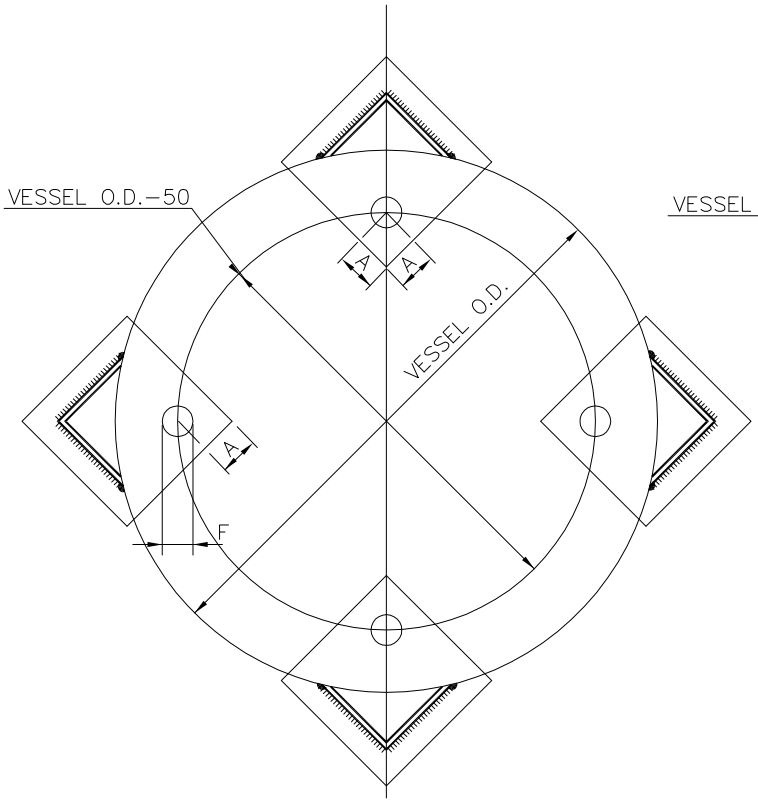


SEC. B-B
EARTH TERMINAL

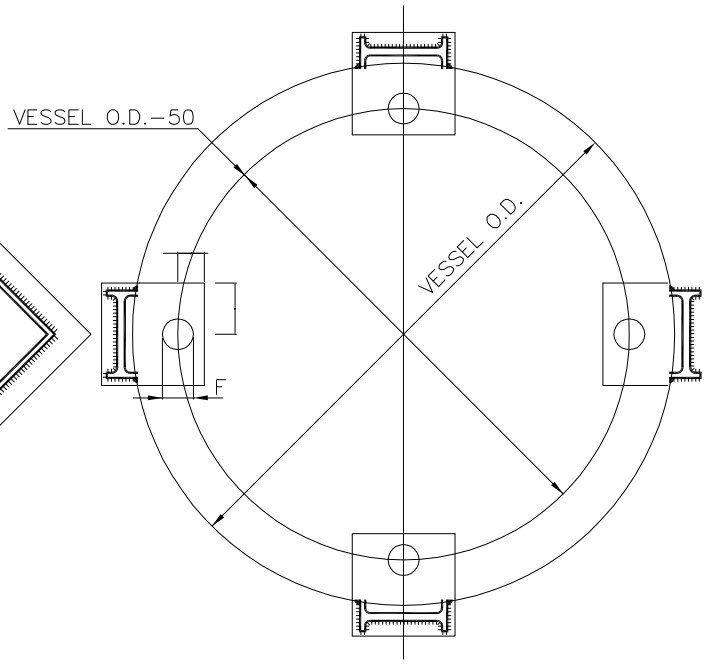


VIEW A





LEG FROM ANGLE



LEG FROM I-BEAM

H MAX (mm)	ID MAX (mm)	TOTAL MAX WEIGHT (HYDRO TEST+INT.) TON.	LEG SIZE (mm)	BASE PLATE SIZE mm
1000	UP TO 1300	3.00	L 75 x 75 x 13	140 x 140 x 14
	1300 TO 1600	5.00	L 100 x 100 x 13	205 x 205 x 14
	1600 TO 2000	8.50	L 100 x 100 x 16	200 x 200 x 15
2000	UP TO 1300	4.7	L 100 x 100 x 13	205 x 205 x 14
	1300 TO 1600	7.3	L 100 x 100 x 16	200 x 200 x 15
	1600 TO 2000	12.0	L 130 x 130 x 13	230 x 230 x 14
3000	UP TO 1300	6.3	L 100 x 100 x 13	205 x 205 x 14
	1300 TO 1600	9.0	L 100 x 100 x 16	200 x 200 x 15
	1600 TO 2000	15.7	L 130 x 130 x 16	230 x 230 x 16
4000	UP TO 1300	7.5	L 100 x 100 x 13	205 x 205 x 14
	1300 TO 1600	12.0	L 130 x 130 x 13	230 x 230 x 14
	1600 TO 2000	19.3	L 130 x 130 x 20	230 x 230 x 20
5000	UP TO 1300	9.5	L 100 x 100 x 16	200 x 200 x 15
	1300 TO 1600	14.4	L 130 x 130 x 16	230 x 230 x 16
	1600 TO 2000	21.0	L 150 x 150 x 13	300 x 300 x 15
6000	UP TO 1300	11.0	L 130 x 130 x 11	255 x 255 x 15
	1300 TO 1600	16.3	L 130 x 130 x 16	230 x 230 x 16
	1600 TO 2000	25.0	IPE 270	
7000	UP TO 1300	12.7	L 130 x 130 x 13	230 x 230 x 14
	1300 TO 1600	19.0	L 130 x 130 x 20	230 x 230 x 20
	1600 TO 2000	30.0	IPE 300	
8000	UP TO 1300	14.3	L 130 x 130 x 16	230 x 230 x 14
	1300 TO 1600	21.4	L 150 x 150 x 13	300 x 300 x 16
9000	UP TO 1300	15.9	L 130 x 130 x 16	230 x 230 x 16
	1300 TO 1600	23.8	IPE 270	

NOTES:

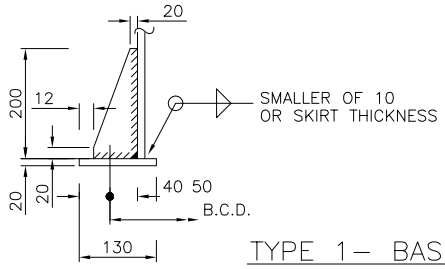
1. All dimensions are in mm, otherwise as specified.
2. Vessel drawing specifies requirement of reinforcing pad for carbon steel vessels. For alloy steel vessels reinforcing pad is required. pad thickness must be indicated on the vessel drawing. z dimension shall be sized by vendor.
3. Where required reinforcing material should be the same as vessel material.
4. Provide two earth terminals at 180° for equipment with four support legs MAT. 18-8 S.S.
5. S=LEG (Angle) Thickness
6. For intermediate values of the table use larger figures.
7. MAX. Length of leg (L) is 2.5 meters.
8. All corners of base plate shall be rounded off to A 10 mm radius.
9. No wind or earth quake loadings have been considered.
10. Temperature effect has not been considered.
11. Compression strength of the concrete is 3000 PSI.
12. Table can be used based on the vessel weight.
13. Support legs shall have the same p-number as the vessel to which they are welded. For CS vessels supp. Material is ASTM. A-36 for alloy vessels support material is the same as vessel material.
14. The welds shall be carried out and inspected at shop as per ASME code.

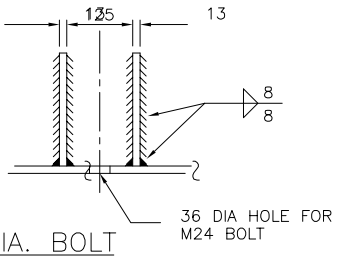
NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک	PEDCO HIRGAN ENERGY

شماره پیمان:	Standard Detail Drawing for Pressure Vessels and Heat Exchanger	شماره صفحه: ۲۰ از ۵۶

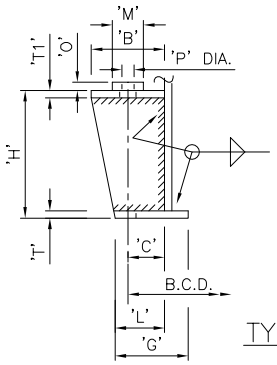
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه
BK	GNRAL	PEDCO	000	ME	DW	0001	D02

053-073-9184

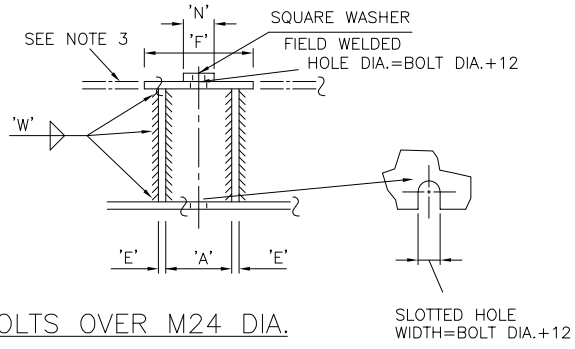




TYPE 1– BASE LUG FOR M24 DIA. BOLT



SMALLER OF 10
OR SKIRT THICKNESS



TYPE 2– BASE LUG FOR BOLTS OVER M24 DIA.

SKIRT ID AT BASE RING	MINIMUM NUMBER OF ANCHOR BOLTS (SEE NOTE 1)			
	OVERALL HEIGHT OF VESSEL (METERS)			
	UP TO 10m	10m TO 30m	30m TO 50m	OVER 50m
UP TO 2300	4	8	12	16
2300 & OVER	8	8	12	16

	BOLT SIZE	EFFECTIVE STRESS AREA sqmm see note 6	DIMENSIONS														
			A	B	C	E	F	G	H	L	T	T1	W	M	N	O	P
	M24	235.6	80	100	55	10	140	125	250	70	22	16	10	70	110	12	26
	M30	442.1	100	115	60	10	150	150	300	75	28	19	10	75	120	14	33
	M36	672.1	100	130	65	10	150	165	300	85	31	21	10	85	120	14	39
	M42	949.1	100	140	70	13	150	180	300	95	33	24	10	100	140	16	45
	M48	1273.2	115	150	75	13	180	190	360	100	35	27	10	110	150	16	52
	M56	1797.4	130	165	85	16	200	220	380	115	37	32	13	115	170	19	62
	M64	2411.7	130	180	90	16	200	240	410	125	43	37	13	125	180	19	70
*	M72	3154.0	145	210	105	20	225	280	440	145	52	43	16	140	190	22	78
*	M80	4000.0	160	240	120	22	250	320	510	160	59	49	16	145	220	25	86

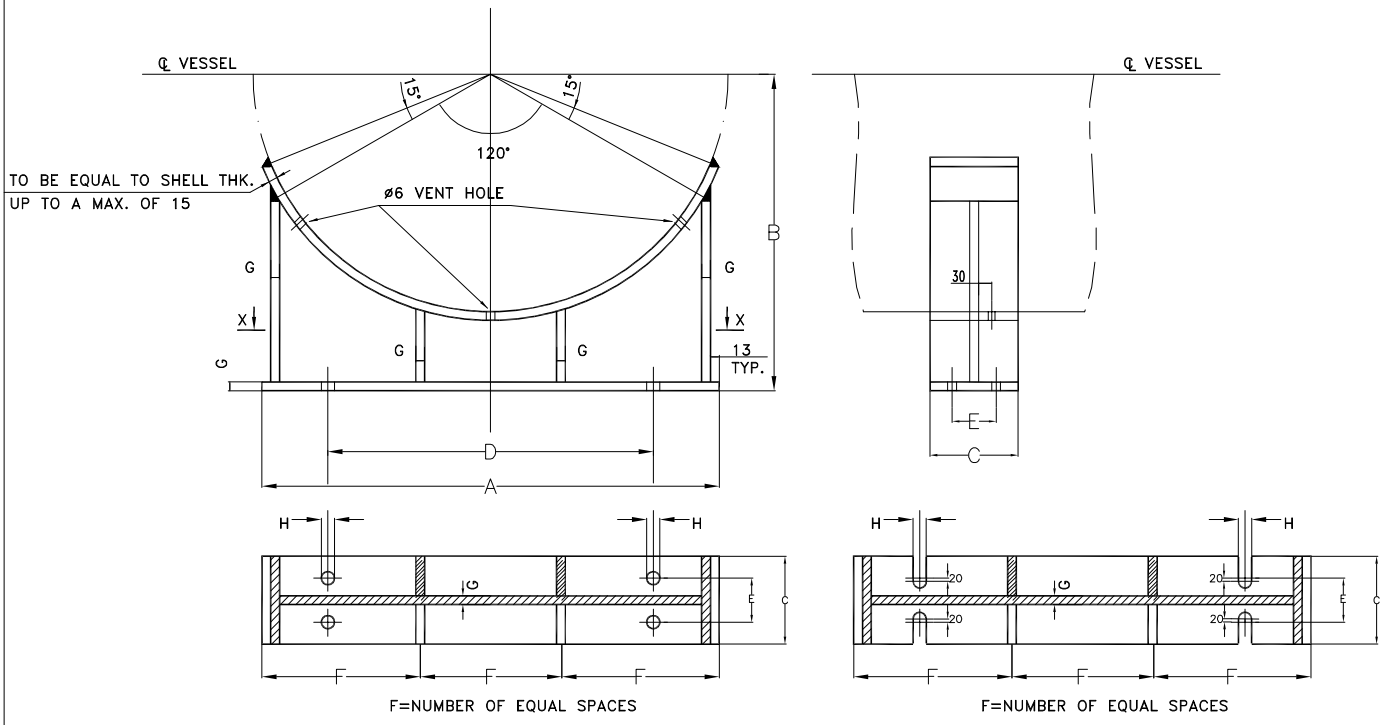
GENERAL NOTES:

1. Actual vessel requirements decided by calculation. the number of anchor bolts shall be a multiple of four.
2. If necessary, allowance to be made for expansion of vessel.
3. Continuous top ring may be substituted in all cases, but must be provided if
   $\frac{\Pi \times B.C.D}{NO.\ OF\ LUGS}$ <250 For bolts M30 to M42 DIA. INCL.
   <300 For bolts M48 to M80 DIA. INCL.
4. Minimum bolt spacing in all cases must not be less than six x bolt diameter.
5. These bolt sizes should only be specified if no alternative is possible.

* 6. Allows for 3mm corrosion on core diameter.

7. Bolt holes to straddle north & south C'S, unless stated otherwise.
8. All specified thicknesses and basering dimensions shall be confirmed by vendor.
9. All contacting edges of plates shall be welded with continuous fillet weld.

4.7 SADDLE DETAILS FOR HORIZONTAL VESSELS



SECTION X-X (FIXED SADDLE)

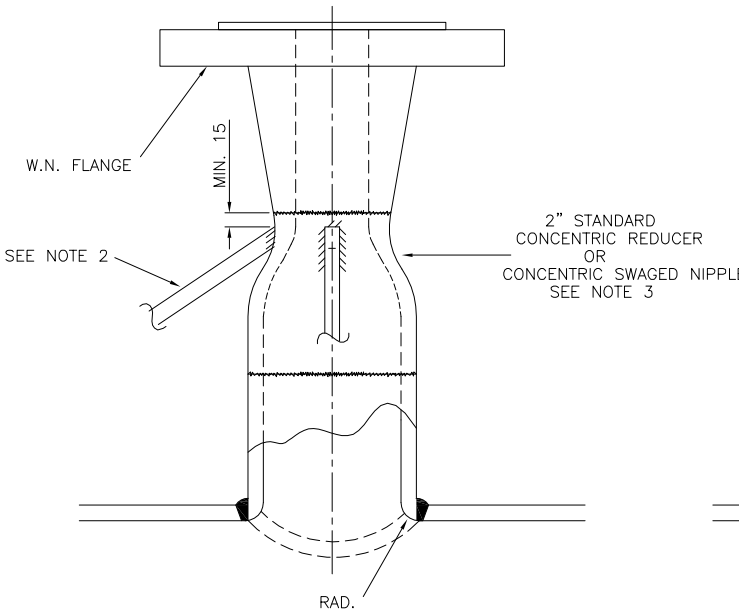
SECTION X-X (SLIDING SADDLE)

VESSEL O.D.	A	B	C	D	E	F No. OF EQ. SPACES	G	H	BOLTS DIA. (NOTE 5)	MAX. LOAD PER SADDLE (KG.)
600	600	475	150	350	89	2	10	26	M20	2500
750	750	550		450						
900	900	625		600						5000
1050	1050	700		750			13			9000
1200	1200	775		900		3		30	M24	20000
1350	1350	850		1000						
1500	1500	925		1150						
1650	1650	1000		1250						45000
1800	1800	1075	200	1400	114	4	16	36	M30	
1950	1950	1150		1550						
2100	2100	1225		1650						65000
2250	2250	1300		1800						
2400	2400	1375		1900						100000

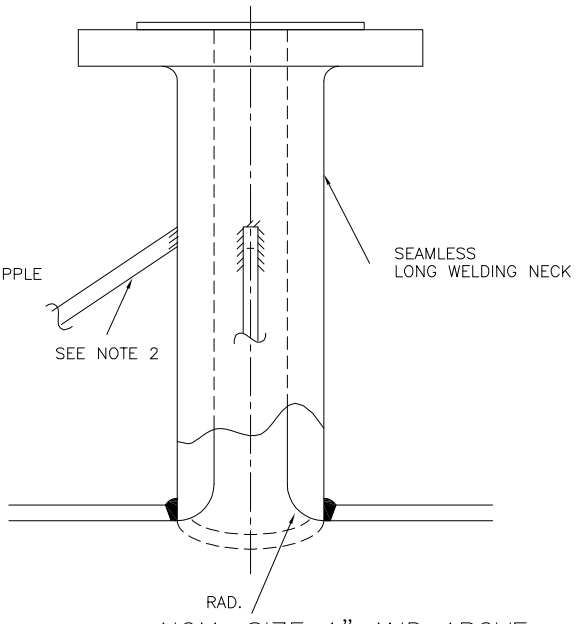
DIMENSIONS OF SADDLE

NOTES:
1. All dimensions are in millimeters unless otherwise specified.
2. Top saddle plate material shall be the same as the shell plate.
3. Fix points of saddle plates shall be continuously fillet WELDED ON both sides of the plate leg length of 0.7 plate Thk.
4. If the load on one saddle is exceeding the max. saddle load,the low friction supports shall be installed under the sliding saddle.
5. Bolt material shall be as per related data sheet.

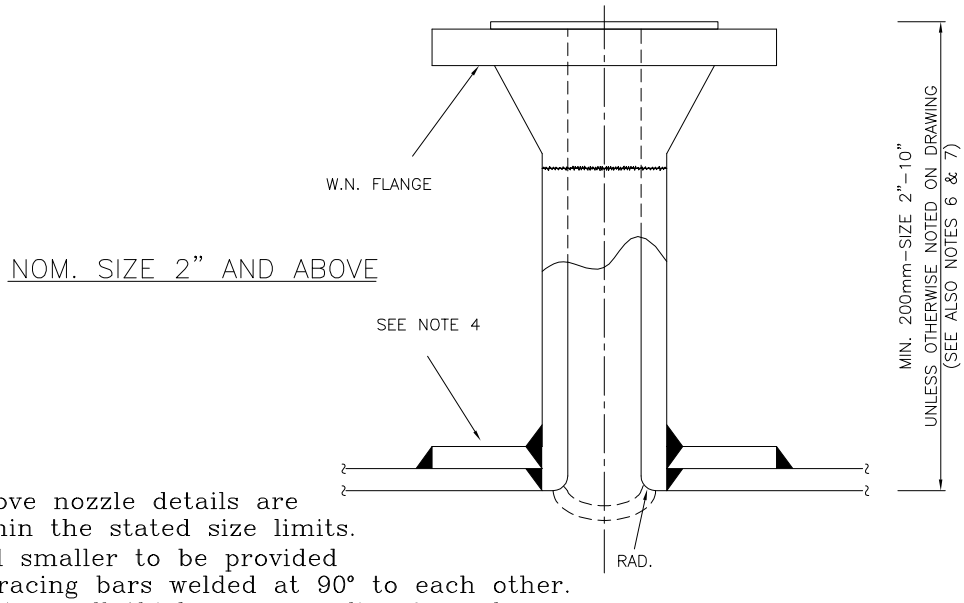
4.8 NOZZLE DETAILS



NOM. SIZE 3/4" UP TO 1 1/2"



NOM. SIZE 1" AND ABOVE

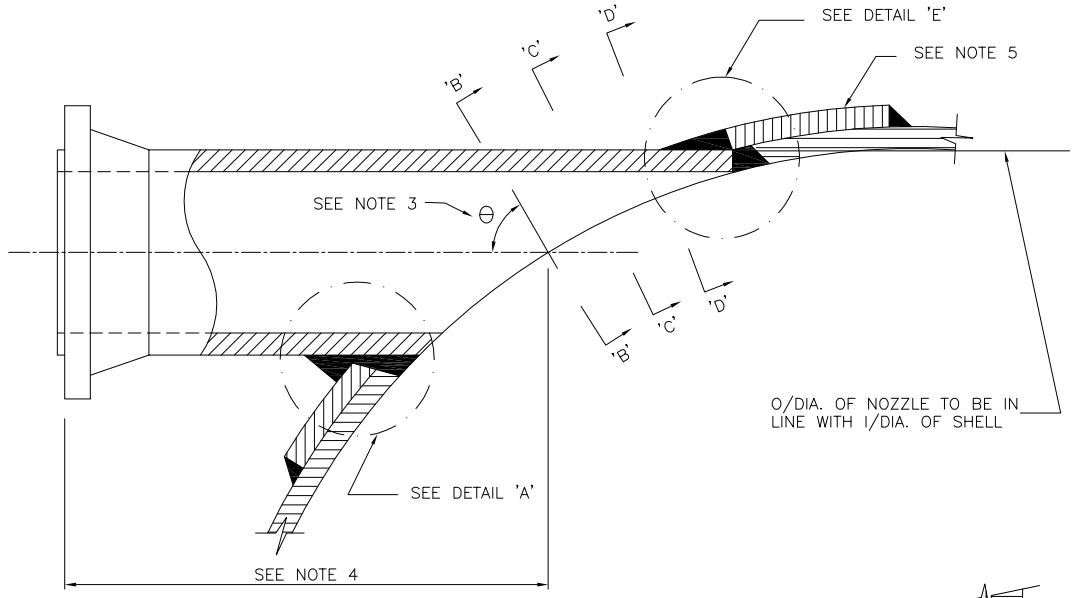


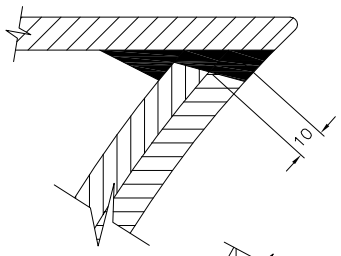
NOM. SIZE 2" AND ABOVE

GENERAL NOTES:

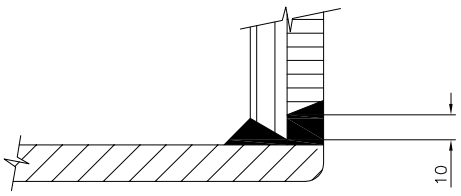
1. Any of the above nozzle details are acceptable within the stated size limits.
2. Nozzles 2" and smaller to be provided with 2-40x6 bracing bars welded at 90° to each other.
3. Reducer and pipe wall thickness according to code requirements but sch. 160 minimum.
4. Reinforcement to be provided as applicable to contract standards.
5. Flanges other than W.N. can only be used if allowed by contract standards and approved by contractor/consultant.
6. For vessels with insulation thicker than 50mm, difference above 50mm shall be added to this dimension.
7. See individual vessel data sheet for the type of flange and reinforcement of nozzles and their projections.

4.9 TANGENTIAL NOZZLE WELD DETAILS

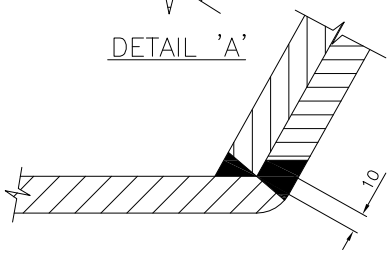




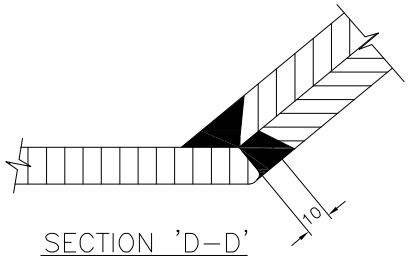
DETAIL 'A'



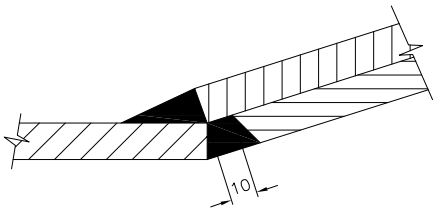
SECTION 'B–B'



SECTION 'C–C'



SECTION 'D–D'

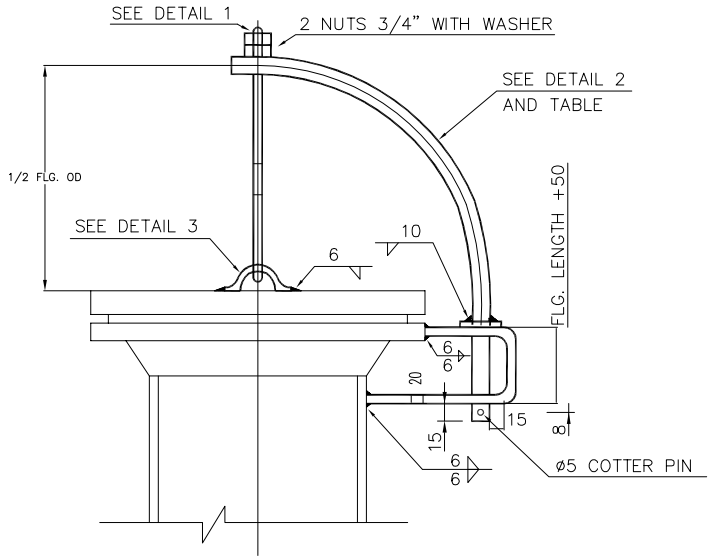


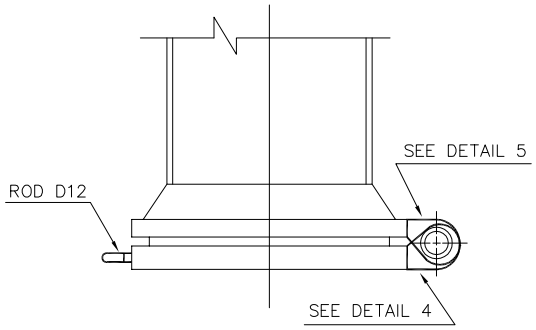
DETAIL 'E'

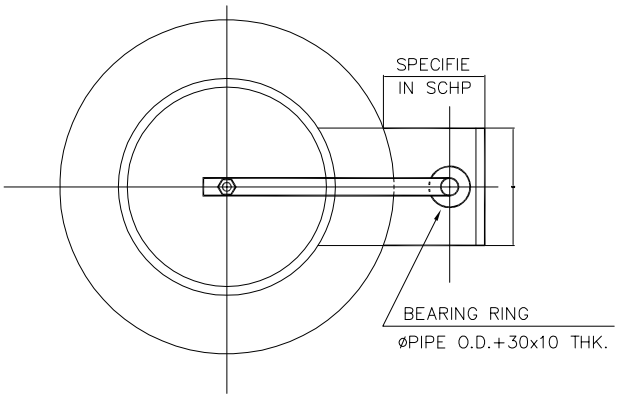
GENERAL NOTES :

1. Shell weld preparation varies gradually from detail 'A' through 'B–B', 'C–C', 'D–D' TO detail 'E'.
2. Reinforcing plate to nozzle neck weld varies but must equal a full penetration weld.
3. Tangential nozzles to comply with code requirements. (Note: when using bs 5500 is not to exceed 50°, unless a proof test is carried out or a proven design is submitted for contractor/consultant review).
4. If stand out from vessel shell exceeds 300, provide 40x6 bracing bars for all nozzles up to 3" DIA.
5. Reinforcing pad to be provided giving at least 100% area replacement both circumferentially and axially.

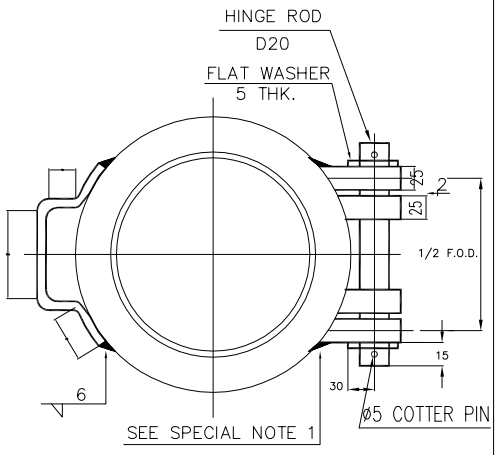
4.10 HINGE AND DAVIT DETAILS FOR MANHOLES







VERTICAL MANHOLE



MANHOLE COVER HINGE
USE FOR BOTTOM ENTRY

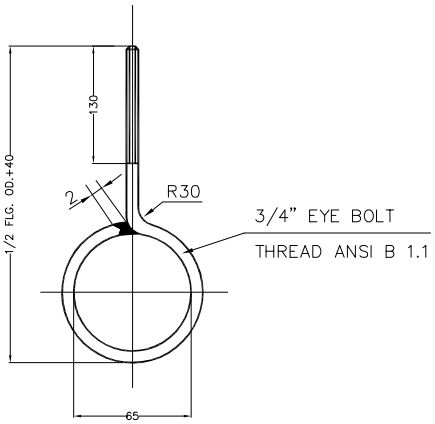
FLANGE RATING		150#(20 PN)					300#(50 PN)					600#(100 PN)					900#(150 PN)				
FLANGE SIZE		14" 350	16" 400	18" 450	20" 500	24" 600	14" 350	16" 400	18" 450	20" 500	24" 600	14" 350	16" 400	18" 450	20" 500	24" 600	14" 350	16" 400	18" 450	20" 500	24" 600
DAVIT SIZE (PIPE)	IN	1 1/2	1 1/2	1 1/2	2	2	1 1/2	1 1/2	2	3	3	2 1/2	2 1/2	2 1/2	3	3	2 1/2	3	3	3	4
	PN	40	40	40	50	50	40	40	50	50	50	65	65	65	80	80	65	80	80	80	80
	SCH.	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
	THK.	5.08	5.08	5.08	5.54	5.54	5.08	5.08	5.54	7.62	7.62	7.01	7.01	7.01	7.62	7.62	7.01	7.62	7.62	7.62	8.55

GENERAL NOTES:

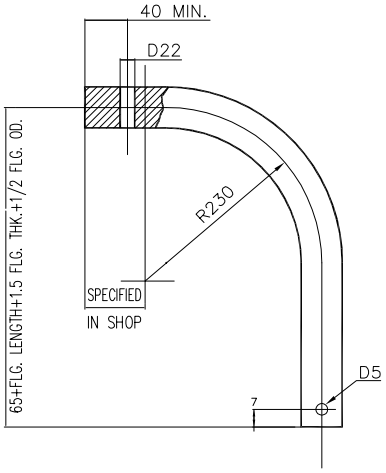
1. All dimensions are in mm. , unless otherwise shown.
2. Davit assembly shall be in true vertical alignment after welding support on to nozzle neck, or flange, manhole position is indicated on vessel drawing.
3. Material:
   Pin, rod & eyebolt=a36 or equivalent
   Pipe=a53 gr.b or equivalent
   Plate=a283 gr. c or equivalent (for alloy and s.s flanges use transition plate.)
4. See vessel drawing for hinge and davit orientation.
5. All weldings shall be made before vessel heat treatment.(if any)
6. Welding symbols procedure and tests are per a.w.s.

SPECIAL NOTES:

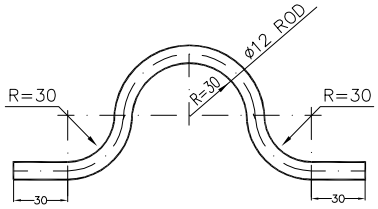
1. Weld to full penetration without excessive heating to avoid flange damage or distortion.
2. Fit lugs and pin so that pin is loose when cover is bolted uP.



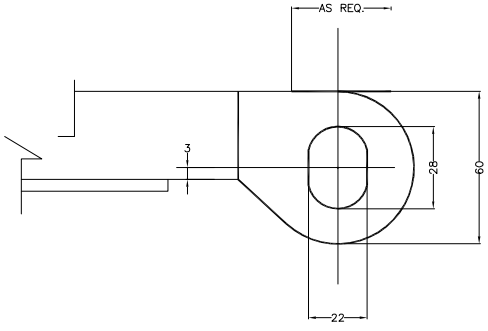
DETAIL 1
EYE BOLT



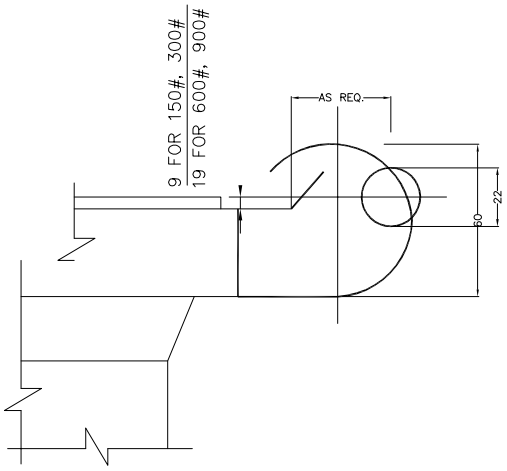
DETAIL 2
DAVIT



DETAIL 3
LUG(HANDLE)

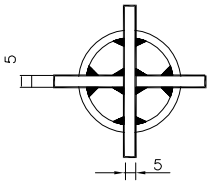


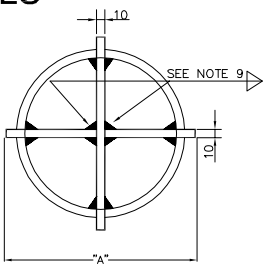
DETAIL 4
COVER HINGE

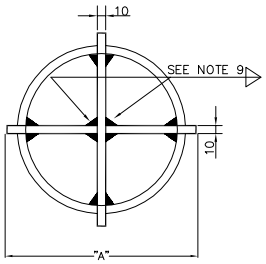


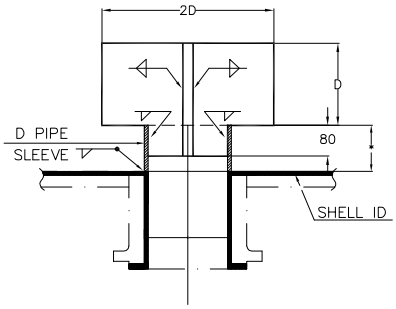
DETAIL 5
FLANGE HINGE

4.11 VORTEX BREAKERS DETAILS



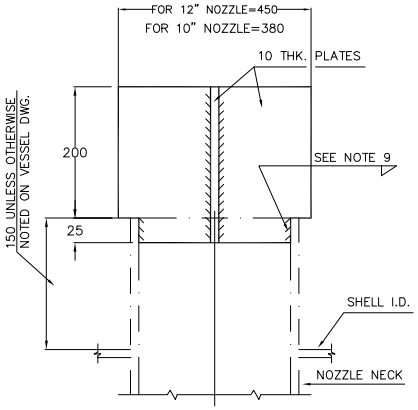




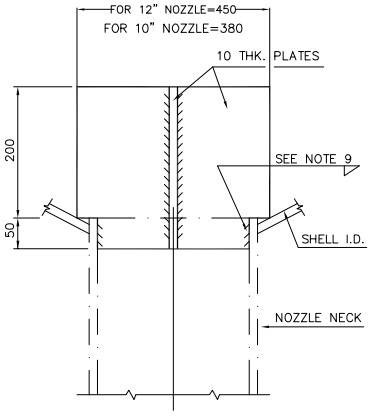


80(3") AND OVER

FOR LINED VESSELS



TYPE-A



TYPE-B

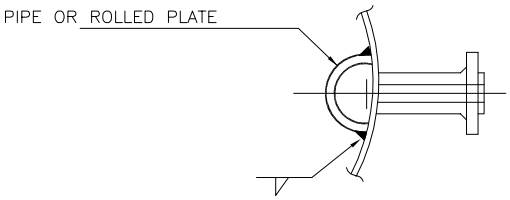
80(3")AND OVER

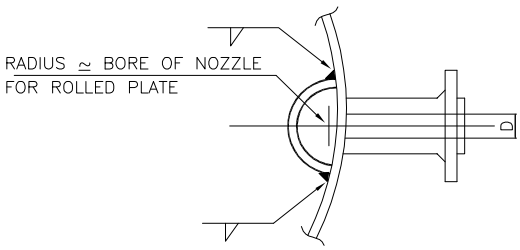
FOR UNLINED VESSELS

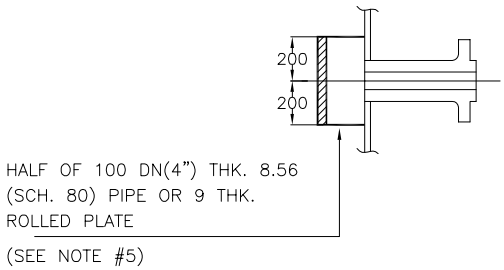
NOTES:

1. All dimensions are in millimeters.
2. See vessel outline drawing for material & pipe size.
3. Vessel fabricator to furnish & install vortex breakers.
4. In case of conflict between this standard and vessel drawing the latter shall govern.
5. For stainless steel vessels, (vortex breaker) plate shall be 6mm thk., same material as Vessel.
6. Alloy or concrete lined baffle and sleeve material shall be 5 plate steel material as nozzle lining.
7. Details, dimensions and notes in project specification-vessels take precedence over those shown hereon.
8. For i.d. of the penetrating pipe in to the nozzle see vessel drawing.
   * See project specification-vessels.
9. All weldings shall be of continuous fillet type with size at least tHINNER OF THE WELDED parts.

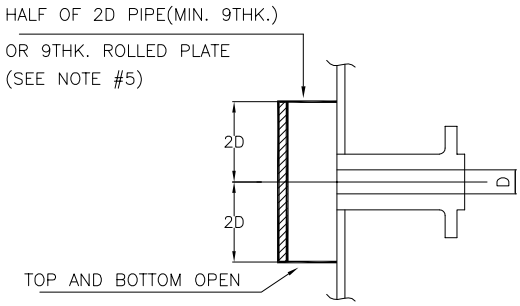
4.12 BAFFLE FOR COLUMN & DRUM



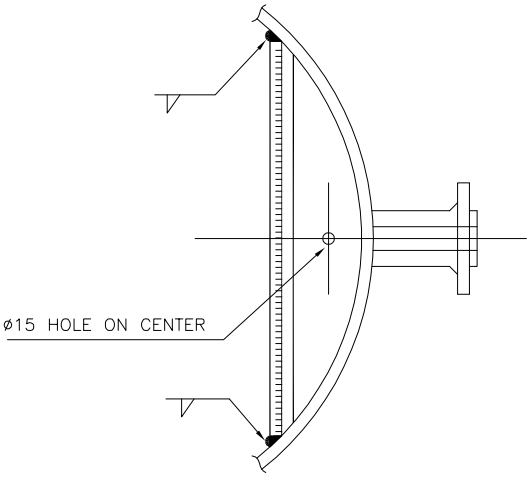


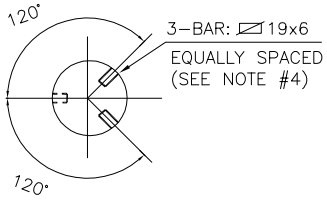


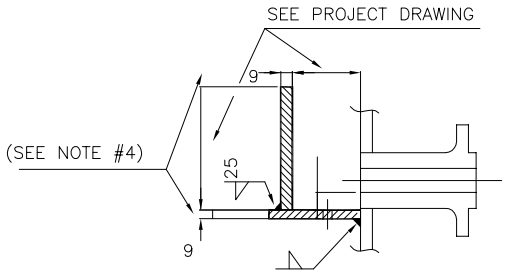
TYPE 1



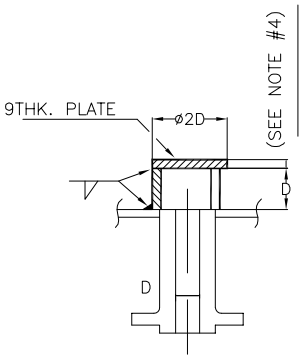
TYPE 2







TYPE 3



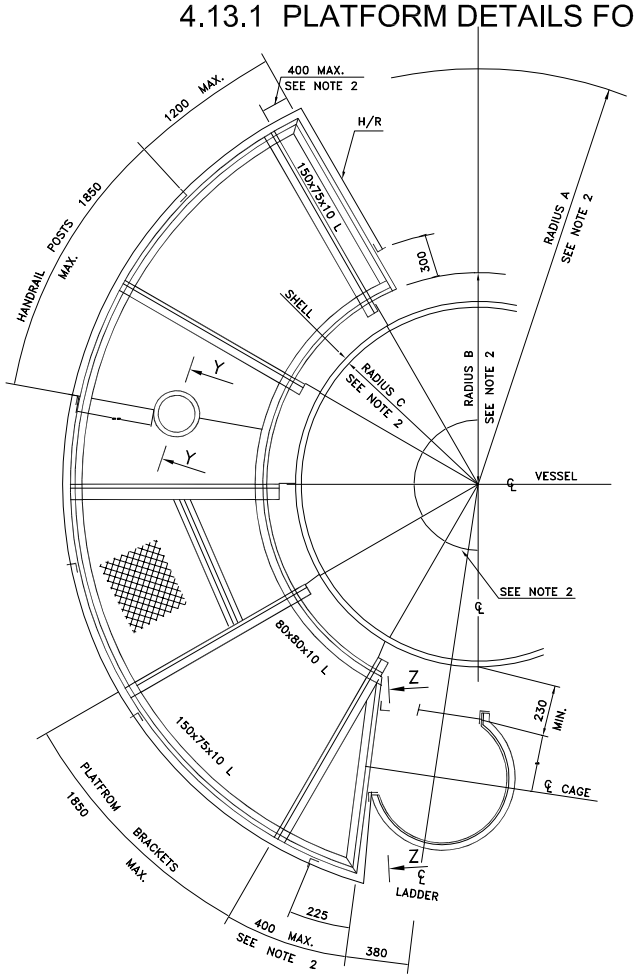
TYPE 4

NOTES:

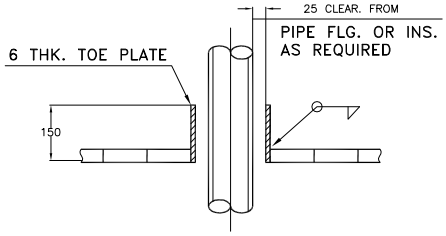
1. All dimensions are in millimeters, unless otherwise indicated.
2. Materials of baffle plates and pipes shall be as specified on the vessel drawing.
3. Construction detail dimensions and materials in drawings or data sheet shall take precedence over those shown hereon.
4. Where corrosion allowance exceeds 3.0 mm. , plate thk. and pipes. thk. shall be increased.
5. Plate thickness to be 6 for stainless, alloy steel vessels, lining or cladded vessels.
6. Welds shall be carried out and inspected at shop as per vessel design code.
7. All weld shall be same as baffle thk.

4.13 TYPICAL DETAILS VESSEL PLATFORM AND LADDERS

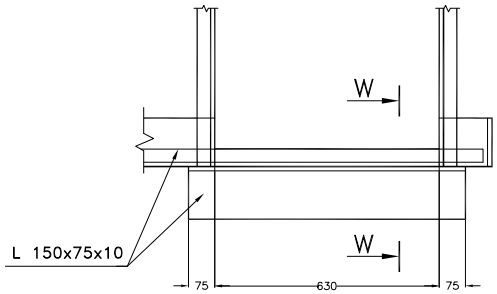
4.13.1 PLATFORM DETAILS FOR VERTICAL VESSELS



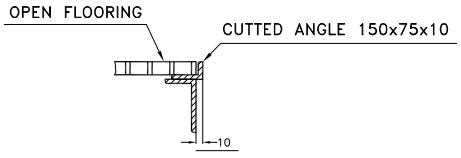
TYPICAL SIDE PLATFORM



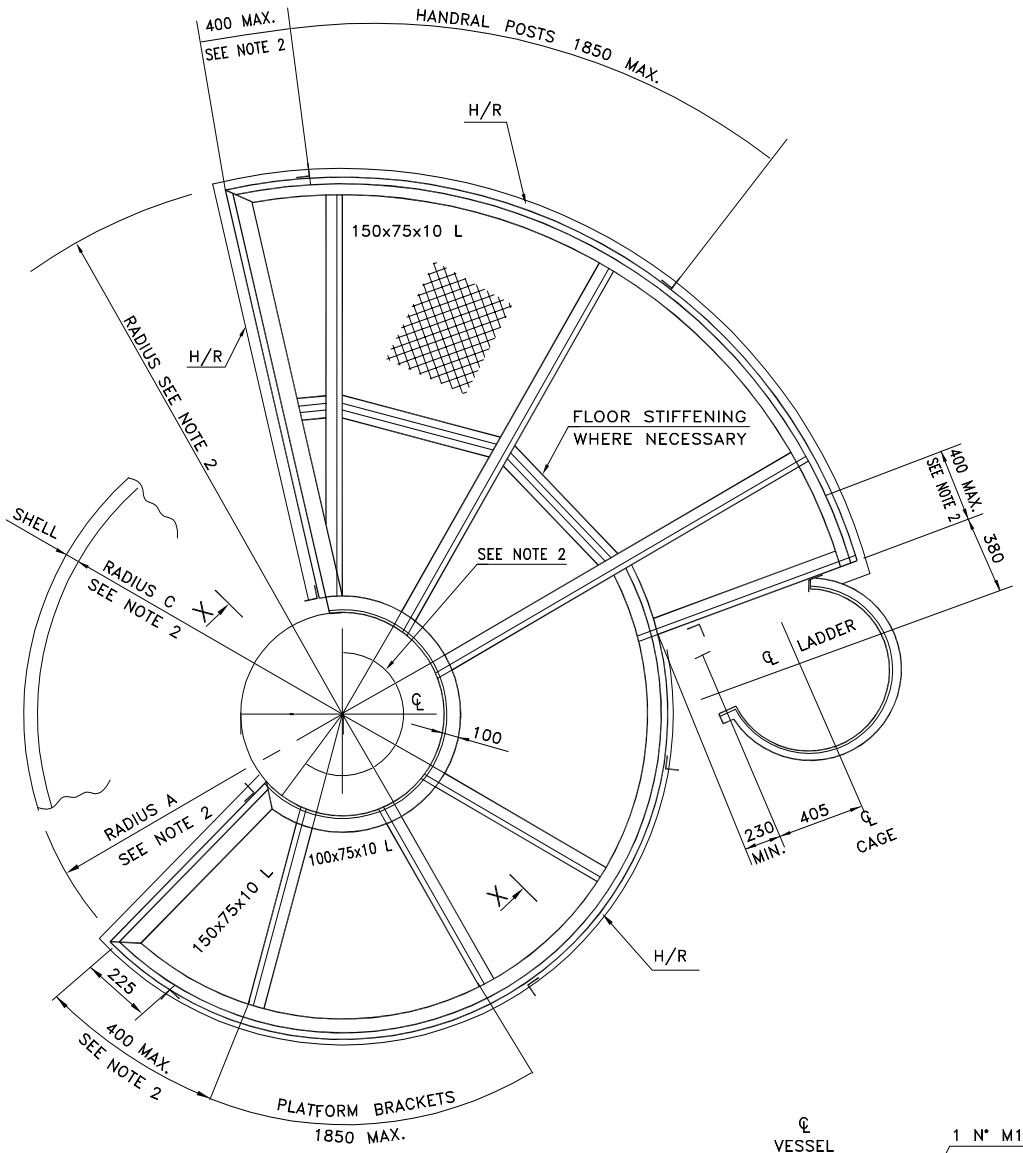
SECTION Y-Y
TYPICAL PIPE PENETRATION



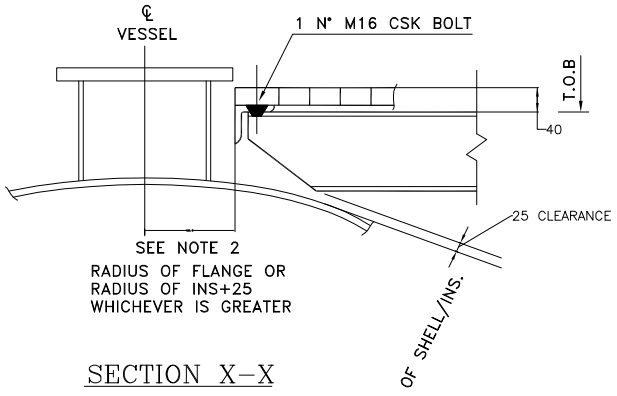
SECTION Z-Z



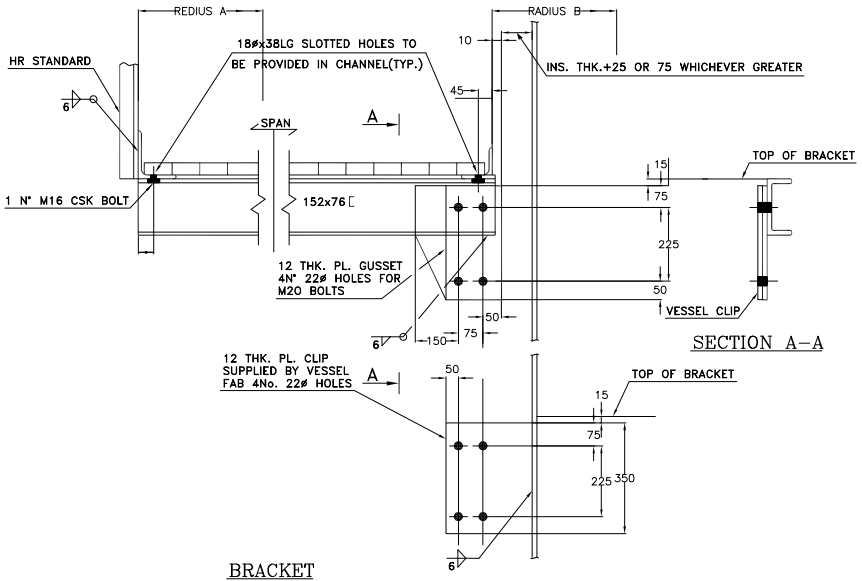
SECTION W-W



TYPICAL TOP HEAD PLATFORM



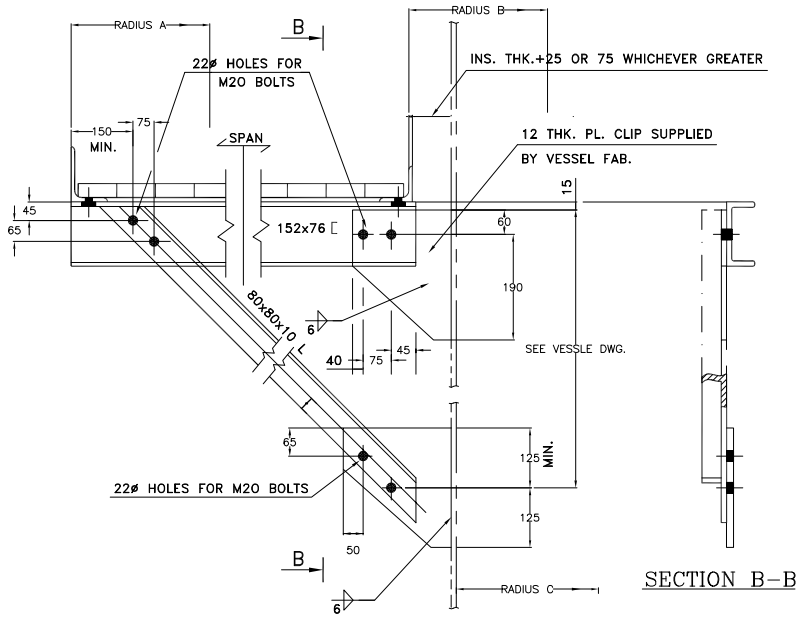
SECTION X-X



BRACKET
TYPE I

NOTE: THIS BRACKET IS DESIGNED FOR A MAX. SPAN OF 1500

VESSEL DIA. m	MAX. ANGLE BETWEEN BRACKET				
	PLATFORM WIDTH				
	TYPE "I"		TYPE "II"		
	UP TO 1.25m	1.5m	1.75m	2m	2.25m
2	40°	40°	33°	27°	22°
3	34°	32°	26°	22°	18°
4	29°	26°	22°	18°	15°
5	25°	22°	18°	16°	13°
6	23°	19°	16°	14°	12°
7	20°	17°	14°	12°	11°
8	18°	15°	13°	11°	10°
9	17°	14°	12°	10°	9°
10	16°	13°	11°	9°	8°

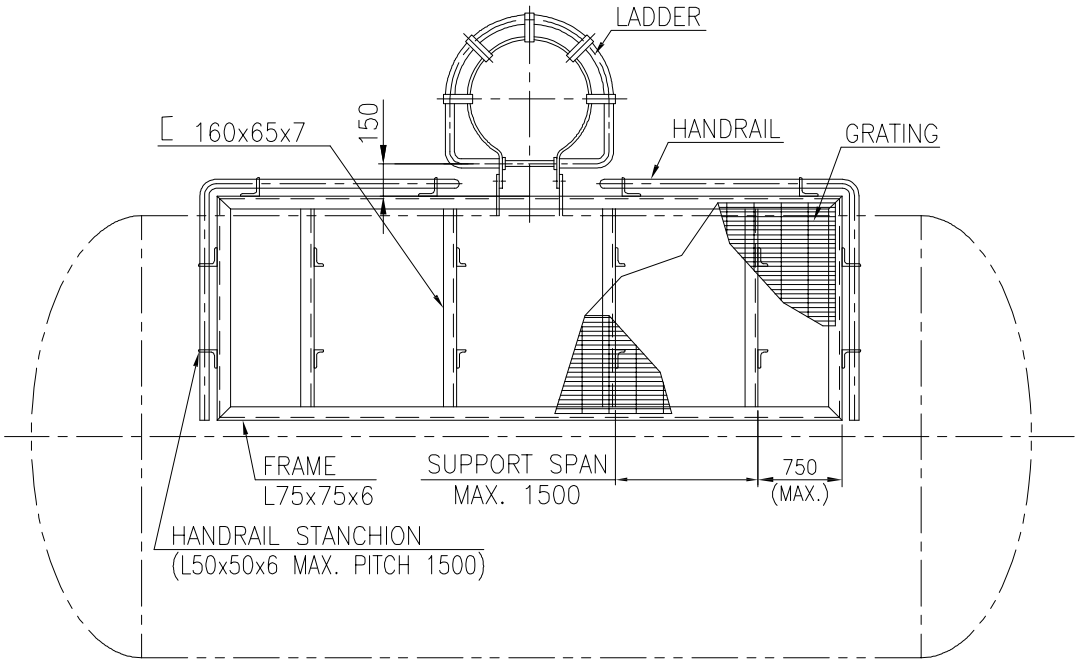


BRACKET
TYPE II

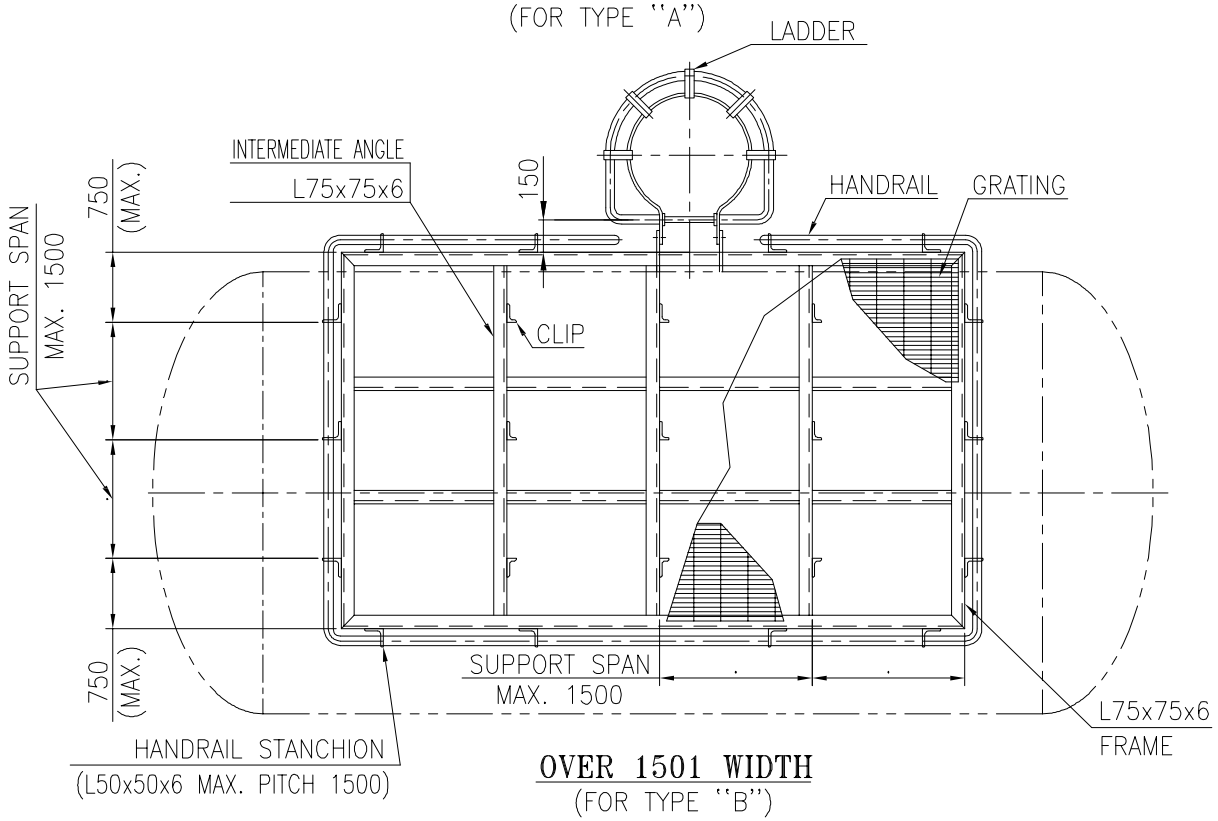
NOTES:

1. All dimensions are in millimetres.
2. See ladder & platform drawings for specific job requirements and vessel drawings.
3. All vessel clips to be supplied & installed by vessel fabricator.
4. All welds shall be 6 fillet.
5. All platform flooring shall be galvanized open steel rectangular pattern.
6. Stiffeners to be provided when platform width exceeds 1.75 m.

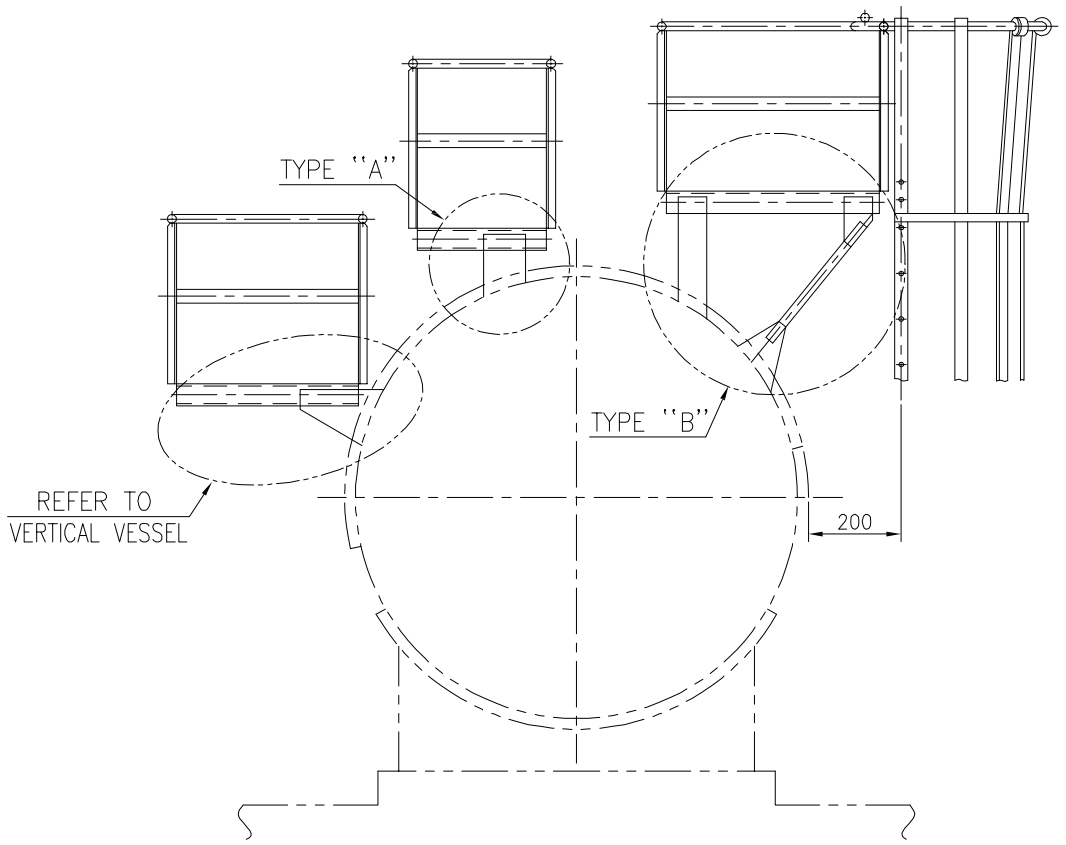
4.13.2 PLATFORM DETAILS FOR HORIZONTAL VESSELS

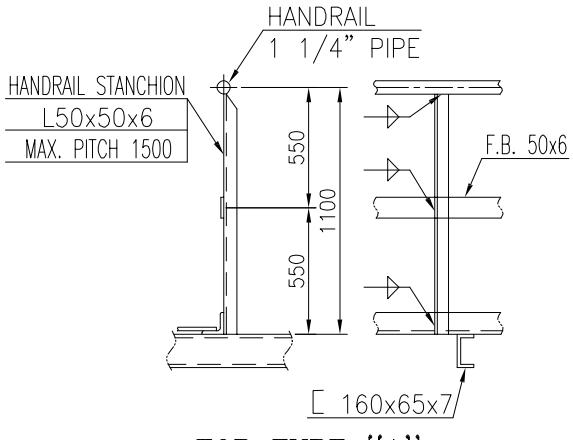


UP TO 1500 WIDTH
(FOR TYPE ''A'')

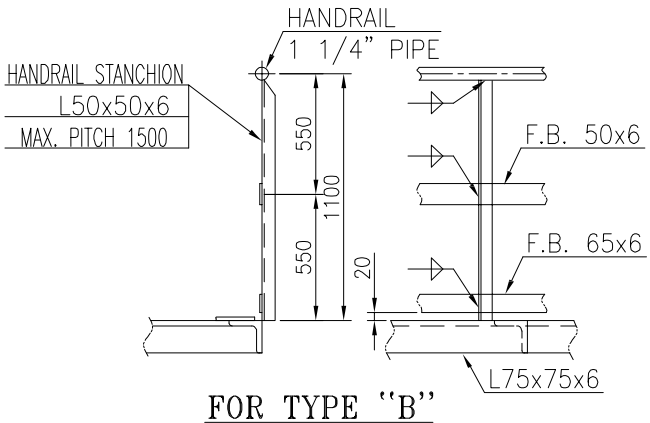


OVER 1501 WIDTH
(FOR TYPE ''B'')



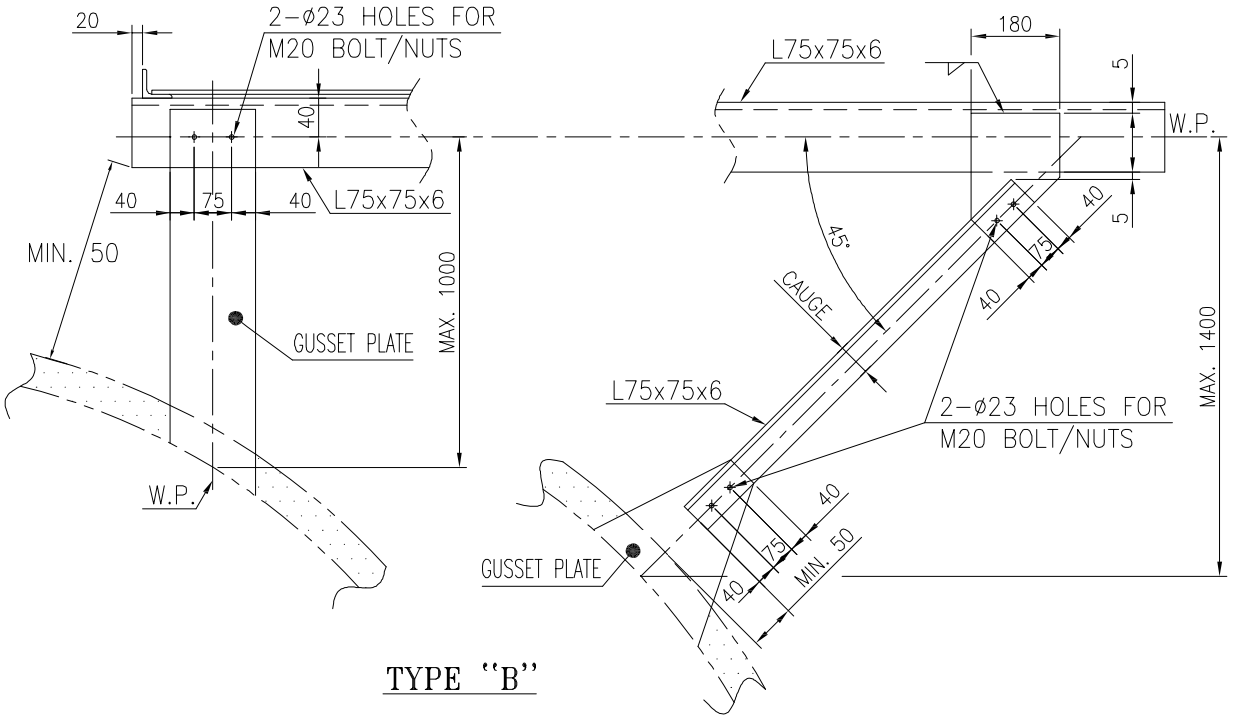


FOR TYPE ''A''

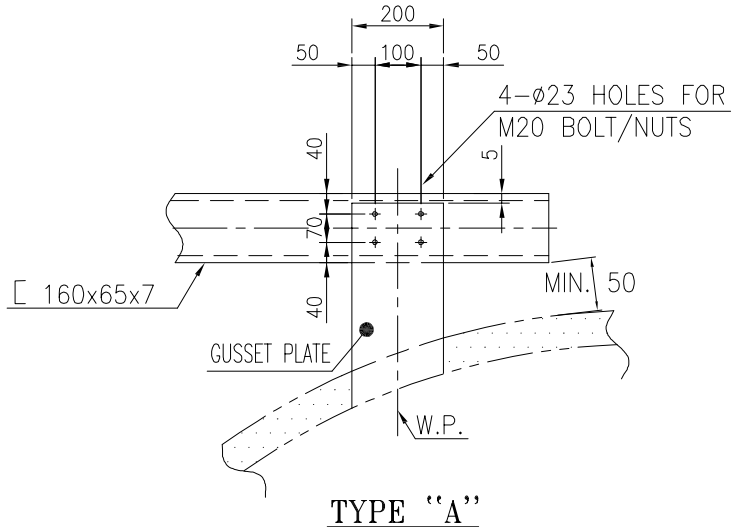


FOR TYPE ''B''

DETAIL OF HANDRAIL FOR FOR HORIZONTAL VESSEL



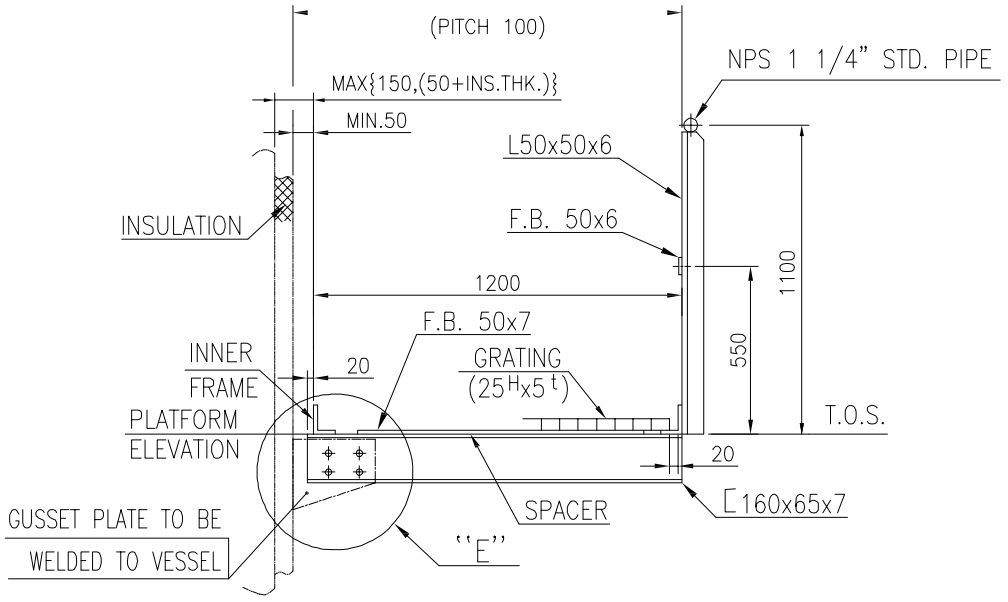
TYPE "B"

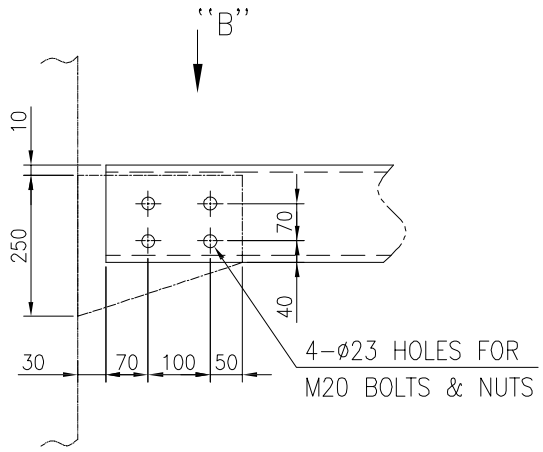


TYPE "A"

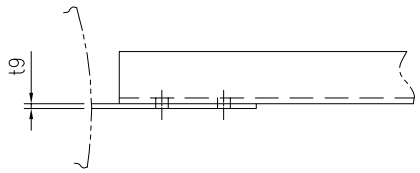
NOTE

- WHEN THE PLATFORM ELEVATION IS LOWER THAN 4M, SAFETY CAGE IS NOT REQUIRED.

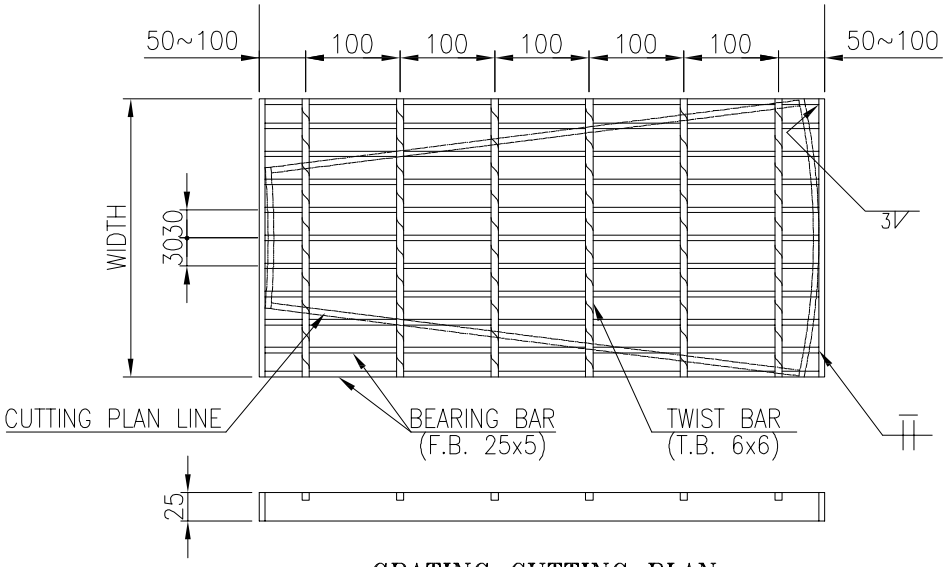




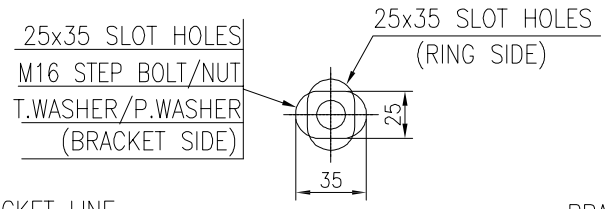
DETAIL "E"



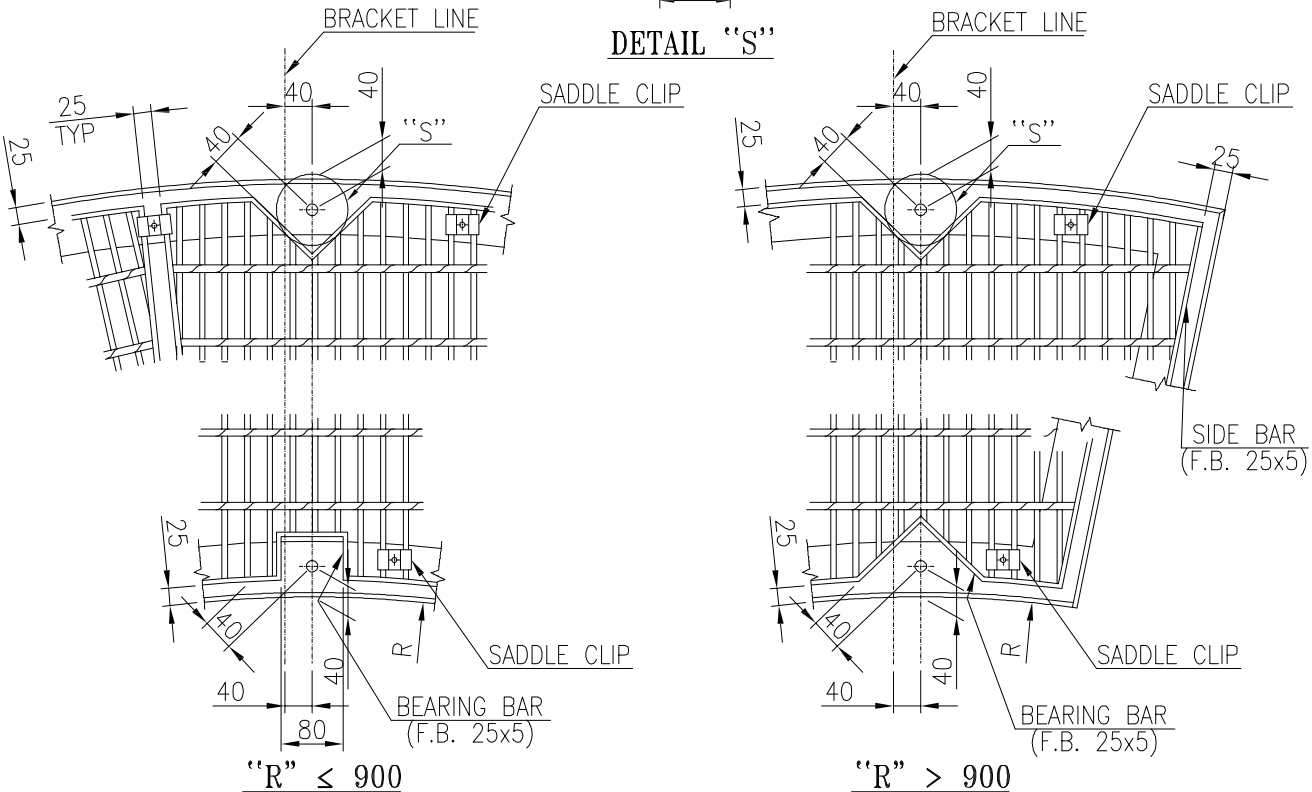
VIEW "B"



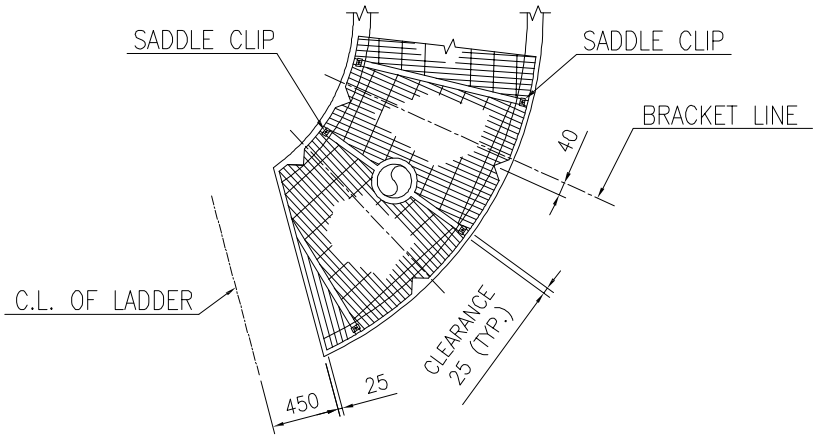
GRATING CUTTING PLAN



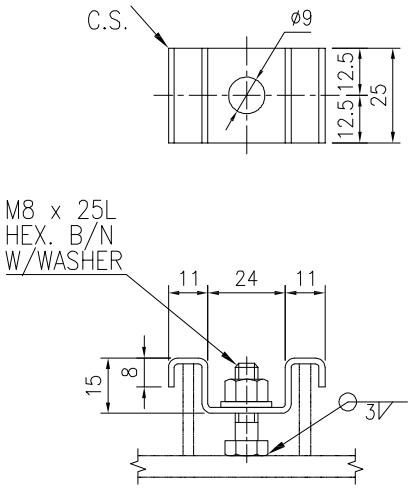
DETAIL "S"



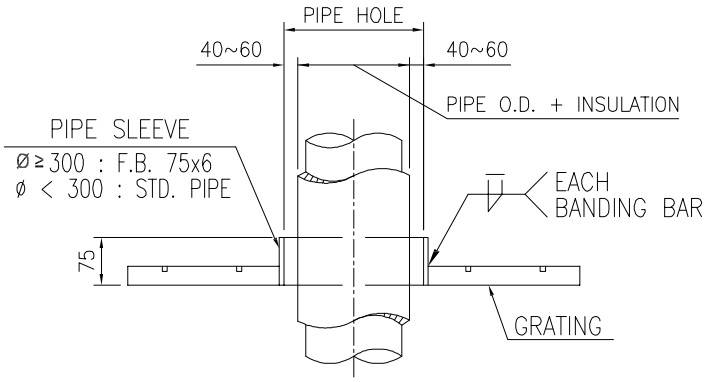
DETAIL OF BRACKET



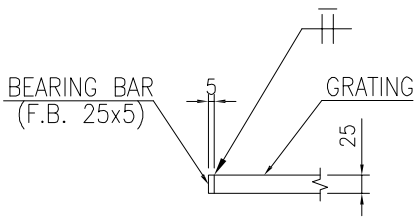
TYPICAL DETAIL OF STRUCTURE



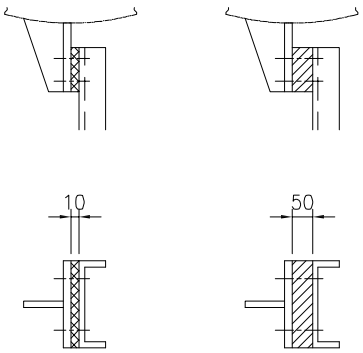
DETAIL OF SADDLE CLIP



DETAIL OF PIPE SLEEVE

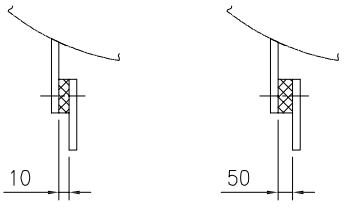


DETAIL OF BANDING BAR



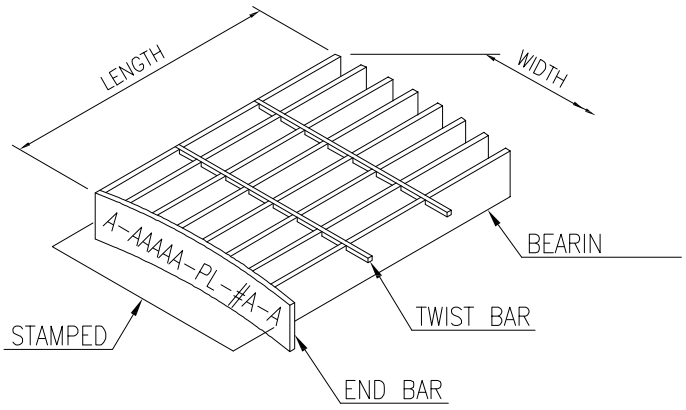
OPER TEMP.: ASBESTOS (−20°C ~ −50°C) WOOD (−51°C ~ −196°C)

COLD TYPE

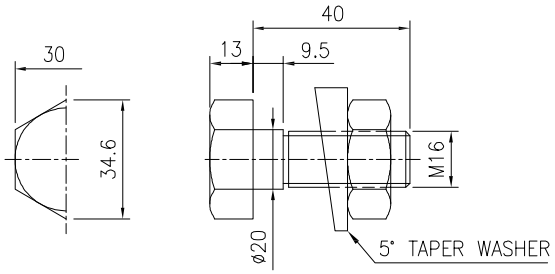


ASBESTOS (−20°C ~ −196°C) WOOD (−20°C ~ −196°C)

COLD TYPE



GRATING PIECE MARK



STEP-BOLT & NUT DETAIL
SIZE FOR LADDER

REMARKS:

1) ALL DIMENSIONS ARE IN mm.

2) MATERIAL SHALL BE AS FOLLOWS:

GRATING :	...ASTM A36 OR EQUIVALENT WITH HOT DIP GALVANIZED
SADDLE CLIP :	...ASTM 304SS OR EQUIVALENT
BOLT NUT :	...DEPENDS ON OPERATING TEMPERATURE
−19°C & OVER	...ASTM A307GR.B OR EQUIVALENT
−20°C ~ −100°C	...ASTM A320L7/A194GR.4 OR 304SS OR EQUIVALENT
−101°C & UNDER	...ASTM 304SS OR EQUIVALENT
WOOD :	...APITONG
STRUCTURAL STEEL :	...ASTM A36 OR EQUIVALENT
LUG :	...SEE ENGINEERING DWG.

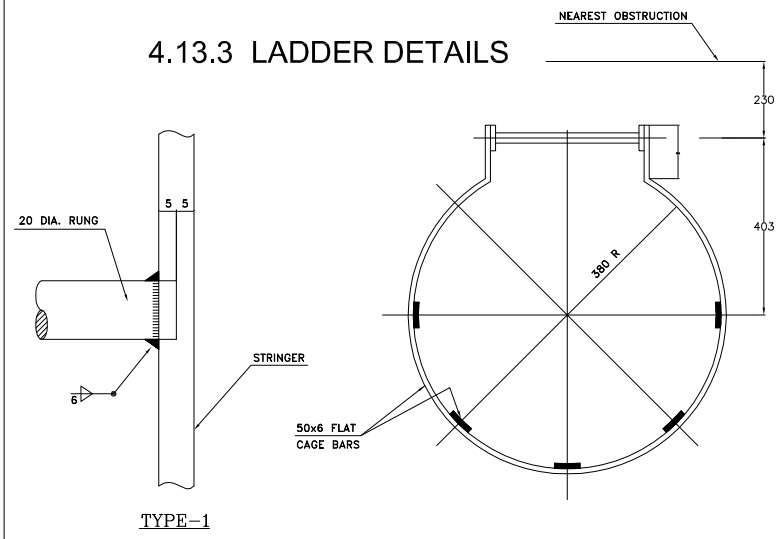
3) DESIGN LOAD OF PLATFORM IS 500 KG/m2, UNLESS OTHERWISE NOTED.

4) WHEN PLATFORM WIDTH EXCEEDS 1000 mm, THE FLOOR SHALL BE SUITABLY REINFORCED TO PREVENT FLOOR FROM DEFLECTION.

5) GRATING TO BE FIXED ON STRUCTURE BY SADDLE CLIPS.

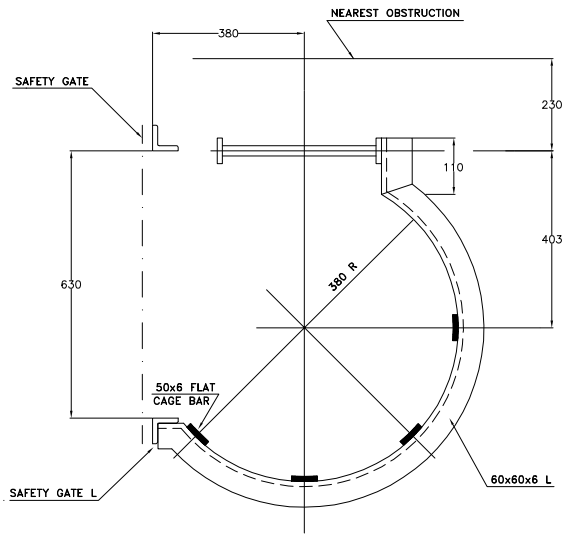
6) MIN. WELD LEG IS EQUAL TO 0.7 THINNER PART FOR EACH WELD JOINT OR OTHERWISE IS SPECIFIED.

4.13.3 LADDER DETAILS

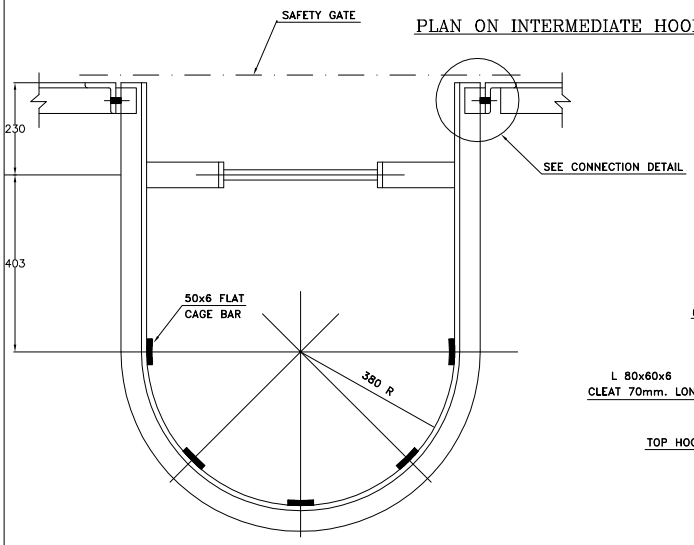


TYPE-1

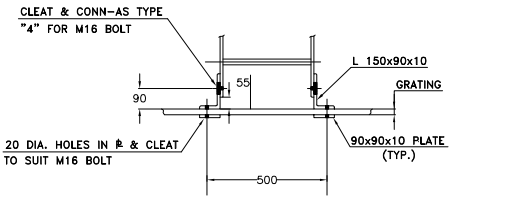
PLAN ON INTERMEDIATE HOOP



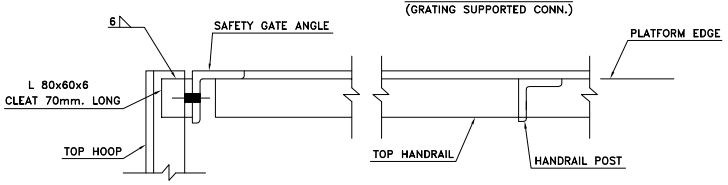
PLAN ON TOP HOOP SIDE STEP



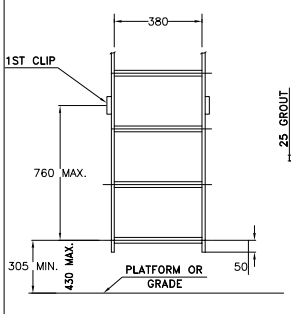
PLAN ON TOP HOOP STEP THROUGH



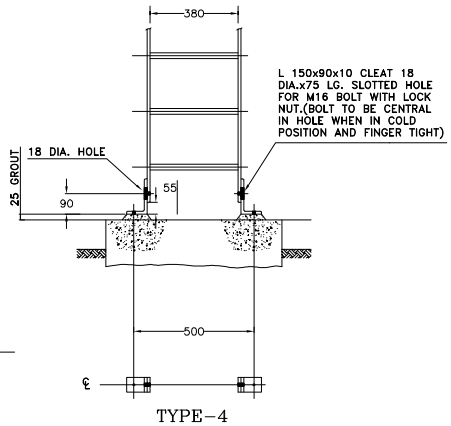
TYPE-5
(GRATING SUPPORTED CONN.)



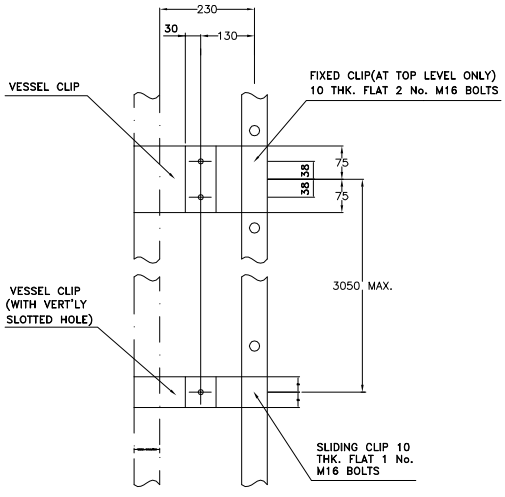
CONNECTION DETAIL



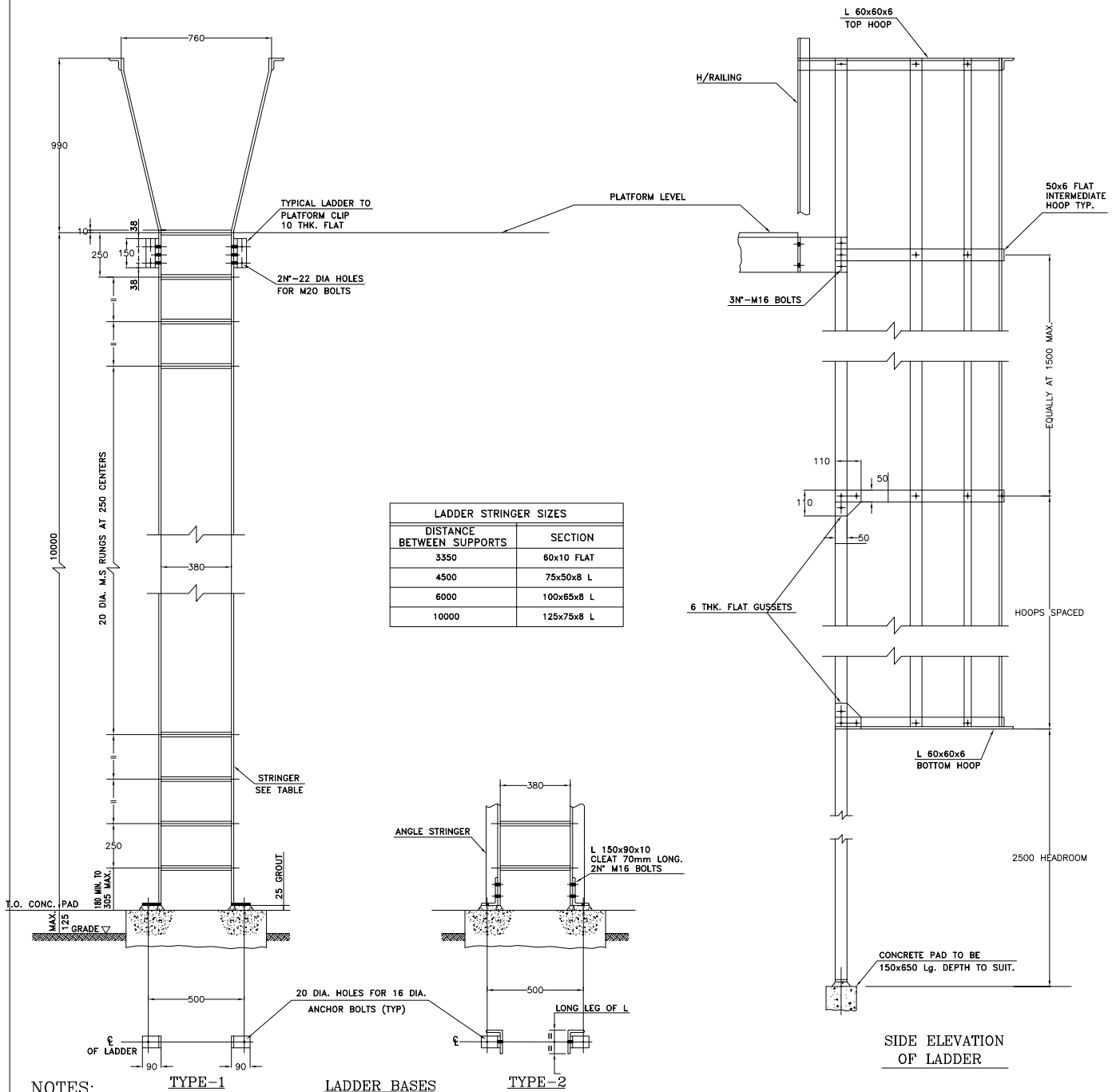
TYPE-3
(STRUCTURE SUPPORTED)
CONN.



TYPE-4
(SLIDING CONN.)



LADDER CLIP DETAILS

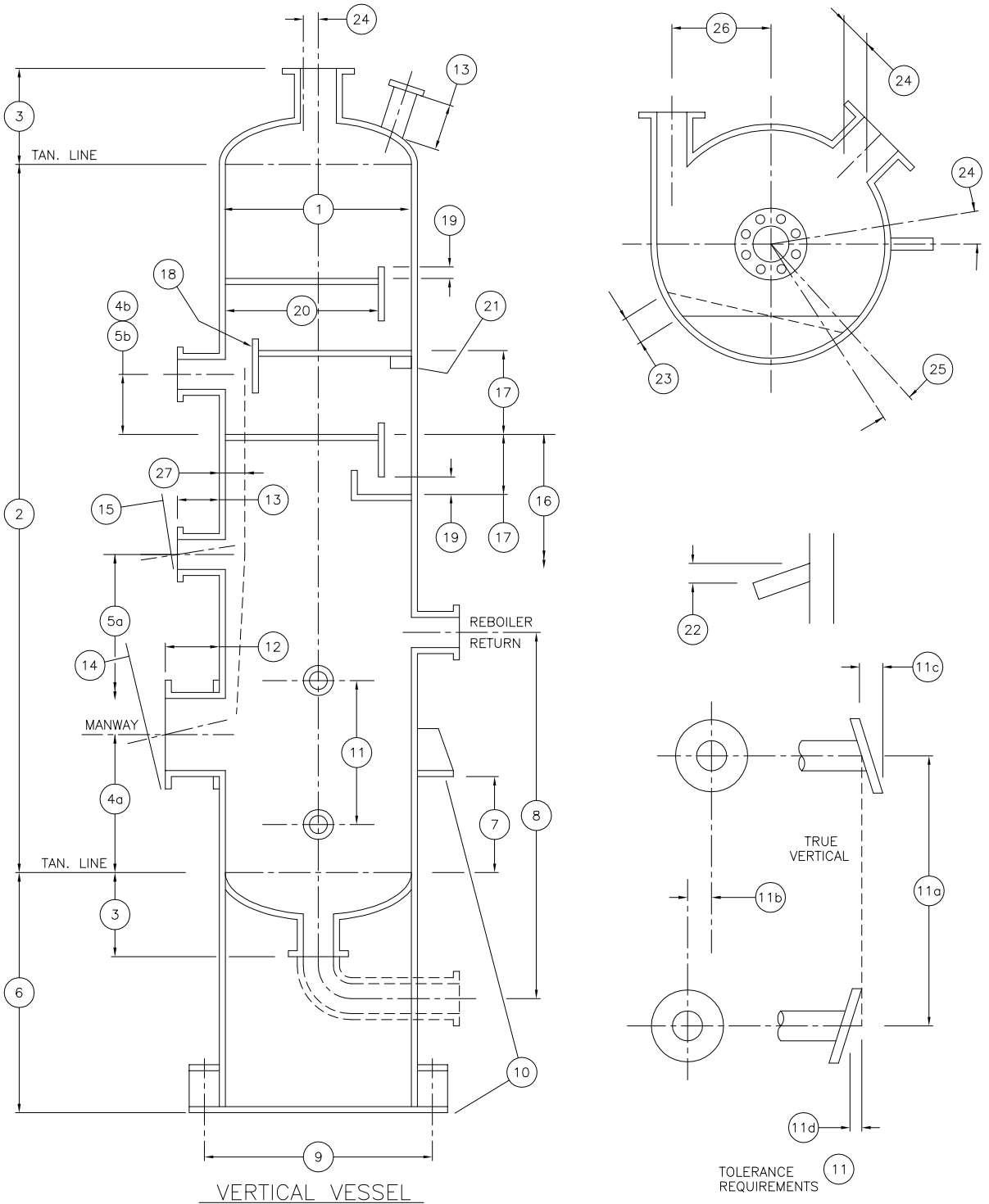


LADDER STRINGER SIZES	
DISTANCE BETWEEN SUPPORTS	SECTION
3350	60x10 FLAT
4500	75x50x8 L
6000	100x65x8 L
10000	125x75x8 L

NOTES:

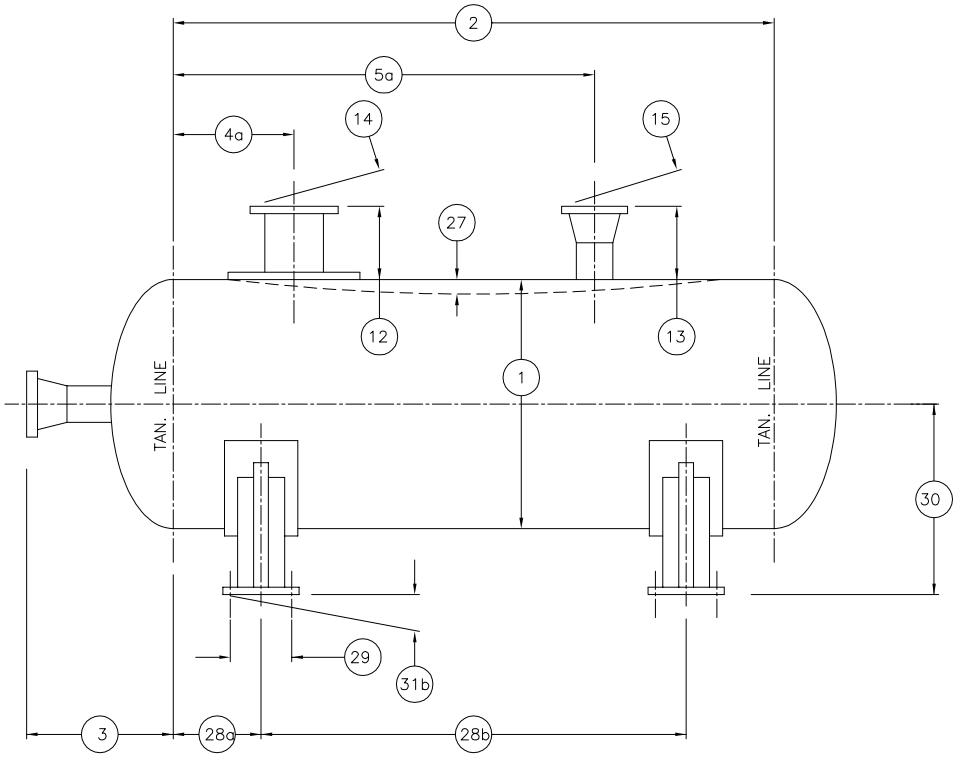
1. All dimensions are in millimeters.
2. Cage to be provided as indicated on layout drawings.
3. Cage is to be of bolted construction using M16 shallow cup headed bolts or alternatively the cage may be of welded construction and if so the corner gussets will not be required but the hoop to stringer joint must have full periphery welds.
4. The top rung shall be at the same level as the platform and shall be extended if necessary to limit the gap between rung and platform to be not more than 75mm. Alternatively the platform may be extended to replace the top rung. (Applicable only to "step throgh" ladders)
5. Ladders with "side step" entry to extend at least 1200mm. above platform level.
6. On tower platforms the rungs shall be set so that they are in line with the uppermost platform served by that ladder.

4.14 FABRICATION DIMENSIONAL TOLERANCES FOR PRESSURE VESSELS

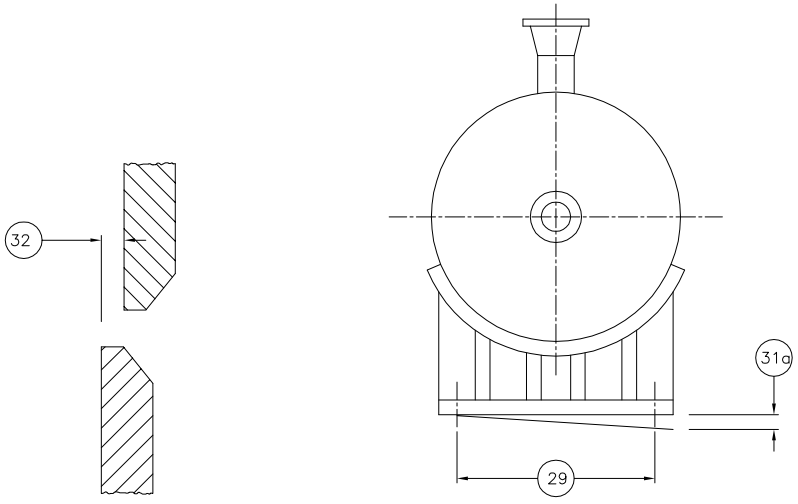


VERTICAL VESSEL

(LOWER TANGENT LINE IS THE REFERENCE PLANE FOR EXTENDED DIMENSIONS)



THE SAME TOLERANCES APPLY TO NOZZLES AND MANWAYS AS FOR VERTICAL VESSELS.



HORIZONTAL VESSELS

REFERENCED NUMBERS:

1. Diameter, circumference and OUT-OF-Roundness: The tolerances. On these dimensions should not exceed those specified in the applicable design code such as BS 5500 or ASME VIII division 1. The following shall be complied with for all vessels. The difference between maximum and minimum inside diameters shall not exceed 1% of the inside diameter up to 1900mm or 12mm +0.4% of the inside diameter for larger diameters. The circumferential tolerance for vessels up to 610mm outside diameter shall be ± 5mm and ± 0.25% of the circumference for larger diameters.

2. Tolerances on length between reference planes (Tangent lines).

Up to and including 2.5m	± 6mm
Over 2.5m up to and including 5m	± 10mm
Over 5m up to and including 10m	± 13mm
Over 10m up to and including 15m	± 16mm
Over 15m up to and including 30m	± 20mm
Over 30m	± 25mm or as otherwise agreed with vendor

(Consideration must be given to the effect of shrinkage due to welding)

3. Dimension from tangent line to flange face ± 5mm.
4a. Manways to be positioned from tangent line ± 13mm.
4b. Manways related to tray supports and draw - OFF pans ± 3mm.
5a. Nozzles to be positioned from tangent line ± 6mm.
5b. Nozzles related to tray supports and draw - OFF pans ± 3mm.
6. Distance from underside of base ring to tangent line +0, -12mm.
7. Distance from underside of support to tangent line ± 12mm.
8. Dimensions for nozzles used as a reboiler connection ± 3mm.
9. Bolt hole circle (Skirt or support lugs):
   For all vessel diameters ± 3mm. Circumferential position of bolt holes ± 3mm from designed position.
10. Base ring out of level (Measured over any diameter). (See also sheet 5 of 5)

VESSEL DIAMETER	TOLERANCE
Up to and including 2m	3mm
Over 2m	6mm

11. Where dimensions between nozzles have to be maintained e.g. level gauge connections.

11a. Distance between nozzle ± 1.5mm.
11b. Difference of orientation not to exceed 1.5mm.
11c. Flange face from vertical plane not to exceed 1.5mm.
11d. Flange face not to deviate from parallelism when compared with a flat surface by more than 0.5mm per 100mm of flange diameter.
12. Dimension from manway flange face to vessel outside diameter ± 10mm.
13. Dimension from nozzle flange face to vessel outside diameter ± 5mm.
14. The maximum tilt across full manway flange face not to exceed 6mm.
15. Nozzle flange face not to deviate from parallelism with the indicated plane in any direction by more than 1mm per 100mm of flange diameter (± 1/2%) to a maximum of 6mm. (see also page 6).
16. Dimension between the first tray support ring and the tangent line ± 5mm.
17. Distance between adjacent tray support rings and related parts (Height of downcomers and weirs) ± 3mm.

18. Top of weir to be level within the following:

VESSEL DIAMETER	DIFFERENCE BETWEEN HIGH AND LOW POINT
Up to and including 1.2m	3mm
Over 1.2m up to and including 2.4m	5mm
Over 2.4m	6mm

19. Height of weir of bottom of downcomer bar above tray support ring ± 3mm.
20. Weir location to far of tower ± 10mm.
21. Tray support rings across the diameter shall be level within the following limits:

VESSEL DIAMETER	DIFFERENCE BETWEEN HIGH AND LOW POINT
Up to and including 1.2m	3mm
Over 1.2m up to and including 2.4m	5mm
Over 2.4m	6mm

22. Tray support ring to be at right angles to shell within a tolerance of 1mm per 50mm of support width.
23. Radial orientation of downcomer and seal pans measured on the internal surface of vessel ±6mm.
24. Orientation of nozzles and other attachment measured by strapping of shell ±6mm.
25. Maximum rotational displacement of bolt holes not to exceed ± 1.5mm.
26. Tangential nozzles to be parallel with the indicated centerline of vessel to within ± 3mm over the indicated length.
27. The maximum deviation of shell from a straight line over any section of vessel shall not exceed 0.1% of the length of that section with a maximum of 12mm in 15000 or 50mm overall. Inspector shall select sections which provide the most severe check.
    A vertical vessel shall be installed to the same tolerance for verticality I.E. 0.1% of length or 50mm maximum. Distortion caused by welding of circumferential or longitudinal joints shall not exceed 6 mm maximum depth in a 900mm length of shell centered on the weld.
    For design deflection criteria, refer to project specification 602-000-ME-SP-002 Para 4.7.
28. Location of saddles.

28a. From saddle centerline to tangent line and

DIMENSION	TOLERANCE
Up to and including 4m	± 3mm
Over 4m up to and including 7m	± 6mm
Over 7m up to and including 10m	± 9mm
Over 10m	± 13mm

29. Bolt hole centers ± 3mm
30. Height of saddle +0, −6mm

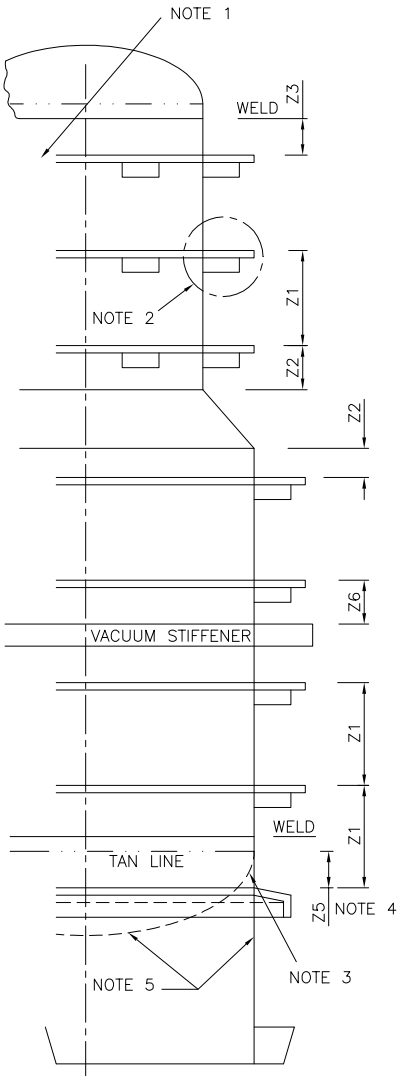
31a. Deviation from level of saddle base along its length 3mm maximum.

31b. Deviation from level of saddle base across its width shall be 1.5mm maximum.

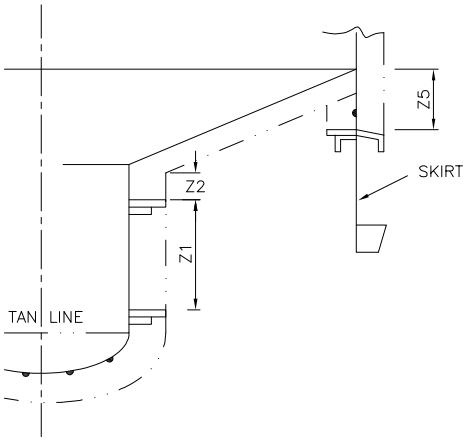
32. The butting edges of the plates forming the longitudinal and circumferential seams shall be in line within the following limits:

Plates up to 10mm thick	−1mm
Plates over 10mm to 50mm thick	−10% Of the plate thickness or 3mm whichever is smaller
Plates over 50mm thick	−T/16 OR 6mm Whichever is smaller.

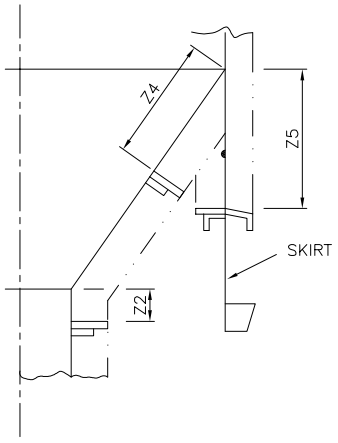
4.15 VERTICAL VESSEL INSULATION AND FIREPROOFING SUPPORTS



TYPICAL SPACING OF INSULATION SUPPORTS



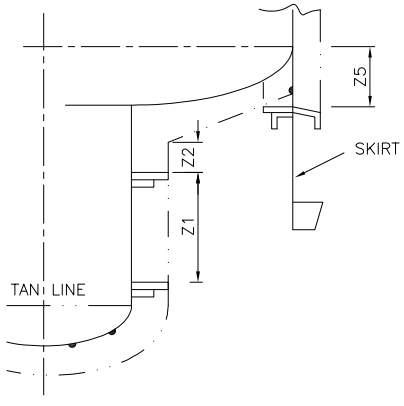
TYPE 1



TYPE 2

STANDARD DIMENSIONS

Z1 = 1000 MIN.
3600 MAX.
Z2 = 150
Z3 = 300
Z4 = 600
Z5 = 600 MIN.
900 MAX. NOTE 4
Z6 = INSULATION
THICKNESS + 150

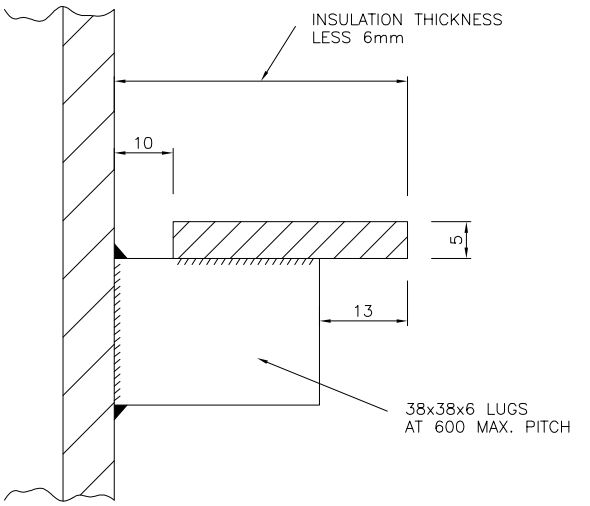


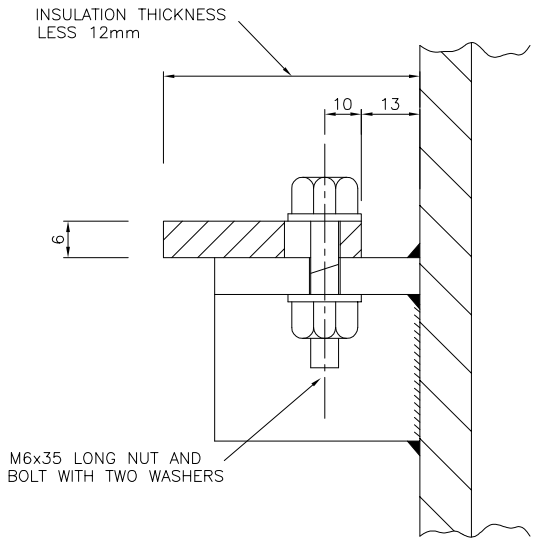
TYPE 3

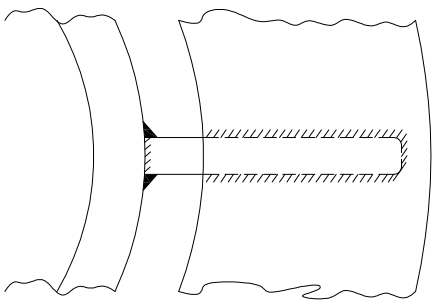
TYPE 1, 2 & 3 ARE DETAILS FOR OPEN SKIRTS

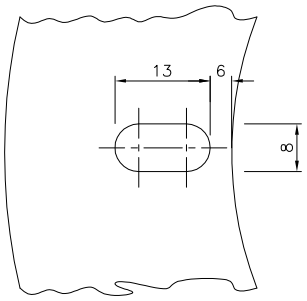
NOTES:

1. Clips are not required on top head unless specified on vessel data sheet.
2. Details at clip supports type 'A' or 'B'.
3. Skirt hot box to be fitted only when required. limitations and details on sheet 4 of 4.
4. Standard location of lower ring is 600. position may be adjusted within stated dimensions to clear nozzles, external attachments and welds.
5. For inside skirt and bottom head insulation and fireproofing supports see sheet 3 of 4.
6. Vessel data sheet will specify when fireproofing is required.
7. When skirt diameter is less than 1200, nuts are only required on the outside of the skirt.
8. Based on 75 thick insulation. dimension to be adjusted for greater insulation thickness.

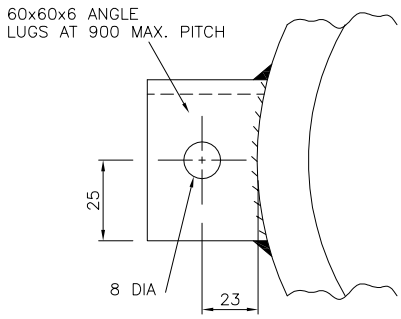








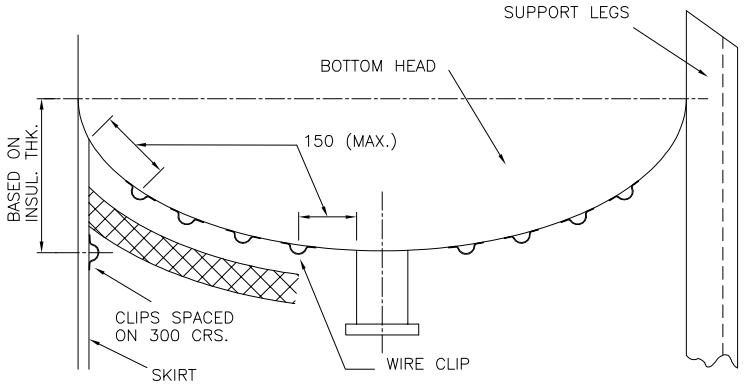
TYPE 'A' RING
FOR INSULATION LESS THAN 63mm THICK.

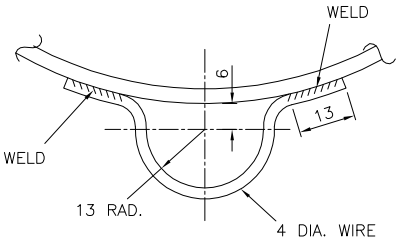


TYPE 'B' RING

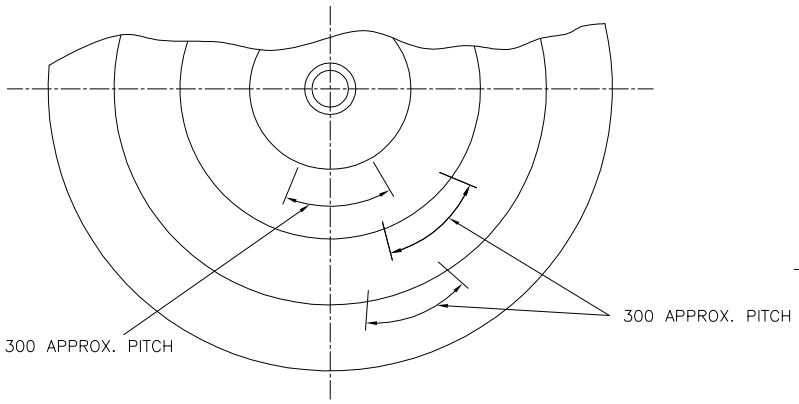
NOTES – CONTINUED:

9. Angle lugs may be fabricated from plate.
10. 6mm Continuous fillet welds required in all locations.
11. Where insulation rings coincide with nozzles and manways the ring should be cut and A lug fitted at each end. no lug welds are to be less than 40mm from any nozzle welds.
12. Rings can be butt welded. if not they must form a complete ring with A lug at each end of each ring segment.

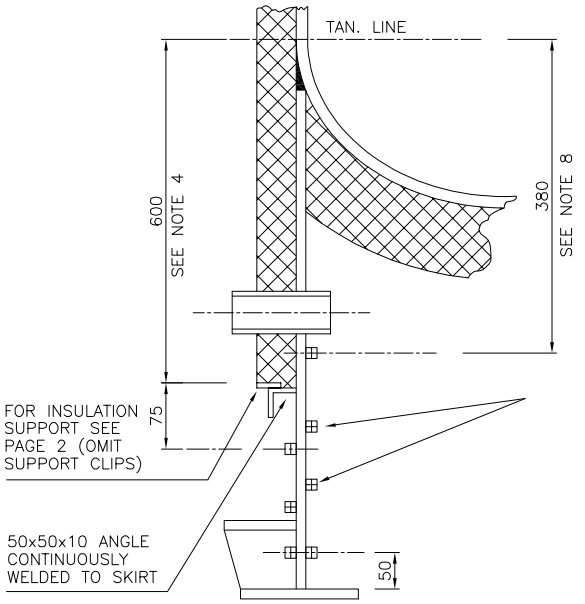




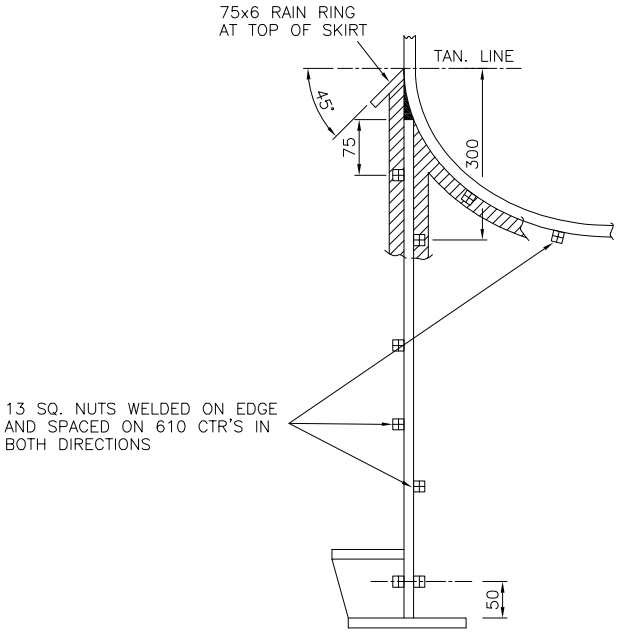
WIRE CLIP



BOTTOM HEAD DETAILS

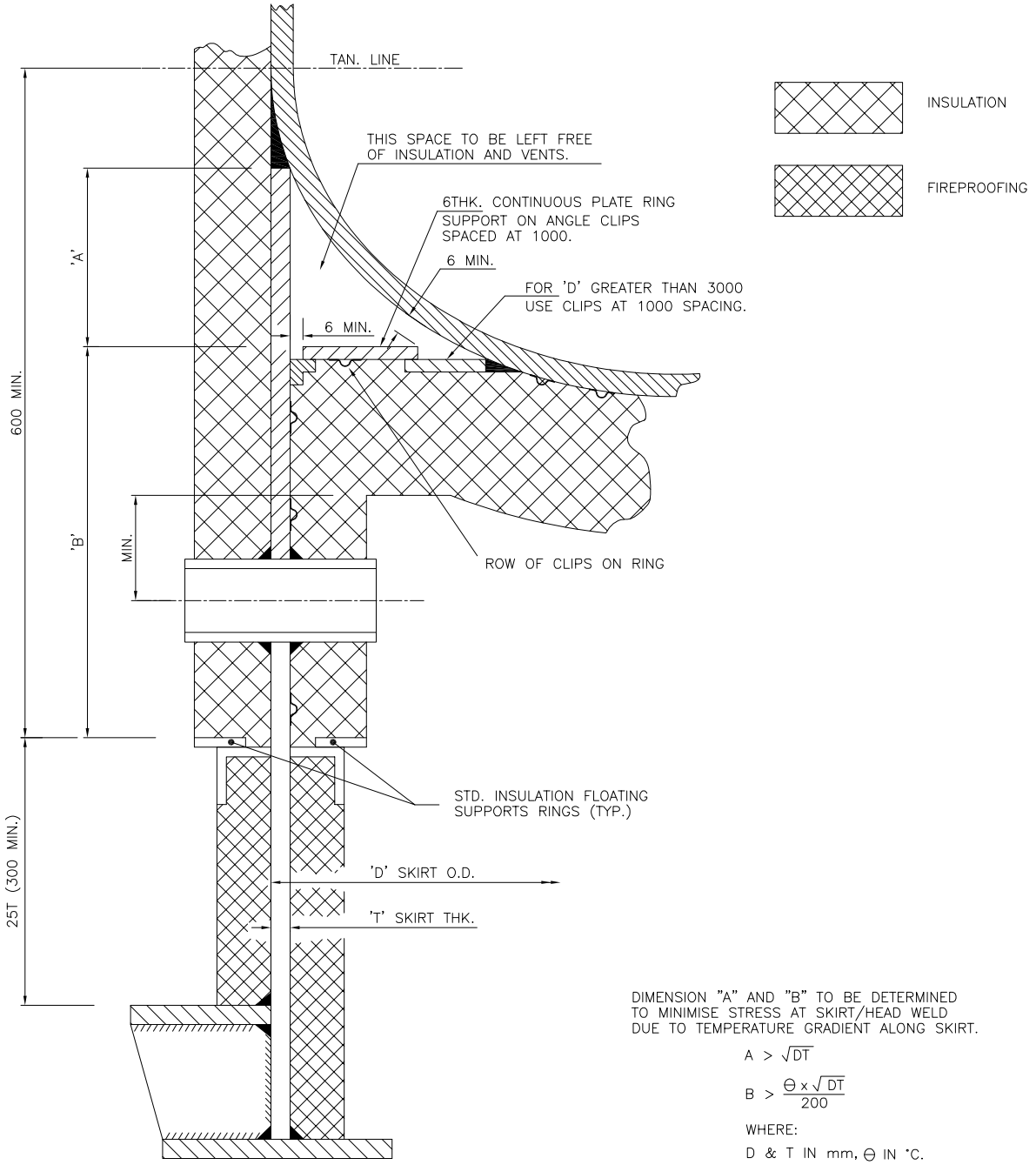


INSULATED VESSEL



UNINSULATED VESSEL WITH FIREPROOFED SKIRT

FIREPROOFING SUPPORT DETAILS



DIMENSION "A" AND "B" TO BE DETERMINED TO MINIMISE STRESS AT SKIRT/HEAD WELD DUE TO TEMPERATURE GRADIENT ALONG SKIRT.

$$A > \sqrt{DT}$$

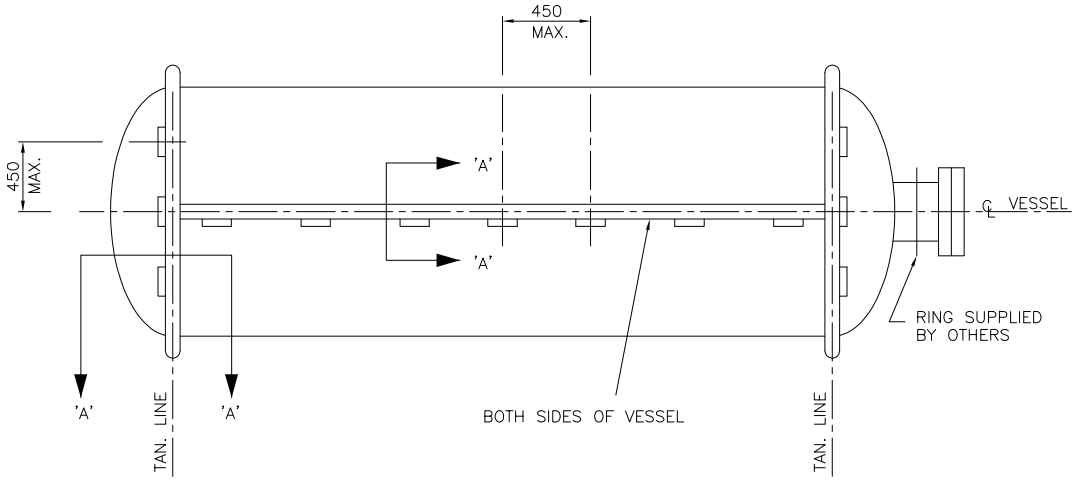
$$B > \frac{\Theta \times \sqrt{DT}}{200}$$

WHERE:

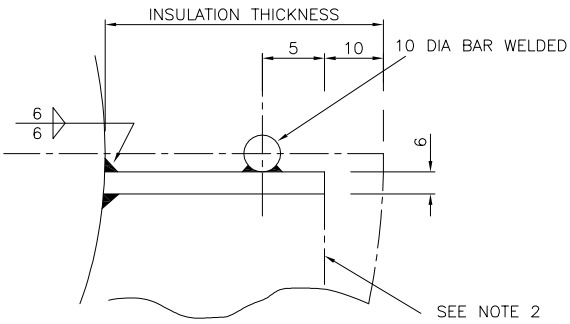
D & T IN mm, Θ IN °C.

SKIRT HOT BOX DETAIL TO BE USED FOR DESIGN TEMPERATURE (Θ) OVER 340°C OR $DxTx\Theta$ GREATER THAN $1.6x10^7$

4.16 HORIZONTAL VESSEL INSULATION SUPPORTS

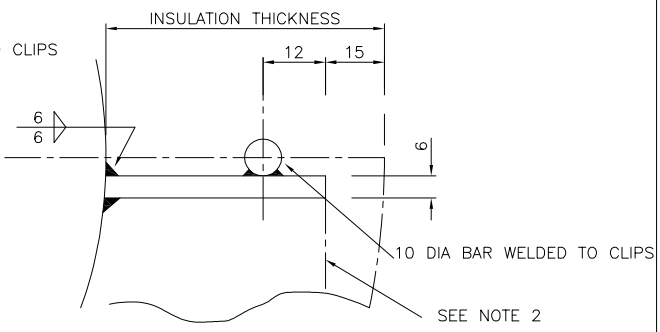


(1) INSULATION TH'K =< 30 mm

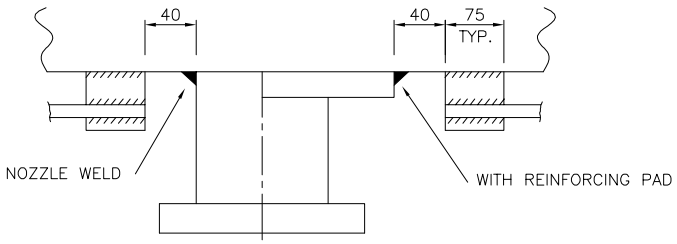


SECTION 'A–A'

(2) INSULATION TH'K > 30 mm



SECTION 'A–A'

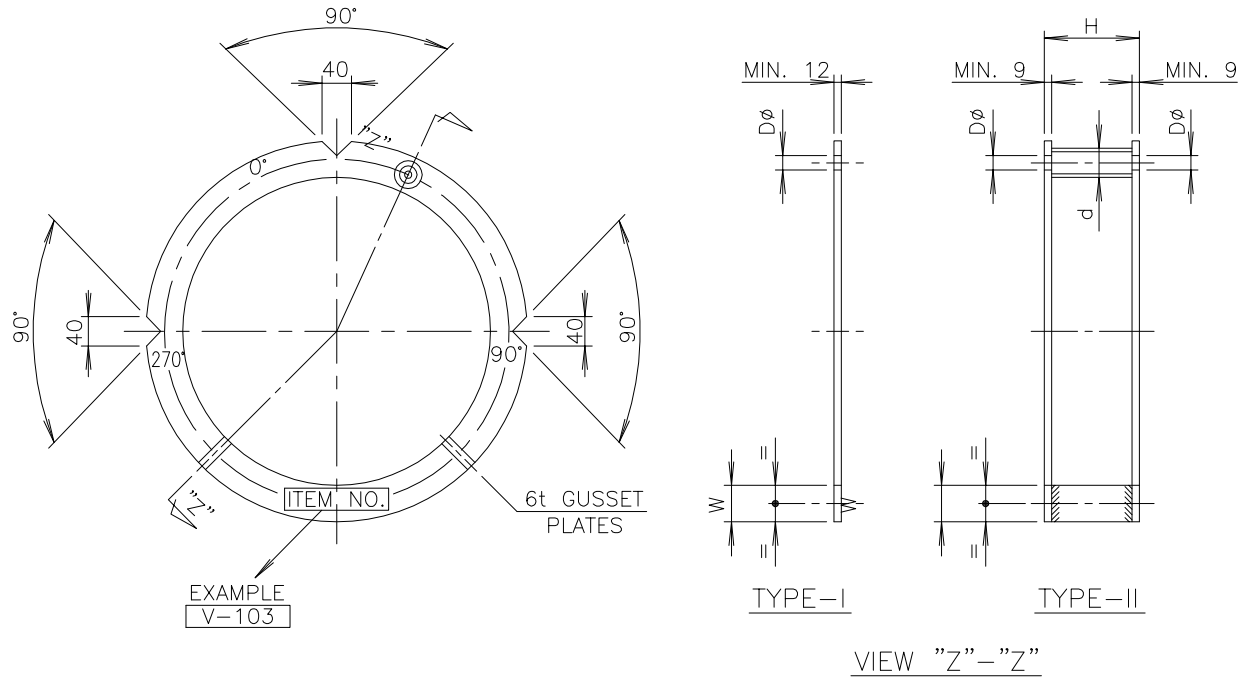


TYPICAL DETAIL OF SUPPORT RINGS AT NOZZLES
MANHOLES AND OTHER EXTERNAL ATTACHMENTS

NOTES :

1. For vessel DIA < 1500 supports required at both ends only.
   > 1500 supports required at both sides and ends.
2. 6 Thk. Flat is standard for all insulation thicknesses on ends and sides up to 150 Thk. use 75x75x6 Thk. angle on sides when insulation thickness is greater than 150.

4.17 TEMPLATE FOR VERTICAL VESSELS

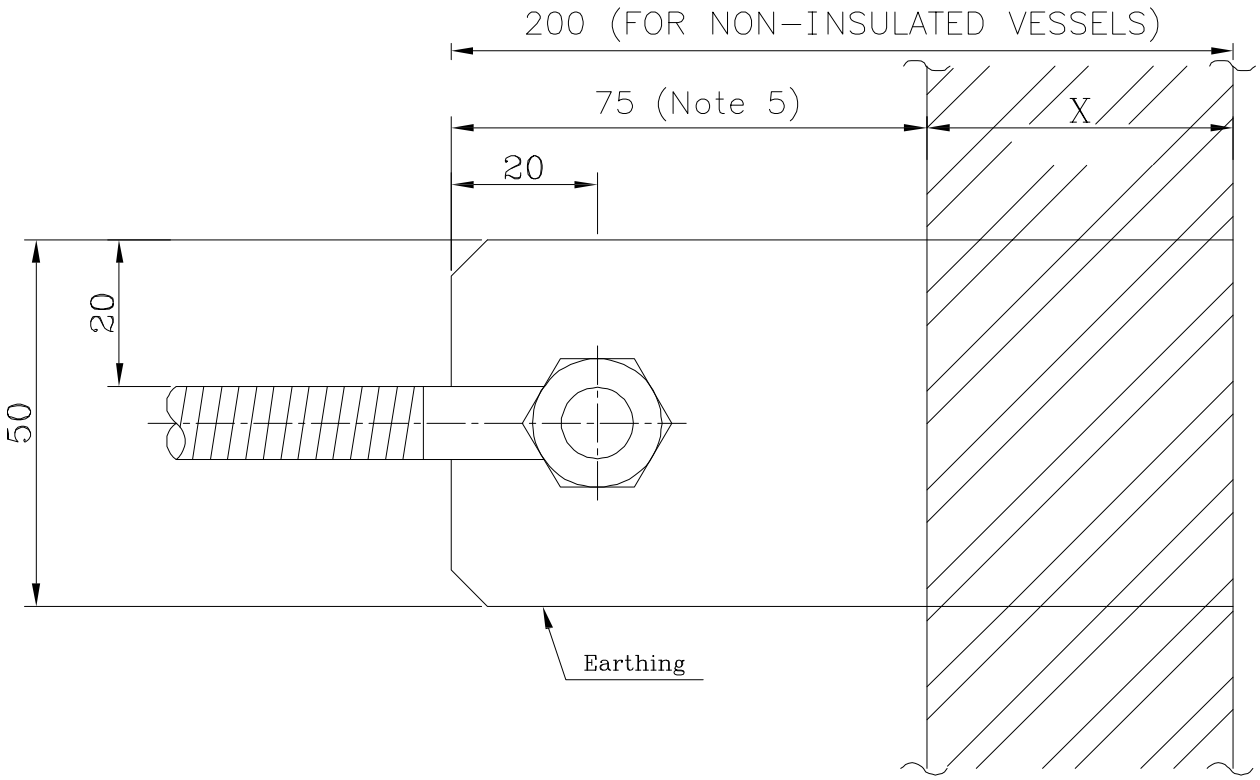


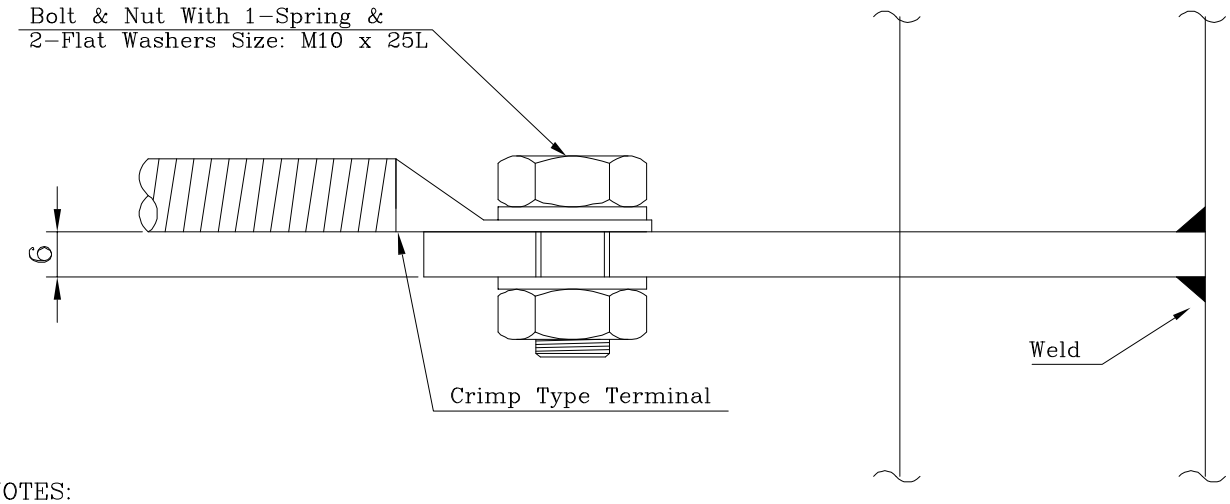
	BOLT SIZE								
	M24	M30	M36	M42	M48	M56	M64	M72	M80
H	262	314	314	316	376	399	429	462	535
W	100	100	110	120	130	150	160	170	180
Dø	26	33	39	45	52	62	70	78	86
d (NPS)	1 1/2	1 1/2	2	2	2 1/2	3	3	4	4

NOTES :

1. All dimensions are in mm.
2. Materials shall be as follows:
   Plate ..... ASTM A283-GR.C or equivalent
   Pipe ..... ASTM A120 or equivalent
3. Bolt holes in template and base ring of vessel shall be drilled using the same gauge plate.
4. Reinforcement of template shall be designed to prevent deformation, during transportation.
5. Orientation mark 0°, 90°, 270° and item number shall be marked by hard stamp and white paint on the upper face of template.
6. In case bolt pitch is 800 mm and over, gusset plates shall be required.
7. Divided templates shall be reinforced for transportation, etc. and adjusted easily for site assembling.

4.18 EARTHLING BOSS

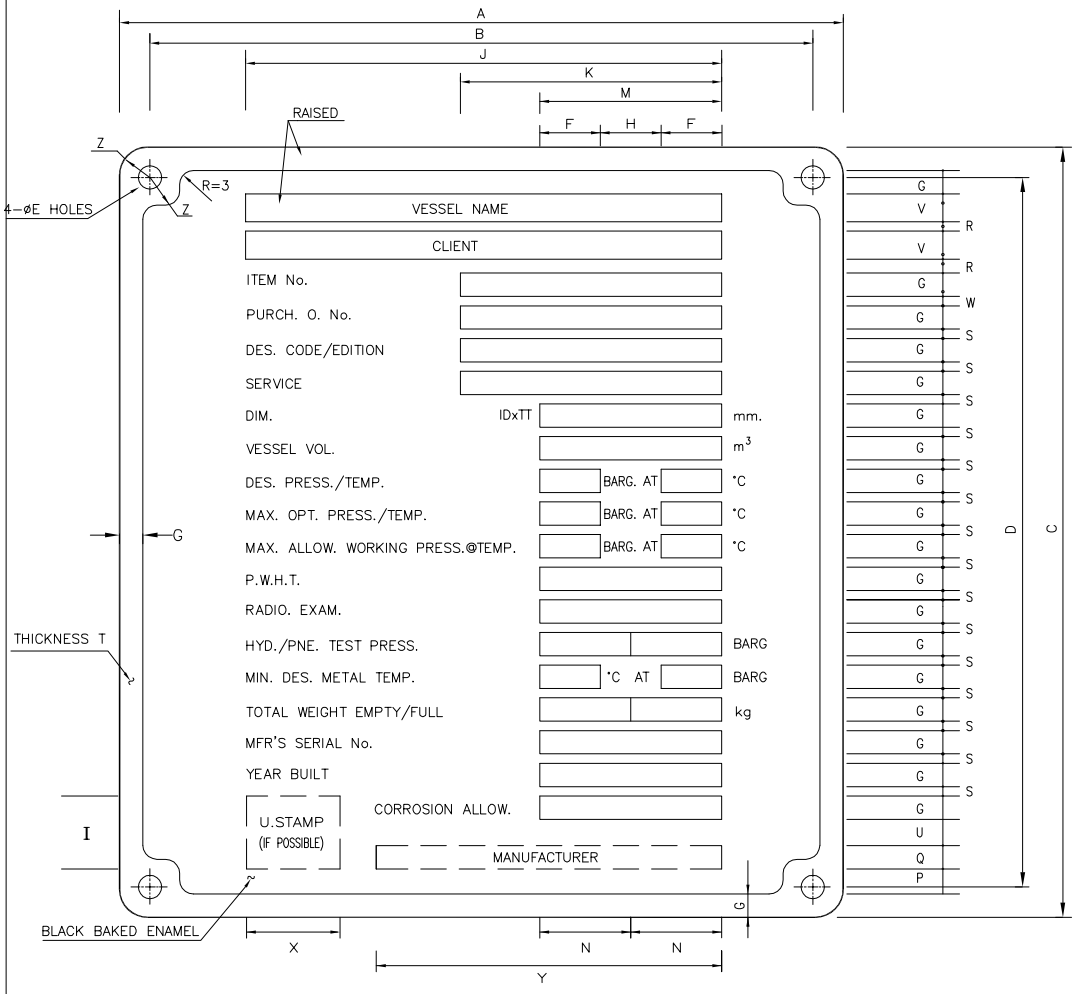




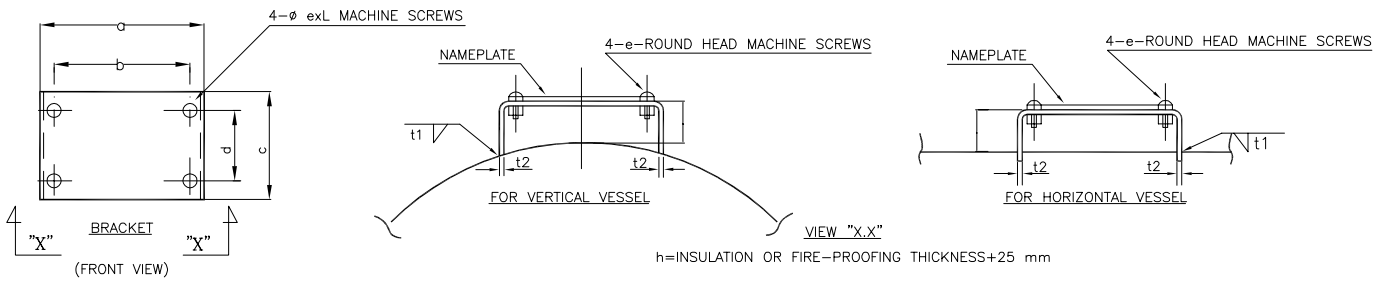
NOTES:

1. Earthing Lug Shall Be Hot Dip Galvanized Steel.
2. "X" Is Thickness Of The Fireproofing Or Insulation, if any.
3. Earthing Lug Can Be Used For Vessels, Thanks, Steel Structures, Pipe Rack & Pipes.
4. Dimensions Are In mm.
5. For Insulated vessels, the earthing boss standout length shall be 75 mm.

4.19 NAME PLATE FOR PRESSURE VESSELS



TYPE	A	B	C	D	E	Z	G	N	J	K	M	F	H	P	Q	R	S	T	U	V	W	Y	X	I	a	b	c	d	L	e	t1	t2
I	128	120	141	133	4	4	4	11	70	35	22	7	8	2	5	2	1	1	6	5	4	50	12	15	138	120	105	97	16	3	4	4.5
II	188	178	193	183	4	5	6	12.5	100	50	25	8	9	5	6	3	2	1	4	7	6	75	14	16	198	178	157	147	16	3	4	4.5
III	328	308	287	267	7	10	8	25	200	100	50	16	18	10	12	6	4	2	10	14	12	150	26	30	348	308	250	230	18	6	5	6



INDICATION OF NAMEPLATE

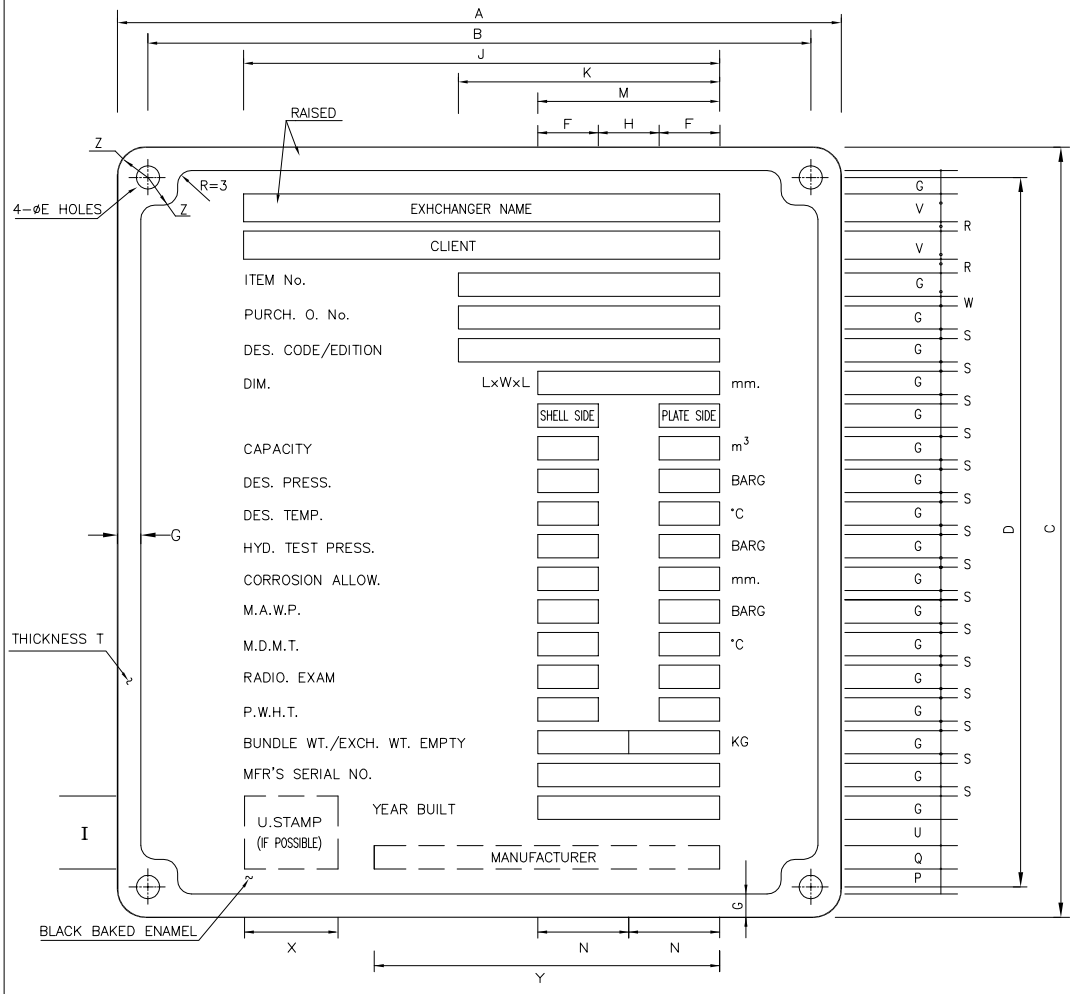
1. All dimensions are in mm.
2. Lettering shall be in roman vertical block type.
3. Contents shall be indicated as follows:

(1) Vessel name : full name as shown in vessel drawing.
(2) Item number : designated mark and number as shown in vessel drawing.
(3) Design code : applied code title e.g. asme viii div. 1.
(4) Post weld heat treatment : "YES" OR "NO".
(5) Radiographic examination : "FULL","SPOT" OR "NO".
(6) Weight : net weight of the empty vessel
(7) Year built : month and year of completion e.g. oct. 1992.

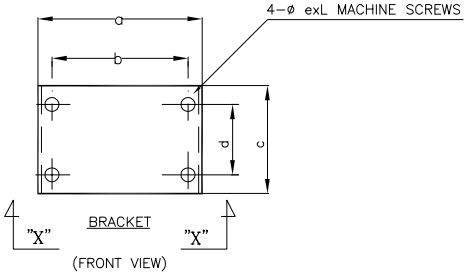
NOTES:

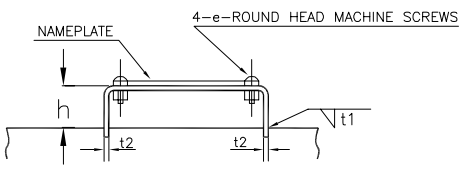
1. Materials shall be as follows:
   Nameplate : a 240 tp 304, stainless steel
   Screw : type 304 stainless steel
   Bracket : same material as attached parts
2. The marks, letters and portions illustrated as [ ] shall be in relief by means of etching. the manufacturer's mark and name shall not be framed.
3. The placing location of nameplate shall be indicated in the vessel drawing.
4. Type of nameplate shall be selected by the outside diameter of vessels in mm. as follows:
   Type I for O.D.<400
   Type II for 400<O.D.<4000
   Type III for O.D.>4000

4.20 NAME PLATE FOR PLATE & FRAME HEAT EXCHANGERS



TYPE	A	B	C	D	E	Z	G	N	J	K	M	F	H	P	Q	R	S	T	U	V	W	Y	X	I	a	b	c	d	L	e	t1	t2
I	128	120	141	133	4	4	4	11	70	35	22	7	8	2	5	2	1	1	6	5	4	50	12	15	138	120	105	97	16	3	4	4.5
II	188	178	193	183	4	5	6	12.5	100	50	25	8	9	5	6	3	2	1	4	7	6	75	14	16	198	178	157	147	16	3	4	4.5
III	328	308	287	267	7	10	8	25	200	100	50	16	18	10	12	6	4	2	10	14	12	150	26	30	348	308	250	230	18	6	5	6





VIEW "X.X"

h=INSULATION OR FIRE-PROOFING THICKNESS+25 mm

INDICATION OF NAMEPLATE

1. All dimensions are in mm.
2. Lettering shall be in roman vertical block type.
3. Contents shall be indicated as follows:

(1) Exchanger name : full name as shown in exchanger drawing.
(2) Item number : designated mark and number as shown in exchanger drawing.
(3) Design code : applied code title e.g. ASME VIII div. 1 , API Std. 662.
(4) Post weld heat treatment : "YES" OR "NO".
(5) Radiographic examination : "FULL","SPOT" OR "NO".
(6) Weights : net weight of the empty exchanger and bundle weight
(7) Year built : month and year of completion e.g. oct. 1992.

NOTES:

1. Materials shall be as follows:
   Nameplate : a 240 tp 304, stainless steel
   Screw : type 304 stainless steel
   Bracket : same material as attached parts
2. The marks, letters and portions illustrated as [ ] shall be in relief by means of etching. the manufacturer's mark and name shall not be framed.
3. The placing location of nameplate shall be indicated in the exchanger drawing.
4. Type of nameplate shall be selected by the lenght (L) of exchanger in mm. as follows:
   Type I for L<400
   Type II for 400<L<4000
   Type III for L>4000