FORMAT NO. : HSE-5 REV 0

MONTHLY HEALTH, SAFETY &ENVIRONMENTAL (HSE) REPORT

(To be submitted by each Contractor)

Actual work start Date: _____ For the Month of: _____

Project: _____ Report No: _____

Name of the Contractor: _____ Status as on: _____

Name of Work: _____ Job No : _____

(Contractor in consultation with EIL shall generate the reports through web basedpackage (www3.eil.co.in/eilhse)only.

ITEM		UPTO PREVIOUS MONTH	THIS MONTH	CUMULATIVE
1) Average number of Staff & Workmen (average daily headcount, not man days)				
2)Total Man-hours worked				
3) Number of site personnel undergone HSE Induction				
4) Number of HSE meetings organized at site				
5) Number of HSE awareness programmes conducted at site				
6) Number of Tool Box Talks conducted				
7) Number of Loss Time Injuries (LTI)	Fatalities			
	Other LTI			
8) Number of Non disabling injury (Non-LTI)				
9) Number of First Aid Cases				
10) Number of Near Miss Incidents				
11) Number of Dangerous Occurrences				
12) No. of unsafe acts/ practices detected				
13) No. of disciplinary actions taken against staff/ workmen				
14) Man-days lost due to injury				
15) LTI Free man-hours i.e. LTI free man-hours counted from the Last LTI (enter date: .....)				
16) Frequency Rate (No. of reportable LTI per 10lacs man-hours worked)				
17) Severity Rate (No. of man days lost due to LTI per 10lacs man-hours worked)				
18) No. of activities for which HIRAC Completed				
19) No. of incentives/ awards given				
20) No. of occasions on which penalty imposed by EIL/ Owner				
21) No. of Audits conducted				
22) No. of pending NCs in above Audits				
23) Compensation cases raised with Insurance				
24) Compensation cases resolved and paid to workmen				
25) No of Vehicular Accident cases				
26) No of fire/Explosion cases				

27) Whether workmen compensation policy taken			Yes		No
28) Whether workmen compensation policy is valid			Yes		No
29) Whether workmen registered under ESI Act, as applicable			Yes		No
30) Whether HIRAC Register prepared and updated			Yes		No
31)Whether Environment Aspect Impact Register prepared and updated			Yes		No
32) Whether Legal Register prepared and updated			Yes		No

Remarks, if any

Date:

Prepared by Safety Officer Approved by Site Head / Resident Construction Manager

(Signature and Name)(Signature and Name)

To: -

- RCM EIL

FORMAT NO. : HSE-6 REV 1

PERMIT FOR WORKING AT HEIGHTS (ABOVE 2.0 METER)

(In duplicate to be issued daily for site and for office)

Permit No…….. Name of Main Contractor……

Name of work executing agency / sub agency / vendor:……

Date…… Exact Location of work……

Nature of work ……..Duration of work (from) …… (to) ……

Number of workers covered within this permit……

(*List enclosed with name & gate pass numbers.*)

Sl. No.	Items / Subjects	Status of compliance (Yes / No)	
1	Work areas / Equipment's inspected		
2	Work area cordoned off		
3	Adequate lighting is provided		
4	Precautions against public traffic taken		
5	Concerned persons in & around have been alerted & cautioned		
6	Hazards / risks involved in routine / non-routine task assessed and control measures have been implemented at specific task		
7	ELCB provided for electrical connection & found working		
8	Ladder safely attached / fixed		
9	Scaffoldings are checked and TAGs are found used correctly		
10	Working platforms are provided and are found sound /safe for use		
11	Safe access & egress arrangements (e.g. ladders, fall arresters, life-lines etc.) are satisfactorily incorporated		
12	a. Openings on platform / floors are effectively cordoned / covered		
	b. Safety Nets are provided wherever required		
13	Use of following safety gadgets by people working at area under this permit, is checked and found satisfactory - Safety helmet Safety harness (full body) with double lanyard Safety Shoes Safety gloves Safety goggles		
14	Housekeeping of work area found satisfactorily tidy / clean & clear		
15	Adequate measures have been taken for works being continued at the ground level, when simultaneous works are permitted overhead at that very location.		
16	Materials are not thrown from heights on to ground		
17	Medical examination of workers are made & found satisfactory		
18	Responsible job engineer / supervisor found physically present at work spot for overall administration of work as well as safety of people.		

Above items have been checked & compliance has been found in place. Hence work is permitted to start / continue at the above-mentioned location. Work shall not start till identified lapses are rectified.

Additional Precautions, if any ……

……

Work Permit Receiver Verification By Work Permit issuer

Contractor Job Supervisor Contractor Safety Officer Contractor Engineer/RCM

AT THE END OF THE DAY/WORK:

All works at height are completed & workmen have returned safely from work location at (time)…….. (date)……

(Sig. Contractor Engineer)

FORMAT NO. : HSE-7 REV 1

CONFINED SPACE ENTRY PERMIT

Project site _____ Sr. No. _____

Name of the work _____ Date _____

Name of Contractor _____ Nature of work _____

Exact location of work _____

Safety Requirements POSITIVE ISOLATION OF THE VESSEL IS MANDATORY

(A) Has the equipment been ?

Y	NR		Y	NR		Y	NR	
☐	☐	Isolated from power/steam/air	☐	☐	water flushed &/or steamed	☐	☐	radiation sources removed
☐	☐	isolated from liquid or gases	☐	☐	Man ways open & ventilated	☐	☐	proper lighting provided
☐	☐	depressurized &/or drained	☐	☐	cont. inert gas flow arranged	☐	☐	
☐	☐	blanked/ blinded/ disconnected	☐	☐	adequately cooled	☐	☐	

(B) Expected Residual Hazards

☐☐	lack of O_2	☐☐	combustible gas/ liquid	☐☐	H_2S / toxic gases
☐☐	corrosive chemicals	☐☐	pyrophoric iron / scales	☐☐	electricity / static
☐☐	heat/ steam / frost	☐☐	high humidity	☐☐	ionizing radiation
☐☐		☐☐		☐☐	

(C) Protection Measures

☐☐	gloves	☐☐	ear plug / muff	☐☐	goggles / face shield
☐☐	protective clothing	☐☐	dust / gas / air line mask	☐☐	personal gas alarm
☐☐	grounded air duct/blower /AC	☐☐	attendant with SCBA/air mask	☐☐	rescue equipment/team
☐☐	Fire fighting arrangements	☐☐	safety harness & lifeline	☐☐	communication equipment
☐☐		☐☐		☐☐	

Authorization / Renewal (It is safe to enter the confined space)

	No. of persons allowed	Name of persons allowed	Signature			Time		Signature
			Work Permit Receiver(Contractor Supervisor)	Verification by Contractor Safety officer	Work permit issuer Contractor Engineer/RCM	From	To	Workman

Permit Closure :

(A) Entry ☐ was closed ☐ stopped ☐ will continue on ...

(B)☐ Site left in a safe condition ☐ Housekeeping done

(C) Multi lock☐ removed ☐ key transferred

☐ Ensured all men have come out ☐ Man-ways barricaded

Remarks, if any:

FORMAT NO. : HSE-8 REV 0

RADIATION WORK PERMIT

Project :
Name of the work :
Name of site contractor :

Sr. No. :
Date :
Job No. :

Location of work :

Source strength :

Cordoned distance (m) :

Name of Radiography agency :

Approved by Owner/EIL ☐

No. of workers engaged :
(List enclosed with name & gate pass numbers.)

The following items have been checked &compliance shall be ensured during currency of the permit:

S. No.	Item description	Done
	Safety regulations as per BARC/AERB ensured while source in use/in transit & during storage	
	Area cordoned off / safe working platform provided	
	Lighting arrangements for working during nights ensured	
	Warning signs/ flash lights installed	
	Cold work permit taken (if applicable)	
	PPEs like film badges, dosimeters used	

Additional precautions, if any _____

(Radiography Agency's BARC/AERB authorized Supervisor)

Permission is granted.

Permit is valid from _____ AM/PM _____ Date to _____ AM/PM _____ Date

(Signature of permit issuing authority-RCM of contractor)
Name : Designation: Date:

Permit renewal:

Permit extended up to		Additional precautions required, if any	Sign of issuing authority with date (of site contractor)	
Date	Time			

Work completed/ stopped/ area cleared at _____ Hrs of Date _____
(Sign. of permit issuing authority)
Name& Signature of site contractor:

FORMAT NO. : HSE-9 REV 1

DEMOLISHING/DISMANTLING WORK PERMIT

Project : Sr.No. :
Name of the work : Date :
Name of contractor : Job No. :

Name of sub-contractor : No. of workers to be engaged:
(List enclosed with name & gate pass numbers.)

Line No./ Equipment No./ Structure to be dismantled :

Location details of dismantling/ demolition with sketch : (clearly indicate the area)

The following items have been checked &compliance shall be ensured during currency of the permit:

S. No.	Item description	Done	Not Applicable
	Services like power, gas supply, water, etc. disconnected	☐	☐
	Dismantling/ Demolishing method reviewed & approved	☐	☐
	Usage of appropriate PPEs ensured	☐	☐
	Precautions taken for neighboring structures	☐	☐
	First-Aid arrangements made	☐	☐
	Fire fighting arrangements ensured	☐	☐
	Precautions taken for blasting	☐	☐

Work Permit Receiver
(Contractor's Supervisor/Engineer)

Verification by Contractor
(Contractor's Safety Officer)

Permission is granted.

(Work Permit issuer-Client)

Name :
Date :

Completion report:

Dismantling/ Demolishing is completed on _____ Date at _____ Hrs.

Materials/ debris transported to identified location ☐ Tagging completed (as applicable) ☐

Services like power, gas supply, water, etc. restored ☐

(Permit issuing authority-Client)

CONTRACTOR's NAME

FORMAT NO. : HSE-10 REV 0

DAILY SAFETY CHECKLIST

(To make use of before start of day's work)

Project :
Name of the work :
Name of contractor :

Sr.No. :
Date :
Job No. :

Description of Job decided to perform : -

- **Use of PPE / Safety Gadgets**

Sl. No	PPEs	Compliance (Yes / No)	Sl. No	PPEs	Compliance (Yes / No)
1	Safety Helmets		6	Face Shield	
2	Safety Shoes		7	Full body harness	
3	Hand Gloves		8	Fall Arrest System	
4	Dust Musk		9	Safety net	
5	Safety Goggles		10	Horizontal life-line made of steel wire, (dia not less than 8.0 mm.)	

(Serial No. 1 & 2 are compulsory for everyone. Specify & ensure use of other safety gadgets as required for the job)

- **Identify following important unsafe conditions: -**

Sl. No	Conditions	Yes / No
1	Access to work site / emergency escape clear	
2	Soil / Loose earth kept away from excavated pit / slope / ladder provided	
3	Electrical wire / welding lead lying entangled on ground / welding m/c. booth accessible	
4	Elevated work platform / open ends are protected	
5	Ground area cordoned off before lifting works or erection at height / ground area checked & cordoned-off before start of height works	
6	Structural members / erected pipes / wooden boards/pieces etc. are safely anchored at heights and are not likely to fall down on people when working beneath	
7	Ladders tied-up on tall steel structures, long before are removed to get rid of their use	
8	Any Other	

- **Indicate actions taken, if status of any of the above items is found "No"**
  .....
  .....
- **Specific Safety guidelines / precautions, if any** (communicated thro' TBT)
  .....
  .....
- **Above conditions and PPE compliances are checked by undersigned and correct status are indicated after verification**

Prepared by
Contractor Site Engineer

Verification By
Contractor Safety Officer

FORMAT NO. : HSE-11 REV 0

(Sheet 1 of 2)

HOUSEKEEPING ASSESSMENT& COMPLIANCE

Project :
Name of the work :
Name of contractor :
Name of contractor : Fortnightly

Sr.No. :
Date :
Job No. :

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/No	Remarks	Action
1.	Cleanliness at the Main entry / access of site				
2.	Ground condition / floor areas free from water-logging / oil spillage				
3.	Ground & elevated floors free from rubbish / wastes / accumulated debris / scraps.				
4.	Manholes / openings are covered / fenced				
5.	Trenches are barricaded / walkways are in place				
6.	Drains are cleaned / not choked / not occupied by dumped materials				
7.	Sufficient CAUTION boards / instructions displayed				
8.	Construction machinery are maintained & parked in orderly manner.				
9.	Movement of site people are not obstructed because of dumping / storing of construction materials				
10.	Access / egress to Electrical Distribution Boards / Panels clear from wires / cables / earth-strips etc.				
11.	Electrical panel rooms / sheds / MCC / Control rooms / Substations etc. are clean & tidy and not used for storing dress / clothes, tiffin-box or bicycles.				
12.	Passage behind Elec. panels are free for access				
13.	Fire extinguishers / fire-buckets are accessible without any difficulty.				
14.	Stair-steps, platforms & landings are clear & tidy				
15.	Sheds / rooms & work areas have got sufficient illumination as well as ventilation				
16.	Cables / Wires / welding leads are routed / hanged appropriately & are not creating unsafe condition.				
17.	Stacking / storing of insulation materials or their packing.				
18.	Removal or cleanliness of left-over sand, concrete, brick-bats, insulation-materials, excess earth, wastes etc.				
19.	Storing / stacking of sand, metal chips, re-bars, steel pipes, valves, fittings etc.				
20.	One escape route at ground & minimum two escape routes at elevation available,				

FORMAT NO. : HSE-11 REV 0

(Sheet 2 of 2)

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/No	Remarks	Action
21.	Captions / Posters / Slogans on various safety instructions are displayed legibly in local language				
22.	Cable trenches are water-free or regular arrangement for taking out accumulated water exists.				
23.	Windows of rooms / offices are regularly cleaned				
24.	Facilities for cycle sheds, drinking water, washing, rest-rooms etc. are maintained in tidy manner.				
25.	Toilet, Urinals, Canteen / kitchen / pantry etc. are maintained & free from obnoxious smell.				
26.	Construction tools / tackles are stored systematically - the items are tagged / tested / certified by competent third party.				
27.	Sufficient numbers of Dust-bins / Waste-bins found at site and are regularly emptied.				

Additional remarks, if any -

.....

.....

.....

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

FORMAT NO. : HSE-12 REV 0

INSPECTION OF TEMPORARY ELECTRICAL BOOTH / INSTALLATION

Project :
Name of the work :
Name of contractor :
Sub Station No:/Booth No

Sr.No. :
Date :
Job No. :
Location:

SL NO	SUBJECTS	OBSERVATION (YES /NO)	ACTION TAKEN
1	Switchboards installed properly are in order and protected from rain & water-logging.		
2	Adequate illumination provided for switchboard operation during night hours & the lamps are protected from direct human contact.		
3	Voltage ratings, DANGER signs, Shock-Treatment-Chart displayed in the installation / booth		
4	Fire extinguisher (DCP or CO_2) & Sand Bucket kept in close vicinity of Switchboards		
5	Valid License & Competent Electrician / Wireman available & name/ license no. displayed at booth / installation.		
6	General housekeeping in & around booth / installation found in order.		
7	Cable-route-markers for U/G cables provided.		
8	Monthly inspection report of Electrical hand tools available in booth / installation.		
9	Electrical Panel door to be in closed condition and Insulated Mat to be provided in front of panel.		
10	Rubber hand gloves available/ used by Electricians		
11	Availability of CAUTION boards for shutdown & / or repairing works.		
12	All incoming & outgoing feeders have proper MCCB / HRC fuses / Switches.		
13	Switchboards "earthed" at two distinctly isolated locations.		
14	Switchboards have adequate operating space at the front face & at the rear face too.		
15	All connections provided through 30mA ELCB.		
16	Testing records of all ELCBs available at site		
17	Only industrial type plugs & sockets are used.		
18	Temporary connections are 3-core double insulated & free from cuts & joints and 3rd core is earthed at both ends		
19	Socket boards are properly mounted on stand & protected from water ingress.		
20	Electrical equipments operating above 250V have two earthing / double earthing.		
21	All incoming / outgoing cables are properly glanded& terminated with "lugs".		
22	Switch-boards are of industrial variety / type.		
23	Sketch for installation / connection (SLD) made & pasted& other safety labels/display boards		
24	Labeling of incoming / outgoing feeders made.		
25	All hand lamps are protected from direct contact.		
26	All electrical cable / joints are in safe condition		

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

FORMAT NO. : HSE-13 REV 0

(Sheet 1 of 2)

INSPECTION FOR SCAFFOLDING

Project :
Name of the work :
Name of contractor :

Sr.No. :
Date :
Job No. :

Sl. No	Description	Yes	No	N.A.	Actions taken
1	Whether work permit is obtained to take up work at height above 1.5 Mts?				
2	Whether atmospheric condition is "stormy" or "raining" and works at heights have been permitted?				
3	Whether steel pipes scaffoldings are used for units /off-site areas?				
4	Whether scaffolding has been erected on rigid/firm/leveled surfaces / ground? Whether "foot-seals" or "base-plates" are used beneath the up-rights (vertical steel pipes)				
5	Whether scaffold construction is as per IS specification with toe-board and hand-rails (top-rail as well as mid-rail)?				
6	Whether distance between two successive up-rights are less than 2.5 Mts (height of scaffold & load carrying capacity governs the distance between two uprights)				
7	Whether all uprights are extended at least 900 mm above the top most working platform (to enable fitting of handrails)?				
8	Whether vertical distance of two successive ledgers is satisfactory? *(varying between 1.3 Mts. To 2.1 Mts)*				
9	Whether the peripheral areas of working at height are cordoned-off? (for avoiding accident to people arising out of dropped / deflected materials)				
10	Whether platform is provided? Is it safely approachable?				
11	Whether end of scaffold platform / board are extended beyond transoms? (125mm to 150 mm)				
12	Whether CE / IS approved quality and worthy conditioned full-body safety harness (with double lanyard & karabiners) are used while working at heights?				
13	Whether life-line of safety harness is anchored to an independent secured support capable of withstanding load of a falling person?				
14	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person / vehicle?				
15	Whether clamps used are of good condition, of adequate strength and free from defects?				
16	Whether ladder is placed at secured and leveled surface?				
17	Whether water-pass and oil-spills are avoided around the scaffold structure?				
18	Whether ladder is extended 1.5mts. above the landing point at height?				
19	Whether more than one access/egress provided to the scaffold?				
20	Whether ladder used are of adequate length and overlapping of short ladders avoided?				
21	Whether metallic ladders are placed much away from near-by electrical transmission line?				
22	Whether rungs of ladder are inspected and found in good order?				
23	Whether fall-arresters provided on both the access/egress routes?				
24	Whether diagonal (cross) bracings are provided at regular interval on the scaffold?				
25	Whether working platform on the scaffold has been made free from "jolt" or "gap"?				
26	Whether tools or materials are removed after completion of the day's job at heights?				
27	Whether a valid Permit for Work (PFW) is obtained before taking up work over asbestos or fragile roof?				
28	Whether sufficient precaution is taken while working on fragile roof?				

FORMAT NO. : HSE-13 REV 0

(Sheet 2 of 2)

Sl. No	Description	Yes	No	N. A	Actions taken
29	Whether provision is made to arrange duck ladder, crawling board for working on fragile roof?				
30	Whether scaffold has been inspected by qualified civil engineers prior to their use?				
31	Whether the scaffolding has been designed for the load to be borne by the same?				
32	Whether the erection and dismantling of the scaffolding is being done by trained persons and under adequate supervision?				
33	Whether safety net with proper working arrangement and life-line has been provided?				
34	Whether TAGS (Green for acceptable and Red for incomplete/unsafe scaffolds) are used on scaffolds?				
35	Whether sufficient illumination is provided in and around the scaffold and access?				
36	Whether emergency rescue / response arrangements are made in place				

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

FORMAT NO. : HSE-14 REV 1

(sheet 1 of 2)

PERMIT FOR ERECTION / MODIFICATION & DISMANTLING OFSCAFFOLDING

Project :
Name of the work :
Name of contractor :
Nature of activities :

Sr.No. :
Date :
Job No. :
Duration: From.....To.....

SL. No.	SUBJECTS / ITEMS	DONE	NOT DONE	REMARKS
1	Specific task of Erection / Modification / Dismantling of scaffolds, identified & TAGGED accordingly (before as well as after carrying-out jobs).			
2	People engaged in doing the job are identified & are certified by Job Engineer of Main Contractor as experienced / trained.			Names to be noted
3	Concerned persons are alerted by the Job Engineer of Main Contractor in connection with possible hazards & what the workmen MUST do / MUST not do.			
4	Verification by Job Engineer of Main Contractor made for confirming that all persons permitted to carry-out the jobs are making use of Helmet, Safety Shoes, Goggles, Gloves & Double lanyard safety harness and other relevant PPEs.			
5	Area of work is effectively cordoned-off / barricaded / illuminated.			
6	For taking-up / lowering down Scaffolding members / clamps / couplings etc. appropriate ropes / pulleys/ chains etc. have been arranged for use (not to throw any item) & the same have been verified as "fit for purpose".			
7	Items / members of scaffold, being lowered are removed from the area & stacked correctly.			
8	Ropes, chains, pulley blocks etc. being used for lifting or lowering scaffold items, are inspected by the Job Engineer & their certifications as well as physical conditions have been found O.K, before signing this PERMIT.			
9	Safety Net / Life-line / Fall Arresters etc. are arranged in position and Job Engineer has found working conditions favorable for activities to start.			
10	Scaffold erection or dismantling tasks are being supervised by Experienced Engineer / Competent person.			
11	Only competent & experienced people have been selected / engaged in Scaffolding erection, modification or dismantling tasks.			
12	Adequate & effective actions for traffic and movement of people around the cordoned-off area taken to avoid inadvertent incident			
13	Working platforms are protected with handrails & toe-boards.			
14	Access & Exit (for reach & escape) are safe for use by people.			
15	Tools, tackles to be used for above jobs are verified by job Engineers of Main contractor as genuinely good and tied-up at height (to prevent their fall).			
16	Site important Telephone Nos. are made known to everyone			
17	SOP (Safe Operating Procedure) for the specific task is made & followed too.			
18	Emergency vehicle has been arranged at work locations.			

- This permit for work shall be available at specific work location all the time.
- After completion of work, permit shall be returned to safety cell of main contractor, without fail.
- This Permit shall be issued maximum upto (Monday to Sunday).
- Additional Precautions, if any

  .....

- **ACCORD OF PERMISSION** (to be ticked) - **YES** ( )/ NO ( )

  Work Permit Receiver Verification By Work Permit issuer Contractor Job Supervisor
  Contractor Safety Officer Contractor Engineer/RCM

FORMAT NO. : HSE-14 REV 1

(sheet 2of 2)

Everyday Site working conditions & performance of workmen shall be assessed / checked by Contractor Site Engr. and Safety Officer shall verify the same.

	Name / Sign.	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Site Engr.								
Safety Off.								

FORMAT NO. : HSE-15 REV 1

PERMIT FOR HEAVY LIFT/CRITICAL ERECTION

Project :
Name of the work :
Name of contractor :
Nature of activities :
Location of work :
Equipment/Structure to be erected:

Sr. No. :
Date :
Job No.:
Duration: From.....To.....
Name /Type of crane :
Wt. of equipment/ structure to be erected

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Is the crane type suitable for lift or as per erection procedure?				
2)	Is the crane have the correct number of counterweights fitted?				
3)	Availability of Load Certification of crane from authorized agency.				
4)	Is the load chart of crane available in carne cabin/or with Crane operator?				
5)	Is the device to check the Wind speed in crane is working? Is the safety features in crane are working?				
6)	Availability of Load certification of slings and other accessories from authorized agency				
7)	Availability of Licensee/certificate for crane operator from authorized agency.				
8)	Availability of approved HIRAC for the subject activities.				
9)	Availability of approved erection/rigging procedures.				
10)	Availability of temporary gratings/ platforms for critical lifting(as applicable)				
11)	Tool Box conducted before erection?				
12)	Has the area been cordoned off?				
13)	Are the authorized persons during erection are identified?				
14)	Does each person identified for erection understand their roles and responsibilities?				
15)	Is the ground on which crane will rest or outrigger support are correct?				
16)	Is hard stand requirement (if any) complied?				
17)	Is the communication system (viz walkie-talkies, etc. are working properly?				
18)	If more than one crane is lifting the load, is an Intermediate rigger will supervise the lift?				
19)	If there is other obstruction within the operating radius of the crane, have correct precautions been taken to prevent collision?				
20)	All the persons are wearing the requisite PPE?				

Work Permit Receiver Verification By Work Permit issuer Contractor Job Supervisor
Contractor Safety Officer Contractor Engineer/RCM

FORMAT NO. : HSE-16 REV 1

PERMIT FOR ENERGY ISOLATION & DE-ISOLATION

Project :
Name of the work :
Name of contractor :

Sr.No. :
Date :
Job No. :

ENERGY ISOLATION PERMIT

- Clearance required from:.....Hrs .....Date To .....Hrs ....Date
- Name of equipment/ energy source etc. .....
- Nature of job to be done: .....
- Area.....Location:.....

PERMIT VALIDATION	PERFORMING AUTHORITY
I hereby authorize the .....personnel(performer) to isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for maintenance/repair. Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name:	The work and precautions will be carried out under my overall responsibility.(Testing/execution engineer) Signature: Date: Name:

SAFETY PRECAUTIONS FOR CLEARANCE	NORMALISING AFTER CLEARANCE
1. Notify workers of intent to de- energize ☐ 2. Obtain lock, tag or locking/tagging devices ☐ 3. Shut down, de-energize, dissipate any residual energies. ☐ 4. Apply lock ,tag and locking and/or tagging devices ☐ 5. *Any other job specific precautions ☐ 6. Verify effectiveness of lockout by attempting to restart. ☐ 7. Proper PPE is ensured ☐ I certify that the energy source mentioned above is isolated from all sources and is safe to start the work. Tag No:..... Lock No:..... Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name: **(*to be included by contractor in consultation with issuing authority)**	1. Notify workers of intent to re- energize ☐ 2. Conduct visual inspection to confirm that the danger zone is clear of workers ☐ 3. Conduct visual inspection to confirm that tools ,equipment's danger zone is clear of workers ☐ 4. Reposition the safety devices(interlocks, valves, guards, covers ,sensors, as applicable, etc.) ☐ 5. *Any other job specific normalizing details ☐ 6. Remove lock, tag and locking and/or tagging devices. ☐ 7. Re-energize. ☐ 8. Confirm system is operating properly& safely I certify that the energy source mentioned above is isolated from all sources and is safe to start the work. Tag No:..... Lock No:..... Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name: **(*to be included by contractor in consultation with issuing authority)**

ENERGY DE-ISOLATION PERMIT

PERMIT VALIDATION	PERFORMING AUTHORITY
I hereby authorize the .....personnel(performer) to de- isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for normal operation.. Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name:	I hereby certify that the equipment/energy source mentioned above has been de-isolated and is ready for normal operation.(Testing/execution engineer) Signature: Date: Name: Countersigned by Issuing authority

FORMAT NO. : HSE-17 REV 1

PERMIT FOR EXCAVATION (depth 2m and above)

(Sheet 1of 2)

Project :
Name of the work :
Name of contractor :
Job Description :
Size of excavation :

Sr.No. :
Date :
Job No. :
Location:

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Suitable and sufficient risk assessments and method statements has been carried to ensure that the work shall be undertaken in accordance with specification and standard.				
2)	Are plans/details of underground services available and the same has been reviewed?				
3)	Has survey done to locate the services/obstacles etc.				
4)	Has the live services (electrical, water line, air line, telephone line, etc)has been disabled for carrying out the job.				
5)	Is adequate barriers/fences to protect the excavation are in place?				
6)	Is Adequate warning signs are in place?				
7)	Is Assessment of ground conditions done and remedial action(if any) taken?				
8)	Safe access / egress (e.g. ramp / steps / ladders etc.) provided for site workmen & supervisors.				
9)	Is the excavation work being undertaken in proximity of structure, etc. ?If Yes, it's effect is considered?				
10)	Availability of competent person for supervising the excavation work?				
11)	Adequate safe arrangement to prevent collapse of edges (e.g. shoring / strutting / benching / sloping etc.) made at site.				
12)	Hard barricades (at least 1.0M away from edge & for excavation near site access roads) with warning signs/caution boards are provided				
13)	Accumulation / passage-ways of water at periphery of excavation / trench stopped/ restricted.				
14)	Is the equipment being used for excavation has been checked for adequacy and is in good working condition having all the safety features?				
15)	Age & fitness of workmen ensured by medical test before engagement in job ?				
16)	Arrangement of Monitoring of possible oxygen deficiency or obnoxious gases done & action taken?				

PERMIT GRANTED - Yes / No

(*List enclosed with name & gate pass numbers.*)

Name & Signature of Site Engr.

Name & Signature of Area – In charge/RCM of Contractor (Receiver)

Contractor (Issuer)

Verification by Contractor Safety Officer

FORMAT NO. : HSE-17 REV 1

PERMIT FOR EXCAVATION

(Sheet 2of 2)

NOTES: -

1. Slopes or benches for excavation beyond 2.0M depth shall be designed & approved by Contractor's site head.
2. Excavated earth to be kept at least 1.5M away from edges
3. Safety helmets, Safety shoes or gum-boots, gloves, goggles, Face shield, Safety Harness shall be essential PPEs.
4. Permit shall be made in **duplicate** and original shall be available at site of work.
5. Permit shall be issued for maximum **one week** only (Monday to Sunday)
6. After completion of works, permit shall be closed & preserved for record purpose

GRANT OF PERMIT AND EXTENSIONS

Sl. No.	Validity period From ____To ____	Working Time From _____To _____	Receiver (site Engr. of Main Contractor)	Issuer(Area In charge/RCM of Main Contractor)	Review by EIL / Owner (Remarks with date
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Additional safety instructions if any: -

1.

2.

3.

FORMAT NO. : HSE-18 REV 0 **(Sheet 1of 2)**

IDENTIFICATION OF ENVIRONMENTAL ASPECTS, IMPACT ASSESSMENT AND CONTROL MEASURES

S.No	Activity	Environmental Aspect	N/A/E	Environment Impact	Control Measures	Consequences						Risk Level	Significant	Gaps/ Recommendations
						A	B	C	D	E	F	G	Yes/No	

(Sheet 2 of 2)

INITIAL ENVIRONMENT REVIEW TECHNIQUE

Environmental Impacts	AP = Air Pollution	WP = Water Pollution	LC = Land Contamination	DNR = Depletion of Natural Resources	NP = Noise Pollution

Scale	**Quantity (A)**	**Occurrence (B)**	**Severity of Impact (C)**	**Detection (D)**	**Control (E)**	**Legal and other requirements (F)**
1	Negligible	Very Rare	Negligible visual impact	Immediately	Available & effective at place	In compliance or not applicable
2	Low	Once a month or less	Causes Discomfort or Nuisance	Within 1 hour	Has in-built Secondary control	
3	Moderate	Once a day	Resource Depletion	Within 8 hours	Needs human Intervention	
4	High	Several times a Day	Affects Aquatic Life, flora, fauna or global issue	Within 24 hours	Mechanism in place but not reliable	
5	Excessive	Continuous	Human health effect	More than 24 hours	Absent or no effective control	Not in compliance

Risk Level - G : A x B x C x D x Ex F

Aspects with score of **100 and above** are considered as significant.
Also, Irrespective of the score, all legal noncompliance's to be considered as significant

Condition	
N	NORMAL
A	ABNORMAL
E	EMERGENCY

FORMAT NO. : HSE-19 REV 0 HIRAC

Risk Identification						Desired Controls & Existing Gaps, If Any		Risk Assessment				Recommended Control Actions To Reduce The Risk Level	Action By	Remarks
SN	Activity	Activity Type (R/NR)	Hazards	Condition(N/AN/E)	Associated Risk	Desired Control Measures	Gaps If Any	Probability(P)	Impact (I)	Risk R= P*I	Risk Classification			

Likelihood – Possibility of occurrence of risks based on present gaps (technological / operational / competence / measurement and monitoring);

UL: Unlikely, **L:** Likely, **VL:** Very Likely, **FR:** Frequent, **C**: Continuous

Impact –

SI: Slight Injury, **MI:** Minor Injury, **MJ:** Major Injury, **SF:** Single Fatality, **MF:** Multiple Fatalities

Level of consequence – Refer Guidance criteria for this i.e. possible degree of damage;

Condition- N: Normal, **AN**: Abnormal, **E**-Emergency

Activity Type: R- Routine, NR- Non Routine

RISK –

L: Low Risk, **M:** Moderate Risk, **H:** High Risk

FORMAT NO.: **HSE-20 REV 0**

Inspection of Tower Crane

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Serial number plate &SWL marking		
2	Valid TPI Certificate		
3	Valid Insurance		
4	Safe access and egress are provided to the crane operator.		
5	Front glass of Operator cabin		
6	Operator crane cabin is provided with a locking mechanism so as to prevent unauthorised entry.		
7	A safety bar is fitted across the operator's cabin window where there is likelihood of the operator falling through it.		
8	Manufacturer Operating Manual and Maintenance Manual are made available.		
9	An updated Operation and Maintenance log book is available in the operator cabin.		
10	All mounting bolts are in good condition.		
11	Load chart provided		
12	SLI available		
13	Crane hooks have got smooth surface and no dent		
14	Hook-latch / Dog-clamp in hook is effective		
15	Over hoist limit switch		
16	Double body earthing of Tower Crane		
17	Jib angle indicator is provided (For Luffing Jib Tower Crane).		
18	Emergency stop button, which will terminate the operation of the crane engine, is installed in the operator cabin and correctly identified.		
19	Effective braking mechanisms for Hoisting, Derricking, Slewing, Trolley Travelling maintained:		
20	Trolley Travelling limiter to prevent over-travelling of trolley is functional.		
21	Limit switches to prevent over-derricking and over-lowering of jib (For Luffing Jib Tower Crane) is functional.		
22	Slewing limiter to restrict slewing of crane is functional.		
23	Over load Limiter to prevent overloading of crane is functional.		
24	Load Moment Limiter to prevent over-turning moment is functional.		
25	Anti-collision devices are tested to stop the tower crane's operation such that the crane-to-crane interference must be maintained at not less than 3 m.		
26	Condition of boom		
27	Counter weight placement and pins		
28	Winches, pulleys and wire ropes are in good working condition.		
29	Colour coding		
30	Leakage in hydraulic cylinder		

31	Fire Extinguisher		
32	Tower crane is adequately grounded or protected against lightning.		
33	Wind anemometer is installed and is in good working condition.		
34	Aviation lamp is functional (Reqd. for 30mt and above)		
35	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
36	Safety Induction for Operator		
37	Others		

Signature & Name of Operator:

Signature and name of Job Engineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-21 REV 0

Crane Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Crane hooks have got smooth surface and no dent		
2	Hook-latch / Dog-clamp in hook is effective		
3	Over hoist limit switch		
4	Over Load Indicator		
5	Over Boom limit switch		
6	Boom angle indicator		
7	Colour coding		
8	Condition of boom		
9	Condition of wire rope		
10	Rope drum / sheaves are in good working condition		
11	Swing break & lock		
12	Swing Alarm		
13	Over hoist break & lock		
14	Boom break & lock (For Telescopic Boom)		
15	Leakage in hydraulic cylinder		
16	Condition of Outrigger (For Tyre Mounted Crane)		
17	Outrigger fully extended Marking (For Tyre Mounted Crane)		
18	Condition of Tyre (For Tyre Mounted Crane)		
19	Wheel chokes are present and are used whenever required (For Tyre mounted)		
20	Battery & lamps		
21	Moving & rotating parts guarded		
22	Load chart provided		
23	Reverse horn (For Tyre Mounted Crane)		
24	Body Condition of crane		
25	Front glass of Operator cabin		
26	Both side Mirror		
27	Number Plate (For Tyre Mounted Crane)		
28	Fire Extinguisher		
29	Horn		
30	Windshield and wipers		
31	Working of light & Indicator		
32	SLI		
33	Spark Arrestor(For Running Refinery/ Petrochemical/Chemical Plant)		

34	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
35	TPI Certificate		
36	RC Document (For Tyre Mounted Crane)		
37	Fitness Certificate of Vehicle by authority		
38	Insurance		
39	PUC		
40	HMV License for Operator		
41	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
42	Safety Induction for Operator		
43	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-22 REV 0

Hydraulic Mobile Crane- Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Identification number of Hydraulic Mobile crane boldly scribed in front and rear end of machine		
2	Operator has got adequate document in support of his competency (i.e. HMV driving license, knowledge & training)		
3	Marking of SWL on hook position is clearly visible		
4	Test & examination of Hydraulic Mobile crane by statutory / competent authority is carried out & document is valid		
5	Colour Coding		
6	RC Document		
7	Fitness Certificate of Vehicle by authority		
8	Valid Insurance		
9	Valid PUC		
10	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
11	Safety Induction for Operator		
12	Crane hooks have got smooth surface and no dent		
13	Hook-latch / Dog-clamp in hook is effective		
14	Over hoist limit switch		
15	Over Load Indicator		
16	SLI		
17	Condition of boom		
18	Condition of wire rope		
19	Rope drum / sheaves are in good working condition		
20	Leakage in hydraulic cylinder		
21	Tyre condition		

22	Battery		
23	Moving & rotating parts guarded		
24	Break		
25	Parking Break		
26	Front horn		
27	Reverse horn		
28	Hydraulic Mobile Crane cabin body and frame of machine is in good order		
29	Both side Mirror		
30	Fire Extinguisher		
31	Front glass pane of the Hydraulic Mobile operator's cabin is clean & clear (i.e. not cracked / damaged / broken)		
32	Windshield and wipers condition		
33	Working of front & back lights, turn Indicators, parking lights & fog lamps		
34	Spark Arrestor(For Running Refinery/ Petrochemical/Chemical Plant)		
35	Wheel chokes are present and are used whenever required		
36	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
37	Others		

Signature & Name of Operator

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-23 REV 0

Hydraulic Rig Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
2	All switch & mechanical guards are in good condition and properly installed		
3	All Safety Indicator lights work		
4	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
5	Motion alarms are functional		
6	Safety decals are in place and readable		
7	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
8	Braking devices are operating properly		
9	Winches, pulleys and wire ropes are in good working condition.		
10	Function of interlocks and limit switch		
11	The manufacturer's operations manual (in all languages of the operators)		
12	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		
13	Battery Charge		
14	Outriggers in place or functioning. Associated alarms working		
15	Moving & rotating parts guarded		

16	Load chart provided		
17	Fire Extinguisher		
18	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
19	Serial number plate		
20	SLI		
21	TPI Certificate		
22	Colour Coding		
23	Insurance		
24	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
25	Safety Induction for Operator		
26	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-24 REV 0

Boom Lift Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Operating and emergency controls are in proper working condition, EMO button or Emergency Stop Device		
2	Functional upper drive control interlock (i.e. foot pedal, spring lock, or two hand controls)		
3	Emergency Lowering function operates properly		
4	Lower operating controls successfully override the upper controls		
5	Both upper and lower controls are adequately protected from inadvertent operation.		
6	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
7	All switch & mechanical guards are in good condition and properly installed		
8	All Safety Indicator lights work		
9	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
10	Motion alarms are functional		
11	Safety decals are in place and readable		
12	Guardrails and anchor points are in place, and in good condition		
13	Work platform & extension slides are clean, dry, & clear of debris		
14	Work platform extension slides in and out freely with safety locking pins in place to lock setting on models with extension platforms.		
15	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
16	Braking devices are operating properly		
17	The manufacturer's operations manual is stored on AWP (in all languages of the operators)		
18	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		

19	Battery Charge		
20	Outriggers in place or functioning. Associated alarms working		
21	Tyres and wheels are in good condition, with adequate air pressure if pneumatic		
22	Wheel chokes are present and are used whenever required		
23	Moving & rotating parts guarded		
24	Load chart provided		
25	Fire Extinguisher		
26	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
27	Serial number plate with Load capacity		
28	TPI Certificate		
29	Colour Coding		
30	Insurance		
31	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
32	Safety Induction for Operator		
33	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

निर्माण स्थलों पर सकारात्मक सामग्री पहचान के लिए मानक विनिर्देश

STANDARD SPECIFICATION FOR POSITIVE MATERIAL IDENTIFICATION AT CONSTRUCTION SITES

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
5	10/08/2023	Revised and updated	DK	DG	RKS	SM
4	23/07/2018	Revised and updated	SKG	AP	AKK	RKT
3	12/10/2015	Revised and updated	DJ	SNB	TKS	SC
2	14/11/2011	Revised and updated	SM	SM	MKG	DM
1	02/01/2007	Revised and updated	AS	MPJ	VNP	VC
0	22/07/2002	Issued as Standard Specification	MPJ	MPJ	RSG	GRR

Abbreviations:

API	:	American Petroleum Institute
ASM	:	American Society for Metals
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing and Materials
AS	:	Alloy Steel
CS	:	Carbon Steel
EIL	:	Engineers India Limited
ITP	:	Inspection Test Plan
PMI	:	Positive Material Identification
RTJ	:	Ring Type Joint
SS	:	Stainless Steel
TPI/ TPIA	:	Third Party Inspection/Third Party Inspection Agency

Construction Standards Committee

Convenor: Sh. R K Singh, ED (Construction)

Members:
Sh. Janak Kishore, ED (Projects)
Sh. Chinmoy Kapuria, CGM (SCM)
Sh. Udayan Chakravarty, Sr. GM (Piping)
Sh. Debasish Ghosal, GM (Construction)
Sh. Pankaj Kumar Rai, DGM (Construction)

CONTENTS

1.0 SCOPE

1.1 This specification applies to metallic alloy materials as well as carbon steel materials as defined in this document used in piping, heater coils, storage tanks, vessels etc. at construction sites. Positive Material Identification (PMI) is to be carried out on Owner supplied material as well on materials purchased by the contractor after installation (before testing). PMI may be carried out at the ware house also for identification / segregation of materials as per instruction of Engineer in Charge

1.2 Any deviation from this specification must be approved by Owner/ EIL in the prescribed format.

2.0 DEFINITIONS

2.1 Positive Material Identification (PMI)

The term Positive Material Identification (PMI) refers primarily for determination/ verification of alloy type or its composition using portable or mobile spectrometer/ alloy analyzer. For the purpose of this specification, some carbon steel materials as defined in clause no 3.1.11 in this document are also included for PMI checking to avoid mix up with Alloy steel during installation.

Chemical spot checking, resistivity testing, eddy current testing, electromagnetic alloy sorting, thermoelectric testing shall not be considered as PMI for the purpose of this specification.

3.0 SPECIFIC APPLICABILITY

3.1 The following items (AS/SS from clause 3.1.1 up to 3.1.10 and CS at clause 3.1.11) require PMI unless specifically exempted through a Concession/ Deviation permit by Owner/ EIL.

3.1.1 All pressure containing piping components including, thermowells instrument manifolds, RTJ gaskets, fasteners etc. All valves installed on line.

3.1.2 Tubular products used in the fabrication of heaters.

3.1.3 Pressure - containing instrument housings (e.g. gauge glass housings, orifice meter tubes).

3.1.4 Internal metallic linings/cladding, and weld overlay, done at site, used for protection against corrosive environments. Weather protection jacket (cladding) materials, securement bands /wires, screws, rivets, 'S' & 'J' – clips etc used for insulation works.

3.1.5 Tubing

3.1.6 Stud, bolts and nuts

3.1.7 Plates

3.1.8 All pressure containing welds.

3.1.9 Pipe supports (welded/ bolted) such as pads, saddles, dummy pipes etc.

3.1.10 Any other components or materials specifically designated for PMI on the purchase order/ contract.

3.1.11 a) Pressure containing CS piping components of rating 900# and above
b) Pressure containing CS steel piping items under H_2 service.

c) Pressure Containing CS Piping NACE MR0103 is applicable as per PMS.

3.2 Exclusions

The following items are exempted unless specifically designated for PMI in the purchase order/contract:

3.2.1 Gaskets (spiral wound or carbon steel only).

3.2.2 Internal instrument parts.

3.2.3 Internal machinery parts.

3.2.4 Internal non pressure - containing baffles, trays, tray clips, supports, pall-rings, support rings, etc.

3.2.5 Electrical components.

3.2.6 Internal valve components.

3.2.7 Compression-type ferrules and fittings for use with 3/4 inch (19mm) outside diameter and smaller tubing.

3.2.8 All carbon steel piping components (including carbon steel pipe supports) other than those specified at 3.1.11.

3.2.9 All carbon steel Studs/ bolts/ nuts.

3.2.10 Carbon Steel Plates.

4.0 REFERENCES

American Society of Mechanical Engineers (ASME) BPV Code Section-II Part A, B and C.

ASME B 31.3

American Society for Testing and Materials (ASTM): As applicable

Material Verification Program for New and Existing Alloy Piping Systems: API RP 578

Any other material specification referenced by the Purchase Order/Contract.

IS 1239, IS 3589 and other relevant BIS codes.

5.0 GENERAL REQUIREMENTS

5.1 The test methods outlined in this specification are intended to identify the nominal composition of alloy/ Stainless steel materials. These test methods are not intended to establish the conformance of a material to a particular specification.

5.2 PMI shall not be considered as a substitute for required mill test reports listing chemical composition. In addition, mill test reports shall not be considered as confirming alloy/ composition verification.

5.3 The PMI activity shall be included in the overall quality plan and Inspection & Test Plan for fabrication/ erection. The contractor shall submit to EIL/ Owner, a procedure for PMI to

comply with the requirements of this specification. Approval of PMI procedure shall be obtained from Owner/ EIL prior to commencement of fabrication/ erection as the case may be.

5.4 Contractor shall engage reputed TPIA specified in the contract to witness inspection at site and accordingly submit ITP for review of owner/ EIL. In case list of approved TPIA is not available in contract, prior approval shall be taken before engagement of TPIA.

5.5 A copy of PMI records duly verified by TPIA shall be submitted to Owner/ EIL.

5.6 After installation, but prior to hydrostatic testing/ painting/ insulation, the contractor shall examine all components requiring PMI for proper compliance to this specification. A record of this final check duly endorsed by TPIA, as specified below, shall be submitted to EIL/ Owner and made part of the permanent inspection records.

5.6.1 Owner Supplied Material

Records signed by contractor and duly verified by TPIA (engaged by contractor)/ and reviewed by EIL/ Owner shall be generated as part of the receiving inspection at warehouse.

5.6.2 Contractor Supplied Material

Records signed by contractor and certified by an approved third party inspection agency.

5.7 After acceptance, all components shall be marked with a suitable and readily visible paint mark. These markings are in addition to markings / colour coding required by other codes/ specifications/ Technical Notes.

5.8 Controls shall be established to keep the non conforming items identified till proper resolution of non conformity.

5.9 EIL/ Owner shall have the right to witness the performance of any PMI test.

6.0 EXTENT OF PMI

PMI shall be done on each component (100 percent PMI inspection) including welds (Except carbon steel Piping welds), unless specifically exempted by Owner/ EIL.

PMI shall be done on pipe supports (welded/ bolted) such as pads, saddles, dummy pipes etc. (100 percent PMI inspection) in all piping systems of alloy material

PMI shall be done on all bolts and nuts (100 percent PMI inspection) of flange joints in all piping systems of alloy material.

7.0 PMI OF PIPING AND HEATER COIL COMPONENTS

PMI testing (irrespective of PMI done at earlier stages) shall be carried out when piping loops/ heater coils have been cleared for hydrostatic testing by EIL/ Owner. Hydrostatic Testing shall be carried out only when non conforming components have been replaced with conforming components and subsequent Non Destructive Testing, Post Weld Heat-Treatment, Hardness checking and re verification by PMI etc., as required by specifications have been completed. PMI records shall form a part of piping/ heater inspection records. Contractor shall demonstrate to EIL that each & every component of the piping system and heater coils has been subjected to PMI by providing line wise records of PMI duly endorsed by TPIA .

8.0 TESTING METHODOLOGY

8.1 The method used for PMI examination shall provide a quantitative determination of the alloying elements like chromium, nickel, molybdenum or vanadium in alloy steel items for the characteristic elements specified in clause 9.0

8.2 Instruments or methods used for PMI examination shall be able to provide quantitative, recordable, elemental composition results for positive identification of elements.

8.3 The acceptable instruments for alloy analyzer shall be either "portable X-ray Fluorescence" or "optical Emission type each capable of verifying the percentage of elements within specified range .The instruments must have the printout facility and sensitivity to detect the elements in the specified range.

8.4 Chemical spot testing, magnets, alloy sorters and other methods using eddy current or triboelectric testing methods are not acceptable for PMI examination.

8.5 All PMI instruments shall have been serviced within a 6 month period of the time of use to verify the suitability of batteries, sources,etc, and the date of the last service shall be stated on the PMI report form.

8.6 The surfaces to be examined shall be prepared and cleaned by suitable means before PMI so that surface be free from grease, oil, paint or oxides. Testing shall be done after proper surface cleaning and other requirements as outlined by the manufacturer of the portable alloy analyzer. Modification, if any, of these procedures must be approved by Owner/ EIL.

8.7 Ring type joint gaskets shall be inspected by using portable X-ray fluorescence instrument.

9.0 CHARACTERISTIC ELEMENTS

Material Specification		Characteristic Elements
ASTM A 335	Gr P11	Cr, Mo
	Gr P5	
	Gr P22	
	Gr P9	
	Gr P91	Cr, Mo, V
ASTM A 312	Type 304	Cr, Ni
	Type 316	Cr, Ni, Mo
	Type 321	Cr, Ni, Ti
	Type 347	Cr. Ni, Columbium, Tantalum

9.1 Carbon Steel materials under clause no 3.1.11 shall be checked to confirm that no mix up has taken place with alloy steel components.

9.2 Characteristic elements for materials not listed above shall be proposed by the contractor for approval of the Owner/ EIL.

10.0 CALIBRATION

10.1 Instruments used for PMI shall have the sensitivity to detect the alloying elements in the specified ranges. Instruments or methods used for examination shall be of the type that will provide quantitative, recordable, elemental composition results for positive identification of the alloy elements present.

10.2 Each alloy analyzer shall be calibrated using known alloy standards for intended materials to be checked by PMI. A calibration certification from the Manufacturer or his authorized agency shall be submitted to EIL/ Owner for records.

10.3 EIL/ Owner shall review the procedure and qualification and witness sample alloy/ carbon steel materials verification tests to confirm that the procedures, equipment and personnel are capable of providing consistent and accurate results. Certified samples, with full traceability, of a known alloy materials/ carbon steel materials shall be available for use as a random spot checking on instrument calibration.

11.0 SITE VERIFICATION OF ANALYZER

Verification using Standard samples supplied by institutes such as ASM (American Society of Metals) for the intended materials type and grade shall be performed each day before using the analyzer. Such verification shall be done again if PMI test is to be performed on different grade or type of material.

12.0 PERSONNEL QUALIFICATION

The persons performing the PMI test should be knowledgeable about properties of material, all aspects of operation of PMI equipment including the method of testing. Qualification/ experience documents of the person performing the PMI test including his training and experience shall be submitted to EIL/ Owner for review and approval.

13.0 ACCEPTANCE CRITERIA

13.1 Base Metal

PMI test results showing presence of characteristic elements upto 10% less than the minimum specified value in the material specification and upto 10% more than the maximum specified value in the material specification shall be acceptable.

13.2 Deposited Weld Metal

For deposited weld metal between base metals of the same specification using matching consumables, the recorded presence of characteristic elements upto 12.5% less than the minimum specified value in the welding consumables specification and upto 12.5% more than the maximum specified value in the welding consumable specification shall be acceptable.

14.0 REJECTION CRITERIA

14.1 If the PMI test results fall outside the acceptable range as given in 13.0 above, the contractor shall obtain a quantitative check analysis performed by a laboratory acceptable to EIL/ Owner for a complete chemical analysis. Results of this analysis shall be submitted to EIL/ Owner, with contractor's recommendation, for final decision.

Decision of EIL/ Owner shall be final in this regard.

14.2 If any material component or weld is found unacceptable, all other represented materials (e.g. in case of fasteners, supports) or welds shall be considered suspect. In such cases, the contractor has the following options:

14.2.1 Scrapping all those represented materials or components and replacing with new components or welds.

14.2.2 Performing 100% examination of the remainder of the represented materials/ components and replacing each item that fails the PMI check.

14.2.3 If the performance of any verification activity is unacceptable to EIL/ Owner or if any material has been incorrectly identified, all further tests shall be subject to EIL/ Owner approval until the problem is corrected.

15.0 DOCUMENTATION

15.1 Print out from alloy analyzer, in original, duly verified by the TPIA engaged by contractor, Contractor and PMI agency.

15.2 PMI report as per format No. 6-82-0002-F1

15.3 Basis and action for resolving and documenting PMI non conformances.

15.4 Contractor shall demonstrate to EIL/ Owner that all components requiring PMI have been subjected to PMI testing and accepted.

POSITIVE MATERIAL IDENTIFICATION TEST REPORT

REPORT NO: _____

Contractor _____ Date of PMI _____

Project _____ Inspection Agency _____

Location _____ PMI Agency _____

Job No. _____ PMI Equipment Model _____

Line No./ ISO Drg. No./ Make & Serial No. _____

Heater No./ Drawing No. _____ Last Service date _____

Sr. No.	Part Identification	Material As per Drg./ Spec.	Material as per PMI	Result (Accepted/ Rejected/ Retest)

(PMI AGENCY) (CONTRACTOR) (TPI AGENCY)

(EIL/ OWNER *)

*Sample verification

पाइपिंग सामग्री के रंग कोड हेतु मानक विनिर्देशन

STANDARD SPECIFICATION FOR COLOUR CODING OF PIPING MATERIAL

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
4	24/07/2024	Revised and Updated	DK	SBB	RKS	MN
3	10/07/2019	Revised and Updated	SKG	AP	AKK	RKT
2	25/06/2014	Revised and updated	SM	DJ	RKD	SC
1	10/07/2009	Revised and updated	SM	SM	RKD	ND
0	30/05/2003	Issued as Standard Specification	RKN	MPJ	RSG	SKG

Abbreviations:

API	:	American Petroleum Institute
ASTM	:	American Society for Testing & Materials
BIS	:	Bureau of Indian Standards
EIL	:	Engineers India Limited
IBR	:	Indian Boiler Regulatory
IS	:	Indian Standard

Construction Standards Committee

Convenor: Sh. R K Singh, ED (Construction)

Members:
Sh. D S N Murthy, GGM (Projects)
Sh. Chinmoy Kapuria, CGM (SCM)
Sh. Udayan Chakravarty, CGM (Piping)
Sh. S.B. Burman, Sr.GM (Construction)
Sh. Abhijit Chakraborty, GM (Construction)
Sh. Pankaj Kumar Rai, DGM (Construction)
Sh. Dhananjay, AGM (Construction)

CONTENTS

1.0 SCOPE

This standard covers the method of identification of the piping materials by coloring using paints in order to avoid mix-up between materials of different metallurgy but similar in physical appearance.

2.0 REFERENCES

The following Code shall be referred to as and when required for resolution of colour shades.

IS: 5-2007: Colours for ready Mixed Paints and Enamels

RAL K5 Classic Edition

3.0 GENERAL GUIDELINES FOR IDENTIFICATION BY COLOUR CODING

i. Materials shall be painted with one colour or combination of colours as set out in this specification.

ii. Paints used for colour coding shall be of quality so as to last for at least 5 years.

iii. Studs/Bolts and Nuts shall be painted.

iv. Colour Identification is not required on Austenitic Steel.

v. Colour identification is not required on galvanized-materials and non-ferrous metals such as copper, lead, aluminum because they are easily distinguished by their specific color and character.

vi. Special items like bellows, strainer, steam traps, valves do not require colour identification as these items are tagged with their identification.

vii. Specified colour shall be marked on the inner and outer surface of pipes & fittings.

viii. Job specific colour coding covered under MR/PR for Piping items shall be referred for any additional requirements.

4.0 IDENTIFICATION COLOURS

i. Paint colours to be used for identification shall be in accordance with Table-1.

ii. Application of various colours for identification shall be as per clause 5.0 of this standard.

5.0 METHOD OF COLOUR CODING

i. Colours and locations of colour identification on pipes, fittings, flanges, gaskets, studs/bolts, nuts shall be in accordance with Table-2 to 4 and Annexure-1.

ii. The identification colour on gaskets shall be painted on the peripheral face of each gasket (refer Annexure-1).

iii. Ends of the materials to be welded shall not be painted.

iv. Width of colour band shall be a minimum of 12 mm for less than 3-inch size components and 25mm for 3 inch and larger sizes, unless otherwise specified.

The length of inner surface painting

- Shall be not less than 4 inch (100 mm) at both ends of pipes and shall start 2 inch (50mm) from pipe ends.
- Shall be about 2 inch (50 mm) at any one end of fittings.

v. Wherever combination of two or more colours is specified, materials shall be painted in parallel colour bands as close to each other as possible (Refer Annexure-1).

vi. Paints containing chlorine, chlorides, sulphur, lead, zinc or any contents detrimental to materials are not acceptable. The contractor shall satisfy and produce documents/carry out tests as required by the owner/EIL.

vii. EIL approval shall be obtained for paint materials which are not covered by this specification.

6.0 TABLE: THE FOLLOWING TABLES SHALL FORM AN INTEGRAL PART OF THIS SPECIFICATION

Table No.	*Tittle*
1.	Basic colour of identification
2.	Colour identification on pipes, fitting and flanges
3.	Colour identification on Bolts/Nuts/studs
4.	Colour identification on Gaskets
Annexure-I	Schematic representation of colour identification

TABLE – 1

BASIC COLOURS FOR IDENTIFICATION (REF. IS: 5 (2007) APPROXIMATE MUNSELL VALUE REFERENCE)

Name of Colour shade	Sl.No.	Indian standard colour (ISC) No.	'Munsell' Value		Equivalent RAL Codes (*)	
			Hue	Value/Chroma	NAME	RAL Code
Dove gray	100	694	2.3 G	5.53/0.48	Mouse Grey	RAL7005
Salmon Pink	68	443	2.5 YR	6.31/4.7	Beige Red	RAL3012
India Brown	65	415	2.7 YR	3.76/3.02	Mahogany brown	RAL 8016
Canary yellow	39	309	4.8 Y	7.89/11.02	Zinc Yellow	RAL1018
Deep orange	87	591	8.9 R	5.04/10.38	Red Orange	RAL2001
Lincoln Green	27	276	0.3 G	3.53/2.81	Fir Green	RAL6009
Sea Green	14	217	6.2 GY	6.12/6.15	Yellow Green	RAL6018
Sky Blue	1	101	8.3G	6.09/2.86	Water Blue	RAL5021
Navy Blue	6	106	6.2 PB	2.61/0.95	Cobalt Blue	RAL5013
Light Purple Brown	73	449	3.2 R	3.07/2.14	Pale brown	RAL8025
Dark Violet	104	796	6.1 P	3.5/4.27	Traffic purple	RAL4006
Chocolate	74	451	3.5 YR	2.82/0.67	Chocolate Brown	RAL8017
Maroon	83	541	1.3 R	2.9/1.36	Wine Red	RAL3005
Post Office Red	81	538	4.2 R	3.55/8.39	Carmine Red	RAL3002

NOTE: ** The Colours are based on RAL K5 Classic Edition by RAL, Deutsches institut, incorporated for international jobs.*

TABLE – 2

COLOUR CODES FOR PIPES, FITTINGS & FORGINGS

Sl. No.	Pipe	Elbows, Reducers, Tee's Caps	Flange/Blind Flange	Sl. No. (As per Table-1)	Colour No. (As per Table-1)	Colour
1		A-234 Gr WPB/WPBW-IBR	A-105 A-182	---	---	----
2		A-234 Gr WPB/WPBW-NON IBR		---	---	None
3		A-234 Gr WPBW-NON IBR &NORMALISED				None
4	API 5L Gr B – Seamless	---	---	---	---	None
5	API 5L Gr B – EFSW	---	---	---	---	None
6	API 5L Gr B – ERW	---	---	6/65	106/415	Navy Blue & India Brown
7	A 106 Gr B	---	---	87	591	Deep Orange
8	A 106 Gr B (Normalized)	A-234 Gr WPB(N)	---	87/14	591/217	Deep Orange & Sea Green
		A-234 WPBW (N)		87/14	591/217	Deep Orange & Sea Green
9	IS 1239/IS 3589 Gr 410			100	694	Dove Grey
10	IS 3589 Gr 330			100/6	694/106	Dove Grey & Navy Blue
11	A 333 Gr 6 (LTCS)	A-420 WPL 6		83	541	Maroon
		A-420 WPL 6W		83	541	Maroon
12	A 335 Gr P1	A-234 WP1	A 182 F1	65	443	Salmon Pink
		A-234 WP1W		65	443	Salmon Pink
13	Stainless steel					No Paint

NOTE i) For Hydrogen service, white colour band shall be applied in addition to above

ii) For IBR material, Post Office red shall be applied in addition to above.

iii) Equivalent RAL Codes shall be used for international jobs for above colour codes as per Table -1

iv) For NACE Service, Canary Yellow shall be applied in addition to above.

v) For CRYO Service, Light Purple brown shall be applied in addition to above.

TABLE - 2

COLOUR CODES FOR PIPES, FITTINGS & FORGINGS (.... Contd.)

Sl. No.	Pipe	Elbows, Reducers, Tee's Caps	Flange/Blind Flange	Sl. No.	Colour No.	Colour
14	A 335 Gr P11	A-234 WP11	A 182 F11	27	276	Lincoln Green
	A 691 Gr 1.25 Cr CL.42 (EFW)	A-234 WP11W		27	276	Lincoln Green
15	A 335 Gr P12	A-234 WP12	A 182 F12	1	101	Sky Blue
		A-234 WP12W	---	1	101	Sky Blue
16	A 335 Gr P22	A-234 WP22	A 182 F22	14	217	Sea Green
	A 691 Gr 2.25 Cr CL.42 (EFW)	A 234 WP22W	---	14	217	Sea Green
17	A 335 Gr P5	A-234 WP5	A 182 F5	6	106	Navy Blue
		A-234 WP5W	---	6	106	Navy Blue
18	A 335 Gr P9	A-234 WP9	A 182 F9	104	796	Dark Violet
		A-234 WP9W	---	104	796	Dark Violet
19	A335Gr P91	A-234 WP91	A182F91	74	451	Chocolate
		A-234 WP91W	---	74	451	Chocolate

NOTE: i) For schematic representation, Refer Annexure-1
ii) Equivalent RAL Codes shall be used for international jobs for above colour codes as per Table -1

TABLE - 3

COLOUR CODE - STUDS/BOLTS AND NUTS

	ASTM DESIGNATION	SL.NO.	INDIAN STD. COLOUR (ISC) NO.	COLOUR SHADES
Bolt	A 193 GR B 7	39	309	Canary Yellow
Nut	A 194 GR 2 H	39	309	Canary Yellow
Bolt	A 307 GR B	65	415	India Brown
Nut	A 307 GR B	65	415	India Brown
Bolt	A 193 GR B 16	27	276	Lincoln Green
Nut	A 194 GR 4	27	276	Lincoln Green
Bolt	A 320 GR L 7	74	451	Chocolate
Bolt	A 320 GR B 8	73	449	Light Purple Brown
Nut	A 194 GR 8	73	449	Light Purple Brown

NOTE: i) For schematic representation, Refer Annexure-1

ii) Equivalent RAL Codes shall be used for international jobs for above colour codes as per Table -1

TABLE - 4

COLOUR CODE FOR GASKETS

TYPE	PART	ASTM DESIGNATION/DESCRIPTION	SL.NO.	INDIAN STD. COLOUR (ISC) NO.	COLOUR SHADES
Compressed Fibre (Ring & Full Face)	Gasket	BS7531 GR.X (FULL FACE)	100	694	Dove Gray
		BS7531 GR.X (RING)	—	—	None
Spiral Wound	Gasket	SS 304 H + Grafoil Filler	68	443	Salmon Pink
		SS 304 + Grafoil Filler	73	449	Light Purple Brown
		SS 304 + Teflon Filler	65	415	India Brown
		SS 304 L SPR WND + Grafoil Filler	83	541	Maroon
		SS 316 SPRWND + Grafoil Filler	87	591	Deep Orange
		SS 316 L SPR. WND + Grafoil Filler	27	276	Lincoln Green
		SS 316 H SPR. WND + Grafoil Filler	39	309	Canary Yellow
		Teflon Jacketed SPR. WND	104	796	Dark Violet
		SS321 Spr WND + Grafoil filler	14	217	Sea Green
		SS347 Spr WND + Grafoil Filler	1	101	Sky Blue
OCT. Ring Gasket	Gasket	5 Cr,1/2 Mo (Max. 120 BHN)	27	276	Lincoln Green
		Soft Iron (Max. 90 BHN)	100	694	Dove Gray

NOTE: i) For schematic representation, Refer Annexure-1

ii) Equivalent RAL Codes shall be used for international jobs for above colour codes as per Table -1

ANNEXURE-1

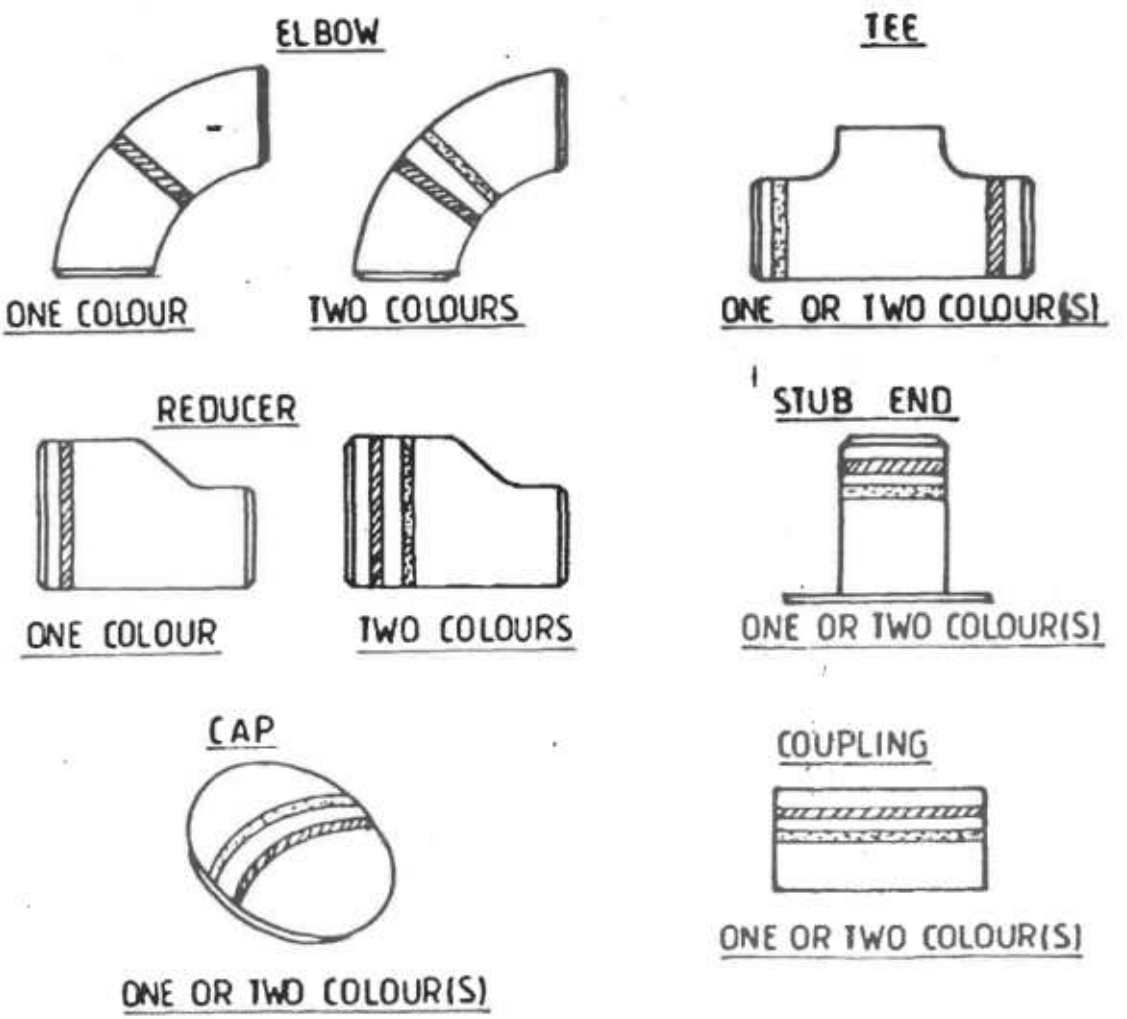
SCHEMATIC REPRESENTATION OF COLOUR IDENTIFICATION

A. COLOUR IDENTIFICATION OF PIPES

ONE COLOUR

TWO COLOUR

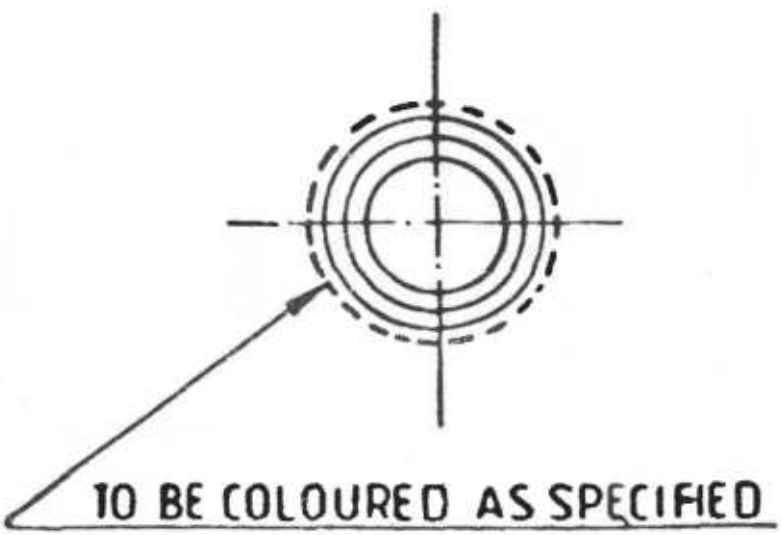
B. COLOUR IDENTIFICATION OF FITTINGS



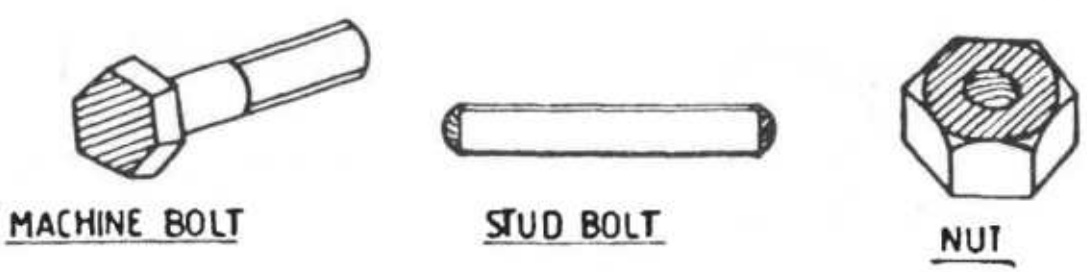
SCHEMATIC REPRESENTATION OF COLOUR IDENTIFICATION (Contd...)

C. COLOUR IDENTIFICATION OF FLANGES

D. COLOUR IDENTIFICATION OF GASKET



E. COLOUR IDENTIFICATION OF STUDS/BOLTS & NUTS



सिविल, सरंचना एवं वास्तुकला कार्यों (ईपीसीसी/ एकमुश्त टर्नकी संविदाओं) के लिए निरीक्षण एवं परीक्षण योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP) CIVIL, STRUCTURAL & ARCHITECTURAL WORKS (EPCC/LSTK CONTRACTS)

Rev. No	Date	Purpose	Prepared by	Checked by	StandardsCommitteeConvenor	Standards Bureau Chairman
					Approved by	
4	29.08.2023	REVISED AND REISSUED	DJ	DG	RKS	SM
3	27.07.2018	REVISED AND REISSUED	SKG	AP	AKK	RKT
2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	17.10.2005	ISSUED AS STANDARD SPECIFICATION	MPJ	SPS	VNP	VJN

Abbreviations:

AFC	:	Approved For Construction
BM	:	Bench Mark
CI	:	Cast Iron
CPT	:	Cone Penetration Test
GI	:	Galvanized Iron
IRC	:	Indian Road Congress
JB	:	Junction Box
MS	:	Mild Steel
MT	:	Magnetic Particle Testing
NDT	:	Non Destructive Testing
PCC	:	Plain Cement Concrete
PQR	:	Procedure Qualification Record
PT	:	Penetration Testing
PVC	:	Poly Vinyl Chloride
PWHT	:	Post Weld Heat Treatment
RCC	:	Reinforced Cement Concrete
RF	:	Reinforcement
SPT	:	Standard Penetration Test
U/G	:	Under Ground
WBM	:	Water Bound Macadam
WMM	:	Water Mix Macadam
WPS	:	Welding Procedure Specification

Construction Standards Committee

Convenor: Sh. Rupesh Kumar Singh , ED (Construction)

Members: Sh. Janak Kishore, ED (Projects),
Sh. Chinmoy Kapuria, CGM (SCM),
Sh. Udayan Chakravarty, Sr. GM (Piping),
Sh. Debasish Ghosal, GM (Construction),
Sh. Pankaj Kumar Rai, DGM (Construction),

CONTENTS

GENERAL NOTE

The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general, role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.

Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP : **Hold Point;**

A point which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W : **Witness Point;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw : **Review** of Contractor's documentation.

S : **Surveillance** Inspection by Owner/ EIL.
Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records.

WC : **100%** Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages

ITP NO. : 2701

LAND & TOPOGRAPHICAL SURVEY

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Boundary markings and submission of drgs./sketches	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Establishing permanent bench marks, temporary bench marks with ref. to Survey of India B.Ms. by check levels	WC	HP
4.	Block levels, contour plans and submission of relevant drgs. & records.	WC	S
5.	Protection of control points, permanent bench marks and regular rechecking	WC	S
6.	Submission of Master plan showing monuments, structures exposed rocks, weirs, water works, ponds, underground services if crossing that area, etc.	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

ITP NO. : 2702

SOIL INVESTIGATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Positioning of test location	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Boring & sampling	WC	S
4.	In-situ testing (SPT, CPT, Plate load test, Soil Resistivity, Block vibration test, etc.)	WC	S
5.	Lab testing (as applicable)	WC	S/Rw
6.	Monitoring of water level	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

ITP NO. : 2703

SITE GRADING

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Clearing and stripping of soil including disposal of unsuitable material	WC	S	-
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw
	b) Field calibration, if any	WC	S	-
3.	Taking and plotting of initial levels at specified intervals for cutting as well as filling areas	WC	S*	S*
4.	Classification (Levels of strata) and testing of filling soil for suitability including preparation of Lead Charts to filling/disposal areas.	WC	S	-
5.	Proper warning of explosions, misfires and storage of explosive materials (As applicable).	WC	-	--
6.	Breaking up of clods, lumps, etc. at the time of filling and compaction.	WC	S	-
7.	Identification and suitability of borrow areas for filling soil/murrum including verification of payments for royalty, etc.	WC	Rw	-
8.	Compaction test for earth filling in specified layers including finished areas.	WC	Rw	-
9.	Verification of final finished grade levels.	WC	S*	S*
10.	Computation of Earth works.	WC	Rw*	Rw*
11.	Record of tree cuttings, stacking of blasted rocks and other quarry materials including handing over to Owner	WC	S	S
12.	Preparation of "As built drawings	WC	Rw	Rw
13.	Removal of Unserviceable Surplus earth/excavated material and leveling in disposal areas.	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B: All fillings
CAT C: All cuttings.

* In case quantum of earthwork is required to be certified by EIL then W.

ITP NO. : 2704

EXCAVATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	-
2.	Layout checking	WC	S	-	-
3.	Taking initial levels	WC	S	-	-
4.	Slopes of excavation, benching, overburden, shoring & strutting (in case of deep excavation)	WC	S	--	-
5.	Check for sub-soil water, dewatering requirements as per specifications.	WC	S	--	--
6.	Bottom level of excavation and compaction	WC	S	--	--
7.	Stacking of different type of soils separately	WC	S	-	-
8.	Making trial pits manually to check UG utilities before carrying out Mechanical excavation (if applicable).	WC	S	S	S
9.	List of obstacles encountered (cables, pipes, conduits, etc)	WC	S	S	-
10.	Barricading of excavated pits for safety & protection from rain	WC	S	S	S
	FOR HARD ROCK				
1	Obtaining license from district authorities for undertaking blasting operations	WC	Rw	Rw	Rw
2	Storing of explosive materials as per explosive rules	WC	--	--	--
3	Prominent display of red flags around the area to be blasted	WC	S	S	S
4	Check the dimensions of bore holes	WC	--	--	--
5	Stacking of hard rock for useable/non useable including handing over to owner	WC	S	S	S
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A : Equipment foundations, Plant buildings, Technological structure, etc.
CAT B : Non Plant buildings, pipe racks, pipe culverts, bridges, etc.
CAT C : Boundary walls, wing walls, manholes, drains, isolated non-critical foundations etc.

ITP NO. : 2705

BACK FILLING

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Selection of materials/selected earth	WC	S	S	S
2.	Check for treatment of soil, if any	WC	S	S	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	-
4.	Filling in specified layers, consolidating, watering.	WC	S	-	-
5.	Compaction tests for layers	WC	Rw	Rw	Rw
6.	Filling to required levels	WC	S	-	-
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A: Equipment foundations, Plant buildings, Technological structure, etc.
CAT B: Non Plant buildings, pipe racks, pipe culverts, bridges, etc.
CAT C: Boundary walls, wing walls, manholes, drains, etc

ITP NO. : 2706

UNDERGROUND PIPING (RCC/ CI/HDPE/UPVC/CPVC)

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Checking of material	WC	NOTE 1	NOTE 1
2.	Adequate slope, benching in excavation for safety purposes (if required)	WC	S	
3.	Layout, line & level	WC	S	-
4.	Laying & jointing, grouting at manholes/chambers	WC	S	-
5.	Check for supports/ firm bed/ sub soil water level	WC	S	-
6.	Testing for leakages by blocking pipe ends	WC	W	W
7.	Hydro-testing and other tests, Removal of blockages, Cleaning & flushing of system	WC	W	W
8.	Backfilling in layers	WC	Rw	Rw
9.	Check for MS rungs in proper position, inlet/outlet pipe levels in manholes	WC	S	--
10.	Preparation of "As-built drawings"	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main Plant Buildings, Utilities, Offsites etc.
CAT C: Non Plant Buildings, Technological Buildings, Admn. Buildings, Gate House, Security Rooms, etc.

ITP NO. : 2707 A

WBM ROADS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw
	b) Field calibration, if any	WC	S	-
2.	Layout checking including Road crossings and taking initial levels	WC	S	S
3.	Approval of source & checking/testing of materials (wherever required)	WC	NOTE 1	NOTE 1
4.	Filling (if any), compaction, providing cambers in sub-base including levels	WC	S	S
5.	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material	WC	-	-
6.	Check for camber, superelevation and levels over metalling	WC	S	S
7.	Spreading murrum/ sand, watering and rolling	WC	S	-
8.	Checking thickness after each layer and rectification thereof (if any)	WC	S	S
9.	Checking quantity of aggregate by excavation of trial pits as per IRC Code	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Roads subjected to heavy loading, connected to main highway, main plant roads
CAT C: Balance Roads

ITP no: 2707 B

WMM for Roads

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a.) Review of calibration certificates of instruments/testing equipment's.	WC	Rw	Rw
	b)Field calibration, if any.	WC	S	-
2.	Design Mix to fix the proportion of ingredients	WC	Rw/HP	Rw/HP
3.	Layout Checking including Road Crossing & taking initial levels.	WC	S	S
4.	Approval of source & checking /testing of materials (wherever required)	WC	Rw	Rw
5.	Filling (if any), compaction, providing chambers in sub-base including levels.	WC	S	-
6	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material.	WC	S	-
7	Check for camber, superelevation & levels.	WC	S	S
8	Spreading, watering & rolling.	WC	S	-
9	Checking thickness after each layer and rectification thereof (if any).	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT- A –Roads subjected to heavy loading connected to main High way, main plant roads etc.

CAT B- Balance roads

ITP NO. : 2708

BLACK TOPPING- PREMIX CARPETING - PC, BITUMINOUS CONCRETE (BC) & BITUMINOUS MACADAM (BM)/ DENSE BITUMINOUS MACADAM (DBM)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of source of materials	WC	Note 1
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Surface preparation & check for camber/level	WC	S
4.	Checking/ testing of material wherever required	WC	S
5.	Tack coat application	WC	-
6.	Laying of Premix carpeting/ BC/BM/DBM including rolling	WC	S
7.	Application of Seal coat	WC	-
8.	Check for camber, superelevation and levels	WC	S
9.	Check for bitumen temperature and consumption	WC	S
10.	Thickness check of Premix carpet/ BC/BM/DBM	WC	S
11.	Removal of surplus earth	WC	-
12.	Berm preparation	WC	-
13.	Final Inspection	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO. : 2709

TANK PADS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CAT B
1.	Approval of source of materials	WC	NOTE 1	NOTE 1
2.	Stripping the area	WC	-	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	RW
	b) Field calibration, if any	WC	S	S
4.	Layout and marking of ground level	WC	S	-
5.	Excavation to required level, compaction of sub-base	WC	S	S
6.	Checking/ testing of materials	WC	S	S
7.	Filling selected materials in specified layers, rolling, watering	WC	S	-
8.	Compaction tests	WC	Rw	Rw
9.	Gravel filling under annular ring with compaction and adding graded filler material (As applicable)	WC	S	S
10.	Anti-corrosive layer, consolidation	WC	S	-
11.	Premix carpeting on side slopes	WC	S	S
12.	Preparation of "As-built drawing" for erection	WC	Rw	Rw
13.	Check for settlement of pads during hydro testing of tanks	WC	W	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: All Site fabricated steel storage tanks for process fluid/ Hydrocarbon, floating roof, tanks having capacity 600cum or 10m dia. and 8 m height.

CAT B: Site fabricated steel storage tanks for Raw water, Fire water, waste water, DM water, etc. and all tanks not covered under "CAT A".

ITP NO. : 2710

MICRO GRADING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW
	b) Field calibration, if any	WC	-
2.	Taking initial levels	WC	S/Rw
3.	Clearing/ Removal of extra soil, debris, etc. from site by transportation	WC	-
4.	Taking final levels	WC	S
5.	Verification of gradient of ground	WC	S
6.	Finishing of ground surface by hand compactor/ Roller (As applicable)	WC	S
7.	Final inspection	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
A.	**PRIOR TO FABRICATION**			
1	Incoming materials	WC	NOTE 1	NOTE 1
2.	Welding Filler Material Approval/Qualification			
	i) Review of Manufacturer's Test Certificates/ other documents	WC	RW	RW
	ii) Testing, if any	WC	Rw	Rw
3.	WPS/PQR			
	i) Review of proposed Procedure	WC	Rw	Rw
	ii) Welding of test coupon and subsequent Testing, if applicable	WC	W	W
	iii) Approval of Final WPS/PQR	WC	HP	HP
4	Certification & approval of welders	WC	Rw	Rw
5.	NDT Procedure Qualification			
	i) Review of proposed Procedure	WC	Rw	Rw
	ii) Testing	WC	Rw	Rw
	iii) Approval of NDT procedure	WC	HP	HP
6.	Preparation of sketches from General Arrangement drawings	WC	Rw	-
7.	Joint numbering	WC	Rw	-
8.	Approval of colour coding scheme	WC	Rw	-
9.	Monitoring of colour coding on pipes & fittings	WC	S	-
B.	**FABRICATION (SHOP & FIELD)**			
1.	Material as per piping class (check w.r.t. approved colour coding procedure)	WC	S	
	i) Fit-up check ii) Dimensional check	WC WC	S S	Rw Rw

NOTE : 1) For incoming material inspection please refer ITP no: -6-82-1010.

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
2.	Pre-heat (if any)	WC	S	-
3.	Check for purity of purging/shielding Gas (if any)	WC	S	-
4.	Purging (if any)	WC	S	-
5.	Shielding rate (if any)	WC	S	-
6.	Baking of Electrodes	WC	S	-
7.	Inter-pass cleaning & Temperature check.	WC	S	-
8.	Visual check of completed welds	WC	S	-
9.	PT/MT	WC	S	-
10.	Radiography marking (for Random Radiography)	WC	S	S
11.	Radiography Interpretation	WC	Rw	Rw
C.	**HYDROSTATIC/ PNEUMATIC TESTING**			
1.	Procedure Review	WC	Rw	Rw
2.	Correctness of Testing arrangements	WC	S	-
3.	Calibration of Pressure Gauges	WC	-	-
4.	R.F. Pad testing, if any	WC	S	-
5.	Scrutiny of test packs for Mechanical & NDT Clearance (Refer UG-01)	WC	HP	HP
6.	Air/Water Flushing (preliminary)	WC	S	S
6a.	Addition of corrosion inhibitors, if required – Approval of make & quality	WC	S	S

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
7.	Pneumatic/ Hydrostatic testing	WC	S	S
8.	Draining of water & Air drying	WC	S	S
D.	**LAYING**			
1.	Trench excavation and levels	WC	S	-
2.	Cleaning of pipe surface	WC	S	-
3	Approval of wrapping/coating material manufacturers	WC	Note 1	Note 1
4.	Approval of agency for wrapping & coating	WC	Rw	Rw
5.	Sample test of coating materials in approved laboratory	WC	Rw	Rw
6.	Application of primer	WC	S	S
7.	Coal tar temperature	WC	S	-
8.	Coating & wrapping	WC	S	S
9.	Approval of agency for epoxy coating/ cold tape joint/ hot jointing method	WC	Rw	Rw
10.	Check Thickness of coating (if applicable)	WC	S	-
11.	Calibration of Holiday tester	WC	Rw	Rw
12.	Holiday testing	WC	W	S
13.	Peel test	WC	S	S

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

ITP NO. : 2740

FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
14.	Lifting arrangement	WC	S	-
15.	Lowering (levels & orientation of branches)	WC	S	-
16.	Checking of wrapping & coating for damages during lowering, their repair, Holiday Testing, etc.	WC	S	S
17.	Back filling & compaction	WC	S	-
18.	Location, Brickwork, plaster of valve pit	WC	-	-
19.	Top cover & Finish of valve pit	WC	S	S
E.	**SYSTEM COMPLETION**			
1.	Tie in joints	WC	Refer 2740A	Refer 2740A
2.	Scrutiny of test packs for system testing	WC	Refer 2740B	Refer 2740B
3.	System testing	WC	W	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance Works

ITP NO. : 2740A

TIE IN JOINTS FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
A.	Fit up	WC	S
B.	Root Run DP	WC	S
C.	Final Run DP	WC	S
D.	Radiograph Review	WC	Rw
E.	PWHT Hardness	WC	Rw
F.	RF Pad Testing	WC	W
G.	Cleaning & Priming	WC	S
H.	Coating, Wrapping	WC	S
I.	Peel Test	WC	S
J.	Holiday Testing	WC	W
K.	Checking For Any Damage In Wrapping & Coating After Lowering, Their Repair Holiday Testing, Etc.	WC	S
L	Back Filling	WC	S

ITP NO. : 2740B

MECHANICAL COMPLETION RECORD FOR UNDERGROUND PIPING (CARBON STEEL)

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Clearance for flushing & testing	WC	Rw	Rw
1a.	Mechanical clearance			
	- Conformity with drawing	WC	Rw	Rw
	- Material as per Specification	WC	Rw	Rw
1b.	Welding & NDT clearance			
	- Material as per Specification	WC	Rw	Rw
	- Fit-up check record	WC	Rw	Rw
	- Visual check of completed welds	WC	Rw	-
	- PT/MT	WC	Rw	Rw
	- Radiography	WC	Rw	Rw
	- PWHT & hardness	WC	Rw	Rw
	- RF pad testing	WC	Rw	Rw
2.	Flushing & Pressure testing	WC	W	W
3.	Coating & wrapping			
	- Surface preparation	WC	Rw	-
	- Primer application	WC	Rw	Rw
	- Coating, wrapping & peel test	WC	Rw	-
	- Holiday check	WC	Rw	Rw
4.	Laying			
	- Trench leveling	WC	Rw	Rw
	- Lowering & checking for damages in wrapping & coating, their repair, Holiday testing, etc.	WC	Rw	Rw
	- Backfilling	WC	Rw	Rw

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.
CAT C : Balance works

ITP NO : 2741

PLAIN CEMENT CONCRETE

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW	RW
	b) Field calibration, if any	WC	S	Rw
2.	Checking of layout and materials, compaction of sub –grade	WC	S	-
3.	Mix proportion	WC	S	-
4.	Check for shuttering, dewatering if any.	WC	-	-
5.	Concreting with proper compaction	WC	-	-
6.	Checking of top level of PCC	WC	Rw	-
7.	Curing	WC	-	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B : for filled-up area
CAT C : for cutting area

ITP NO : 2742

REINFORCED CEMENT CONCRETE (SUBSTRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1	Approval of source of materials	WC	HP	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	S
3.	Checking of layout & condition of PCC/ leveling course	WC	S	S	-
4.	Incoming material checking	WC	NOTE 1	NOTE 1	NOTE 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP	HP
6.	Check for line & level of shuttering including its condition, quality and rigidity.	WC	S	--	-
7.	Check for sub-soil water & dewatering arrangement, if any	WC	S	--	-
8.	Reinforcement & covers to reinforcement	WC	S	S	--
9.	Inserts, Anchor bolts and pipe sleeves, pockets, dowels, etc.	WC	S	S	--
10.	Pour Card	WC	W	S	Rw
11.	Check for obstacles encountered (Electrical conduits, pipe lines, etc.)	WC	S	--	-
12.	Concreting, testing, compaction & finishing	WC	S	S	-
13.	Casting of cubes	WC	S	S	--
14.	Curing	WC	S	S	-
15.	Testing of cubes – 7 days	WC	S/Rw	S/Rw	S/Rw
16	Testing of cubes – 28 days	WC	W	S/Rw	S/Rw
17.	Removal of shuttering	WC	S	-	-
18.	Check for water tightness, rendering, if any	WC	S	S	S
19.	Preparation of As-built drawings	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Critical foundations of equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and any other foundation with RCC Quantity > 250 Cum in single pour ,etc.

CAT B: Unit Pipe racks, plant buildings and other equipment foundations not covered in category A, etc

CAT C: Non critical pipe racks (branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

ITP NO : 2743

REINFORCED CEMENT CONCRETE (SUPER STRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CATA	CATB	CAT C
1	Approval of source of materials	WC	HP	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	S
3.	Checking of layout	WC	S	--	-
4.	Incoming material inspection	WC	Note 1	Note 1	Note 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP	HP
6.	Check for line & level of shuttering and scaffolding/ vertical bracing including hoisting arrangements.	WC	S	S	-
7.	Reinforcement & covers to reinforcement	WC	S	S	--
8.	Inserts, bolts, pipe sleeves, MS rungs, concealed electrical conduits, fan hooks, dowels, etc. including welding if any	WC	S	S	-
9.	Pockets/ openings	WC	S	S	-
10.	Expansion joints, if any	WC	S	S	-
11.	Check for water stops, slopes, stoppers, if any	WC	S	S	-
12.	Pour Card	WC	W	S	Rw
13.	Concreting, testing, compaction & finishing	WC	S	S	S
14.	Casting of cubes	WC	S	S	S
15.	Curing	WC	S	S	-
16.	Testing of cubes – 7 days	WC	S/Rw	S/Rw	S/Rw
17	Testing of Cubes – 28 days	WC	W	Rw	S/Rw
18.	Removal of formwork/ staging	WC	S	-	-
19.	Verification of dimensions viz. AFC drawings and tolerances	WC	S	S	S
20.	Check for water tightness, rendering, if any	WC	S	S	-
21.	Preparation of As built drawings.	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Super structure of foundations for Critical equipment's i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and super structure of any other foundation with RCC Quantity > 250 Cum. in single pour, Slabs of plant and non-plant buildings, etc.

CAT B: Unit Pipe racks, plant buildings and super structure of other equipment not covered in category A, etc

CAT C: Non critical pipe racks (branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

ITP NO : 2745

RCC PAVEMENT/FLOORING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of source of materials	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw
	b) Field calibration, if any	WC	S
3.	Layout checking/ excavation of all new foundations	WC	-
4.	Incoming material inspection	WC	NOTE 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP
6.	Check for proper back filling/compaction/ completion of sub - Structure works	WC	S
7.	Check for edges of shuttering, alternate panels	WC	-
8.	Check for slopes, thickness of flooring	WC	S
9.	Shuttering, reinforcement (as applicable)	WC	-
10.	Check for expansion joints/ Construction joints	WC	S
11.	Check for concealed pipe embedment, earthing, if any	WC	-
12.	Check for dividing strips, as applicable	WC	S
13.	Concreting, finishing, etc	WC	S
14.	Checking for line, levels, slopes, joints, thickness of flooring viz. AFC drawings	WC	S
15.	Curing	WC	S
16.	Grinding & polishing, as applicable	WC	S
17.	Testing of concrete cubes -7 days (as applicable)	WC	S/Rw
18	Testing of concrete cubes -28 days (as applicable)	WC	W
19.	Preparation of "As Built Drawings"	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO : 2746

BRICK MASONARY

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW	RW
	b) Field calibration, if any	WC	Rw	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Cleaning of surface	WC	-	-
4.	Wetting/soaking of bricks	WC	S	S
5.	Cement mortar proportion	WC	S	S
6.	Staging & scaffolding	WC	-	-
7.	Hacking of adjacent concrete surface	WC	S	S
8.	Check for bond/closers, thickness of joints	WC	S	-
9.	Line, level & plumb	WC	S	S
10.	Raking out joints, keys in brick work, if any	WC	S	S
11.	Check for placement of Reinforcement bars in case of partition brick work	WC	S	S
12.	Embedment of fixtures	WC	S	S
13.	Curing	WC	-	-
14.	Preparation of 'As Built' Drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B : Load bearing walls
CAT C : Balance works

ITP NO : 2747

STRUCTURAL STEEL WORKS

S. NO	ACTIVITY	CONTRA-CTOR	EIL		
			CAT A	CAT B	CAT C
A	**PRE – FABRICATION ACTIVITIES**				
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	Rw	Rw	Rw
	b) Field calibration, if any	WC	S	S	
2.	Incoming material inspection	WC	Note 1	Note 1	Note 1
3.	Welding Filler material approval/ qualification				
	a) Manufacturing test certificates/ documents	WC	Rw	Rw	Rw
	b) Testing, if any	WC	S	S	S
4.	Approval of WPS/ PQR	WC	HP	HP	HP
5.	Welders performance qualification	WC	Rw	Rw	Rw
6.	Layout checking	WC	S	-	-
7.	Welding equipment and accessories	WC	S	-	-
8.	Preparation and approval of Fabrication drawings	WC	Rw	Rw	-
B	**FABRICATION ACTIVITIES**				
1.	Materials as per design drawing	WC	Rw	Rw	Rw
2.	Check straightness and non-warping of members	WC	S	S	-
3.	Dimensional and fit-up checks including provision of slopes for deflection wherever required	WC	S	S	-
4.	Visual check for welding	WC	S	S	-
5.	Grinding including surface preparation for painting and application of primer	WC	S	S	-
6.	Checking paint as per specs, shelf-life, etc.	WC	S	S	-
7.	Application of specified paint, painting thickness, etc.	WC	S	S	-
C	**FIELD ERECTION ACTIVITIES**				
1.	Lifting arrangements including test certificates of lifting tackles	WC	S	S	Rw
2.	Correctness of location	WC	S	-	-
3.	Orientation of bracing, lugs, Anchor bolts	WC	S	-	-
4.	Alignment & levels	WC	S	-	-
5.	Field welding (if any)	WC	S	S	-
6.	Grouting	WC	S	S	-
7.	Finishing coat of paint, thickness of paint etc.	WC	S	S	S
8.	Preparation of As-built drawings	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Steel structures pertaining to equipments i.e. compressors, reactors, columns, stacks, Technological structures.

CAT B: Steel structures pertaining to Unit Pipe racks, and other equipments not covered in category A, etc.

CAT C: Steel structures of Non critical pipe racks (branch pipe, offsite pipe rack, etc) plant buildings and non-plant buildings, pipe sleepers, manhole, catch pit, walkways, platforms at grade levels, etc.

ITP NO : 2748

PILING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Approval of source of materials	WC	HP	HP	Rw
2.	Layout and ground level	WC	S	S	-
3.	Incoming material inspection	WC	Note 1	Note 1	Note 1
4.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP	HP
5.	Driving of piles & check for set point	WC	S	S	-
6.	Check for depth of bore and lowering of cage measuring	WC	S	-	-
7.	Pour Card	WC	HP	S/Rw	Rw
8.	Concreting,	WC	W	S	S
9.	Casting of cubes/Testing – 7 days	WC	S/Rw	S/Rw	S/Rw
10.	Casting of cubes/Testing – 28 days	WC	W	S/Rw	S
11.	Check for cut off level of concreting & quantity of concrete poured	WC	S	-	-
12.	Lifting of casing pipe	WC	S	--	-
13.	Pile load tests (lateral/vertical/cyclic/pull out)	WC	W	Rw	Rw
14.	Submission of pile load test report	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT A: Critical foundations of equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and any other foundation with RCC Quantity > 250 Cum in single pour ,Technological structures, etc.

CAT B: Unit Pipe racks, plant buildings and other equipment foundations not covered in category A, etc.

CAT C: Non critical pipe racks(branch pipe, offsite pipe rack, etc.) non-plant buildings ,pipe sleepers, manhole, catch pit, etc.

ITP NO : 2771

ANTI-TERMITE TREATMENT

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of applicator agency	WC	HP
2.	Incoming material inspection & spraying devices including personal protective equipments like facemask, gloves, shoes, etc.	WC	Note 1
3.	Preparation of surface for taking dosage of emulsion by ramming of each layer of soil by roding the earth at specified intervals	WC	-
4.	Backfilling and compaction in specified layers along with application of emulsifier along the sides of masonry & RCC structures	WC	S
5.	Compaction of top surface for taking dosage of emulsifier by roding the earth at specified intervals for the entire floor area before concreting	WC	-
6.	Check for consumption of emulsifier utilized	WC	S
7.	Shelf life of anti-termite chemical	WC	S
8.	Guarantee Certificate for performance	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO : 2772

PLASTERING

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Check for completeness of all hidden jobs like piping, conduiting, etc.	WC	-	-
2..	Check for grading of sand, Mix proportion	WC	S	S
3.	Mortar Cube casting & its testing	WC	S	S
4.	Use of Chicken mesh of given gauge at junction of concrete & masonry.	WC	S	S
5.	Sample preparation for finish and its approval	WC	W	S
6.	Neeru application on plaster (as applicable)	WC	S	-
7.	Hacking and cleaning the surface, removing loose particles, wetting the surface	WC	S	S
8.	Leaving plaster rough where tiles are to be fixed	WC	-	-
9.	Checking of plaster thickness, plumb & even surface	WC	S	-
10.	Check for grooves, openings, rounding off the corners, hollowness in plaster	WC	S	S
11.	Checking for use of waterproofing compound , Mix proportion(as applicable)	WC	S	S
12.	Curing	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	-

CAT B: Area requiring special finish (e.g. pebble dash finish etc.)
CAT C: Balance works.

ITP NO. : **2773**

DOORS, ROLLING SHUTTERS, WINDOWS AND VENTILATORS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Check for sections & dimensions	WC	S	-
3.	Line, level & plumb	WC	-	-
4.	Section joinery details	WC	Rw	-
5.	Check for orientation/ opening direction	WC	S	S
6.	Grouting with lugs/ dash fasteners	WC	-	
7.	Check for fixtures & fittings	WC	S	S
8	Check for thickness & type of glazing	WC	-	-
9.	Check for rubber gasket, anodizing (as applicable)	WC	-	-
10	Brand/ shade of paints, no. of coats including surface preparation (as applicable)	WC	S	Rw
11.	Check for fire rated certificate for fire doors/ windows/ partitions	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main plant buildings
CAT C: Balance works

ITP NO. : 2774

PAINTING (BUILDING WORKS)

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Completion of surface preparation	WC	S	S
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Confirmation of colour, shade & brand	WC	S	S
4.	Check for base surface preparation (Putty/ POP, Primer, rendering etc.)	WC	S	-
5.	Check for number of coats and thickness	WC	S	S
6.	Final check for touch up, repairs etc.	WC	S	-
7.	Curing, if any	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main plant buildings
CAT C: Balance works

ITP NO. : 2775

SANITARY FITTINGS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Checking of sample (as applicable)	WC	S	-
3.	Check completeness of finishing works w.r.t. line, level & position	WC	S	-
4.	Check proper fixing of the sanitary fittings to give aesthetic appeal	WC	S	-
5.	Check for leakage/ testing at given pressure	WC	S	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

CAT B: Main plant buildings
CAT C: Balance works

ITP NO. : 2776

WATER PROOFING (ROOF)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Surface preparation for screeding/ water proof plastering	WC	S
2.	Mix proportion, thickness of screeding/ plastering & slope towards rain water pipes	WC	S
3.	Formation of groove at specified height on parapet wall/ pedestal/ columns etc.	WC	S
4.	Incoming material inspection, no. of coats, application procedure and consumption.	WC	S/Note 1
5.	Lapping (along the length & in transverse direction) of waterproofing membrane.	WC	S
6.	Termination of material in groove on vertical plane	WC	S
7.	Check for hollowness, bubbles in water proofing, if any	WC	S
8.	Conducting a sample of water proofing test by flooding the area for specified interval (as applicable)	WC	S
9.	Check for protective layer of PCC over waterproofing with chicken wire mesh, groove cutting, sealant filling.	WC	S
10.	Cleaning of surface	WC	-
11.	Submission of Guarantee in the requisite Performa	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO : 2777

FALSE FLOORING AND FALSE CEILING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
	FALSE FLOORING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Cleaning base floor	WC	S
4.	Painting base floor with Polyurethane based paint (as specified)	WC	S
5.	Check for cutouts in floor, anchor fasteners in floor, studs spacing etc.	WC	S
6.	Proper line, level & layout	WC	S
	FALSE CEILING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Surface preparation of panel boards	WC	-
4.	Proper line, level & cut-outs	WC	S
5.	Finishing of panel boards	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO. : 2778

UNDER DECK INSULATION

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material checking including density	WC	Note 1
2.	Checking of adhesive, fasteners for anchorage	WC	S
3.	Fixing of scaffolding, ladders, platforms	WC	S
4.	Fixing of under-deck insulation with adhesive	WC	S
5.	Use of chicken wire mesh while fixing the insulation sheet.	WC	S
6.	Fixing of dash fasteners at defined spacing	WC	-
7.	Finishing	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO. : 2779

ROOFING ACCESSORIES

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	HP/Note 1	HP/Note 1
2.	Check for mitring, overhang, laps, etc.	WC	S	-
3.	Slopes line, level of sheets, barge boards, ridges & gutters, overhang of sheets	WC	S	-
4.	Checking for profile, coating, shade of sheet.	WC	S	-
4.	Bolting by drilling only, length of bolts, nos., anodizing and type of washers	WC	S	-
5.	Check for slopes of rain gutters, down take pipes, north lighting curves/ supports for gutters	WC	S	-
6.	Check for wind ties installation of required dimensions	WC	S	-
7.	Check for leakage/ passing of light	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.

2) Fixing arrangement need to be reviewed with respect to contract specifications.

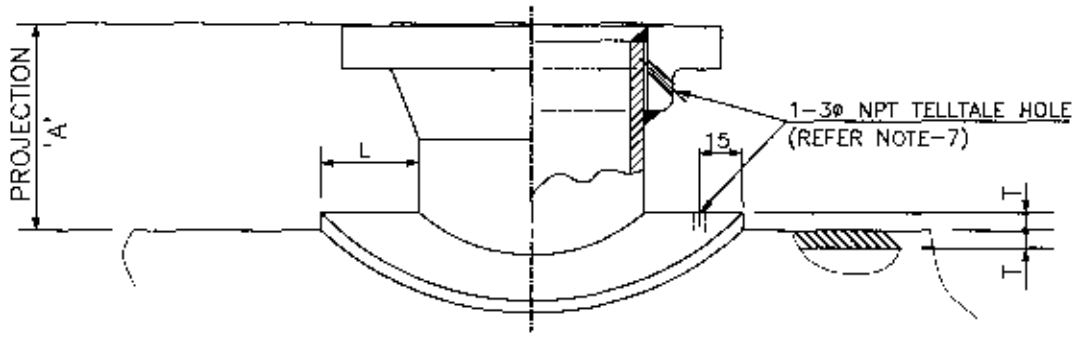
CAT B: Important structures (e.g. Compressor House, Warehouse and Pump House etc.)
CAT C: Balance works.

ITP NO. : 2799

LIGHTING WORKS (NON PLANT BUILDINGS)

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Prepare detailed conduit layout diagram as per the approved electrical drawing	WC	Rw
2.	Provide /PVC/GI sleeves in columns/beams at identified locations to facilitate laying of conduit on later date.	WC	S
3.	Ensure conduit & accessories material is inspected at site before using	WC	Note-1
4.	Ensure that the conduit is laid in line with execution drawings & provide pull-wires as per requirement.	WC	S
5.	Check correctness of drop/JB locations	WC	S
6.	Check threaded joints are proper	WC	S
7.	Ensure all JB/Fan box are properly stuffed with jute	WC	S
8.	Ensure conduits are properly tied to reinforcement bars to prevent floating during concrete	WC	S
9.	Ensure proper supporting of conduit lengths wherever required	WC	S
10.	Ensure adequate chasing depth for conduit portion coming inside brick walls	WC	S
11.	Check workmanship towards joints and presence of any foreign material inside the conduits	WC	S
12.	Ensure wiring material is inspected at site before use & colour code is checked.	WC	Note-1
13.	Ensure correctness of lighting wire size and no. of wires as per the drawing in each conduit portion	WC	S
14.	Preparation of "As Built" drgs.	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer ITP no: 6-82-1010.



NOMINAL PIPE SIZE	OUTSIDE DIAMETER	L (WIDTH OF PAD) ⊛		PROJECTION 'A' SEE NOTE-4,5,9&10			
		SHELL WELD EFF.=0.85	SHELL WELD EFF.=1.0	CLASS 150	CLASS 300	CLASS 600	CLASS 900
BELOW 3"	STANDARD	–	–	150	150	150	150
3"	88.9	40	45	200	200	200	200
4"	114.3	50	60	200	200	200	200
6"	168.3	70	85	200	200	200	250
8"	219.0	95	110	200	200	250	250
10"	273.0	115	135	200	200	250	300
12"	323.8	135	160	200	200	250	300
14"	355.6	150	175	250	250	250	300
16"	406.4	170	200	250	250	250	300
18"	457.2	195	225	250	300	300	350
20"	508.0	215	250	250	300	300	350
24"	609.6	255	300	250	300	300	400
26"	660.4	285	330	250	300	350	450
28"	711.2	305	355	250	300	350	450
30"	762	325	380	250	300	400	450
32"	812.8	350	405	300	350	400	500
34"	863.6	370	430	300	350	400	500
36"	914.4	390	455	300	350	–	–
38"	965.2	410	480	300	350	–	–
40"	1016	435	505	300	350	–	–
42"	1066.8	455	530	300	400	–	–
44"	1117.6	475	555	300	400	–	–
46"	1168.4	500	585	300	400	–	–
48"	1219.2	520	610	300	400	–	–

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	23 01 2020	REAFFIRMED AND REISSUED AS STANDARD	DP	TR	KJH	RKT
6	07 06 2013	REVISED AND REISSUED AS STANDARD	NIKHIL	KA	RKT/SC	DM
5	23 05 2011	REAFFIRMED AND REISSUED AS STANDARD	POREL	RKT		

Approved by

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
3. ⊛ WIDTH IS MINIMUM AND SHALL BE CHECKED AGAINST CODE REQUIREMENT. CHECK REINFORCEMENT REQUIREMENT FOR ALL EXTERNAL PIPING LOADING ALSO.
4. NOZZLE PROJECTIONS ARE BASED ON INSULATION THICKNESS EQUAL TO 75mm. FOR INSULATION THICKNESS GREATER THAN 75mm, THE NOZZLE PROJECTION IS 'A' + [INSULATION THICKNESS(mm)−75].
5. PROJECTION 'A' FOR SELF−REINFORCED NOZZLE SHALL BE BASED ON DESIGN OF REINFORCEMENT SUBJECT TO MINIMUM REQUIREMENTS AS PER THIS STD
6. EXTEND PAD LOCALLY FOR MANHOLE DAVIT SUPPORT, IF REQUIRED
7. EXTERNAL REINFORCING PADS SHALL HAVE A MINIMUM OF 1 NO. TELL−TALE HOLE EXCEPT THAT PADS FOR NOZZLES GREATER THAN 10"NB(250NB) SHALL HAVE MINIMUM TWO NOS. TELL−TALE HOLES AND NOZZLES IN EXCESS OF 36"NB (900NB) SHALL HAVE 4 NOS. TELL−TALE HOLES. PAD INSTALLED IN SECTIONS SHALL HAVE ATLEAST ONE TELL−TALE HOLE PER SECTION TELL−TALE HOLES ON REINFORCEMENT PADS SHALL BE EQUALLY SPACED IN CIRCUMFERENTIAL DIRECTION OF PAD.
8. TELL−TALE HOLE SHALL NOT BE PLUGGED AND SHALL BE FILLED WITH HARD GREASE ONLY, AFTER HYDROTEST/PNEUMATIC TEST OF EQUIPMENT
9. a) FOR COLUMNS & VERTICAL VESSELS, PROJECTION OF NOZZLE ON TOP HEAD SHALL BE 400mm MINIMUM FROM OUTSIDE.
   b) FOR HORIZONTAL VESSELS, PROJECTION OF NOZZLES ON TOP SIDE OF SHELL SHALL BE 300mm MINIMUM FROM OUTSIDE.
10. PROJECTIONS ARE BASED ON ASME B16.5 FLANGES FOR UPTO AND INCLUDING 24"NB NOZZLES AND ASME B16.47 SERIES 'B' FLANGES FOR NOZZLE SIZES ABOVE 24"NB.

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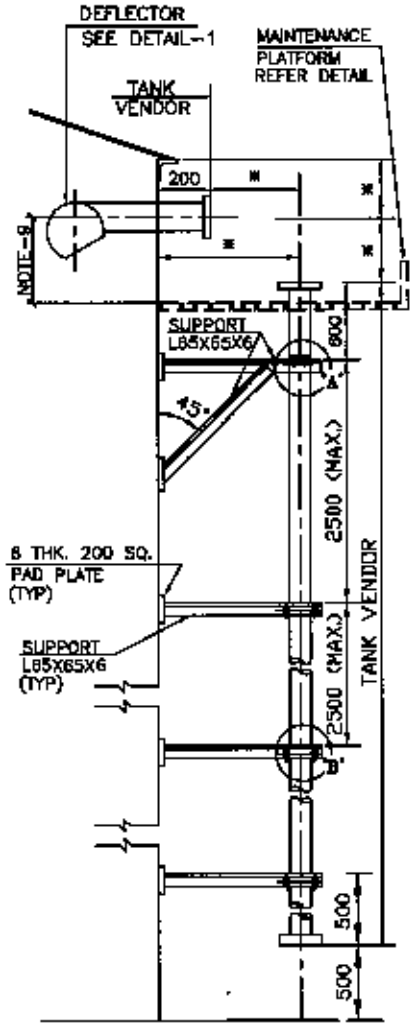
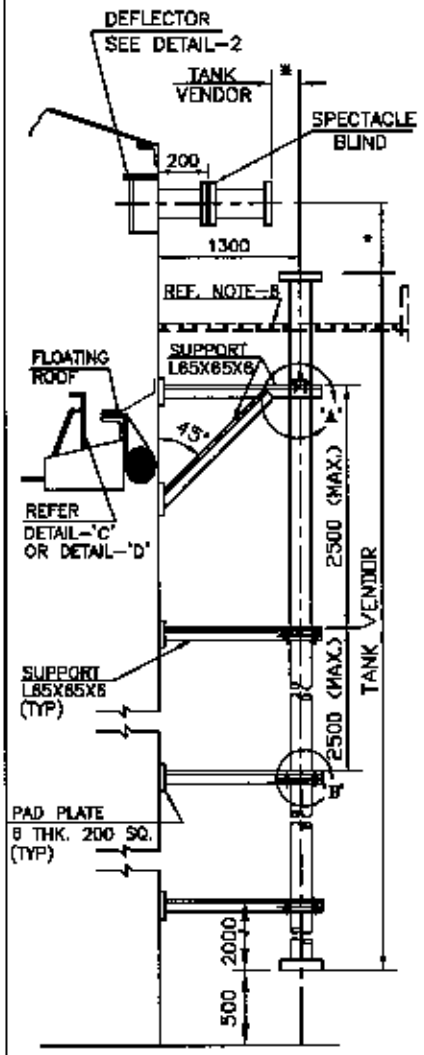
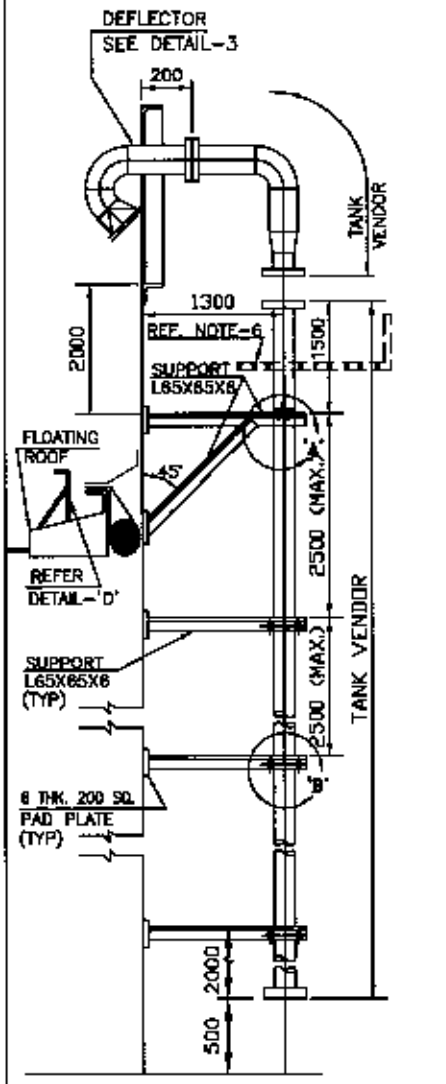
7	23 01 2020	REAFFIRMED AND REISSUED AS STANDARD	DP	KK	KJH	RKT
6	07 06 2013	REVISED AND REISSUED AS STANDARD	NIKHIL	KA	RKT/SC	DM
5	23 05 2011	REAFFIRMED AND REISSUED AS STANDARD	POREL	RKT		



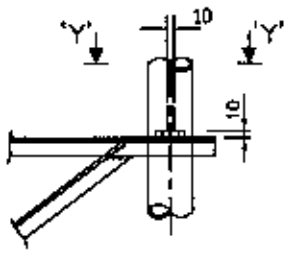
FOR FIXED ROOF TANK



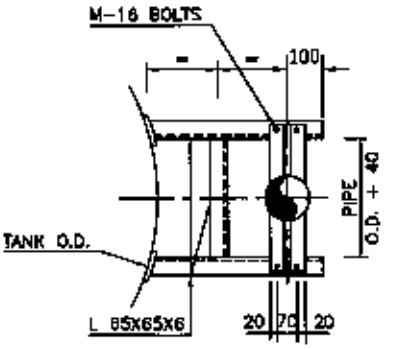
FOR FLOATING CUM FIXED ROOF TANK



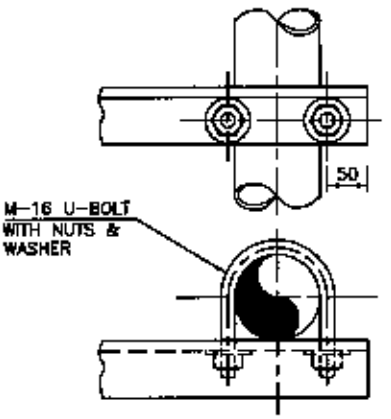
FOR FLOATING ROOF TANK



DETAIL– 'A'

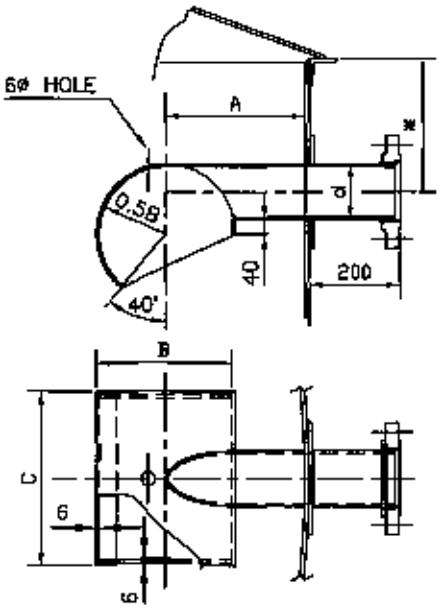


VIEW – 'YY'



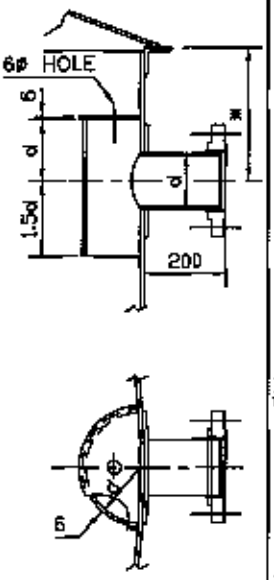
DETAIL – 'B'

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
					Approved by	
7	15 11 2019	REVISED AND REISSUED AS STANDARD	DP		KJH	RKT
6	17 10 2013	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
5	27 01 2009	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC

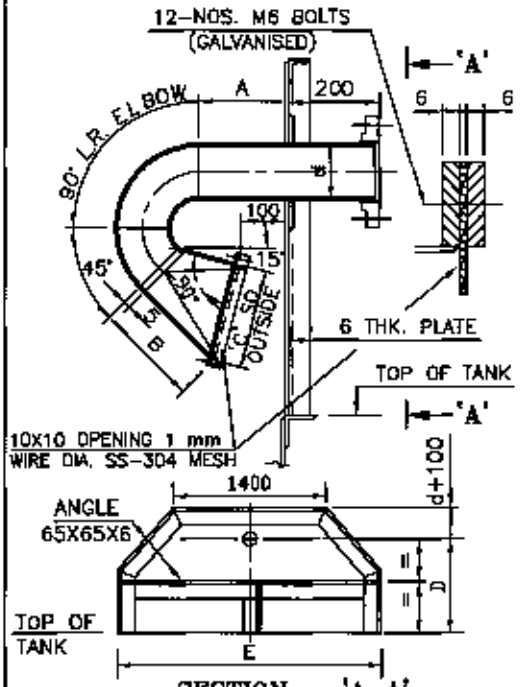


NOM. DIA. OF NOZZLE (d)	A	B	C
100	250	300	500
150	300	350	550
200	350	400	600
250	400	450	650

DETAIL – 1



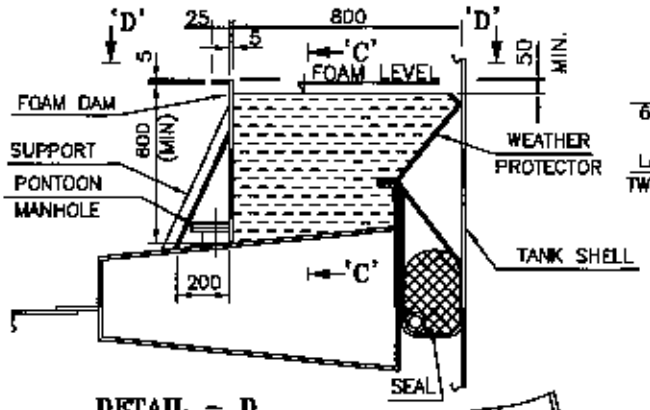
DETAIL – 2



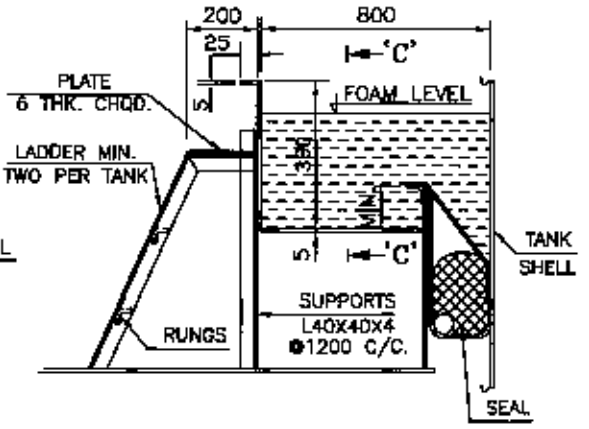
SECTION – 'A–A'

NOM. DIA. OF NOZZLE (d)	A	B	C	D	E
100	146	202	200	1200	2900
150	175	308	300	1425	3350
200	208	421	400	1650	3800
250	236	527	500	1875	4250

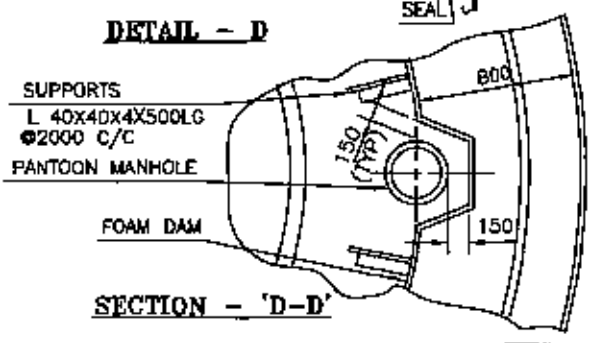
DETAIL – 3



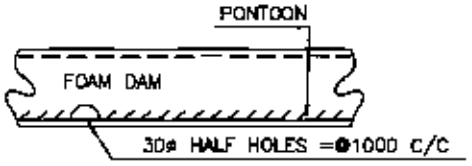
DETAIL – D



DETAIL – C



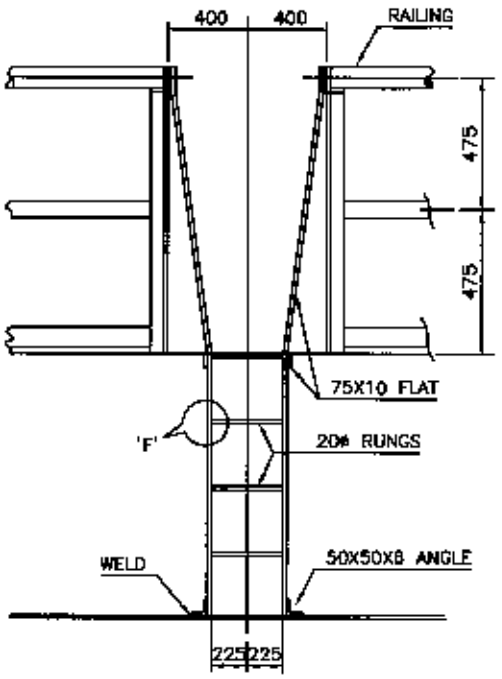
SECTION – 'D–D'



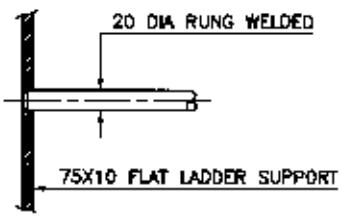
SECTION – 'C–C'

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	15 11 2019	REVISED AND REISSUED AS STANDARD	DP	GK	KJH	RKT
6	17 10 2013	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
5	27 01 2009	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC

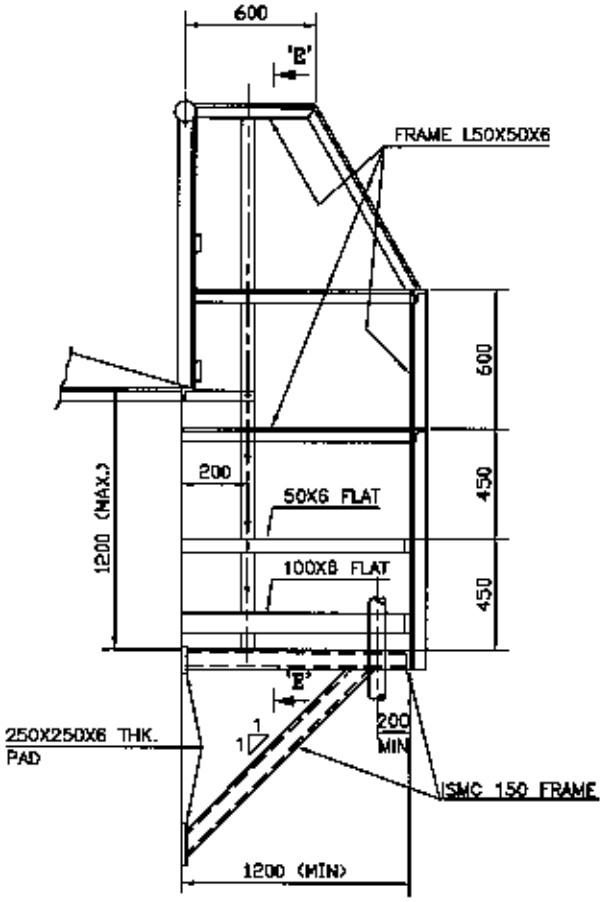
Approved by

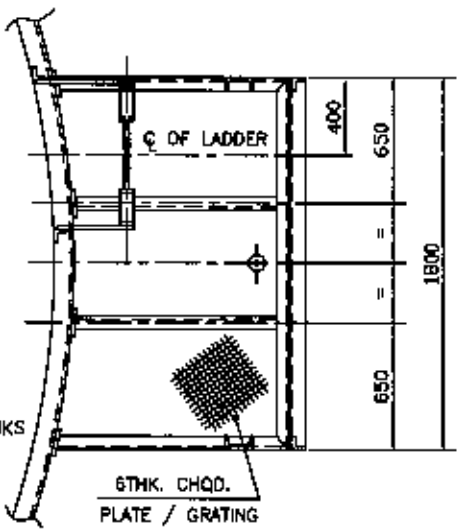


VIEW – 'E–E'



DETAIL – 'F'





DETAIL OF MAINTENANCE PLATFORM

NOTES :–

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2. SIZE AND NOS. OF FOAM RISER SHALL BE DECIDED BY STRUCTURAL UG CIVIL DEPARTMENT.
3. FOAM SYSTEM SHALL BE HYDROSTATIC TESTED @16 Kg/Cm2g.
4. ALL FLANGES SHALL BE AS PER ANSI B16.5 #150 WN RF.
5. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
6. FOR MATERIAL SPECIFICATION & DIMENSIONS MARKED (*) SHALL BE AS PER MANUFACTUREER STANDARDS BASED ON SPECIFICATION AND CAPACITY OF THE FOAM MAKER.
   FOAM MAKER — TO BE PROVIDED FOR FLOATING ROOF TANKS
   FOAM MAKER AND VAPOR SEAL CHAMBER — TO BE PROVIDED FOR CONE ROOF TANKS /FLOATING CUM FIXED ROOF TANKS
   THESE SHALL BE SUPPLIED BY TANK FABRICATOR AS PER SPECIFICATIONS ATTACHED WITH TENDER DOCUMENT.
7. PROVIDE MAINTENENCE PLATFORM WITH APPROACH LADDER FOR FOAM MAKER IN FLOATING ROOF TANK WHERE WIND GIRDER IS NOT USED AS A WALKWAY.
8. FOR EXACT ORIENTATION OF FOAM RISER REFER PIPING ORENTATION PLAN.
9. PLATFORM SHALL BE LOCATED IN SUCH A WAY THAT, FOAM MAKER ASSEMBLY CAN BE EASILY MAINTAINED/ APPROACHED.

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
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7	15 11 2019	REVISED AND REISSUED AS STANDARD	DP		KJH	RKT
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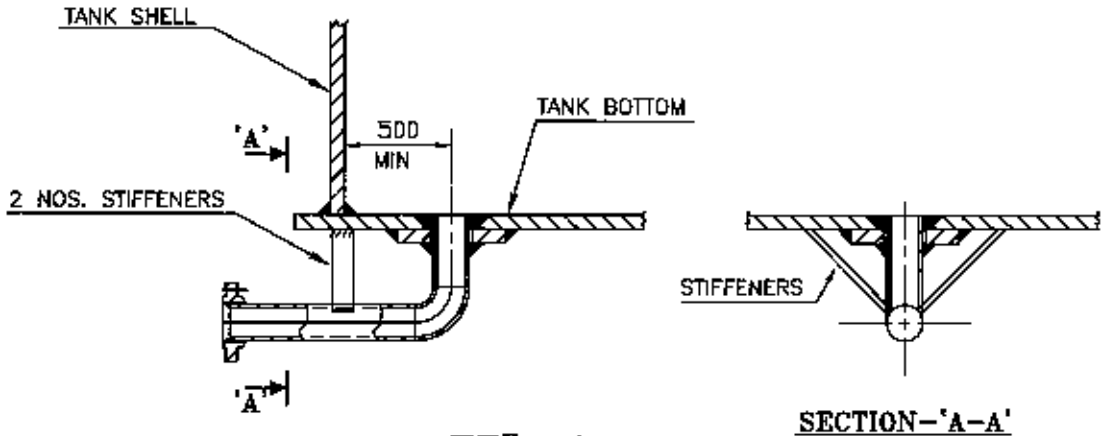
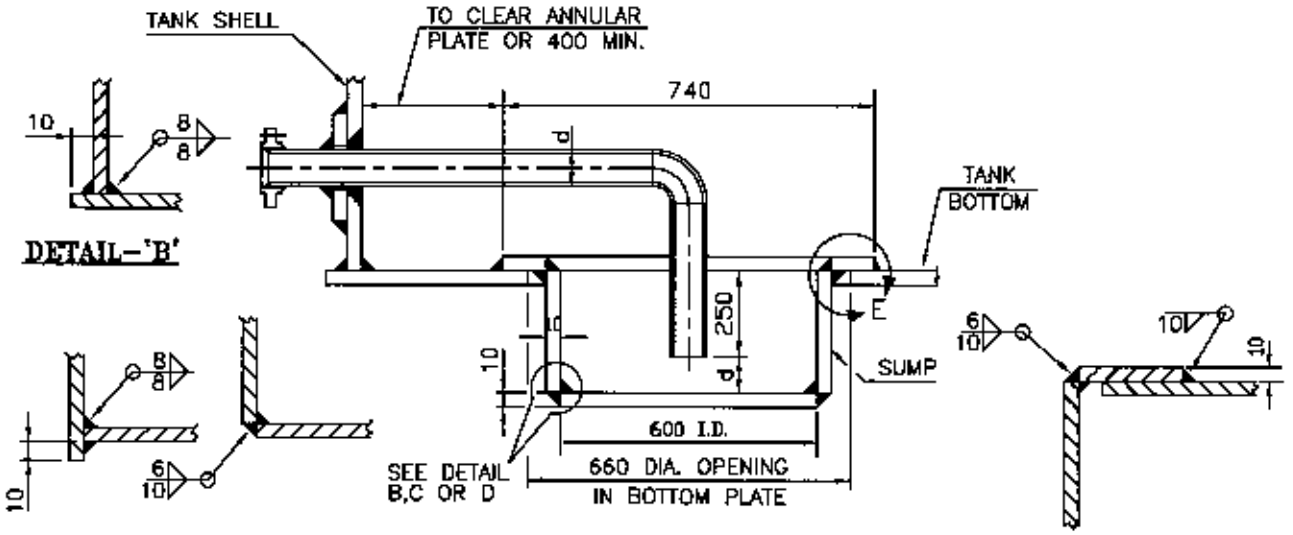


TYPE – 1

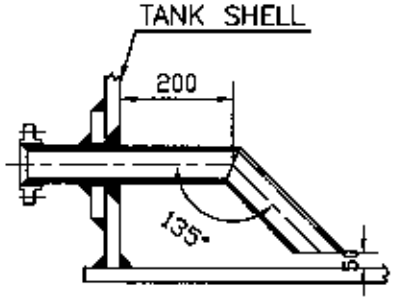
SECTION–'A–A'

(FOR TANKS WHERE BOTTOM IS ACCESSIBLE FROM BELOW)

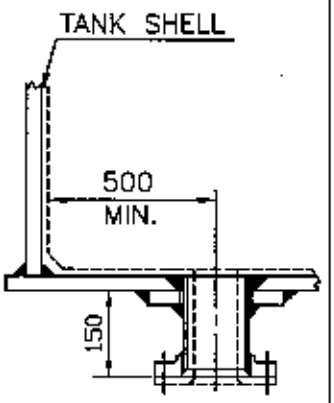


TYPE – 2 (NOTE–5)

DETAIL–'E'



TYPE – 3



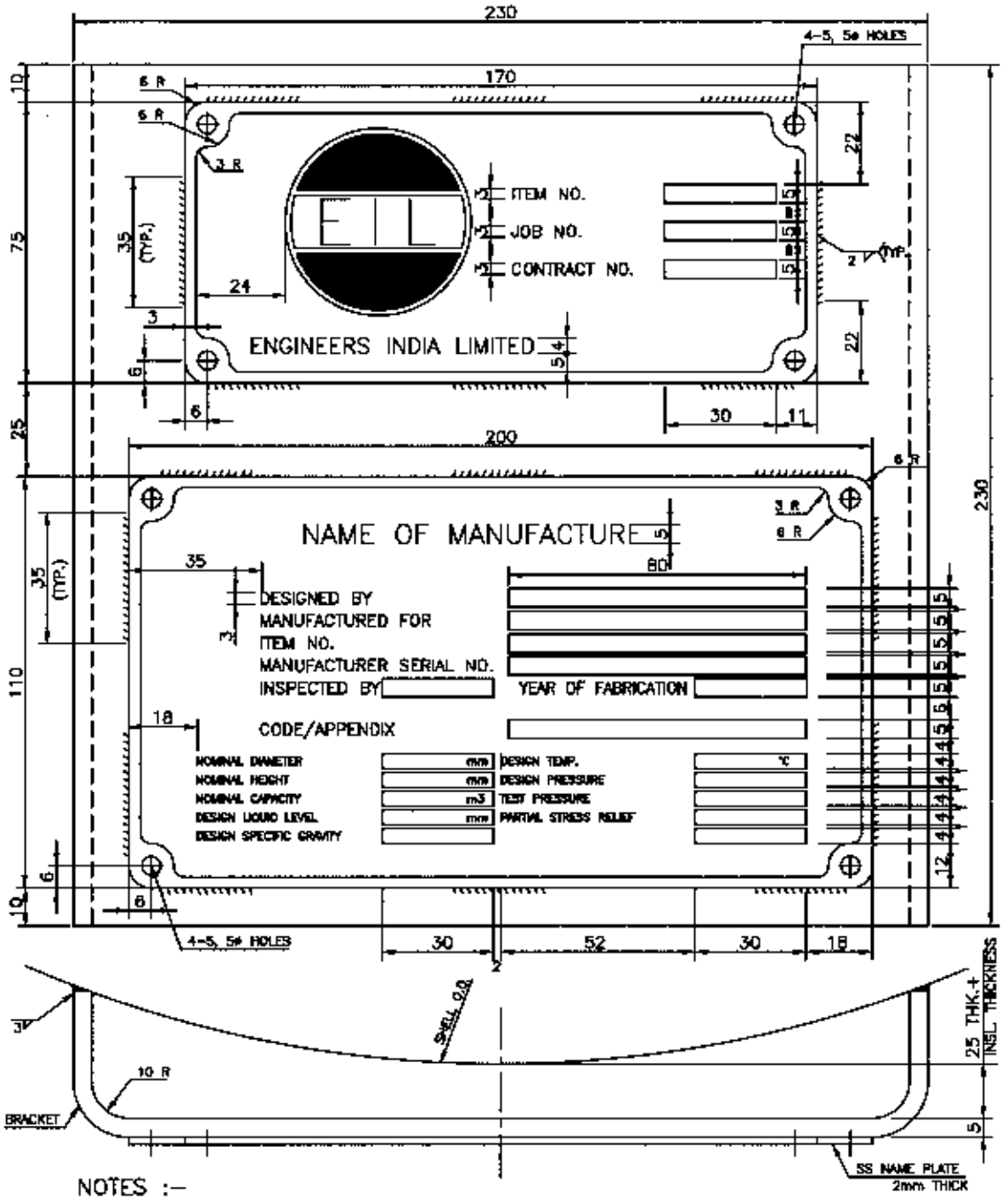
FOR RUBBER LINED TANKS WHERE BOTTOM IS ACCESSIBLE FROM BELOW

TYPE – 4

NOTES : –

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. THIS STANDARD IS APPLICABLE UPTO 150 NB NOZZLE.
3. FOR MATERIAL SPECIFICATION REFER ENGINEERING DRAWING.
4. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
5. FOR TANK DIAMETER GREATER THAN 6M, SUMP AND DRAIN OUTLET DETAILS SHALL BE AS PER API–650.

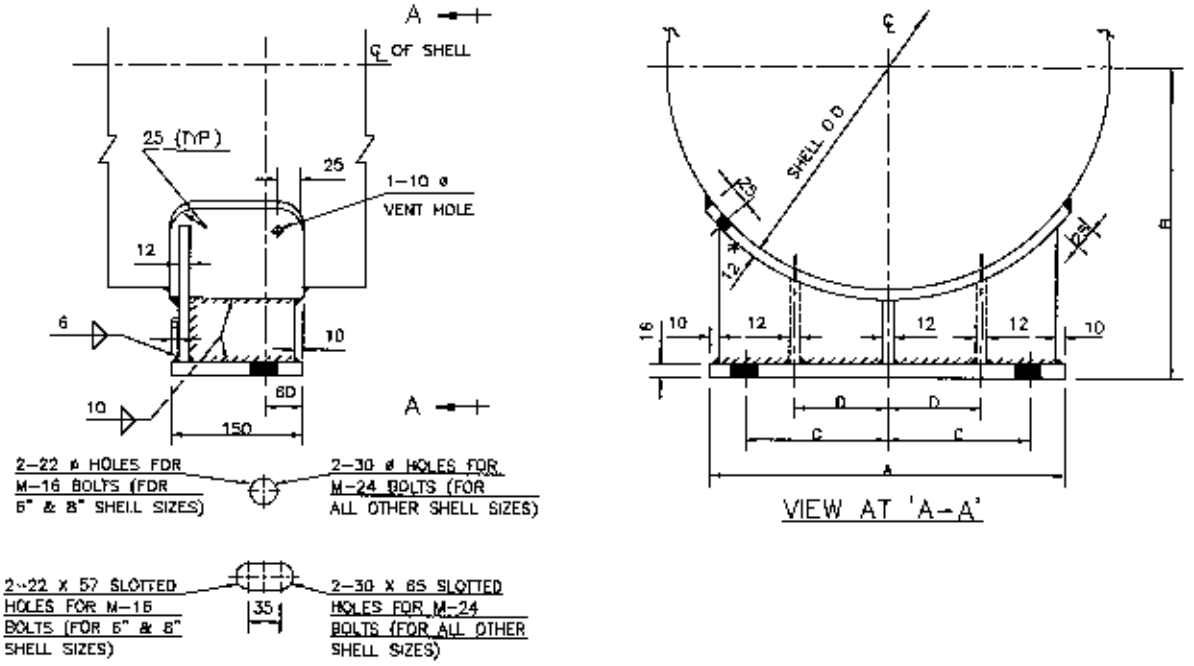
Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
					Approved by	
7	15 11 2019	REAFFIRMED AND REISSUED AS STANDARD	DP		KJH	RKT
6	17 10 2013	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
5	27 01 2009	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC



NOTES :–

1. ALL LETTERS, BLOCKS AND BORDER SHALL BE RAISED POLISHED FACE.
2. BACKGROUND TO BE BLACK.
3. ALL DIMENTIONS ARE IN mm UNLESS OTHERWISE STATED.
4. NAME PLATES MAY BE RIVED WITH S.S. RIVETS OR TACK WELDED TO BRACKET.
5. BRACKET MATERIAL SHALL BE SAME AS SHELL MATERIAL.
6. THE NAME PLATE BRACKET SHALL BE LOCATED ON THE TANK SHELL NEAR TO STAIRWAY ENTRANCE AT 1.5 M FROM BOTTOM OF TANK.

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
					Approved by	
5	20 06 2019	REAFFIRMED AND REISSUED AS STANDARD	DP	DK	KJH	RKT
4	17 10 2013	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
3	27 01 2009	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC



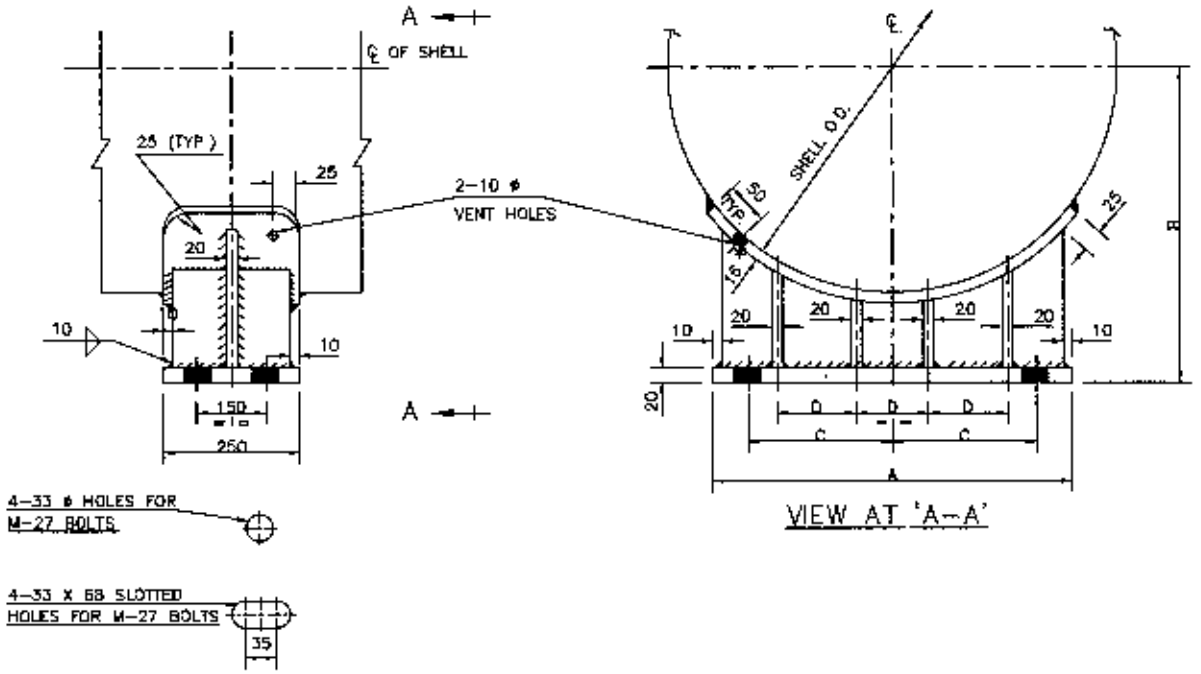
SADDLE NO.	UNIT SIZE O.D. mm.	A	B	C	D	NO. OF RIBS	TOTAL WT. OF 2 SADDLES (kg.)	REMARKS
1	168.3	160	200	50	–	1	17	
2	219.1	160	230	50	–	1	18	
3	273	220	260	70	–	1	21	
4	323.8	230	270	75	–	1	22	
5	355.6	260	280	90	–	1	26	
6	406.4	300	310	110	–	1	30	
7	457.2	350	330	135	80	2	36	
8	500	400	350	160	105	3	44	
9	550	400	380	160	105	3	44	
10	600	430	400	175	120	3	46	
11	650	460	430	190	135	3	50	
12	700	510	450	215	160	3	56	
13	750	530	480	225	165	3	60	
14	800	590	500	240	180	3	82	
15	850	610	530	255	195	3	84	
16	900	660	550	280	220	3	92	
17	950	690	580	295	235	3	98	

NOTES: –

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. INTERMEDIATE SADDLES TO BE TAKEN TO THE NEAREST SIZE.
* 3 FOR S.S. 10 mm THK FOR SADDLE NOS. 1 TO 17 & 14 mm THK. FOR SADDLE NOS 18 TO 37.

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
5	31.10.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC

Approved by



SADDLE NO.	UNIT SIZE O.D. mm	A	B	C	D	NO. OF RIBS	TOTAL WT. OF TWO SADDLES (kg)	REMARKS
18	1000	900	650	370	180	8	258	
19	1050	950	675	390	200		278	
20	1100	1000	700	420	220		290	
21	1150	1050	725	440	230		302	
22	1200	1100	750	470	250		320	
23	1250	1150	775	490	270		336	
24	1300	1200	800	520	280		348	
25	1350	1200	825	520	280		356	
26	1400	1250	850	540	300		368	
27	1450	1300	875	570	320		380	
28	1500	1350	900	590	340		398	
29	1600	1400	950	620	350		406	
30	1700	1500	1000	670	380		440	
31	1800	1600	1050	720	420		472	
32	1900	1700	1100	770	450		516	
33	2000	1800	1150	820	480		546	
34	2100	1850	1200	840	500		568	
35	2200	1950	1250	890	530		602	
36	2300	2000	1300	920	550		606	
37	2400	2100	1350	970	580		640	

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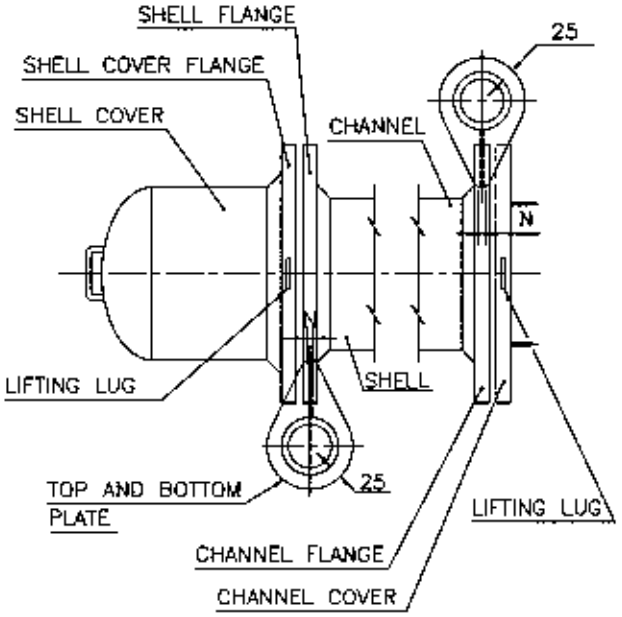
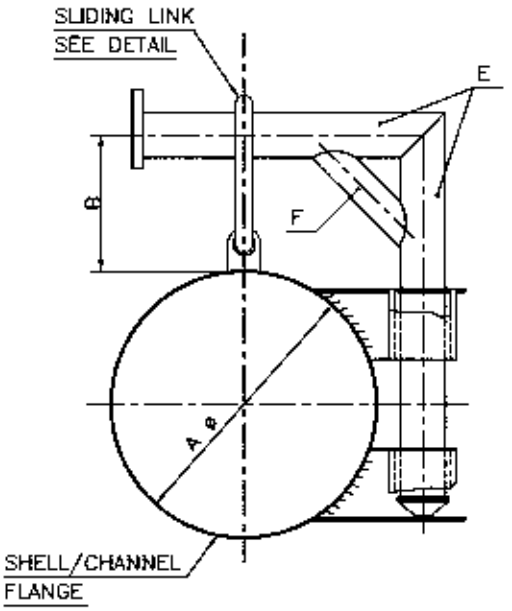
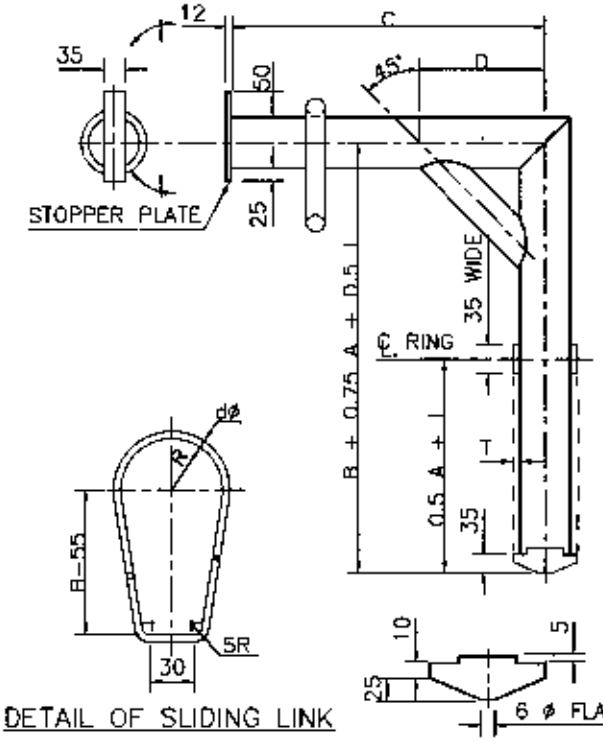
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC



PLAN OF DAVIT SUPPORT

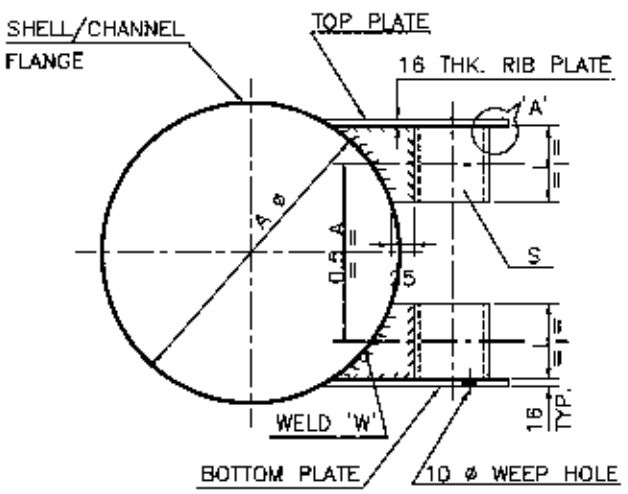


ASSEMBLY OF DAVIT ON EXCHANGER



DETAIL OF SLIDING LINK

DETAIL OF DAVIT



DETAIL OF DAVIT SUPPORT

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
5	31.10.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC

Approved by

DAVIT FOR SHELL COVER TABLE–1

DAVIT DIMN.	DIMENSION–A																			
	UPTO 500	501 TO 600	601 TO 700	701 TO 800	801 TO 900	901 TO 1000	1001 TO 1100	1101 TO 1200	1201 TO 1300	1301 TO 1400	1401 TO 1500	1501 TO 1600	1601 TO 1700	1701 TO 1800	1801 TO 1900	1901 TO 2000	2001 TO 2100	2101 TO 2200	2201 TO 2300	2301 TO 2400	2401 TO 2500
B	230	230	250	250	250	250	275	275	275	300	300	300	325	325	325	325	325	325	325	325	325
C	580	650	750	800	850	900	1000	1050	1100	1190	1240	1290	1360	1410	1460	1510	1560	1610	1660	1710	1760
D	260	260	300	300	300	300	340	350	380	390	400	430	430	430	430	450	450	460	460	480	480
L	125	150	180	200	230	250	280	300	330	350	390	400	430	450	480	500	530	550	580	600	630
N	20	20	25	25	30	30	30	30	30	30	30	30	30	25	30	30	40	40	40	40	40
d	16	16	20	20	20	20	20	20	20	25	25	25	25	25	30	30	30	30	30	30	30

DAVIT FOR CHANNEL COVER TABLE–2

DAVIT DIMN.	DIMENSION–A																			
	UPTO 500	501 TO 600	601 TO 700	701 TO 800	801 TO 900	901 TO 1000	1001 TO 1100	1101 TO 1200	1201 TO 1300	1301 TO 1400	1401 TO 1500	1501 TO 1600	1601 TO 1700	1701 TO 1800	1801 TO 1900	1901 TO 2000	2001 TO 2100	2101 TO 2200	2201 TO 2300	2301 TO 2400	2401 TO 2500
B	180	180	200	200	200	200	200	230	230	260	260	260	260	260	290	290	290	290	290	290	290
C	350	400	450	525	575	625	675	750	800	875	925	975	1025	1075	1150	1200	1225	1275	1325	1375	1425
D	210	210	250	250	260	260	270	300	300	350	350	350	375	375	410	410	410	425	425	450	450
L	125	150	180	200	230	250	280	300	330	350	380	400	430	450	480	500	530	550	580	600	630
N	20	20	25	25	30	30	30	30	30	30	30	30	30	30	30	30	40	40	40	40	40
d	16	16	20	20	20	20	20	20	20	25	25	25	25	25	30	30	30	30	30	30	30

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5	31.10.19	REAFFIRMED AND REISSUED AS STANDARD	DP	JNSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC

Approved by

TABLE – 3

WT. X C. (TON) (MTR)	DIMENSIONS/SIZE OF DAVITS				
	E NB SCH	F NB SCH	T	R	S NB SCH
UPTO 0.1	2"–160	1-1/2"-160	3	32	3"–160
0.11–0.3	3"–160	2"–160	3	47	4"–80
0.31–0.6	4"–160	2"–160	13	59	6"–80
0.61–1.25	6"–80	3"–160	10	86	8"–80
1.26–2.5	8"–80	3"–160	11	112	10"–60
2.6–4.0	10"–60	4"–120	8	139	12"–60
4.1–6.3	10"–120	4"–120	8	139	12"–60
6.4–7.8	10"–160	4"–120	8	139	12"–60

NOTES: –

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE INDICATED.
2. WHEN DAVITS ARE REQUIRED, USE THE FOLLOWING PROCEDURE TO FIND OUT THE DIMENSIONS
   2.1 IDENTIFY THE DIMENSION A, i.e. THE MAXIMUM DIAMETER OF THE COMPONENT TO BE HANDLED.
   2.2 REFER TABLE–1 OR TABLE–2 (AS THE CASE MAY BE) FOR THE DIMENSIONS AND SIZES B,C,D,L,N & d INDICATED IN THE COLUMN CORRESPONDING TO DIMENSION A.
   2.3 DETERMINE WEIGHT OF THE PART TO BE HANDLED (i e. WT. OF SHELL COVER ASSEMBLY OR CHANNEL COVER)
   2.4 CALCULATE THE PRODUCT OF WEIGHT (IN TONNES) X DIMENSION C (IN METRES)
   2.5 REFER TABLE–3 & OBTAIN DIMENSION AND SIZES E,F,T,S & R INDICATED IN THE ROW AGAINST THE PRODUCT CALCULATED AT 2.4 ABOVE.
3. MATERIALS OF CONSTRUCTION–a TOP/BOTTOM/RIB PLATE– COMPATIBLE WITH PART IT IS WELDED TO (USE BOILER QUALITY FOR CARBON STEEL)
   b. OTHERS IS 1239 OR EQUIV

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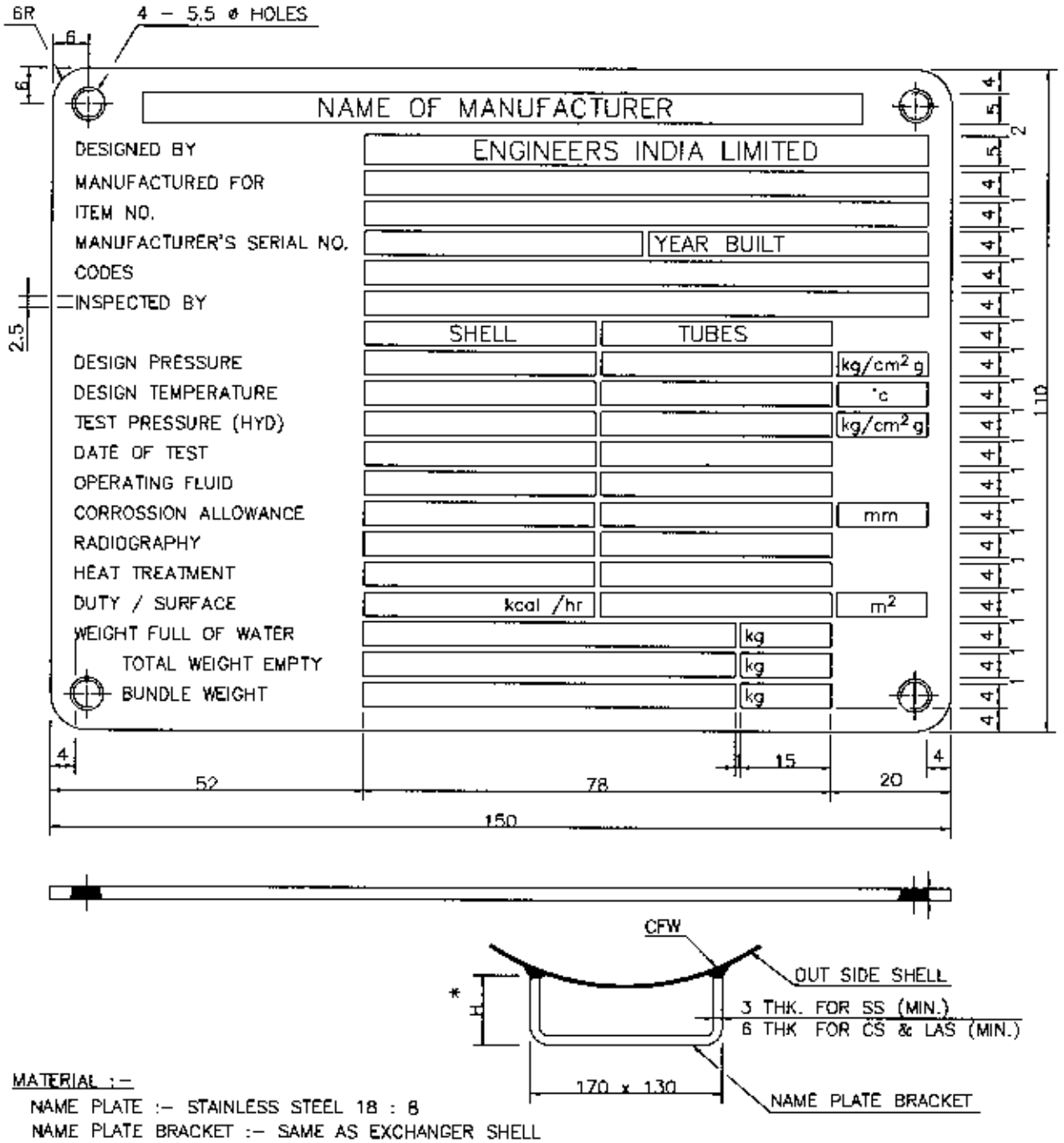
Approved by



MATERIAL :–

NAME PLATE :– STAINLESS STEEL 18 : 8

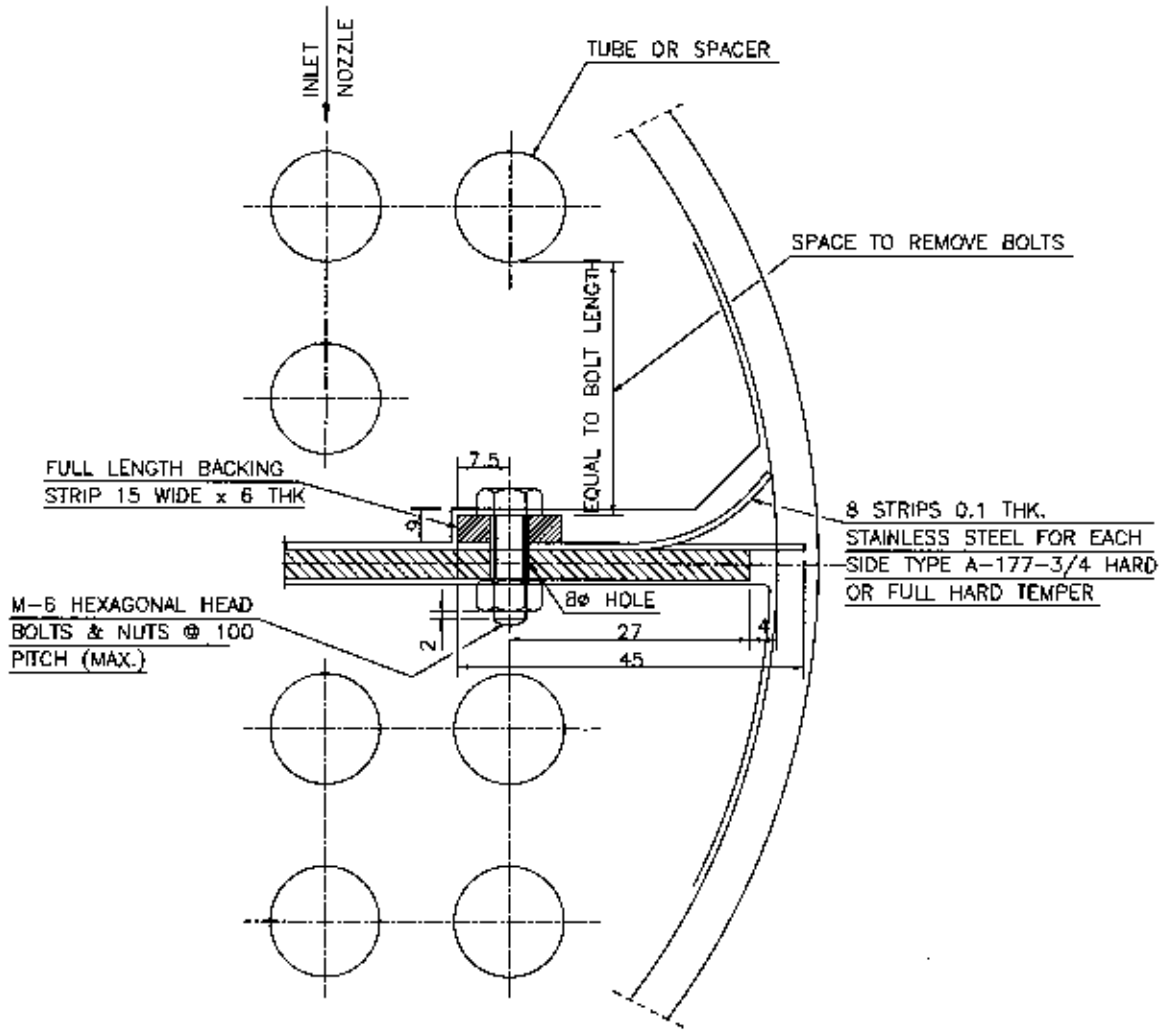
NAME PLATE BRACKET :– SAME AS EXCHANGER SHELL

NOTES:–

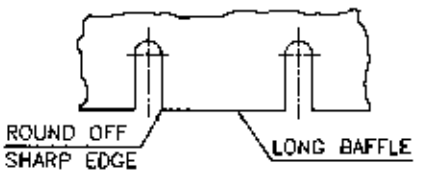
1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL LETTERS AND LETTER BLOCKS SHALL BE ENGRAVED IN BLACK.
3. * H = 75 OR 'INSULATION THK. + 10 WHICHEVER IS GREATER
4. NAME PLATE SHALL BE RIVETED WITH 5 ø ALUMINIUM RIVETS AND SHALL BE TACK WELDED TO BRACKET ON ALL FOUR SIDES.
5. BRACKET WITH NAME PLATE TO BE LOCATED AS MARKED ON DRAWING.

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
5	31.10.19	REAFFIRMED AND REISSUED AS STANDARD	DP	MSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC

Approved by



TO FACILITATE ASSEMBLY AND MAINTENANCE HOLES DRILLED IN LONG BAFFLE TO BE SLOTTED AS SHOWN



DETAIL SHOWING BOLT HOLES IN LONGITUDINAL BAFFLE

NOTE:-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.

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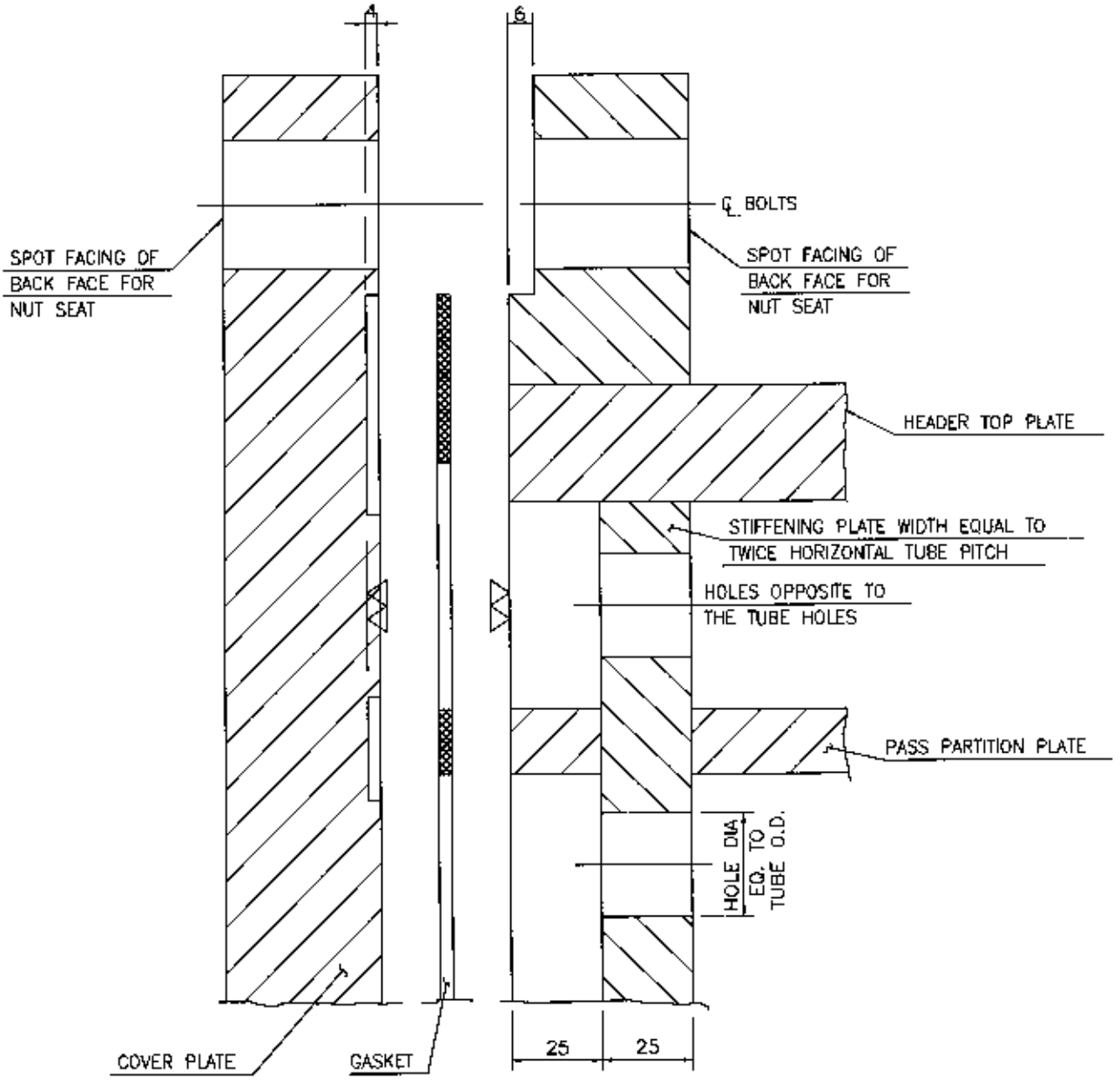
Approved by



NOTE:-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.

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					Approved by	
5	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
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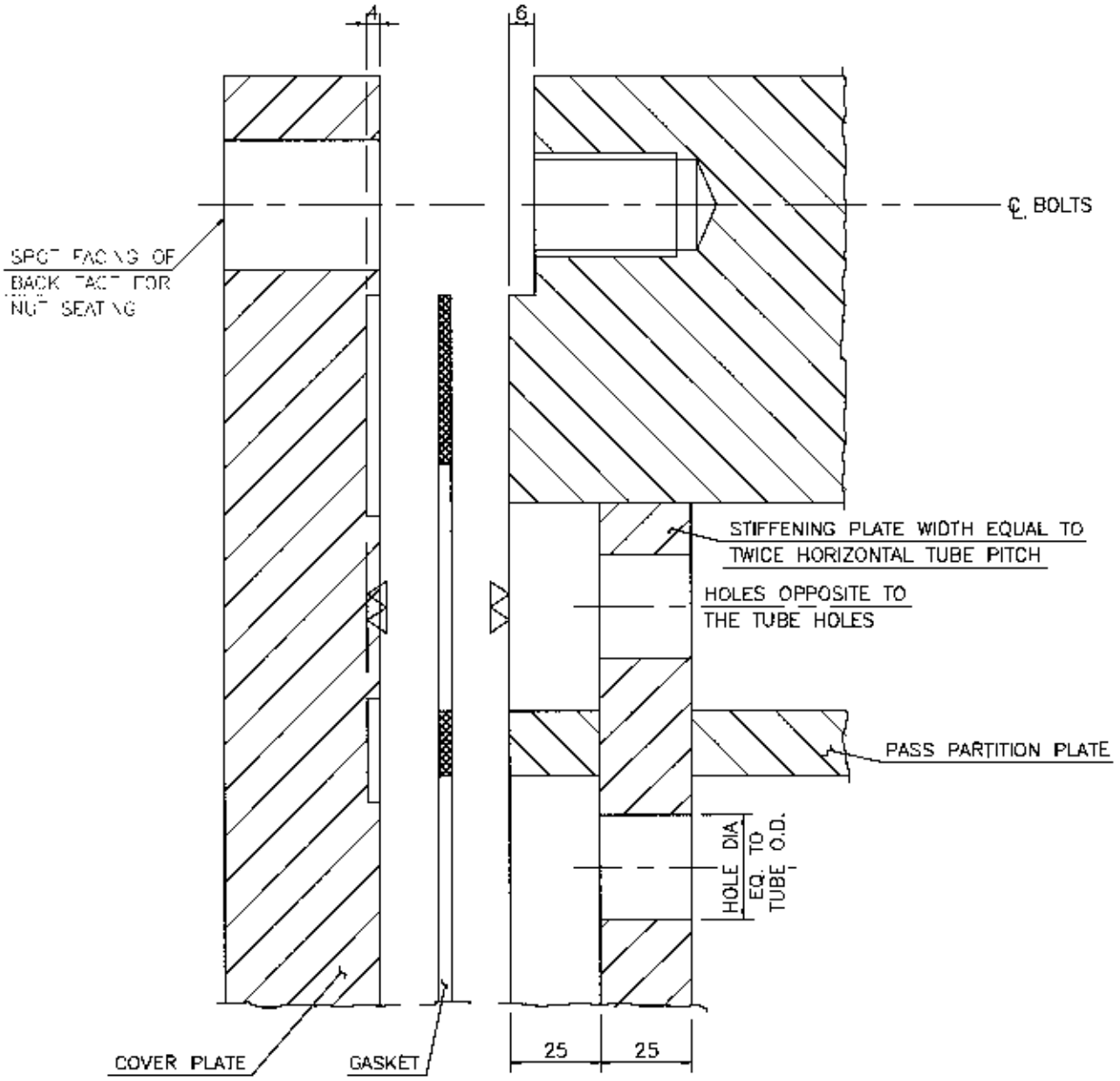
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC



NOTE:–

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.

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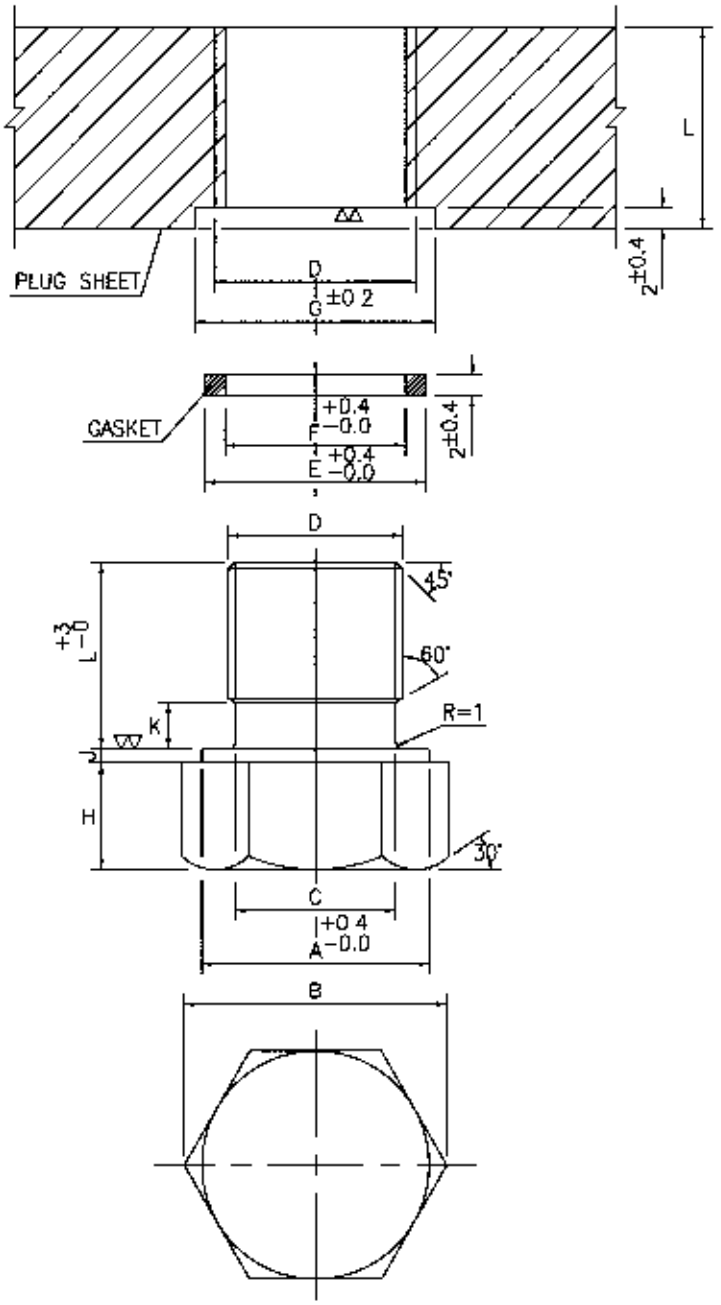
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC

Approved by

TUBE ACCESS PLUG

(AIRCOOLED HEAT EXCHANGERS)



S.NO.	TUBE DIA.		A	B	C	D	E	F	G	H	J	K	L
1	1"	25	35	41.6	26	1 1/8" −12 UNF	35	30	36	15	2	4	PLUG SHEET THICKNESS
2	1 1/4"	32	42	53.1	32	1 3/8" −12 UNF	42	37	43	19	2	5	
3	1 1/2"	38	48	57.7	38	1 5/8" −12 UNF	48	43	49	21	2	5	
4	1 7/8"	48	57	67	47	2" −12 UN	57	52	58	24	2	5	
5	2"	50	64	78	54	2 1/4" −12 UN	64	59	65	27	2	5	

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. THREAD STRAIGHT ACCORDING TO ASME B1.1 CLASS 2A/2B.

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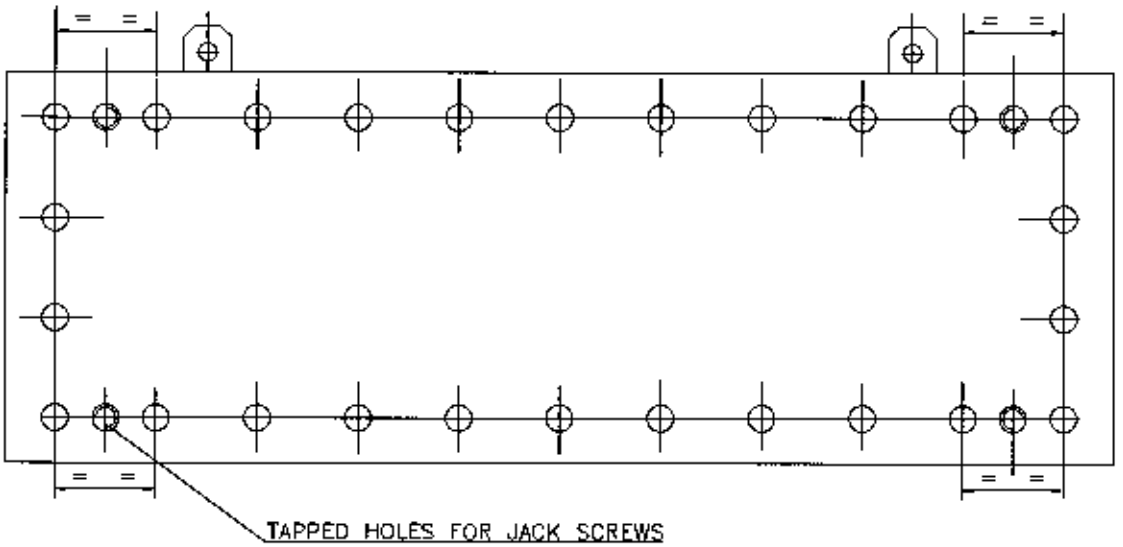
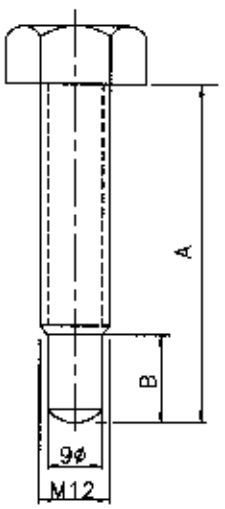
Approved by

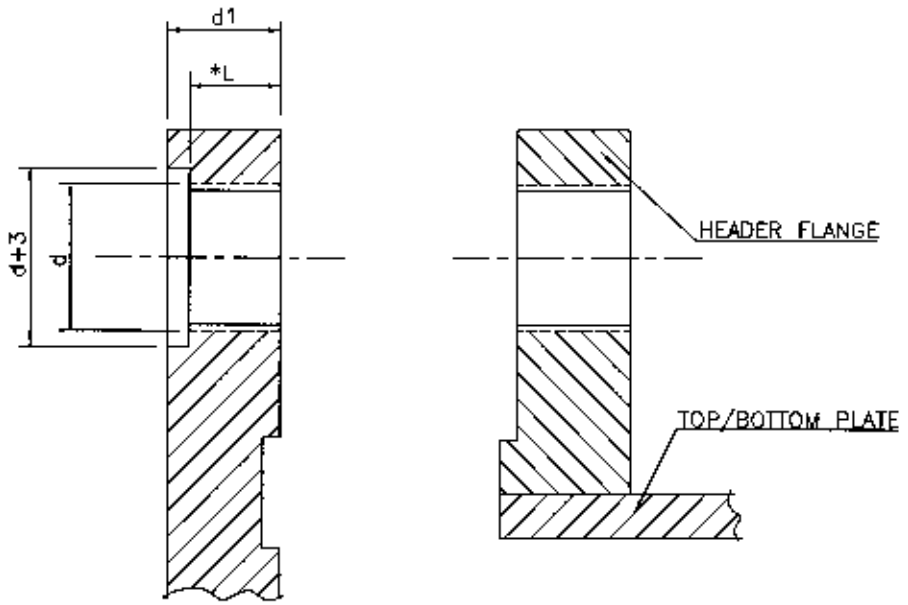


LOCATION OF JACK SCREWS IN COVER PLATE

*L = 2d OR d1 WHICHEVER IS SMALLER



JACK SCREW DETAIL



TAPPING DETAIL IN COVER PLATE

NOTES: –

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. DIMENSION 'A' = FLANGE OR COVER PLATE THK. +15.
3. MATERIAL OF JACK SCREW :– SS
4. JACK SCREWS – 4 NOS. FOR EACH COVER PLATE.

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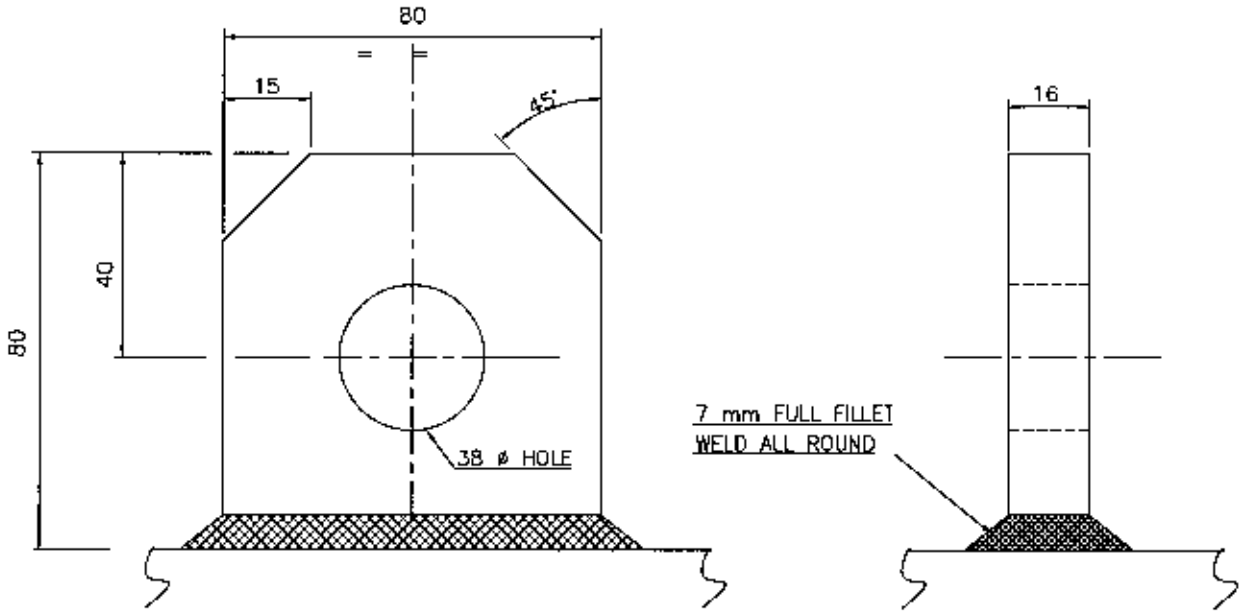

NOTES:–

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. MATERIAL SHALL BE COMPATIBLE WITH PART IT IS WELDED TO. (USE BOILER QUALITY FOR CARBON STEEL)
3. USE TWO LIFTING LUGS FOR EACH COVER PLATE
4. SAFE WORKING LOAD = 1100 kg

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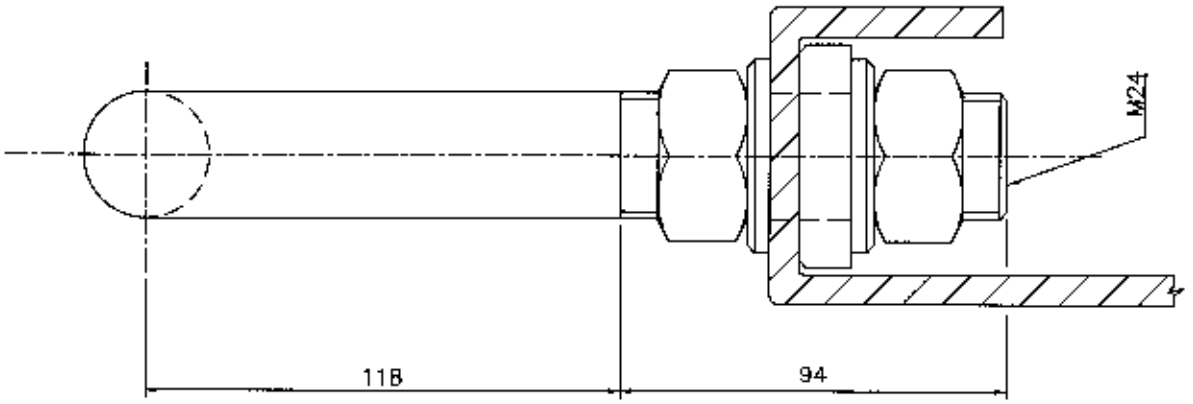

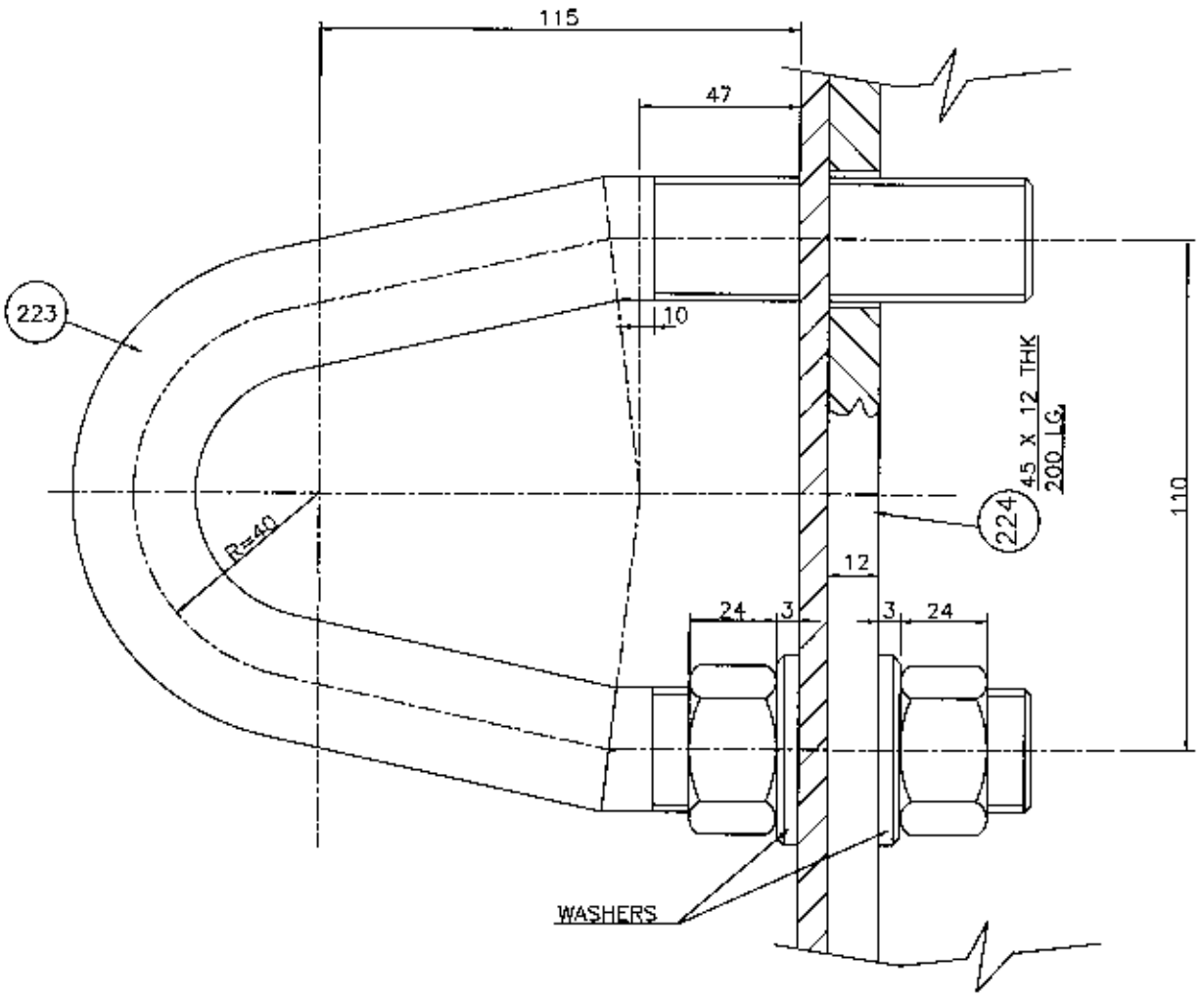

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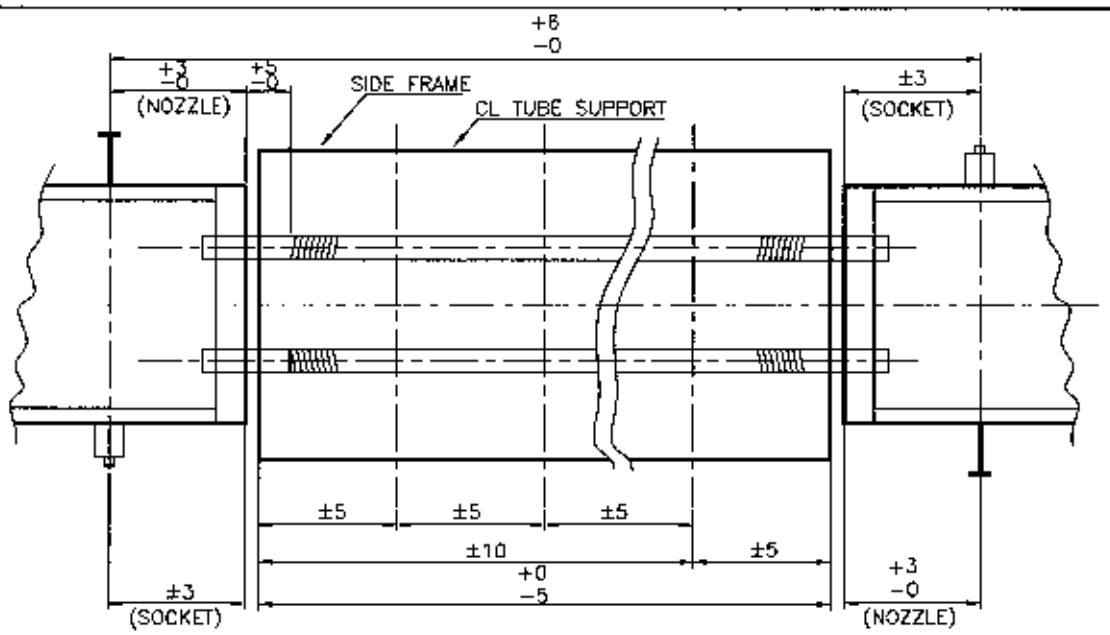
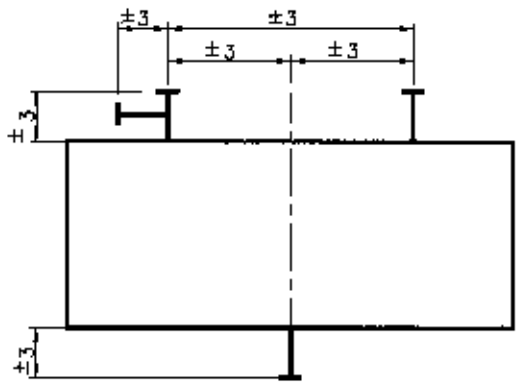
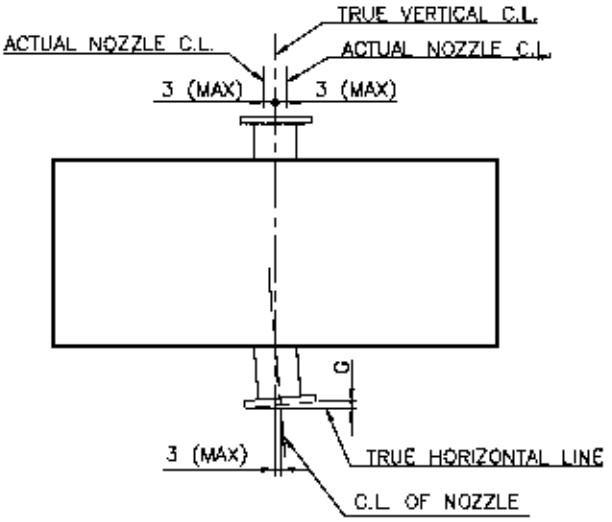
Approved by

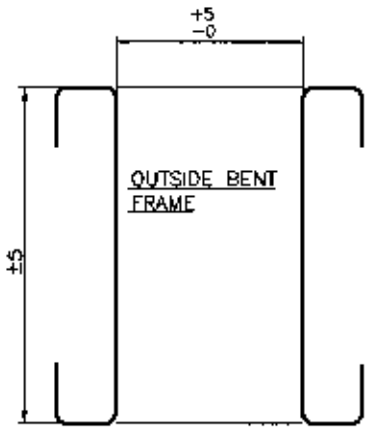


TUBE BUNDLE WITH SIDE FRAME



NOZZLES ON HEADER





SIDE FRAME

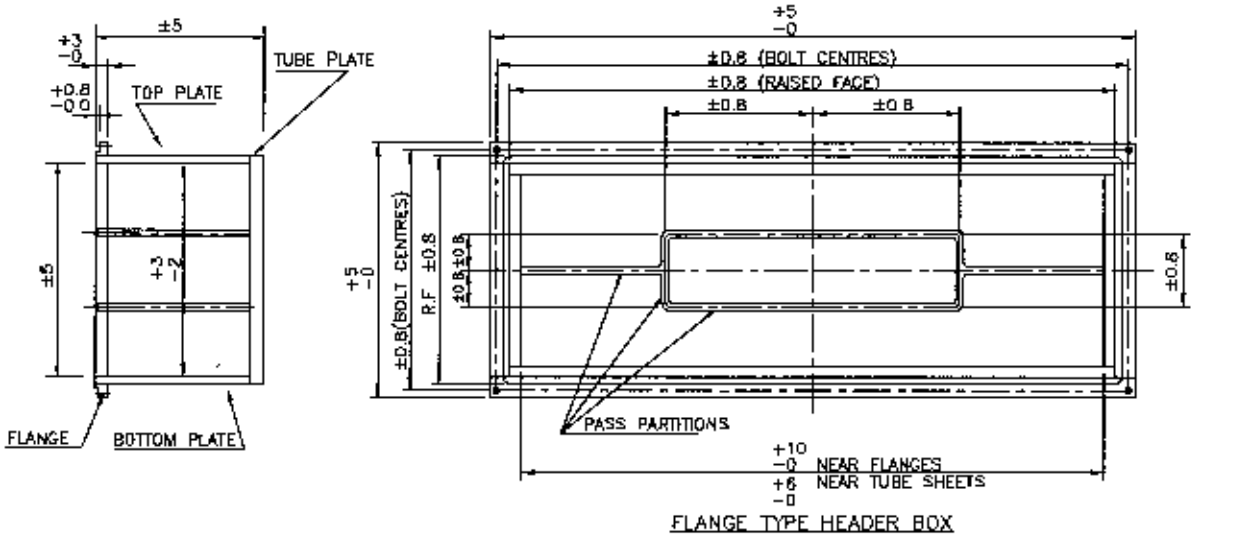
NOMINAL NOZZLE SIZE	G (MAX)
2" – 4" INCL	1.0
6" – 10" INCL	2.0
OVER 10"	2.5

NOZZLE TILT AND OFF SETS

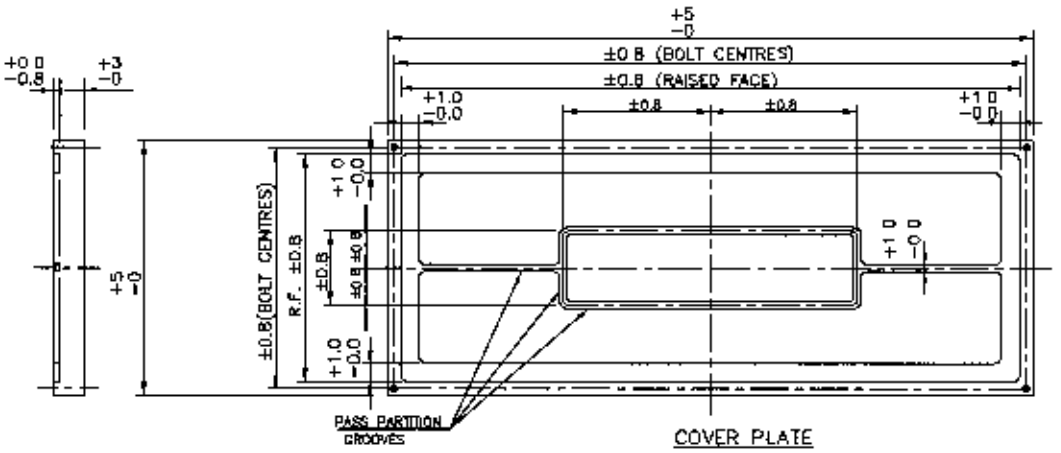
NOTE:–

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE

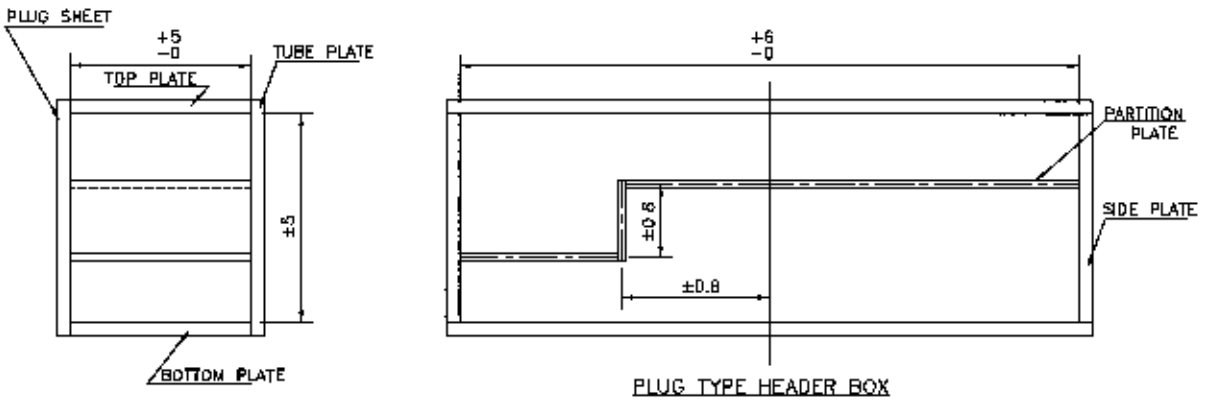
Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
					Approved by	
5	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC



FLANGE TYPE HEADER BOX



COVER PLATE



PLUG TYPE HEADER BOX

NOTES:–

1 ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE
2 TOLERANCES ON PITCH OF STUD HOLES ±0.4
3 TOLERANCES ON ECCENTRICITY OF STUD HOLES WITH RESPECT TO CL OF HEADER ±0.8

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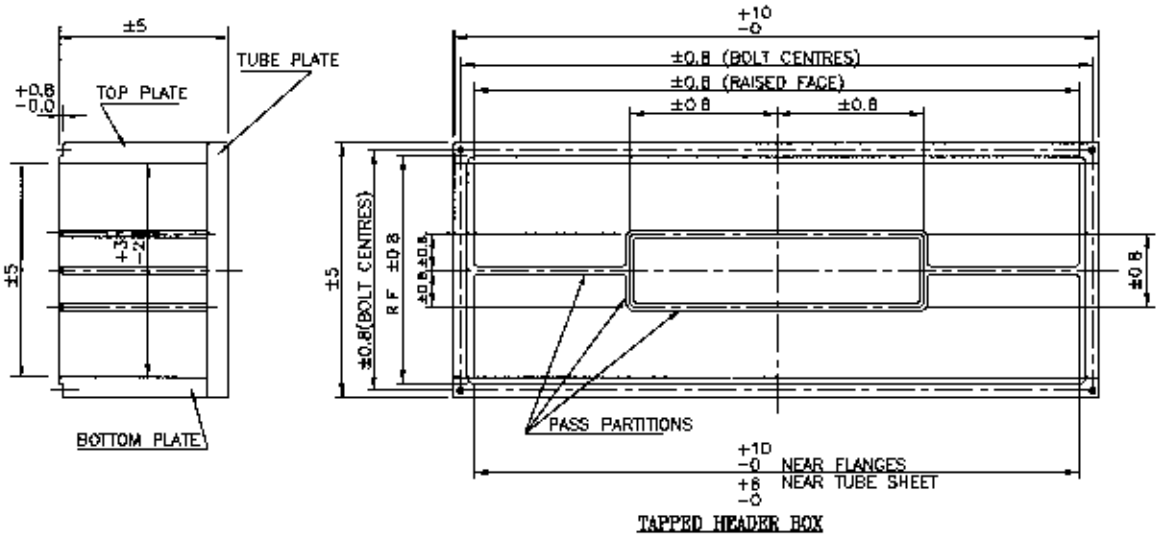
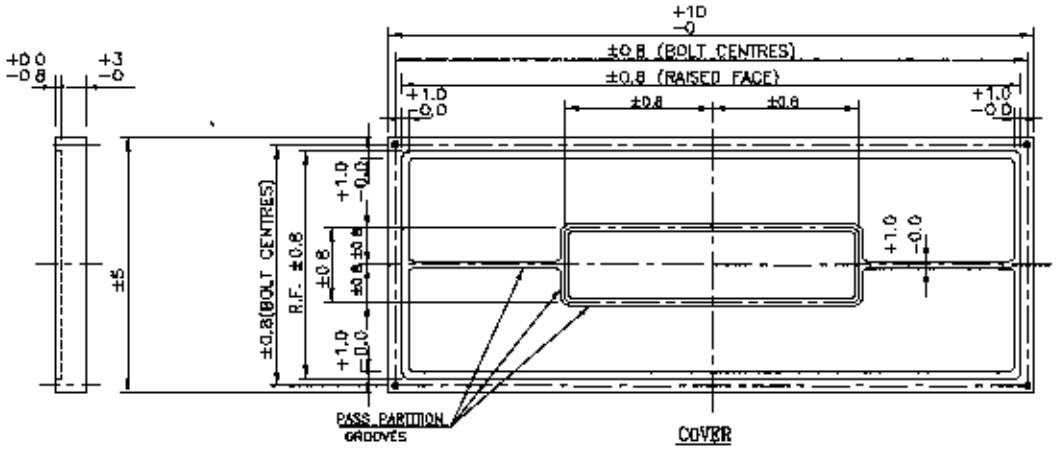
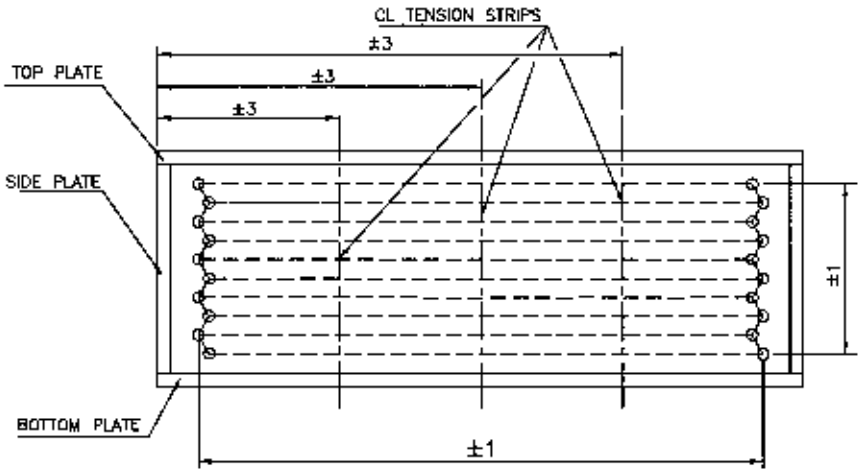
					Approved by	
5	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC



TAPPED HEADER BOX



COVER



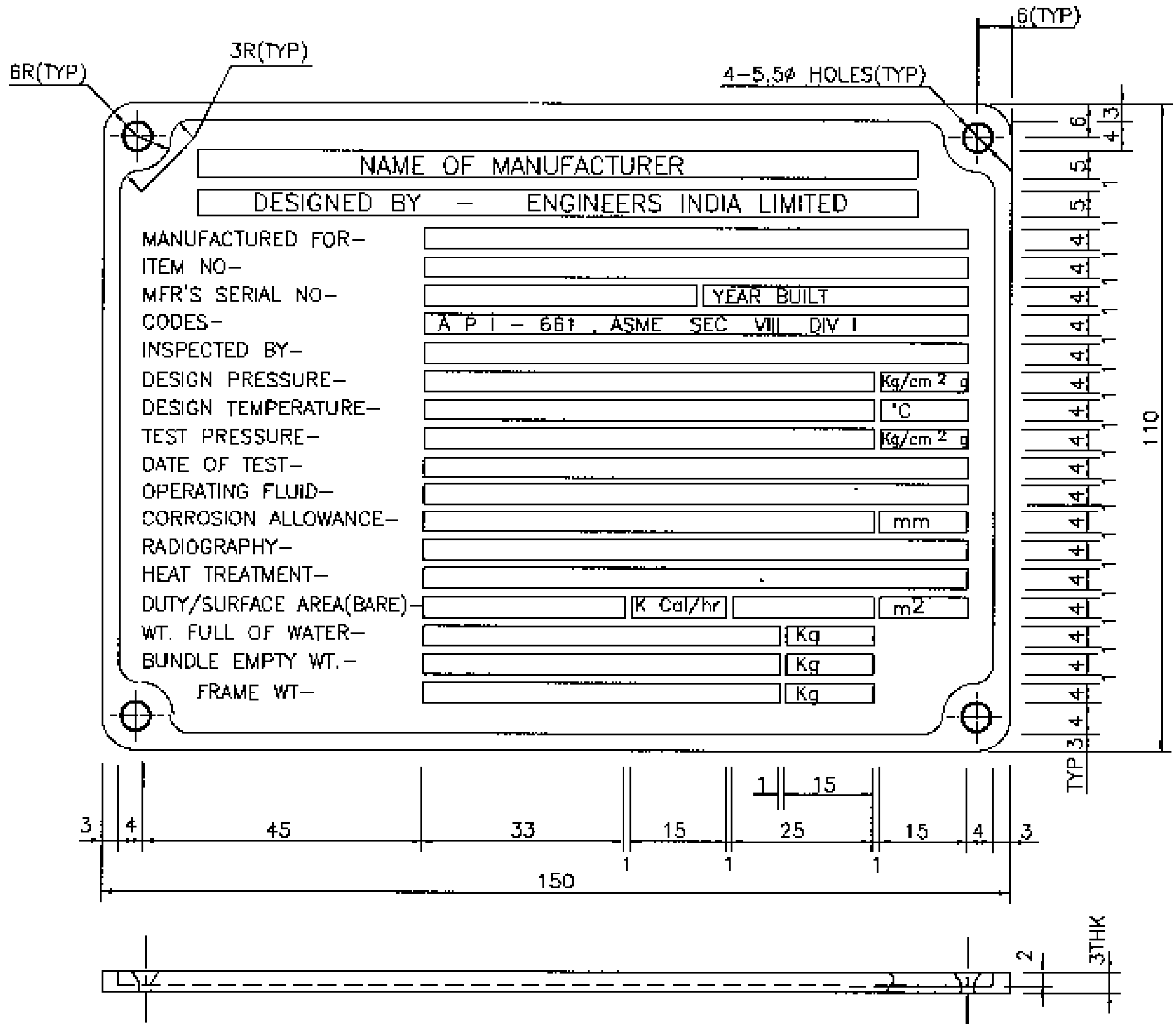
TUBE HOLE LAYOUT AND TENSION STRIPS

NOTES:—

1. ALL DIMENSIONS ARE IN mm. UNLESS STATED OTHERWISE.
2. ECCENTRICITY OF TUBE ACCESS HOLES IN TENSION STRIPS WITH RESPECT TO CORRESPONDING TUBE HOLES IN TUBE PLATE ±0.8

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
5	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC

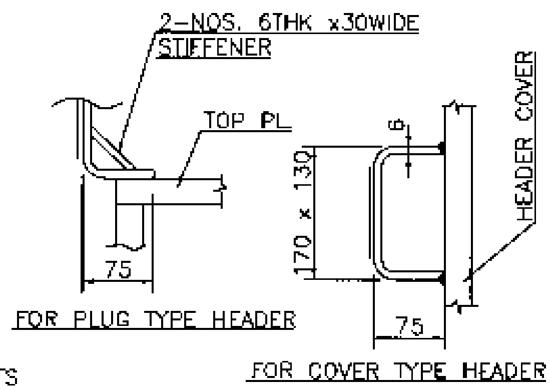
Approved by



MATERIAL :- STAINLESS STEEL 18:8

NOTES :-

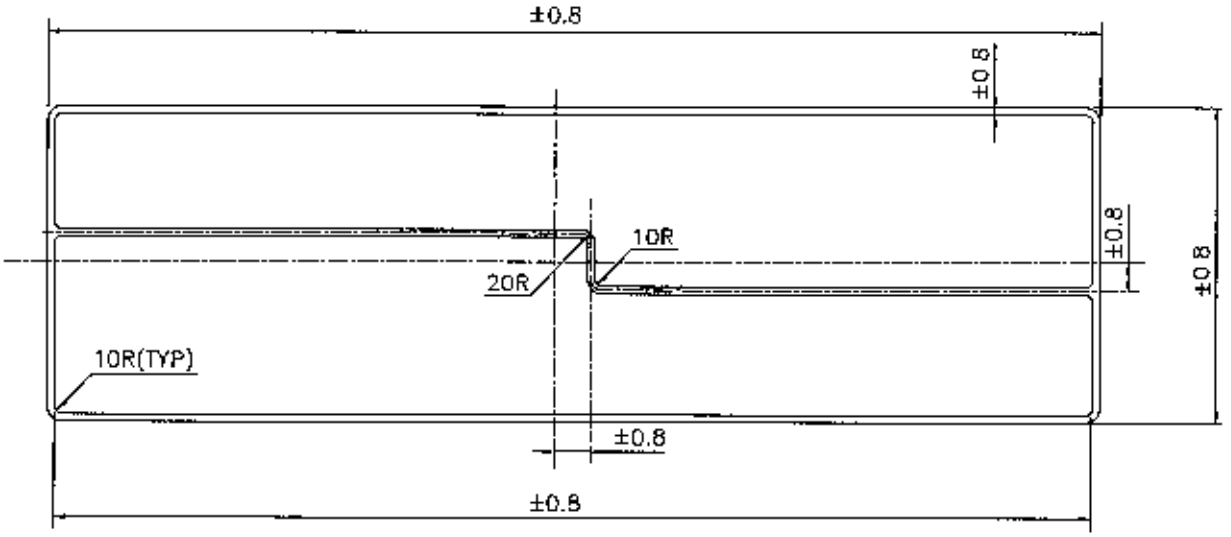
1. ALL LETTERS, BLOCKS & BORDERS SHALL BE RAISED POLISHED FACE.
2. BACK GROUND TO BE BLACK.
3. NAME PLATE SHALL BE SECURED THROUGH ALUMINIUM RIVETS & TACK WELDS ON FOUR SIDES

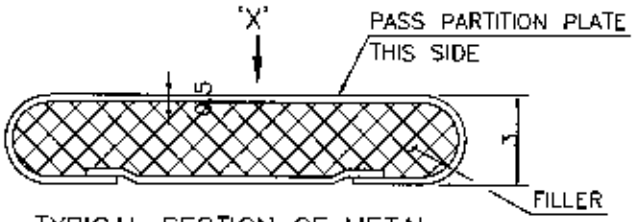


NAME PLATE BRACKET
(SAME MATERIAL AS FOR HEADER)

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor (Approved by)	Stds Bureau Chairman (Approved by)
4	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
3	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
2	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC

PERMISSIBLE TOLERANCES





TYPICAL SECTION OF METAL JACKETTED GASKETS

GENERAL NOTES: –

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. THE HARDNESS OF THE METAL FOR SOLID OR CLAD GASKETS SHALL BE MINIMUM 15 BHN LOWER THAN THAT OF THE MATERIAL OF THE FLANGE GASKET SEATING SURFACE AND IN ANY CASE NOT TO EXCEED THE FOLLOWING.

(a) LOW CARBON STEEL / LAS	–	110 BHN
(b) 5 Cr. 1/2 Mo.	–	130 BHN
(c) STAINLESS STEEL	–	160 BHN
(d) 11 – 13 Cr.	–	170 BHN
(e) MONEL	–	130 BHN
(f) SOFT IRON	–	90 BHN
(g) COPPER, BRASS	–	50 BHN
(h) ALUMINIUM	–	30 BHN

3. FILLER IN METAL JACKETTED GASKETS SHALL NOT BE OF COMPRESSED TYPE.
4. ALL GASKETS SHALL BE MADE IN ONE CONTINUOUS PIECE ALL AROUND INCLUDING THE PASS PARTITION RIBS AND THEREFORE MUST BE CUT FROM ONE SHEET.
5. SOLID FLAT METAL GASKET SHALL BE 2 mm. THK
6. 'm' AND 'y' VALUES SHALL BE AS PER ASME SEC. VIII DIV. I.
7. GASKET PLAN IS VIEWED FROM DIRECTION 'X' .
8. FILLER SHALL BE ARAMIDE FIBRE UNLESS SPECIFIED OTHERWISE IN DRAWINGS & ASBESTOS NOT TO BE USED.

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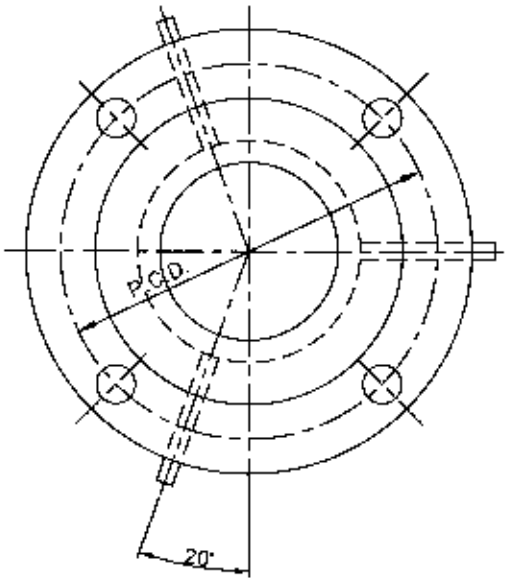
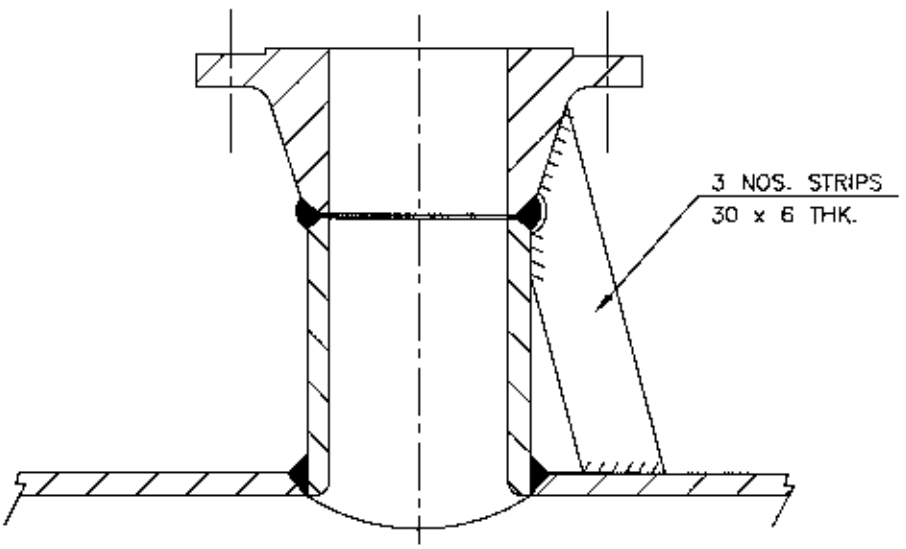
					Approved by	
5	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC





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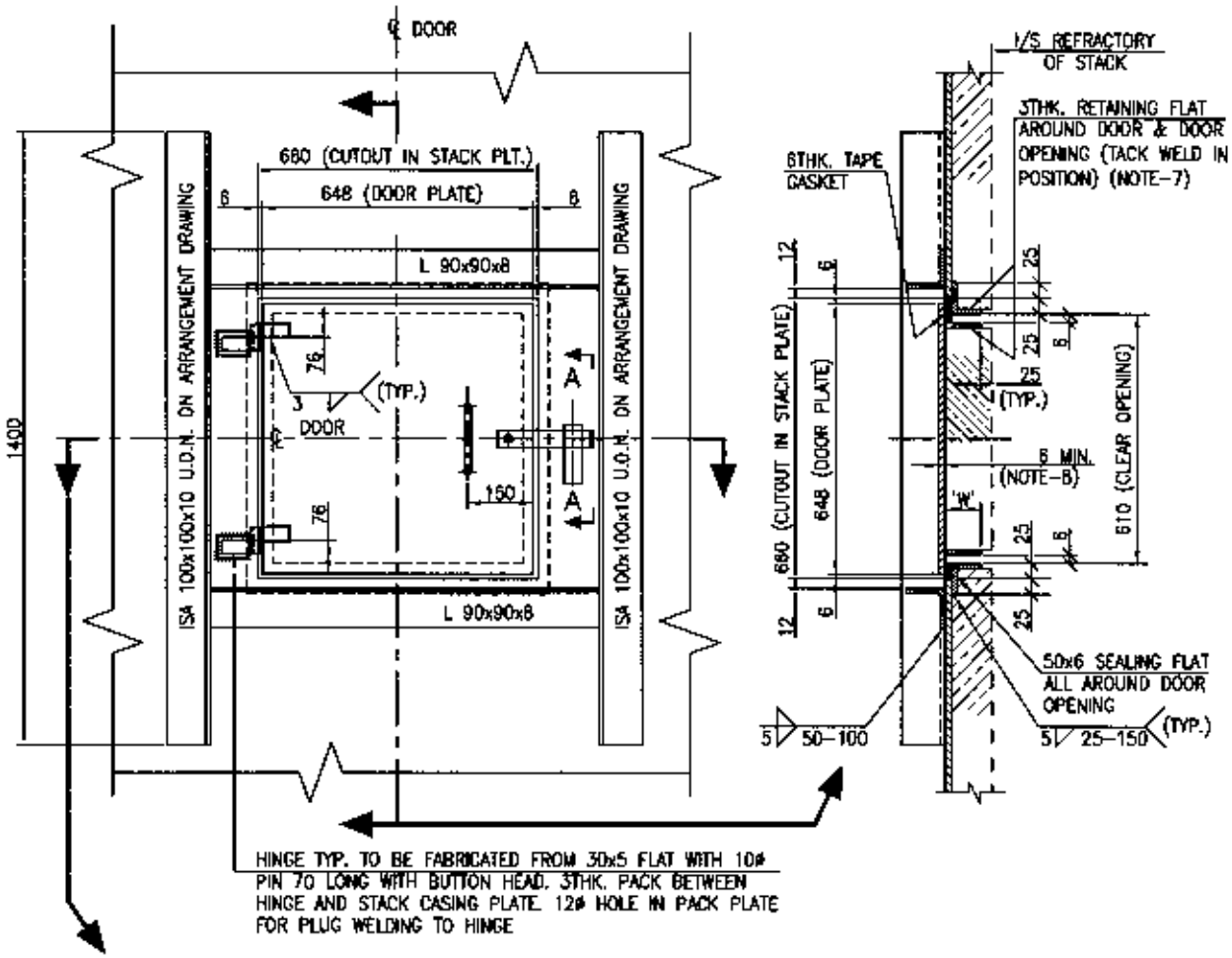
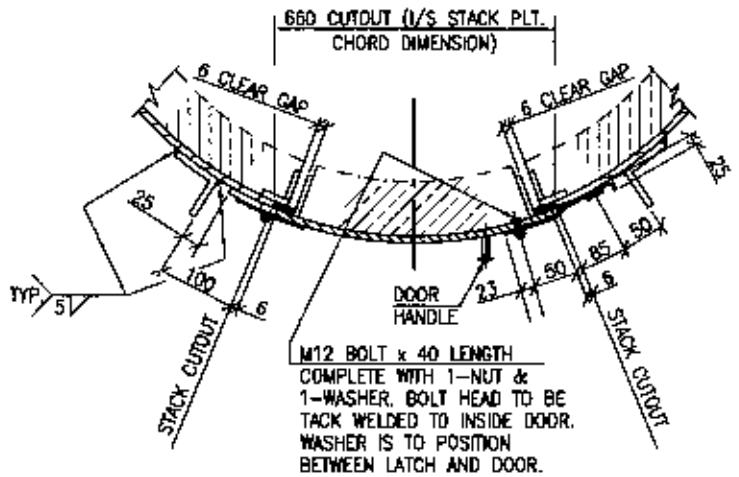
5	27.12.19	REAFFIRMED AND REISSUED AS STANDARD	DP	NSK	KJH	RKT
4	06.05.14	REAFFIRMED AND REISSUED AS STANDARD	GCP	KA	RKT	SC
3	27.01.09	REAFFIRMED AND REISSUED AS STANDARD	VPR	RKG	AKM	VC

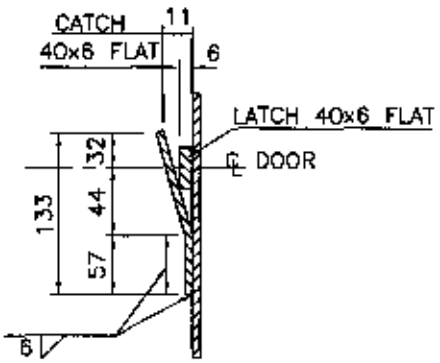




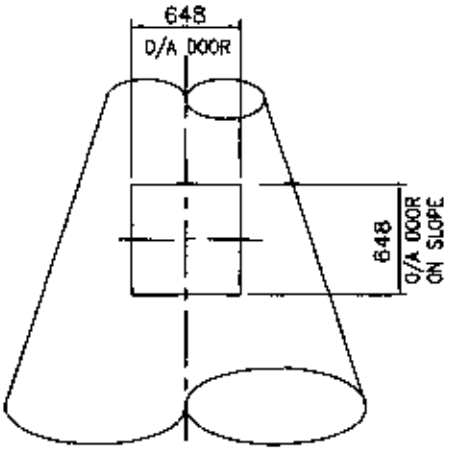
GENERAL NOTES:-

SEE SHEET NO. 2

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
					Approved by	
6	16 12 2019	REVISED & ISSUED AS STANDARD	MB	AV/PG	MK	RKT
5	27 03 2015	REVISED & ISSUED AS STANDARD	SS	RP/KJH	AP	SC



ENLARGED SECTION A-A



ACCESS DOOR FOR FLARED STACK
(DETAILS ARE THE SAME AS FOR DOOR IN STRAIGHT STACK)

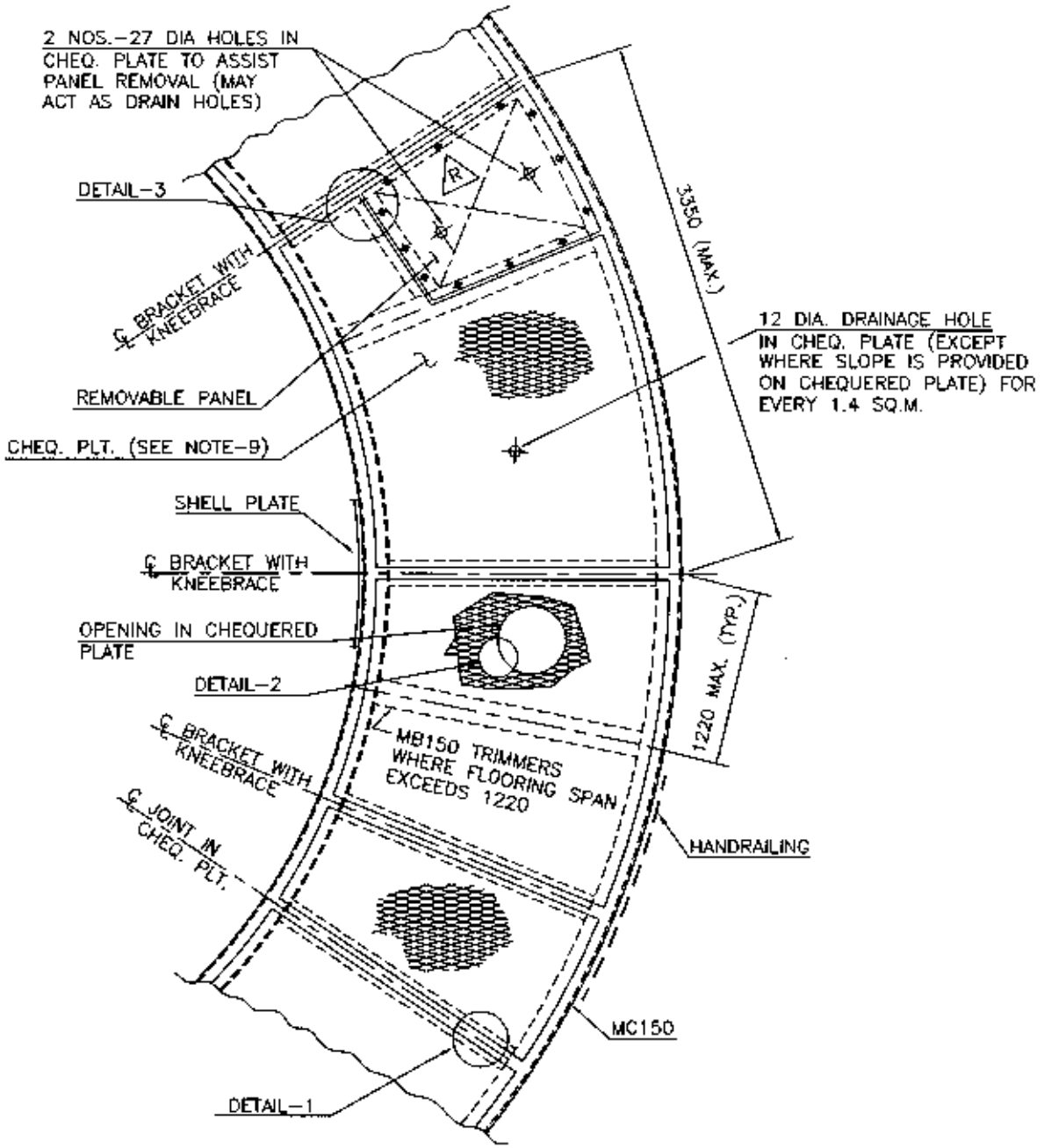
GENERAL NOTES:–

1. ALL DIMENSIONS & MEMBER SIZES ARE IN MILLIMETERS.
2. ALL MATERIALS TO BE CARBON STEEL U.O.N. AS A MINIMUM, RETAINER PLATE MATERIAL FOR GAS OR OIL FIRING SHALL BE SS304L OR SS316L RESPECTIVELY UON IN GENERAL ARRANGEMENT DRAWINGS.
3. ALL MATERIALS SHALL BE SUPPLIED BY CONTRACTOR INCLUDING GASKET AND DOOR REINFORCEMENT (IF ANY).
4. INTERNAL SURFACES ARE NOT TO BE PAINTED.
5. CERAMIC FIBER TAPE GASKET OF 1260°C GRADE TO BE FIXED TO ONE FACE OF STEELWORK WITH HEAT RESISTANT ADHESIVE (SUITABLE FOR 200°C.)
6. CONTRACTOR TO ENSURE THAT DOOR OPERATES FREELY AND THAT CONTACT SURFACE OF FRAME AND DOOR ARE FLAT AND THERE IS NO AIR LEAKAGE.
7. INSULATION RETAINING FLATS TO HAVE 3 THK. x 2/3*'W' DEPTH CUTS IN LEADING EDGE AT APPROX. 150 CRS.
8. ALTERNATELY, THE STACK PIECE CUTOUT FOR THE OPENING CAN BE USED AS DOOR PLATE.

COMPANION STANDARD:– NONE

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
6	16 12 2019	REVISED & ISSUED AS STANDARD	MB	AV/PG	MK	RKT
5	27 03 2015	REVISED & ISSUED AS STANDARD	SS	RP/KJH	AP	SC

Approved by



GENERAL NOTES:–

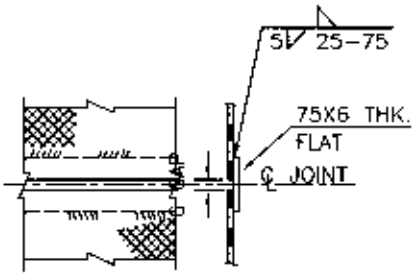
FOR GENERAL NOTES SEE SHEET 2 OF 3.

COMPANION STANDRAD:–

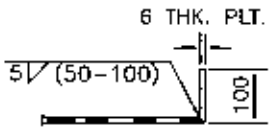
LADDER (SIDE STEP)	– 7–17–0454
LADDER (STEP THROUGH)	– 7–17–0455
STAIR DETAILS	– 7–17–0456
HANDRAIL DETAILS	– 7–17–0461

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
4	22.08.2016	REVISED & ISSUED AS STANDARD	SS	RP/AP	RKT	RN
3	30.01.2012	REVISED & ISSUED AS STANDARD	SS	AP/KJH	AKG	DM

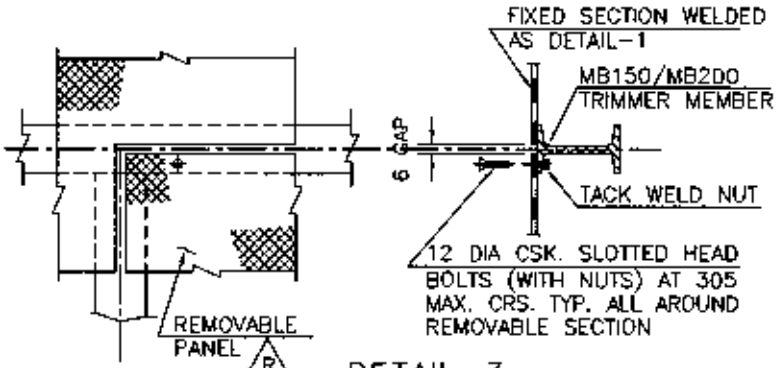
Approved by



DETAIL-1
(WHERE NO MEMBER IS REQD. AT CHEQUERED PLATE JOINT)



DETAIL-2
TOE PLATE 100x6 THK. FLAT (REQD. ONLY WHERE OPENING EXCEEDS 100 IN ANY DIRECTION)



DETAIL-3

GENERAL NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL MATERIAL TO BE CARBON STEEL U.O.N.
3. FOR PAINTING AND/OR GALVANISING SEE ARRANGEMENT DRAWING / TENDER.
4. FOR LAYOUT, OVERALL DIMENSIONS AND ELEVATION OF PLATFORM SEE ARRANGEMENT DRAWING.
5. CHEQUERED PLATE IS FIXED TO FLOOR MEMBERS BY STAGGERED STITCH WELDING 5 25-250.
6. IF GALVANISING OF CHEQUERED PLATE IS SPECIFIED THEN FIXING IS TO BE BY M12 DIA CSK. SLOTTED HEAD BOLTS AT 305 CRS. MAX.
7. FOR PLATFORMS EXCEEDING THE LIMITS SHOWN ON THIS STANDARD OR HAVE PIPING / EQUIPMENT SUPPORT, A DESIGN IS REQUIRED.
8. DETAILS SHOWN ON ARRANGEMENT DRAWING TO TAKE PREFERENCE.
9. 8 THICK COVER CHEQUERED PLATE FLOORING TO BE USED U.O.N. ON ARRANGEMENT DRAWING.
10. DESIGN IS REQUIRED FOR PLATFORMS IN EXCESS OF THOSE COVERED IN THIS STANDARD, OR HAVE PIPING / EQUIPMENT SUPPORT OR IN SITUATION DUE TO HEAD ROOM CONSTRAINT THE KNEE BRACE AS SHOWN IS NOT POSSIBLE.
11. THIS STANDARD IS FOR PLATFORMS WITH NOT MORE THAN 250KG/SQ.M. LIVE LOAD.
12. PLATFORMS MAY BE CIRCULAR OR POLYGON (POLYGON ONLY IN SPECIAL CASES)

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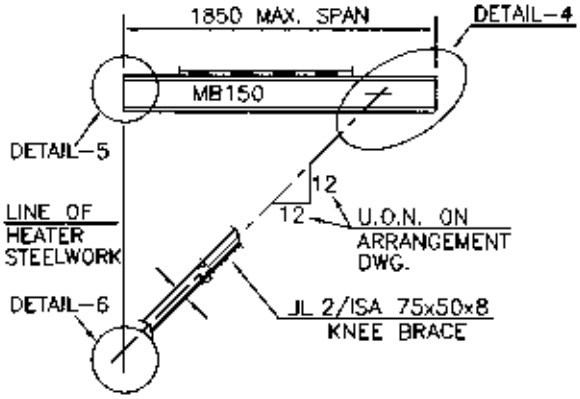
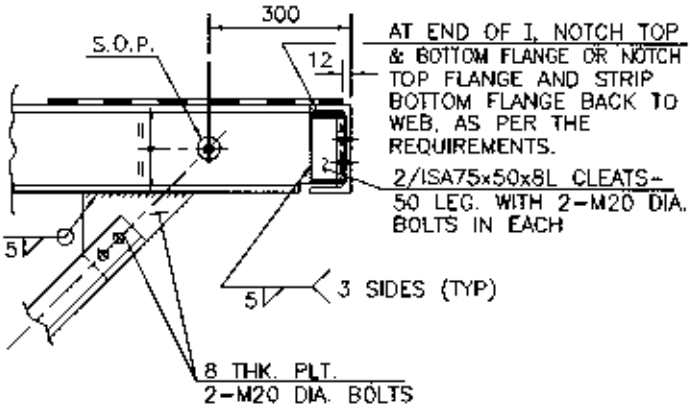
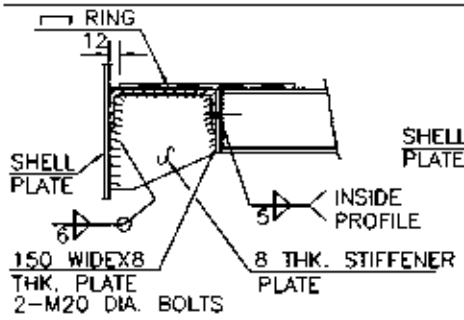
					Approved by	
4	22.08.2016	REVISED & ISSUED AS STANDARD	SS	RP/AP	RKT	RN
3	30.01.2012	REVISED & ISSUED AS STANDARD	SS	AP/KJH	AKG	DM



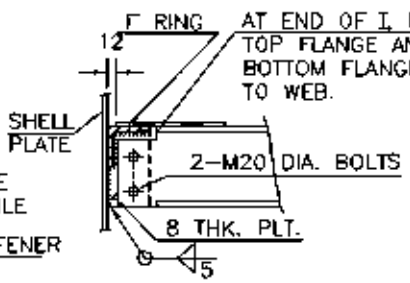
TYP. BRACKET WITH KNEE BRACE (K.B.)



DETAIL-4



RING



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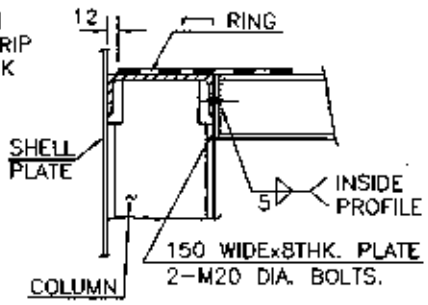
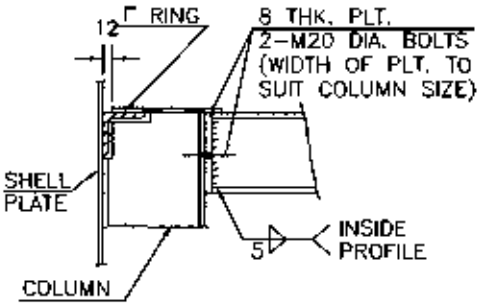
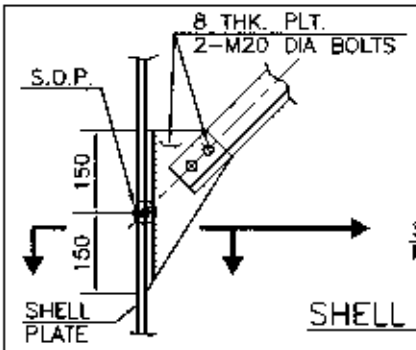


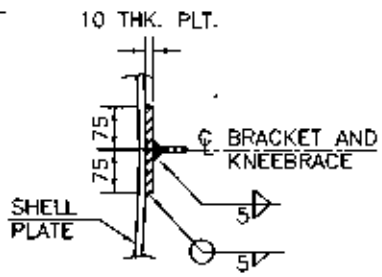
RING WITH COLUMN

DETAIL-5 (4-VARIATIONS)

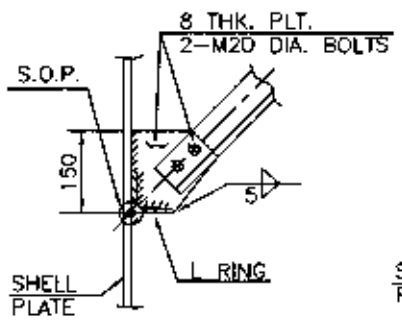


RING WITH COLUMN





SHELL PLATE



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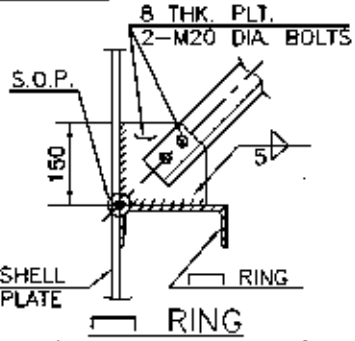

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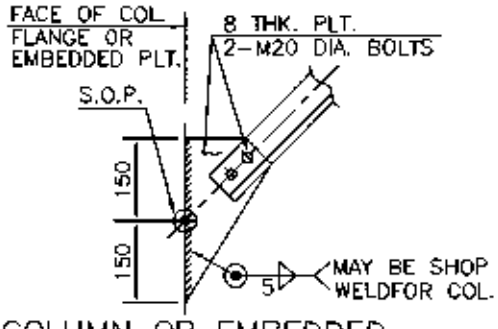
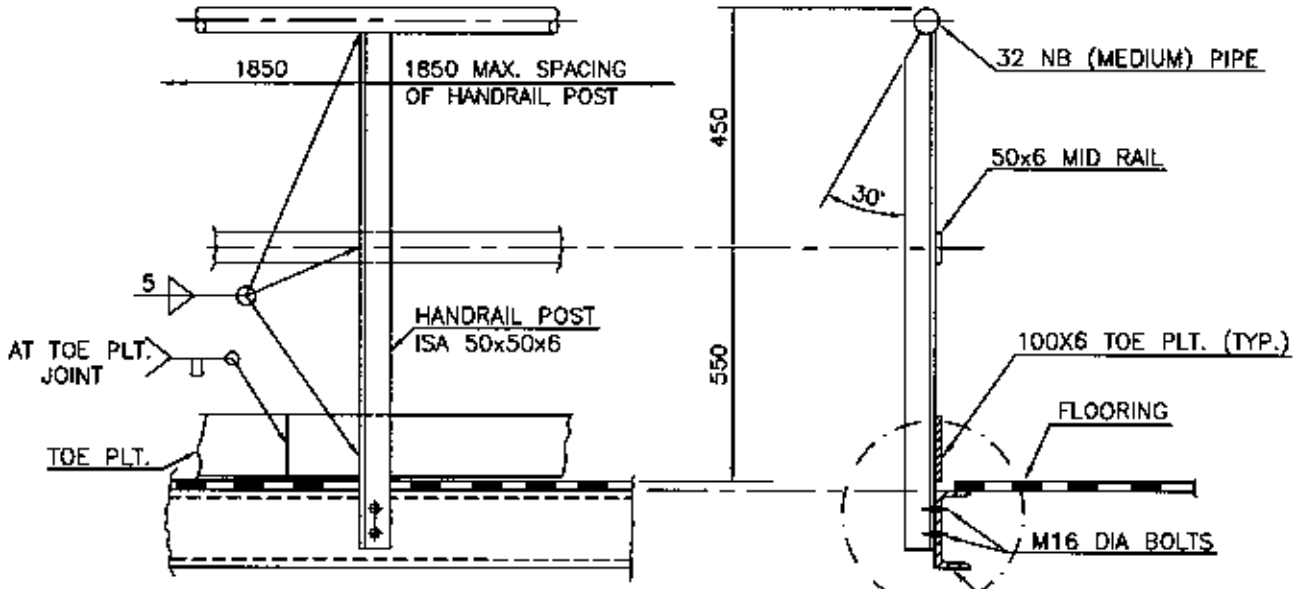
DETAIL-6 (4-VARIATIONS)



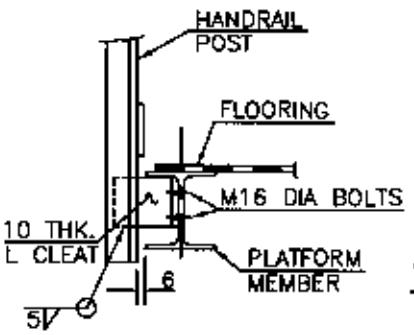
COLUMN OR EMBEDDED PLATE ON FOUNDATION

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
4	22.08.2016	REVISED & ISSUED AS STANDARD	SS	RP/AP	RK	RN
3	30.01.2012	REVISED & ISSUED AS STANDARD	SS	AP/KJH	AKG	DM

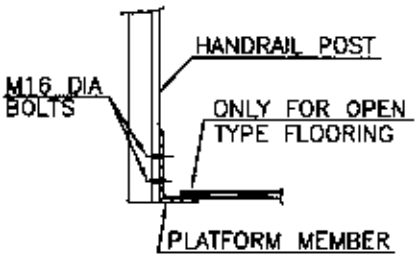
Approved by



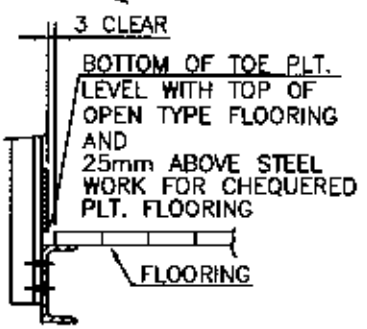
DETAIL OF HANDRAIL
(CONNECTION TO [PLATFORM MEMBER SHOWN)



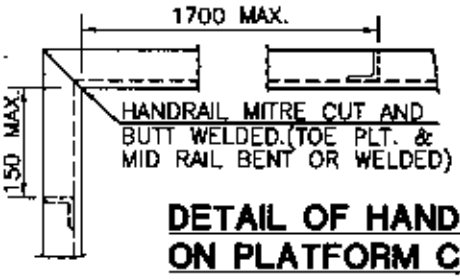
DETAIL OF CONNECTION TO I OR] PLATFORM MEMBER



DETAIL OF CONNECTION TO L PLATFORM MEMBER



DETAIL OF TOE PLATE



DETAIL OF HANDRAILING ON PLATFORM CORNERS

GENERAL NOTES:–

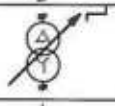
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL MATERIAL TO BE CARBON STEEL U.O.N.
3. FOR EXTENT OF HANDRAIL SEE ARRANGEMENT DWG.
4. FOR PAINTING AND OR GALVANISING SEE ARRANGEMENT DRAWING / TENDER.
5. FOR GALVANISED HANDRAILS, SITE JOINTS ARE TO BE BOLTED.
6. HANDRAIL SECTION IN FRONT OF TUBE PULLING AREA SHALL BE REMOVABLE TYPE. HANDRAIL FOR REMOVABLE SECTION SHALL BE DISCONTINUED WRT ADJACENT SECTION WITH A GAP OF 5mm.
7. HANDRAIL END POINT SHALL COMPULSORILY BE PROVIDED WITH HANDRAIL POST. HANDRAIL DISCONTINUE POINT SHALL BE PROVIDED WITH POSTS LOCATED NOT MORE THAN 150mm FROM THE DISCONTINUE POINT.

COMPANION STANDRAD:–

LADDER (SIDE STEP)	7–17–0454
LADDERS (STEP THROUGH)	7–17–0455
STAIR	7–17–0456
CIRCULAR PLATFORM (CHEQ. PLATE)	7–17–0457
RECTANGULAR PLATFORMS (CHEQ. PLATE)	7–17–0458
CIRCULAR PLATFORM (OPEN TYPE FLOORING)	7–17–0459
RECTANGULAR PLATFORM (OPEN TYPE FLOORING)	7–17–0460

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
5	03 09 2019	REVISED & ISSUED AS STANDARD	MB	PG	MK	RKT
4	10 03 2017	REVISED & ISSUED AS STANDARD	SS	RP/AP	RKT	RN

Approved by

SYMBOL	DESCRIPTION	CODE/AGENCY
	A.C. MOTOR	IEC
	A.C. GENERATOR	IEC
	SYNCHRONOUS GENERATOR (GS)	IEC
	SYNCHRONOUS MOTOR (MS)	IEC
	MOTOR STARTER–GENERAL	IEC
	STARTER–NON REVERSING MOTOR	IEC
	STARTER–REVERSING MOTOR	IEC
	STAR–DELTA STARTER	IEC
	STARTER REGULATOR WITH THYRISTOR	IEC
	DIRECT ON–LINE CONTACTOR STARTER –REVERSING MOTOR	IEC
	STARTER OPERATING IN STEPS	IEC
	THREE PHASE DELTA–STAR TRANSFORMER	IEC
	THREE PHASE DELTA–STAR TRANSFORMER WITH OLTC	IEC
	TRANSFORMER WITH TWO WINDINGS	IEC
	TRANSFORMER WITH THREE WINDINGS	IEC
	VOLTAGE TRANSFORMER	IEC

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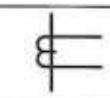
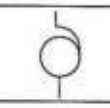
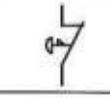
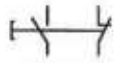
1	05.03.2019	REAFFIRMED & ISSUED AS STANDARD	VKS	HK	BRB	RKT
0	26.03.2014	ISSUED AS STANDARD	SL / AKH	HK / SA	BRB	SC

SYMBOL	DESCRIPTION	CODE/AGENCY
	CURRENT TRANSFORMER	IEC
	CURRENT TRANSFORMER, CORE BALANCE	IEC
	AUTO TRANSFORMER	IEC
	EMERGENCY STOP LOCKING TYPE	EIL
	EMERGENCY STOP NON-LOCKING TYPE	EIL
	THREE PHASE WINDING, STAR	IEC
	THREE PHASE WINDING, DELTA	IEC
	THREE PHASE WINDING, STAR WITH NEUTRAL BROUGHT OUT	IEC
	CIRCUIT BREAKER, GENERAL	IEC
	CIRCUIT BREAKER, 1 POLE	IEC
	CIRCUIT BREAKER, 3 POLE * =DENOTES TYPE ACB = AIR CIRCUIT BREAKER VCB = VACUUM CIRCUIT BREAKER MCCB = MOULDED CASE CKT. BREAKER MCB = MINIATURE CIRCUIT BREAKER SF6 = SULPHUR HEXAFLUORIDE CIRCUIT BREAKER	IEC
	DISCONNECTOR (ISOLATOR) 3 POLE	EIL
	SWITCH DISCONNECTOR, 3 POLE (ON-LOAD ISOLATING SWITCH)	EIL
	SWITCH DISCONNECTOR, 3 POLE NEUTRAL (ON-LOAD ISOLATING SWITCH)	EIL
	SWITCH DISCONNECTOR, 3 POLE NEUTRAL(FIXED) ON-LOAD ISOLATING SWITCH	EIL

SYMBOL	DESCRIPTION	CODE/AGENCY
	FUSE, GENERAL	IEC
	MULTIPLE FUSE	EIL
	FUSE SHOWING POWER FLOW DIRECTION	IEC
	FUSE SWITCH 3 POLE	EIL
	CONTACTOR	IEC
	ARROWHEAD	EIL
	CONNECTION POINT	IEC
	TERMINAL	IEC
	CABLE TERMINATION	IEC
	PLUG AND SOCKET	IEC
	KEY INTERLOCK	IEC
	MECHANICAL INTERLOCK	EIL
	ELECTRICAL INTERLOCK	EIL
	REMOVABLE LINK	IEC
	INTEGRATING METER A1 = DENOTES TYPE Wh = WATT HOUR METER h = HOURS RUN METER Ah = AMPERE–HOUR METER	IEC

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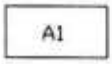
SYMBOL	DESCRIPTION	CODE/AGENCY
	INDICATING INSTRUMENT A1 = DENOTES TYPE V = VOLTMETER A = AMMETER Hz = FREQUENCY METER cos ø = POWER FACTOR METER Var = VAR METER Hz = FREQUENCY METER ø = PHASE METER n = TACHOMETER	IEC
	RECORDING INSTRUMENT A1 = DENOTES TYPE W = WATT METER	IEC
	SYNCHROSCOPE	IEC
	1 PHASE/NEUTRAL/EARTH	EIL
	3 PHASE	EIL
	3 PHASE/NEUTRAL/EARTH	EIL
	DRAWOUT FEATURE	EIL
	BUSDUCT	EIL
	CENTRE BREAK DISCONNECT	EIL
	INTEGRAL EARTHING SWITCHGEAR	EIL
	ROTATING DISCONNECT CLOCKWISE EARTHING SWITCH	EIL
ASS	AMMETER SELECTOR SWITCH	EIL
VSS	VOLTMETER SELECTOR SWITCH	EIL

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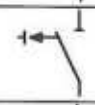
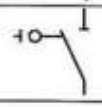
SYMBOL	DESCRIPTION	CODE/AGENCY
	OVERCURRENT PROTECTION	EIL
	THERMAL OVERCURRENT PROTECTION	EIL
	MAGNETIC OVERCURRENT PROTECTION	EIL
	UNDER VOLTAGE PROTECTION	EIL
	EARTH LEAKAGE PROTECTION BY CURRENT	EIL
	EARTH LEAKAGE PROTECTION BY VOLTAGE	EIL
	LOCKING DEVICE PADLOCK FACILITY	EIL
	MECHANICAL INTERLOCK BETWEEN TWO DEVICES	EIL
	AUTOMATIC RETURN	EIL
	OPERATED BY KEY	IEC
	OPERATED BY ELECTRIC MOTOR	IEC
	MOTOR–OPERATED VALVE	EIL
	REMOTE CONTROL UNIT WITH AMMETER CONTROLLED BY ROTARY STACK SWITCH	EIL
	REMOTE CONTROL UNIT WITHOUT AMMETER CONTROLLED BY ROTARY STACK SWITCH	EIL
	REMOTE CONTROL UNIT WITH AMMETER CONTROLLED BY PUSH BUTTON	EIL
	REMOTE CONTROL UNIT WITHOUT AMMETER CONTROLLED BY PUSH BUTTON	EIL

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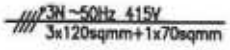
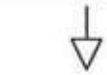
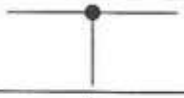
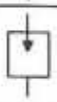
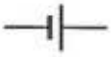
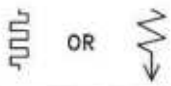
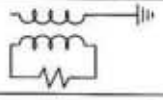
SYMBOL	DESCRIPTION	CODE/AGENCY
	CABLE SINGLE LINE REPRESENTATION	EIL
	EQUIPOTENTIALITY	EIL
	BUSBAR	EIL
	PROTECTIVE EARTH	IEC
	CHANGE-OVER CONTACT WITH CENTRE-OFF POSITION	IEC
	STATIC SWITCH PASSING CURRENT IN ONE DIRECTION	EIL
	T CONNECTION	IEC
	LIGHTENING ARRESTOR	IEC
	REACTOR	IEC
	BATTERY (PRIMARY OR SECONDARY CELLS)	IEC
	RECTIFIER	IEC
	INVERTER	IEC
	DC/DC CONVERTOR	IEC
	NEUTRAL GROUNDING RESISTOR	EIL
	NEUTRAL GROUNDING TRANSFORMER	EIL

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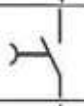
SYMBOL	DESCRIPTION	CODE/AGENCY
	START PUSH-BUTTON AND AUTOMATIC RETURN	IEC
	STOP PUSH-BUTTON	EIL
	MAKE CONTACT DELAYED WHEN CLOSING	IEC
	MAKE CONTACT DELAYED WHEN OPENING	IEC
	BREAK CONTACT DELAYED WHEN OPENING	IEC
	BREAK CONTACT DELAYED WHEN CLOSING	IEC
	MAKE CONTACT	IEC
	BREAK CONTACT	IEC
	CHANGE-OVER CONTACT BREAK BEFORE MAKE	IEC
	CHANGE-OVER CONTACT MAKE BEFORE BREAK	IEC
	CONTACT WITH TWO MAKES	IEC
	CONTACT WITH TWO BREAKS	IEC
	INDICATING LAMP * = DENOTES COLOUR GN = GREEN YE = YELLOW RD = RED BU = BLUE WH = WHITE	IEC
	FUSE SWITCH	IEC
	CIRCUIT BREAKER WITH AUTOMATIC RELEASE	EIL
	RELAY CONTACT MAKE WITH SPRING RETURN	EIL

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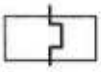
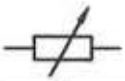
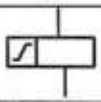
SYMBOL	DESCRIPTION	CODE/AGENCY
	DISCONNECTOR (ISOLATOR)	IEC
	SWITCH–DISCONNECTOR (ON–LOAD ISOLATING SWITCH)	IEC
	FUSE DISCONNECTOR (FUSE ISOLATOR)	IEC
	FUSE SWITCH DISCONNECTOR (ONLOAD ISOLATING FUSE SWITCH)	IEC
	ANTI–CONDENSATION HEATER	IEC
	CONTACTOR COIL	EIL
	EARTH (GROUND), GENERAL SYMBOL	IEC
	CHASSIS OR FRAME EARTH	IEC
	CLEAN EARTH (NOISELESS)	IEC
	THERMAL O/L RELAY–OPERATING DEVICE	IEC
	DIODE	IEC
	THYRISTOR	IEC
	TERMINAL STRIP	IEC
	RESISTOR, GENERAL	IEC
	ADJUSTABLE RESISTOR	IEC
	RELAY COIL OF PERMANENT RELAY	IEC

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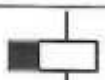
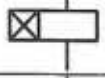
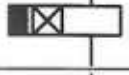
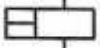
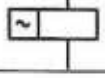
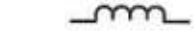
SYMBOL	DESCRIPTION	CODE/AGENCY
	RELAY COIL OF SLOW RELEASING RELAY	IEC
	RELAY COIL OF SLOW OPERATING RELAY	IEC
	RELAY COIL– SLOW OPERATING SLOW RELEASING RELAY	IEC
	RELAY COIL– HIGH SPEED RELAY (FAST OPERATING & RELEASING)	IEC
	RELAY COIL– POLARISED RELAY	IEC
	RELAY COIL OF ALTERNATING CURRENT RELAY	IEC
	CAPACITOR, GENERAL	IEC
	POLARISED CAPACITOR	IEC
	ADUSTABLE CAPACITOR	IEC
	INDUCTOR, COIL, WINDING CHOKE	IEC
	PHOTOVOLTIC CELL	IEC
	PHOTO DIODE (PHOTO CONDUCTIVE WITH ASYMMETRICAL CONDUCTIVITY)	IEC
	LIGHT DEPENDENT RESISTOR (PHOTO CONDUCTIVE DEVICE WITH SYMMETRICAL CONDUCTIVITY)	IEC
	2 POSITION SWITCH	IEC
	3 POSITION SWITCH	IEC
	4 POSITION SWITCH	IEC

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Approved by

SYMBOL	DESCRIPTION	CODE/AGENCY
R1	RELAY COIL GENERAL	IEEE/NEMA
AVR	AUTOMATIC VOLTAGE REGULATOR RELAY	EIL
U=0	NO VOLTAGE RELAY	IEC
2	TIME DELAY RELAY	IEEE/NEMA
12	OVERSPEED RELAY	IEEE/NEMA
21	DISTANCE PROTECTION RELAY	IEEE/NEMA
25	CHECK SYNCHRONISING RELAY	IEEE/NEMA
27	27 – UNDER VOLTAGE RELAY 27R – RESIDUAL VOLTAGE CHECK RELAY 27M – UNDER VOLTAGE RELAY (MOTOR PROTECTION) 27H – VOLTAGE HEALTHY CHECK RELAY	IEEE/NEMA
32	REVERSE POWER / DIRECTIONAL POWER RELAY	IEEE/NEMA
37	LOW FORWARD POWER / UNDER CURRENT RELAY	IEEE/NEMA
40	LOSS OF EXCITATION RELAY	IEEE/NEMA
46	NEGATIVE PHASE SEQUENCE RELAY	IEEE/NEMA
49	THERMAL OVERLOAD RELAY	IEEE/NEMA
50	INSTANTANEOUS OVER CURRENT RELAY	IEEE/NEMA
50N	INSTANTANEOUS EARTH FAULT RELAY	IEEE/NEMA

SYMBOL	DESCRIPTION	CODE/AGENCY
51	IDMTL OVER CURRENT RELAY	IEEE/NEMA
51G	STANDBY EARTH FAULT RELAY	IEEE/NEMA
51N	IDMTL EARTH FAULT RELAY	IEEE/NEMA
51V	VOLTAGE RESTRAINED IDMTL OVER CURRENT RELAY	IEEE/NEMA
59	OVER VOLTAGE RELAY	IEEE/NEMA
60	NEUTRAL DISPLACEMENT RELAY	IEEE/NEMA
63TX	AUX. RELAY FOR TRANSFORMER TROUBLE/TRIP	IEEE/NEMA
64F	ROTOR EARTH FAULT RELAY	IEEE/NEMA
64G 1,2	STATOR EARTH FAULT MAIN AND BACKUP RELAY	IEEE/NEMA
64R	RESTRICTED EARTH FAULT RELAY	IEEE/NEMA
67	DIRECTIONAL OVER CURRENT RELAY	IEEE/NEMA
67N	DIRECTIONAL EARTH FAULT RELAY	IEEE/NEMA
78	OUT OF STEP RELAY	IEEE/NEMA
80	CONTROL SUPPLY SUPERVISION RELAY	IEEE/NEMA
81	UNDER FREQUENCY / df/dt RELAY	IEEE/NEMA
86	LOCKOUT RELAY	IEEE/NEMA

SYMBOL	DESCRIPTION	CODE/AGENCY
87CH	CHECK DIFFERENTIAL RELAY	IEEE/NEMA
87F	DIFFERENTIAL RELAY F–FEEDER, G–GENERATOR, T–TRANSFORMER, GT–GEN.+TRAFO.	IEEE/NEMA
95	TRIP CIRCUIT SUPERVISION RELAY	IEEE/NEMA
97	PT MONITORING RELAY	IEEE/NEMA
98	DEAD BUS RELAY	IEEE/NEMA
99	OVERFLUXING RELAY	IEEE/NEMA
MPR	MOTOR PROTECTION RELAY	EIL
ELR	EARTH LEAKAGE RELAY	EIL

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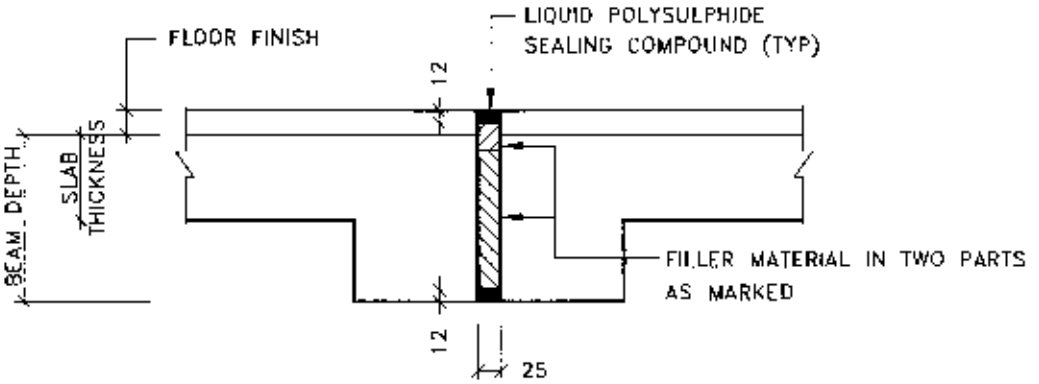
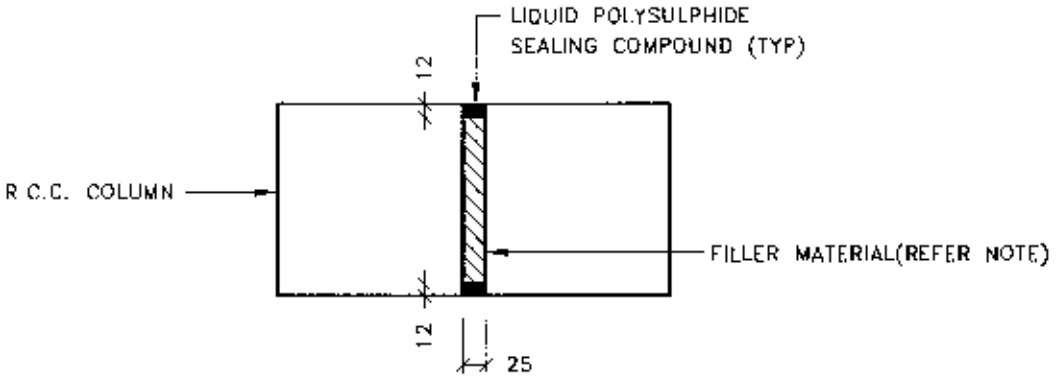


EXPANSION JOINT AT SUSPENDED FLOOR SLAB

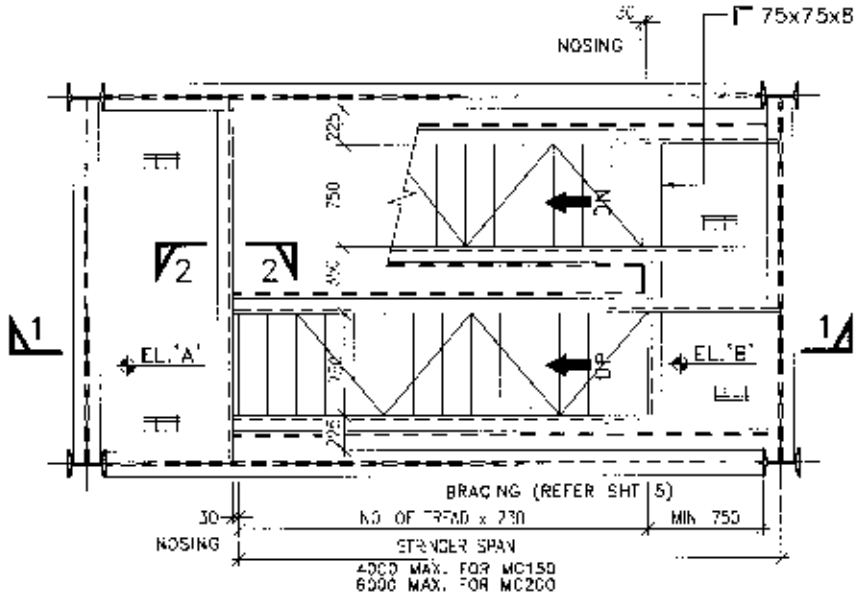


EXPANSION JOINT AT COLUMNS

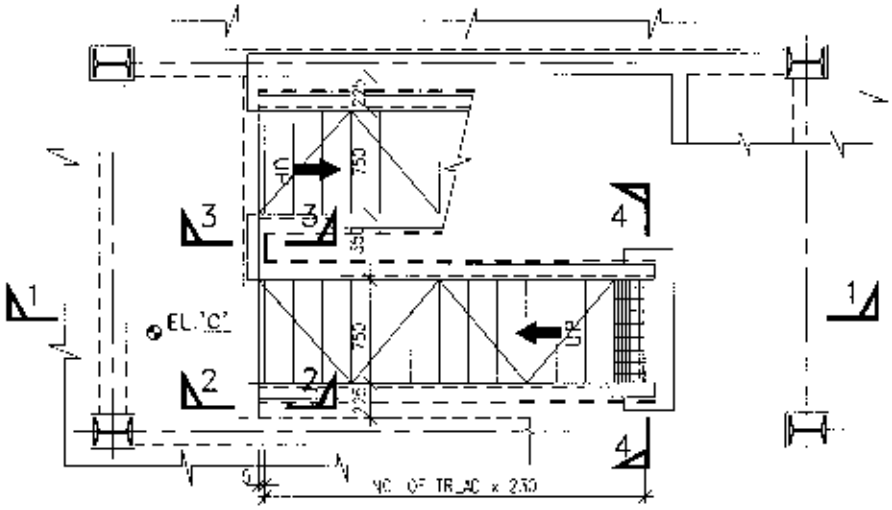
NOTES:

1. FILLER MATERIAL SHALL BE FOAMED POLYETHYLENE STRIP OR NEOPRENE SPONGE OR BITUMEN IMPREGNATED BOARD. THIS SHALL BE FIXED TO THE FACE OF THE FIRST PLACED CONCRETE AND AGAINST WHICH THE SECOND PLACED CONCRETE IS CAST.

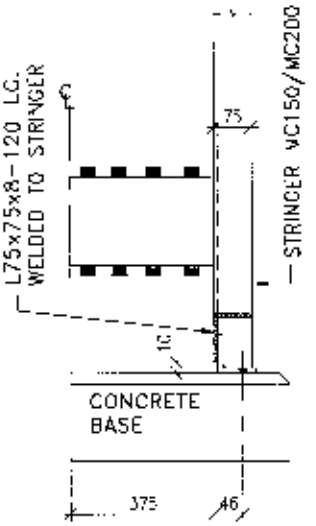
Rev No.	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds. Bureau Chairman
						Approved by
6	27.05.19	REAFFIRMED AND ISSUED AS STANDARD	JG	AJS	RAJANJI SRIVASTAVA	R K TRIVEDI
5	27.12.12	REAFFIRMED AND ISSUED AS STANDARD	VPS	AJS	PK MITTAL	D MALHOTRA



PLAN AT EL. 'A'



PLAN AT EL. 'C'



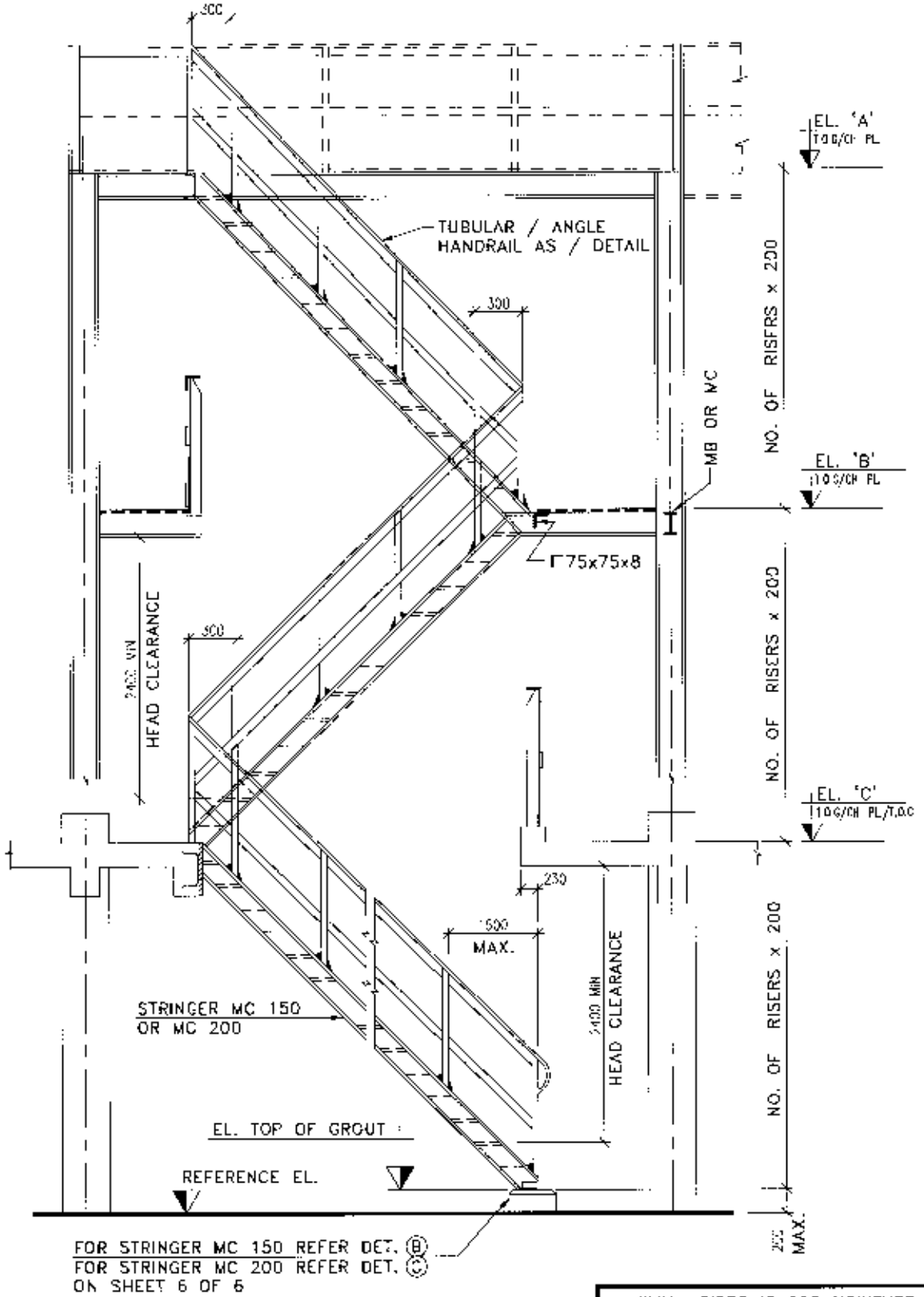
SECTION 4-4

NOTES :-

1. FOR STAIRWAY/TREAD USE ELECTROFORGED GRATING TYPE-II AS PER EIL STD NO 7-68-0697.
2. FOR CONNECTION DETAILS REFER SHEETS 3, 4, 5 AND 6.
3. STRINGER SHALL BE SUITABLY DESIGNED FOR OFFICE BUILDING, WARE HOUSES AND WORKSHOP.
4. FOR DETAIL OF INSERT PLATE 'R1a' REFER EIL STD. NO. 7-68-0056.

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01 08 19	REAFFIRMED AND ISSUED AS STANDARD	JC	AVM	RAJAVLI SRIVASTAVA	R K TRIVEDI
6	18 09 13	REVISED AND ISSUED AS STANDARD	VPS	PJ SINGH	PK MITTAL	D MALHOTRA

Approved by

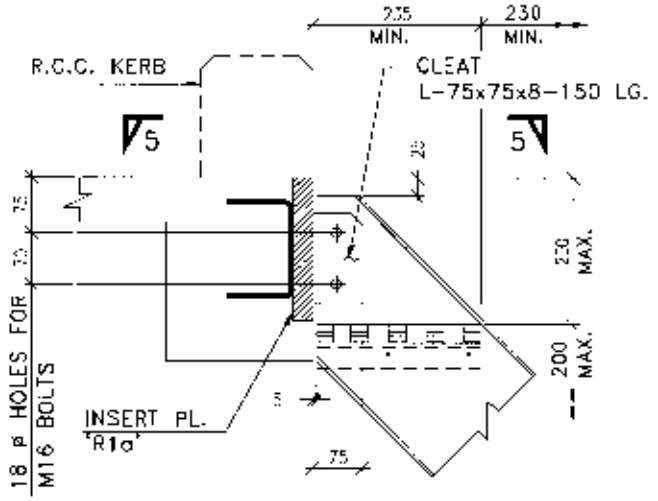


SECTION 1-1

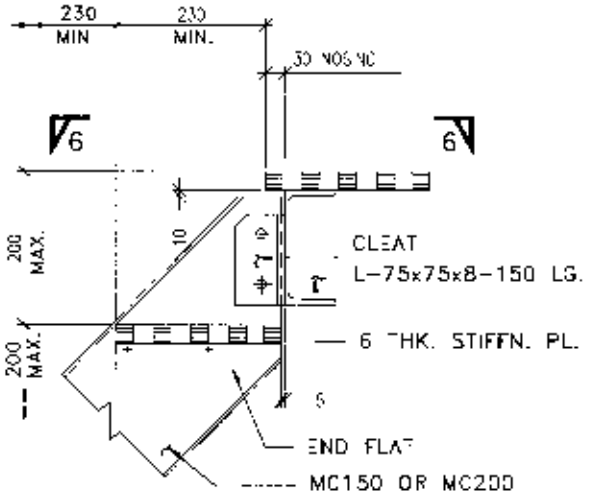
MAXIMUM RISER IS 200 HOWEVER IT MAY BE REDUCED AND ADJUSTED AS REQUIRED.

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01.08.19	REAFFIRMED AND ISSUED AS STANDARD	JG	AVM	RAJANI SRIVASTAVA	R K TRIPATHI
6	18.09.13	REVISED AND ISSUED AS STANDARD	VPS	PJ SINGH	PK MITTAL	B MALHOTRA

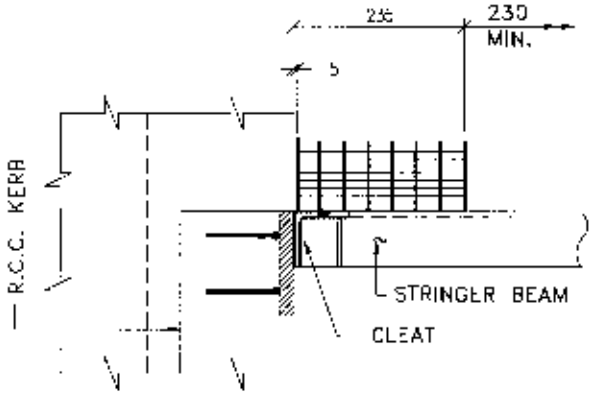
Approved by



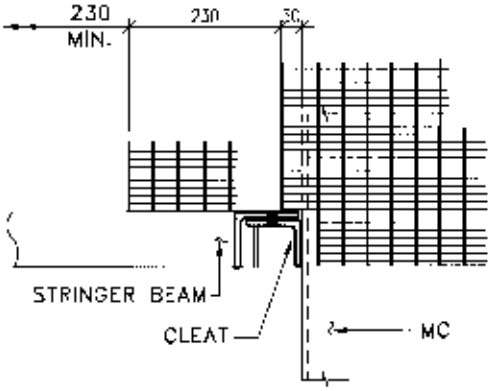
SECTION 2-2
(CONNECTION WITH CONCRETE BEAM)



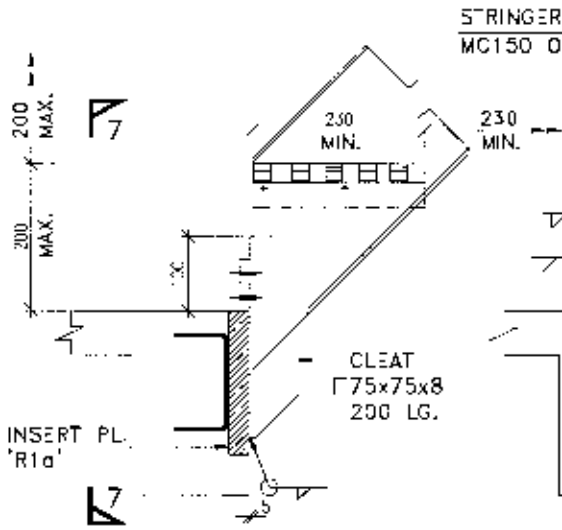
SECTION 2-2
(CONNECTION WITH STEEL BEAM MC)



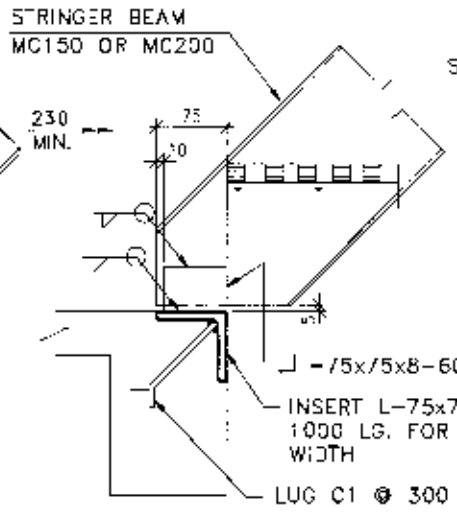
VIEW 5-5



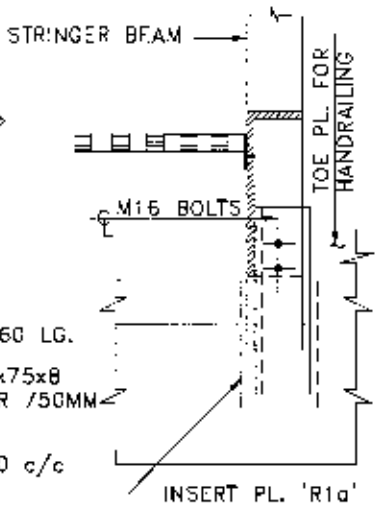
VIEW 6-6



SECTION 3-3
(CONNECTION WITH CONCRETE BEAM)
(R.C.C. KERB NOT SHOWN FOR CLARITY)



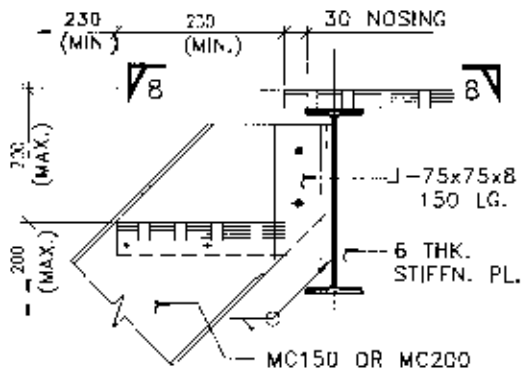
SECTION 3-3 (ALT.)
(CONNECTION WITH CONCRETE BEAM)
(R.C.C. KERB NOT SHOWN FOR CLARITY)



VIEW 7-7

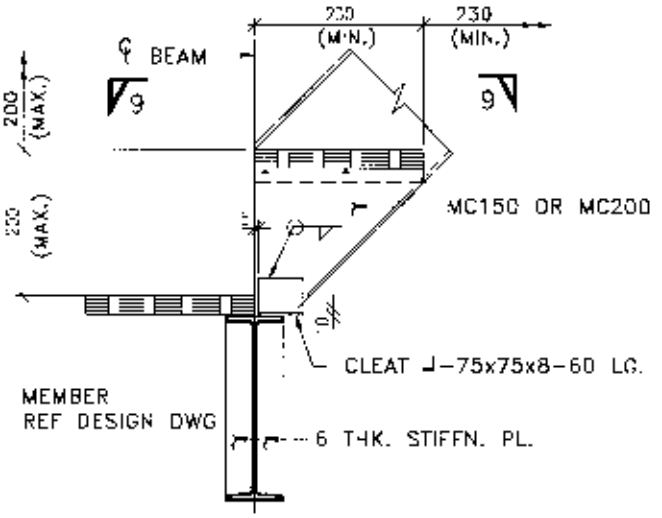
Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01 08 19	REAFFIRMED AND ISSUED AS STANDARD	JS	AVM	RAJANJI SRIVASTAVA	R K TRIVEDI
6	18 09 13	REVISED AND ISSUED AS STANDARD	VPS	PJ SINGH	PK MITTAL	D MALHOTRA

Approved by



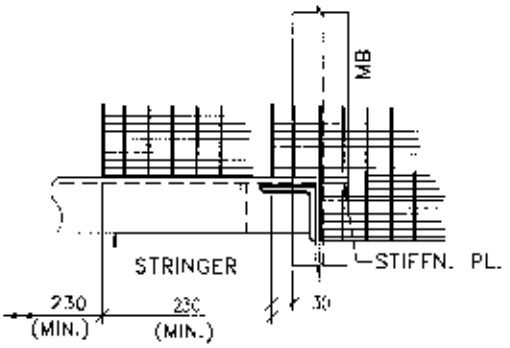
SECTION 2-2

(CONNECTION WITH STEEL BEAM ISMB)

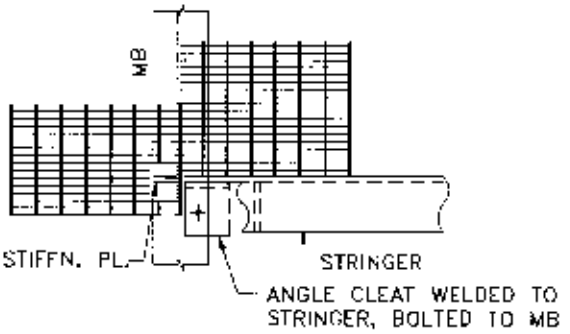


SECTION 3-3

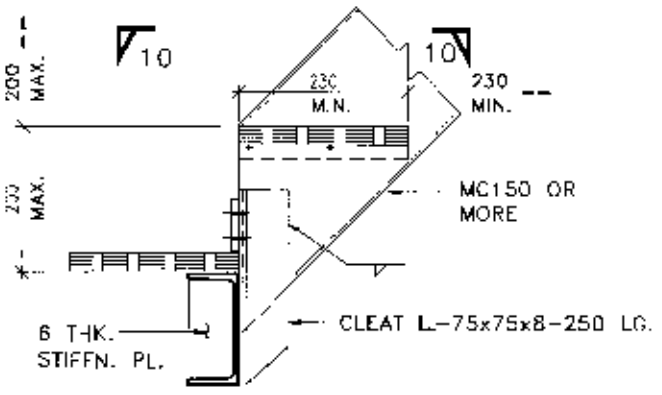
(CONNECTION WITH STEEL BEAM ISMB)



VIEW 8-8

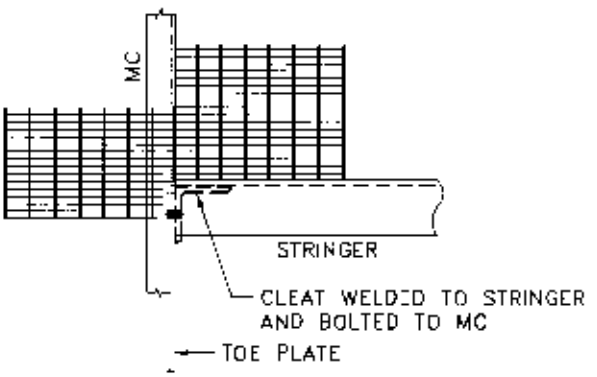


VIEW 9-9



SECTION 3-3

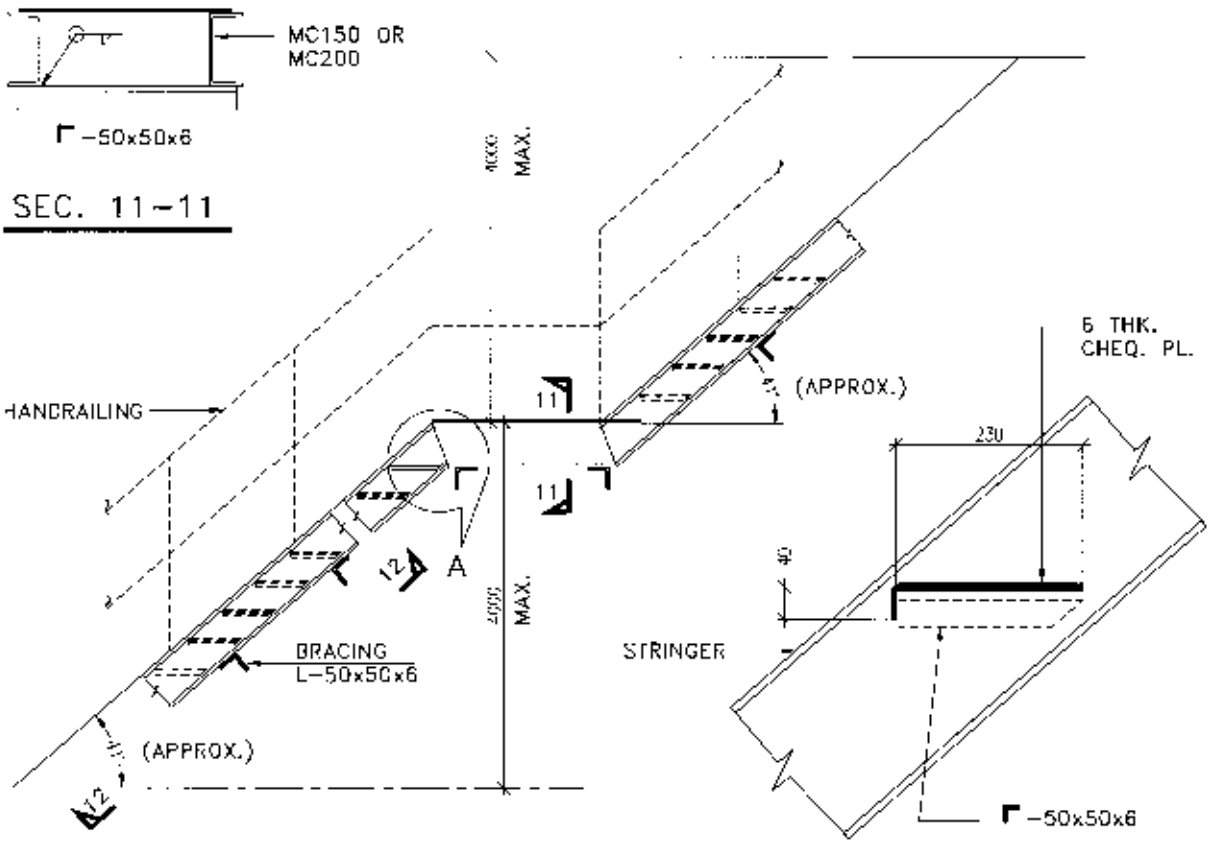
(CONNECTION WITH STEEL BEAM ISMC)



VIEW 10-10

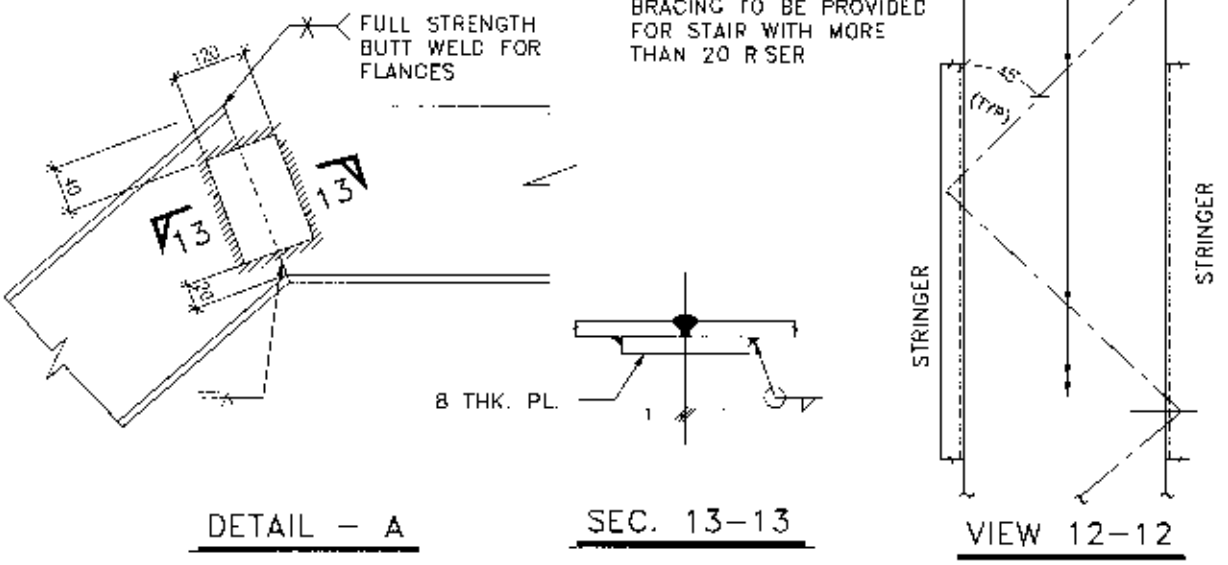
Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01.08.19	REAFFIRMED AND ISSUED AS STANDARD	JG	AVM	RAJAN J SRIVASTAVA	R K TRIVEDI
6	18.09.13	REVISED AND ISSUED AS STANDARD	VPS	PJ SINGH	PK MITTAL	D MALHOTRA

Approved by



ELEVATION SHOWING STRINGER BRACINGS

TYP. DET. OF CHEQ. PL. STEP



DETAIL − A

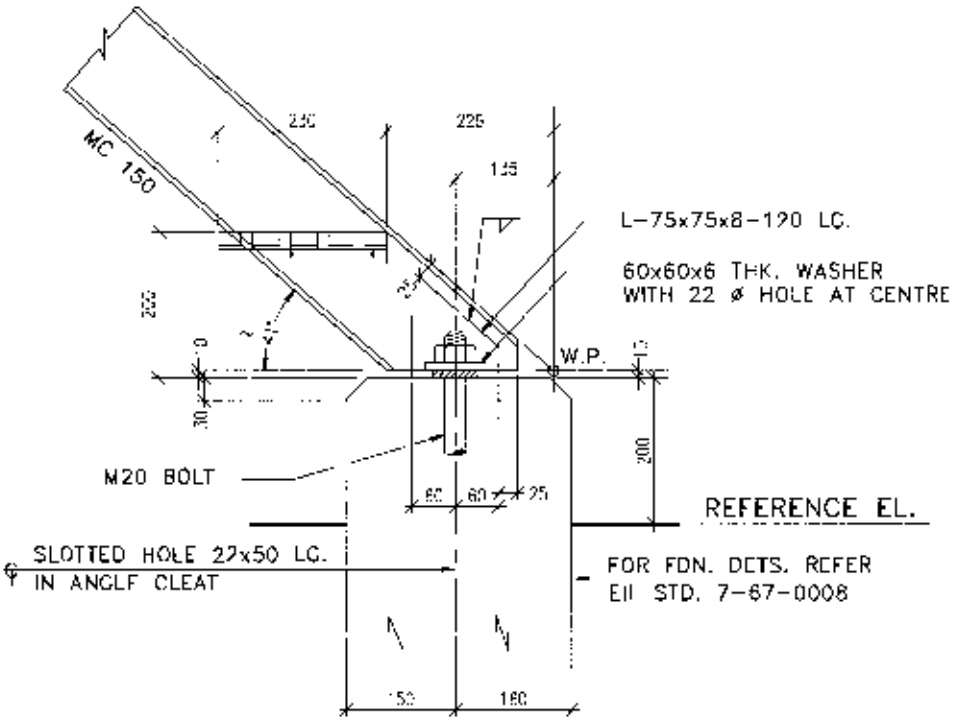
SEC. 13−13

VIEW 12−12

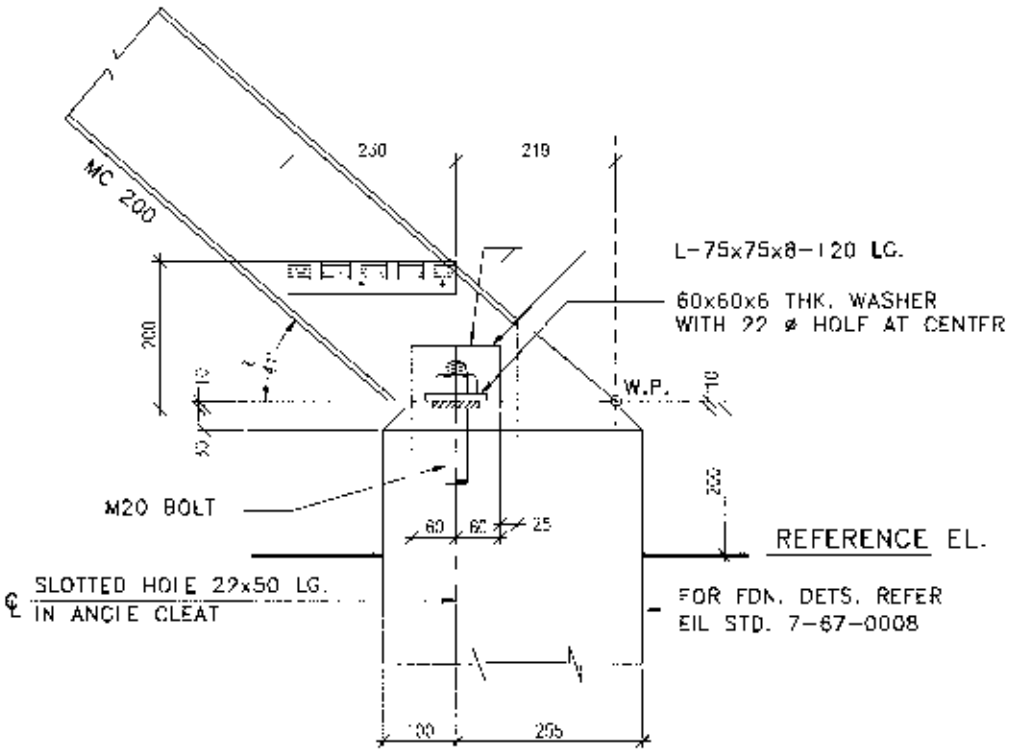
STAIR DETS WITH CHEQURED PLATE STEPS

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01 08 19	REAFFIRMED AND ISSUED AS STANDARD	JG	AVM	RAJANJI SRIVASTAVA	R K TRIVEDI
6	16 09 13	REVISED AND ISSUED AS STANDARD	VPS	PJ SINGH	PK MITTAL	D MACHOTRA

Approved by



DETAIL – B

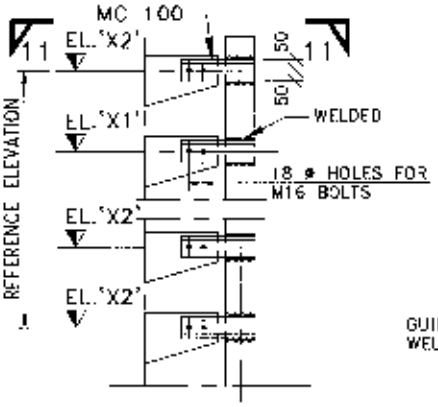


DETAIL – C

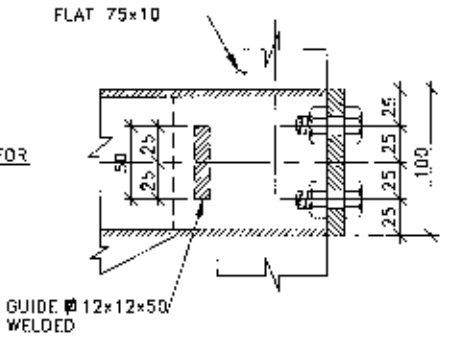
Rev No.	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01.08.19	REAFFIRMED AND ISSUED AS STANDARD	JG	AVM	RAJANJI SRIVASTAVA	R.K. TRIVEDI
6	18.09.13	REVISED AND ISSUED AS STANDARD	VPS	PJ SINGH	PK MITAL	D. MALHOTRA

Approved by

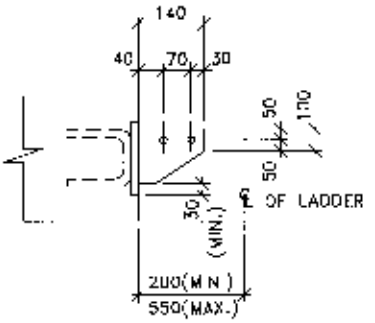
STEEL LADDER JOINT DETAILS



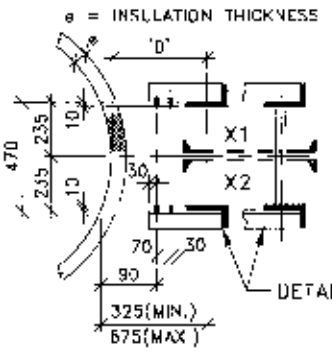
LADDER ATTACHMENT TO VESSELS

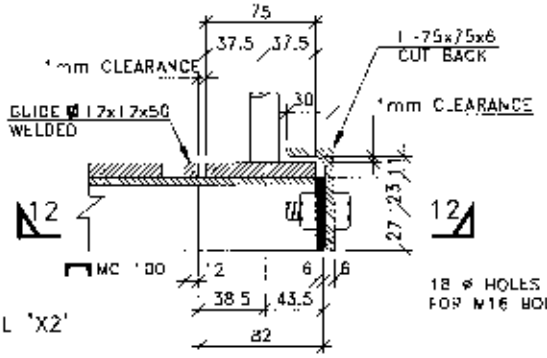


SECTION 12–12



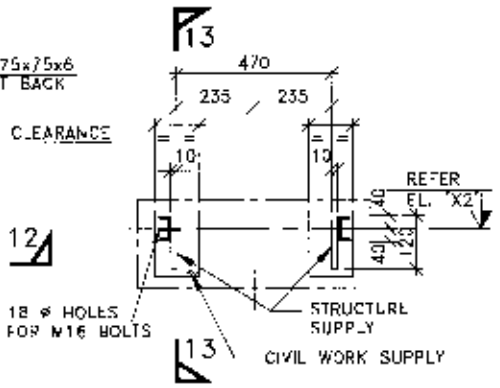
SECTION 13–13



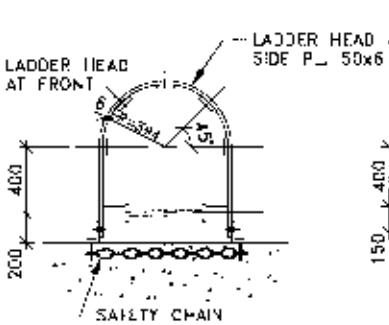


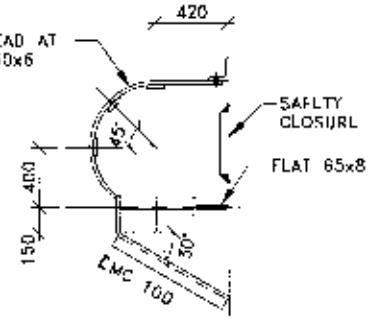
DETAIL 'X2'

(FOR LADDER POST FLAT 75x10)

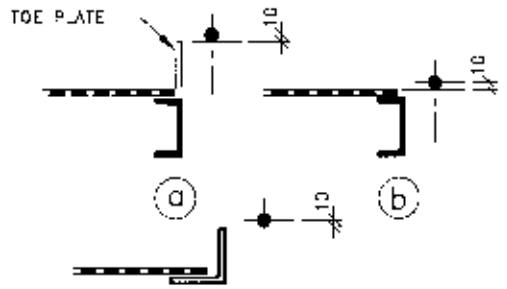


LADDER ATTACHMENT TO CONCRETE

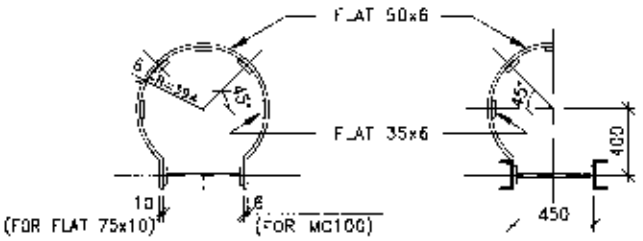




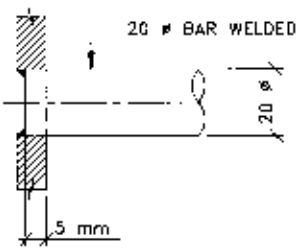
SECTION 11–11



SAFETY CAGE HOOP DETAILS



LOWER AND INTERMEDIATE CAGE

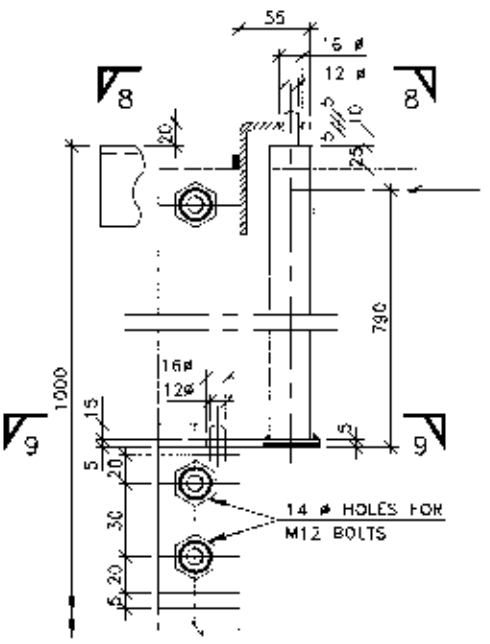


LOCATION OF RUNG FOR LADDER

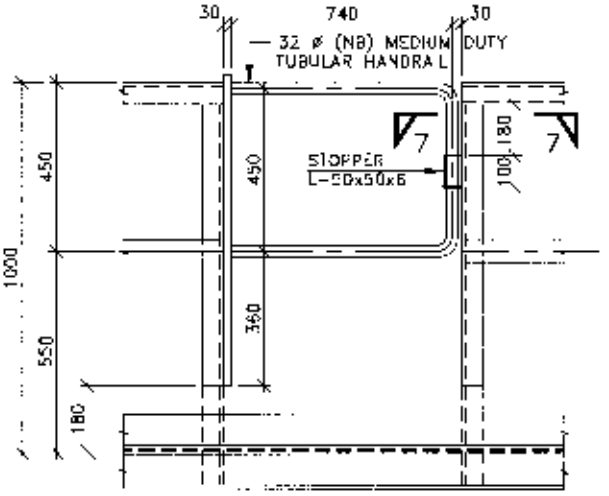
ATTACHMENT OF BAR

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01 08 19	REAFFIRMED AND ISSUED AS STANDARD	JG	AVN	RAJANI SRIVASTAVA	R K TRIVEDI
6	28 11 13	REVISED AND ISSUED AS STANDARD	VPS	AJS	P K MITTAL	S CHANDA

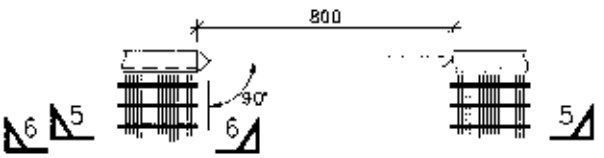
Approved by



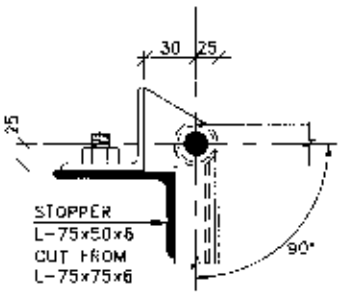
SECTION 6-6



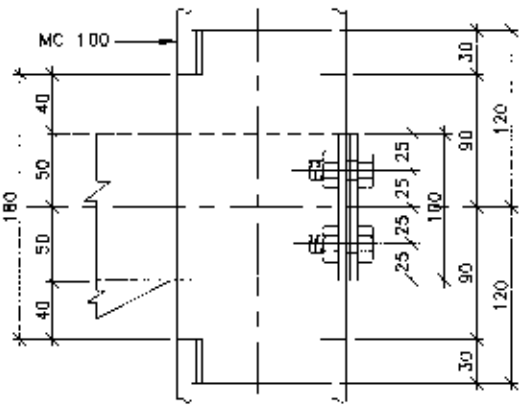
SECTION 5-5



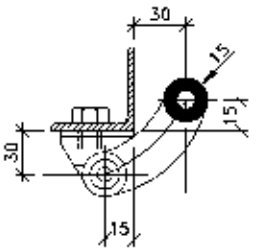
AUTOMATIC BARRIER



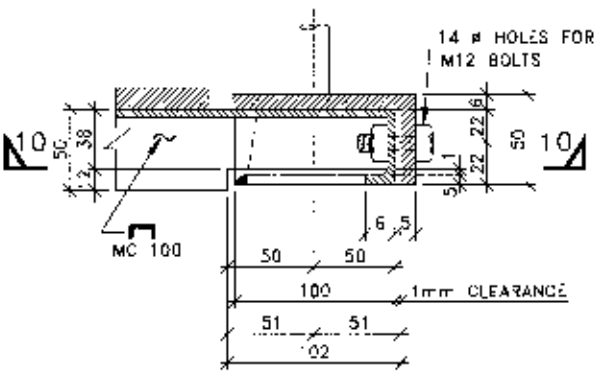
SECTION 8-8



SECTION 10-10

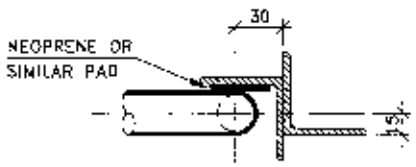


SECTION 9-9



DETAIL 'X2'

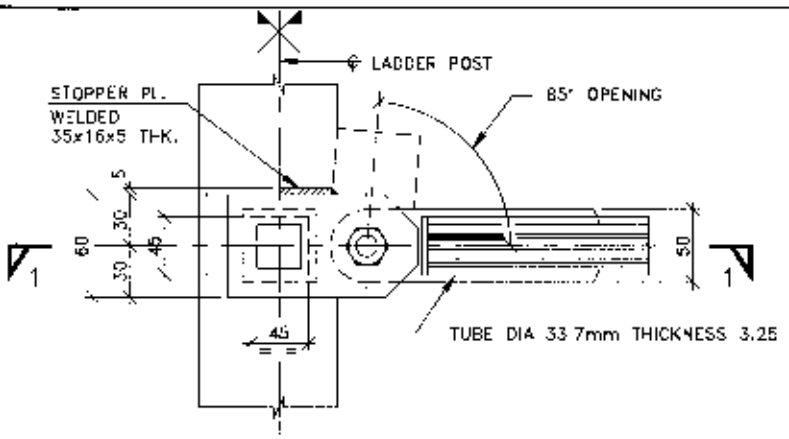
(FOR LADDER POST MC 100)



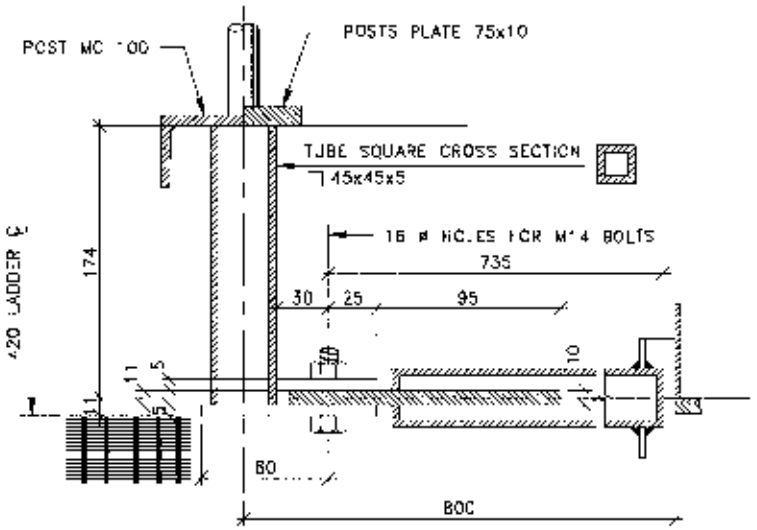
SECTION 7-7

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01 08 19	REAFFIRMED AND ISSUED AS STANDARD	SC	AVM	RAJANI SRIVASTAVA	R K TRIVEDI
6	28 11 13	REVISED AND ISSUED AS STANDARD	VPS	AJS	P K MITTAL	S CHANDA

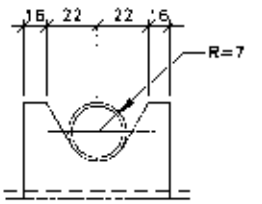
Approved by



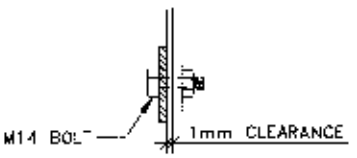
SAFETY BAR INSTALLATION ON LADDER POSTS



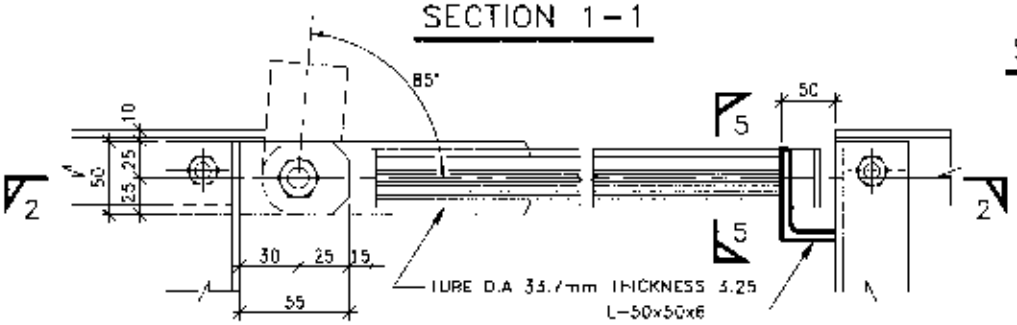
SECTION 1–1



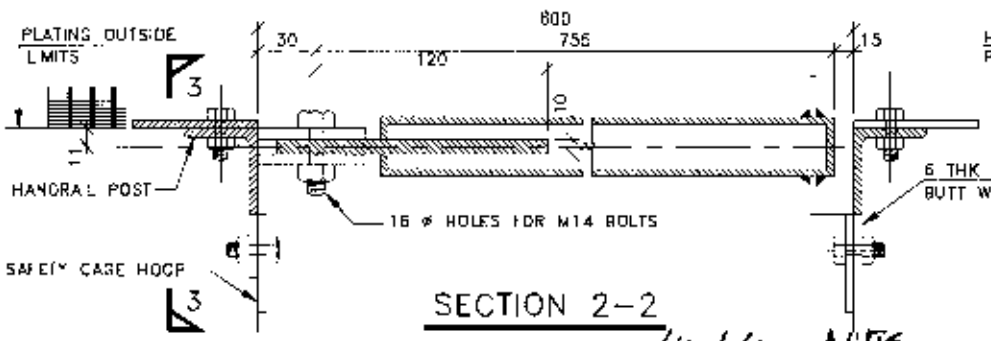
SECTION 5–5



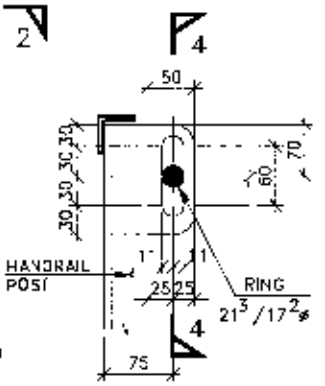
SECTION 4–4



SAFETY BAR INSTALLATION ON HANDRAIL POSTS



SECTION 2–2



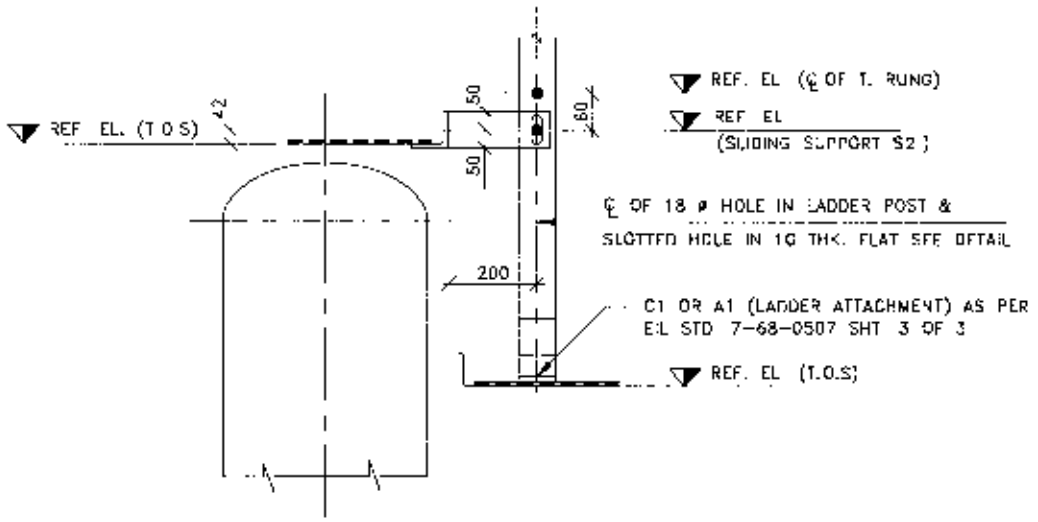
SAFETY CAGE HOOP ATTACHMENT TO HANDRAIL POST

SECTION 3–3

Rev No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01.08.19	REAFFIRMED AND ISSUED AS STANDARD	.G	AVM	RAJANJI SRIVASTAVA	R K TRIVEDI
6	28.11.13	REVISED AND ISSUED AS STANDARD	VPS	AJS	P K MITTAL	S CHANDA

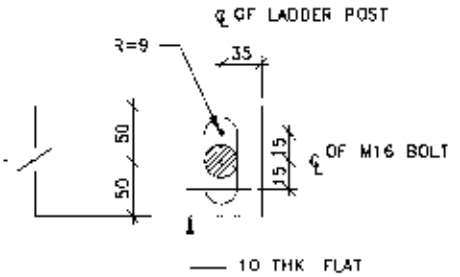
Approved by

STEEL LADDER JOINT DETAILS



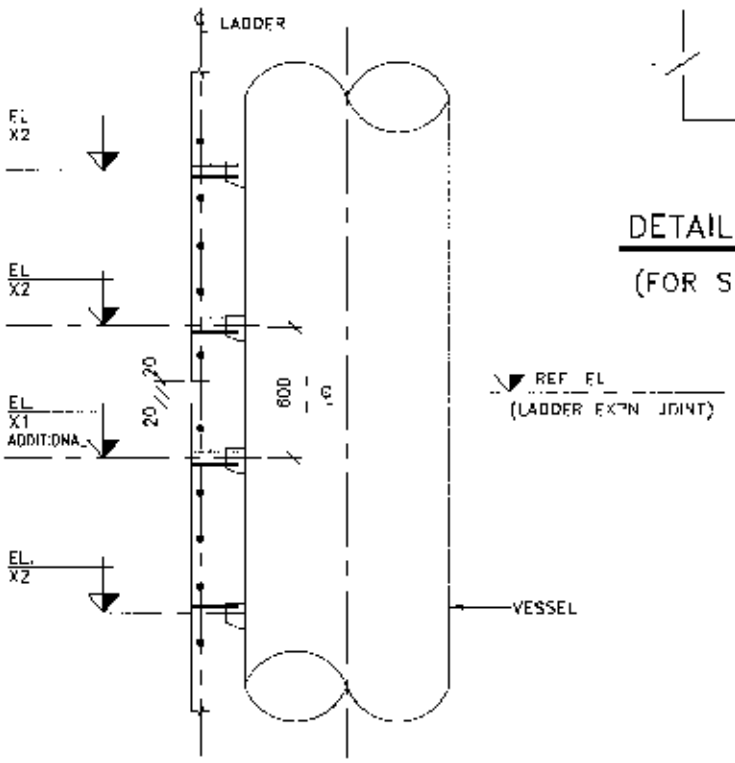
SLIDING CONN. DET. OF LADDER

(WITH TOE ANGLE OF PLATFORM ON THE HEAD OF VESSEL)



DETAIL OF SLOTTED HOLE

(FOR SLIDING SUPPORT S2)



DET. OF LADDER EXPANSION JOINT

(WHEN DISTANCE BETWEEN TOP AND BOT. MOST SUPPORT ⩾ 9000)

Rev. No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds Bureau Chairman
7	01.08.19	REAFFIRMED AND ISSUED AS STANDARD	JC	AVM	RAJANJI SRIVASTAVA	R.K.TRIVEDI
6	28.11.13	REVISED AND ISSUED AS STANDARD	VPS	AJS	P.K.MITTAL	S.CHANDA

Approved by

पैकेज इकाइयों के लिए साइट निष्पादन गारंटी अपेक्षाएँ तैयार करने हेतु विक्रेता को अनुदेश

INSTRUCTIONS TO VENDOR FOR SITE PERFORMANCE GUARANTEE REQUIREMENTS FOR PACKAGE UNITS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
2	30.03.2019	Reaffirmed & Reissued	HRS	PPP	RP	RKT
1	30.05.2008	Revised & Reissued	SMA	PKR	AA	VC
0	10.11.2003	ISSUED AS STANDARD	PKR	PM	VC	SKG

Abbreviations:

LSTK	:	Lumpsum Turnkey
PG	:	Performance Guarantee

General Engg. Standards Committee

Convenor : Ms R Priyamvada (Convenor)

Members :
Mr BR Bhogal (Elect.)
Mr Rajan Srivastava (Strl.)
Mr RB Bhutda (EWS)
Mr Amrendra Kumar (Piping)
Ms NP Guha (Projects)
Mr Amit Prakash (FEM)
Mr KJ Harinarayanan (SME)
Mr VK Tonger (Process-1)
Mr Satyabrata Biswas (Process-2)

CONTENTS

1.0 INTRODUCTION

As a part of engineering services, EIL procures different types of Package Units for various Projects, for and on behalf of the Owner/Purchaser. The vendor is required to design, engineer, manufacture/ procure, inspect, test and supply to site, and also in many cases construct/erect, commission and Performance test the Package Units before handing over the same to Owner/Purchaser, based on Process and Technical requirements defined in the Inquiry/Order document.

2.0 PURPOSE

This document provides instructions to Vendor for Site Performance Guarantee (PG) Requirements for Package Units and shall form a part of the contract, wherever site performance guarantee test is specified in the Inquiry/Order document. The aim is to provide clarity to the Vendor as well as the Commissioning team on site performance guarantee parameters, their measurements during PG Test, and the acceptance of the Package Unit by the Owner/Purchaser after the successful PG Test.

3.0 SCOPE

The requirements of this standard are applicable for all Package Units including LSTK Bid Packages, which require Performance Guarantee Test, after installation and commissioning of the unit at site.

4.0 DEFINITIONS

4.1 "Vendor" means the person(s), company, organization from whom EIL procures products/services as a part of services rendered to the Owner/Purchaser. "Contractor", "Supplier" are considered synonymous to "Vendor".

4.2 "Owner" means the person(s), company, organization to whom EIL is rendering services for the Project.

4.3 "Purchaser" means the person(s), company, organization which awards order for the Package Unit on the Vendor.

5.0 PERFORMANCE GUARANTEE TESTING AT SITE

5.1 General

5.1.1 The overall performance testing of the completely assembled/erected Package unit as a whole shall be carried out at site to establish the performance guarantee parameters specified in Inquiry/Order document. In addition, certain critical equipment/sub-packages may also be performance tested at site if so specified in Inquiry/Order document. The duration of site performance guarantee run shall be as defined in the Inquiry/order document.

The measured parameters, where necessary, shall be adjusted to account for the variation in ambient/operating conditions actually prevailing at site during performance testing, before comparing it with the guaranteed value.

5.1.2 Performance test shall be carried out as per relevant Codes, Standards and Specifications. The Vendor shall submit the following during detail engineering and the same shall be subject to Owner/Purchaser's approval:

- Detailed Test procedure including measurement tolerances, if applicable, calculations/ correction curves for changes in ambient/ operating conditions, and complete test layout, etc.

- Site Performance Guarantee Test Proforma completed in line with enclosed format 7-76-0103-F1.

- Vendor shall list out parameters to be measured and corresponding installed instrument type and tag no. to be used for measurements. Any instrument/measurement device, (required for testing) not installed at site, shall be arranged by vendor. Vendor shall furnish list of such instruments alongwith instrument details.

- Log sheets indicating all parameters that are to be recorded.

- Method of computation of test results including interpretation of test results.

5.2 Test Instruments

All necessary test instruments required for measuring the performance guarantee parameters shall be arranged by the vendor free of charge. These instruments shall be tested & calibrated from reputed test houses like National Physical Laboratories (NPL), Institute for Design of Electrical Measuring Instruments (IDEMI), Electronics Regional Test Laboratories (ERTL) or any other test house approved by the Owner. All test instruments shall have valid calibration reports. The Vendor shall furnish calibration certificates before putting them to use and also, wherever applicable, after completion of the PG test.

5.3 Performance Guarantee Parameters

Guarantee performance parameters shall be as defined in the Process/Mechanical data sheets, Specification, etc. included in the Inquiry/Order document.

5.4 Repair/Rectification/Modification

5.4.1 In case the unit fails to meet the guaranteed parameters, the Vendor shall carryout, necessary repair, rectification and modification within the time frame defined in the contract or as mutually agreed with the Owner/Purchaser, at his own risk and cost to establish the guaranteed parameters in the final performance test. All costs involved for above activities i.e. supply of manpower, materials, consumables and machines etc. shall be to Vendor's account.

5.4.2 Inspite of repair/rectification, incase the guaranteed performance parameters are not met, penalty/rejection as defined in the contract document for shortfall from guaranteed performance parameters shall be applied.

6.0 SITE PERFORMANCE GUARANTEE TEST PROFORMA

Typical Proforma shown in enclosed Format 7-76-0103-F1, shall be used for assessment of Performance guarantee parameters during site PG test.

7.0 ATTACHMENTS

Format No. 7-76-0103-F1	:	SITE PERFORMANCE GUARANTEE TEST PROFORMA.

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

DOCUMENT No.

SITE PERFORMANCE GUARANTEE TEST PROFORMA

Client : *
Project/Location : *
EIL Job No. : *
Package Unit/System: *
Order No. : *
Vendor : *

1. **PACKAGE OPERATING CONDITION (FOR GUARANTEE):**

Operating Parameter	Values as per Inquiry/Order	Value (Actual at site)
*	*	

2. **PERFORMANCE :**

SITE PERFORMANCE TEST PROCEDURE DOC. NO: *
TEST PERIOD:

Parameter (1) *	Measuring Unit (2) *	Guaranteed Value (3) *	Permissible Tolerance (4) *	Measured Value at site (5)	Value after correction for site conditions (6)	Deviation (6) w.r.t.- (3)	Remarks (Acceptable-Y/N) (7)
a)							
b)							
c)							
d)							
e)							

Vendor's Representative
Date

Owner's Commissioning Incharge
Date

Owner
Date

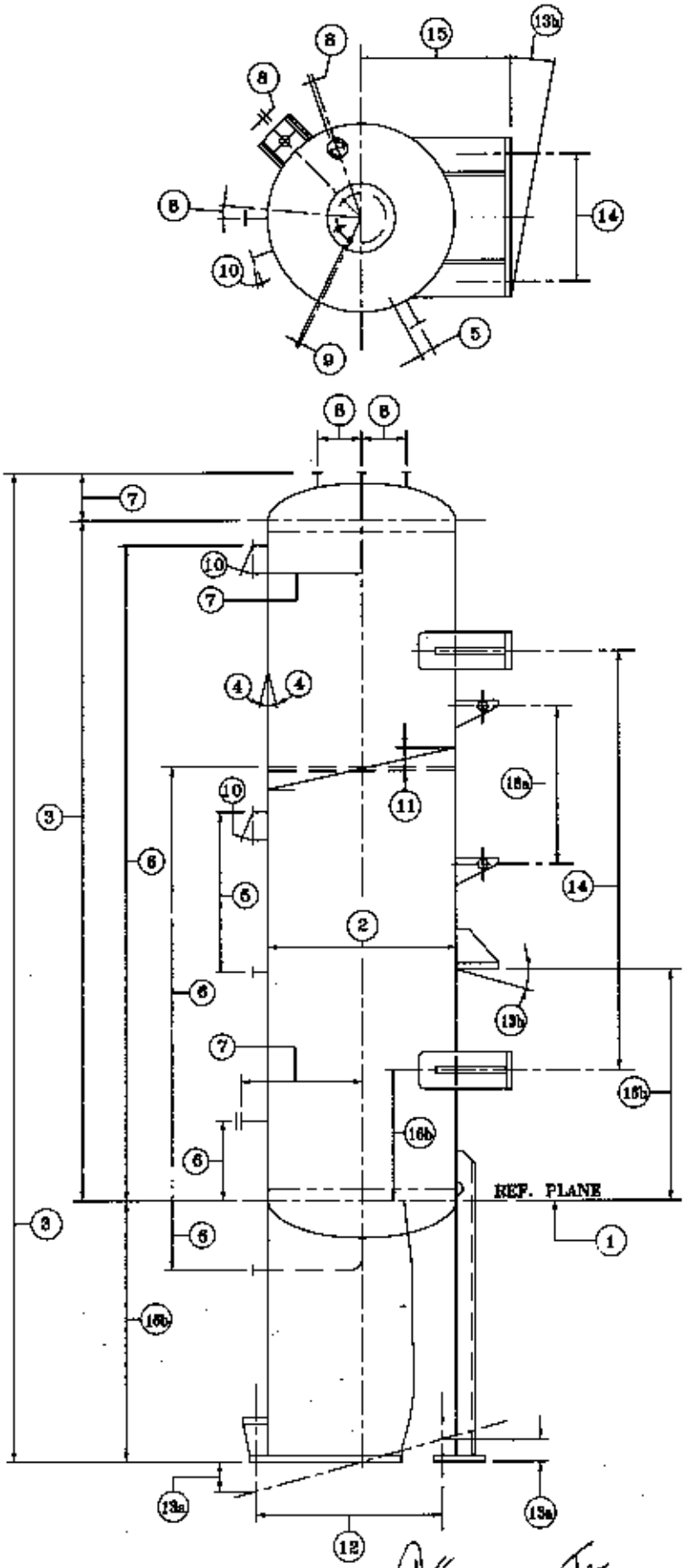
* TO BE FILLED-UP AND/OR DEVELOPED BY VENDOR & SUBMITTED ALONGWITH PERFORMANCE TEST PROCEDURE.

3. OBSERVATIONS:

4. CONCLUSIONS :

Vendor's Representative	**Owner's Commissioning Incharge**	**Owner**
Date	Date	Date

Copy : Engineer-In-Charge.



Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

NOTES

1. REFERENCE LINES SHALL BE LIGHTLY PUNCH-MARKED INSIDE AND OUTSIDE AROUND THE CIRCUMFERENCE OF THE SHELL PLATE ON THE TANGENT LINES OF THE VESSEL.
2. a) OUT OF ROUNDNESS (OVALITY) SHALL BE AS PER APPLICABLE CODE.
   b) OUTSIDE CIRCUMFERENCE OF SHELL SHALL BE WITHIN THE FOLLOWING LIMITS.
      ± 10 mm FOR NOMINAL DIAMETER 1200 mm AND UNDER.
      ± 12 mm FOR NOMINAL DIAMETER 1201 mm THROUGH 2400 mm.
      ± 20 mm FOR NOMINAL DIAMETER ABOVE 2400 mm.
   c) FOLLOWING TOLERANCES ON DIAMETER SHALL APPLY THROUGHOUT ITS LENGTH FOR VESSELS WITH TRAYS AND / OR PACKING. (FOR CARTRIDGE TYPE TRAY REFER SPECIAL NOTE-E).

VESSEL NOM. DIA.	TOLERANCE ON NOM. DIA.
2000 mm AND UNDER	± 0.5%
2001 mm TO 4000 mm	GREATER OF ± 10 mm OR ± 0.35%
4001 mm TO 8000 mm	GREATER OF ± 14 mm OR ± 0.25%
ABOVE 8000 mm	TO BE SPECIFIED ON VESSEL DRAWING.

3. TOLERANCE FOR LENGTH ± 5 mm PER 3000 mm, MAXIMUM 15 mm.
4. OUTSIDE SURFACE OF CYLINDER MAY BE OUT OF ALIGNMENT / STRAIGHTNESS NOT MORE THAN 6 mm PER 6000 mm STRAIGHT LENGHT, BUT NOT MORE THAN 20 mm FOR ANY LENGTH.
5. TOLERANCE FOR CENTRE TO CENTRE DISTANCE BETWEEN ANY PAIR OF INSTRUMENT CONNECTIONS TO BE AS FOLLOWS:-
   DISTANCE BETWEEN NOZZLES : ± 1 mm
   ORIENTATION : ± 1 mm
   NOZZLE FACE INCLINATION : ± 1/4°
6. ELEVATIONS FROM REFERENCE PLANE MAY VARY AS FOLLOWS:-
   MANHOLE: ± 12 mm, NOZZLE ± 6 mm, INTERNAL SUPPORTS: ± 3 mm, EXCEPT THAT LOCATIONS OF MANHOLES AND NOZZLES NEAR THE TRAY SHALL NOT VARY MORE THAN ± 3 mm FROM THE TRAY.
7. PROJECTION OF FLANGE FACE FROM SHELL CENTRAL LINE / TANGENT LINE MAY VARY ± 5 mm FOR NOZZLES AND ± 12 mm FOR MANHOLES.
8. CIRCUMFERENTIAL AND RADIAL DEVIATION OF NOZZLES, MANHOLES AND SUPPORTS FROM THE TRUE POSITION SHALL NOT VARY MORE THAN ± 3 mm.
9. BOLT HOLE ORIENTATION OF NOZZLES MAY VARY ± 2 mm AT BOLT CIRCLE.
10. VERTICAL AND HORIZONTAL DEFLECTION OF NOZZLE FLANGE FACES FROM PLANES NORMAL TO NOZZLE CENTRE LINES OR PARALLEL TO VESSEL CENTRE LINE SHALL NOT BE MORE THAN ± 1/2°
11. ALL TOLERANCES OF TRAY SUPPORTS TO BE AS PER TRAY SPECIFICATIONS / DRAWING.
12. THE BASE RING BOLT CIRCLE DIAMETER MAY VARY ± 5 mm. FOR ANY DIAMETER MEASURED AT POINTS 90° APART, DISTANCE BETWEEN TWO CONSECUTIVE HOLES MAY VARY BY ± 5 mm.
13. a) DEVIATION OF SUPPORT BASE FROM HORIZONTAL MAY BE AS FOLLOWS:-
      FOR VESSEL DIA. 1500 mm AND UNDER 3 mm
      FOR VESSEL DIA. OVER 1500 mm TO 2000 mm 5 mm
      FOR VESSEL DIA. OVER 2000 mm TO 4000 mm 6 mm
      FOR VESSEL DIA. OVER 4000 mm TO 5000 mm 8 mm
      FOR VESSEL DIA. OVER 5000 mm 10 mm
   b) DEVIATION OF SUPPORT BASE FOR BRACKET TYPE SUPPORT / SADDLE SUPPORT FROM HORIZONTAL MAY BE ± 1°
14. DISTANCE BETWEEN CL TO CL OF SUPPORTS AND BOLT HOLES IN SUPPORTS FOR HORIZONTAL VESSELS MAY VARY ± 3 mm.
15. DISTANCE BETWEEN CENTRE LINE OF HORIZONTAL VESSEL AND BOTTOM OF SUPPORT MAY VARY ± 3 mm.
16. a) TOLERANCE FOR CENTRE TO CENTRE DISTANCE BETWEEN ANY PART OF EXTERNAL STRUCTURAL ATTACHMENT SHALL NOT VARY MORE THAN ± 3 mm.
    b) TOLERANCE FOR DISTANCE FROM REFERENCE PLANE TO BASE OF VERTICAL SUPPORTS AND CENTRE LINE OF SADDLE SUPPORT MAY VARY ± 6 mm.

SPECIAL NOTES

A. CUMULATIVE TOLERANCES ON CONSECUTIVE DIMENSIONS SHALL BE LIMITED BY OVERALL DIMENSIONAL TOLERANCES. ALL TOLERANCES ARE FROM REFERENCE PLANE UNLESS OTHERWISE INDICATED.

B. INTERFERENCE BETWEEN INTERNAL AND EXTERNAL PARTS OR ANY RESTRICTION TO THE INTENDED FUNCTION OF ANY PART SHALL BE KEPT IN VIEW WHERE TOLERANCES ARE CUMULATIVE.

C. SPECIFIC TOLERANCES FOR ANY PART SHOWN ON EIL DRAWING SHALL BE GIVEN PREFERENCE TO THOSE GIVEN IN THIS STANDARD.

D. UNUSUALLY LARGE OR COMPLEX VESSELS MAY BE EXECUTED AS PER FABRICATOR'S STANDARD WHEN THE TOLERANCES AS SHOWN ARE UNREASONABLE. IN SUCH INSTANCES FABRICATOR'S TOLERANCES & LIMITS MUST BE SUBMITTED FOR APPROVAL.

E. VESSEL UPTO AND INCLUDING 750 mm NOMINAL DIAMETER SHALL HAVE CARTRIDGE TYPE TRAY. FOLLOWING TOLERANCES ON DIAMETER SHALL APPLY THROUGHOUT ITS LENGTH.

VESSEL NOMINAL DIAMETER	TOLERANCE
500 mm AND UNDER	VESSEL I.D. $^{+1}_{0}$ mm
501 mm TO 750 mm	VESSEL I.D. ± 3 mm

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7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
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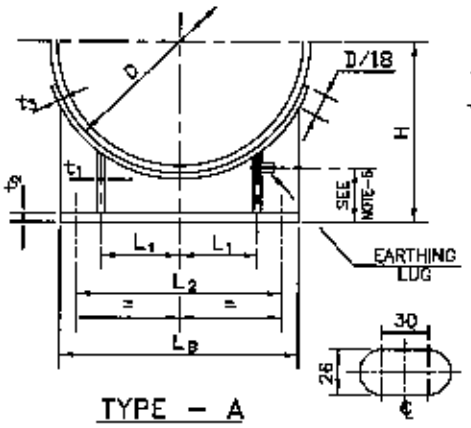
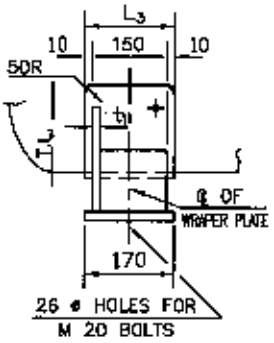
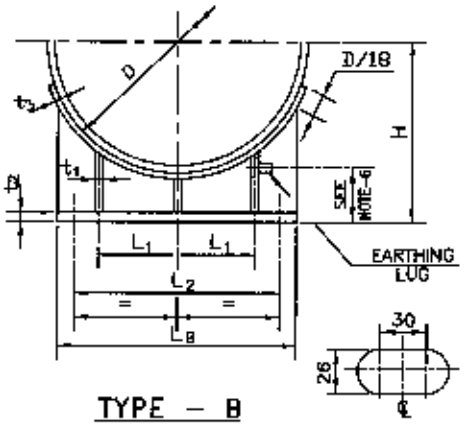


TYPE – A





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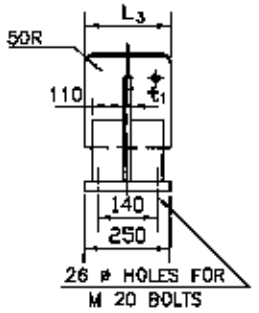
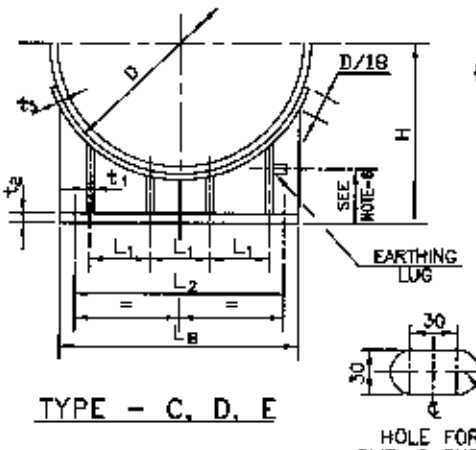
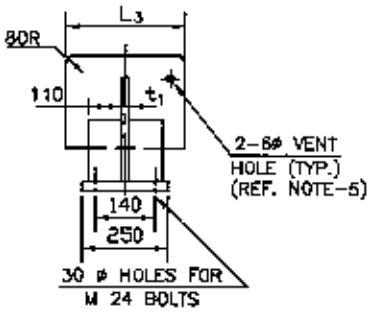




TYPE – C, D, E



D	L_B	H	L_1	L_2	TYPE	MAX. LOAD PER SADDLE (M. TON)	APPROX. WT. PER SADDLE (KGS.)
300	260	300	50	200	A	4.4	17
350	280	325	55	210	A	4.8	18
400	330	350	75	250	A	4.5	20
450	370	375	95	300	A	3.8	22
500	450	450	125	370	A	14.9	40
600	560	500	175	470	A	13.2	50
700	650	550	225	570	A	11.0	55
800	750	600	275	670	A	10.8	65
900	850	650	300	760	A	11.0	75
1000	950	700	330	820	B	12.3	85
1200	1100	800	375	960	B	19.4	130
1400	1250	900	465	1150	B	19.7	140
1600	1450	1000	370	1300	C	23.3	165
1800	1600	1100	410	1450	C	39.1	260
2000	1750	1200	445	1600	C	43.5	290
2200	1950	1300	495	1800	D	49.1	295
2400	2150	1450	545	2000	D	53.5	390
2600	2300	1550	585	2150	D	52.9	440
2800	2500	1650	620	2300	E	52.7	475
3000	2670	1750	670	2500	E	64.9	600
3200	2800	1850	710	2600	E	63.8	620
3400	3000	1950	760	2800	E	64.9	630
3600	3200	2050	830	3000	E	60.5	725
3800	3350	2150	845	3150	E	61.0	745
4000	3550	2250	895	3300	E	60.8	820

TYPE	t_1	t_2	L_3	t_3
A	10	10	170	12
B	10	12	250	12
C	12	16	300	16
D	16	20	350	20
E	20	20	400	20

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. VESSEL DIAMETER 'D' REFERS TO THE OUTER DIAMETER OF THE SHELL.
3. FOR INTERMEDIATE DIAMETERS TAKE THE IMMEDIATE NEAREST DIAMETER SUPPORT.
4. WELDING SHALL BE DONE ALL AROUND AND SHALL BE CONTINUOUS FILLET WELD. WELD SIZE SHALL BE 6 mm FOR VESSELS UPTO 1400 mm DIA AND 8 mm FOR VESSELS ABOVE 1400 mm DIA.
5. PROVIDE 2 NO. 6ø VENT HOLES IN SADDLE WRAPPER PLATE. THESE HOLES SHALL BE PROVIDED DIAGONALLY OPPOSITE AND BE LEFT UNPLUGED AND SHALL BE FILLED WITH HARD GREASE ONLY.
6. WHERE EARTHING LUG CANNOT BE PUT AT AN ELEVATION OF 400 mm ABOVE THE SADDLE BASE PLATE IT SHALL BE LOCATED AS HIGH AS POSSIBLE.
7. EARTHING LUGS ARE NOT TO BE PAINTED OR GALVANIZED.
8. DETAIL DIMENSIONS AND NOTES IN ENGINEERING DRAWING TAKE PRECEDENCE OVER THOSE SHOWN HERE.
9. MATERIALS SHALL BE AS PER ENGINEERING DRAWING.
10. EARTHING LUG SHALL BE AS PER STANDARD 7–12–0026.

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7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	SM
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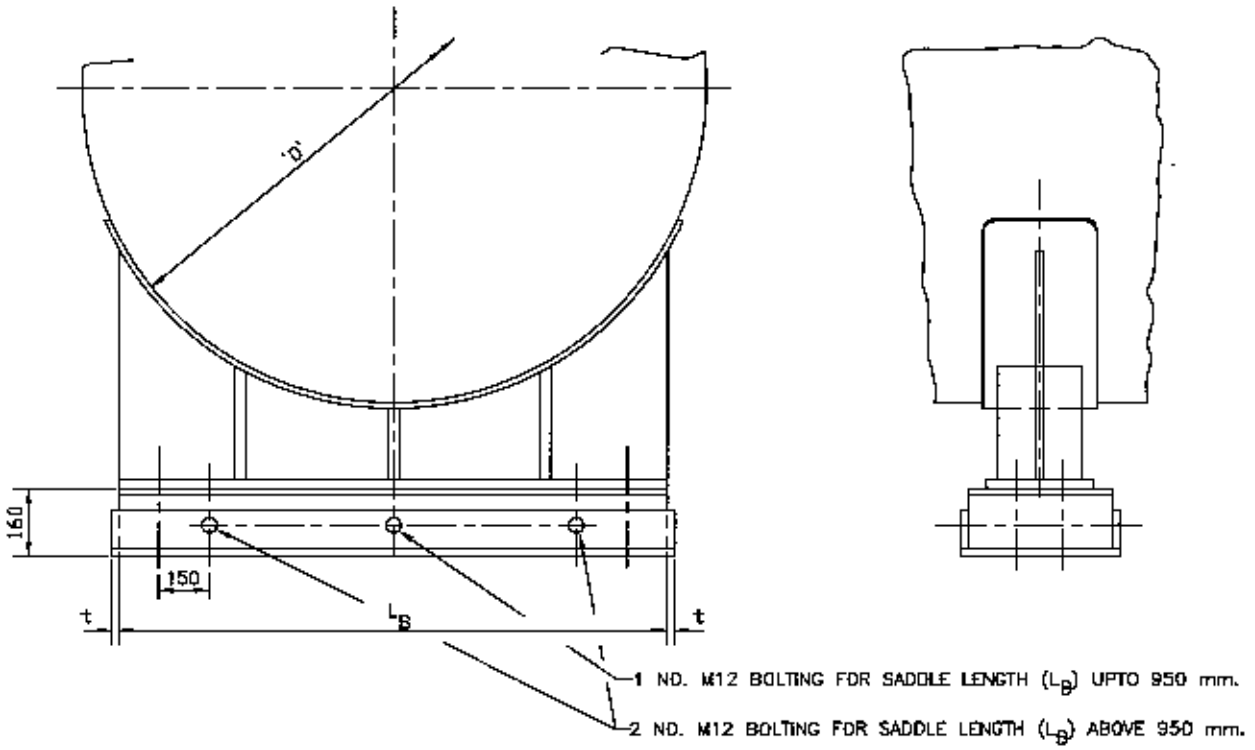
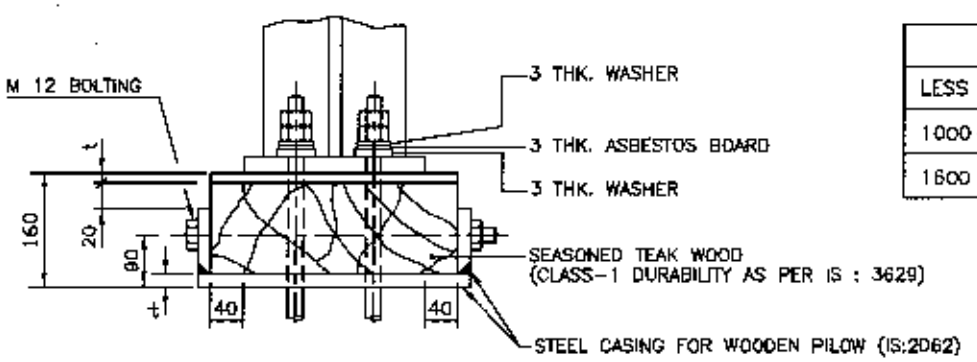
Approved by





D	t
LESS THAN 1000	8
1000 TO 1599	10
1600 TO 4000	12

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. THIS STANDARD IS APPLICABLE FOR ALL HORIZONTAL VESSELS WITH DESIGN TEMPERATUE BELOW 0°C
3. FOR SADDLE DIMENSIONS REFER STANDARD 7-12-0002.
4. 2-WEEP HOLES OF 20 mm DIA SHALL BE PROVIDED AT THE BOTTOM OF THE FRAME.
5. UNLESS OTHERWISE SPECIFIED THE WOODEN PILLOWS REQUIRED FOR SADDLE SUPPORTS SHALL BE SUPPLIED BY MECHANICAL ERECTION CONTRACTOR.

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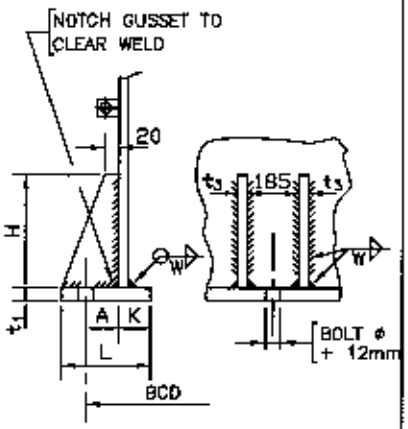
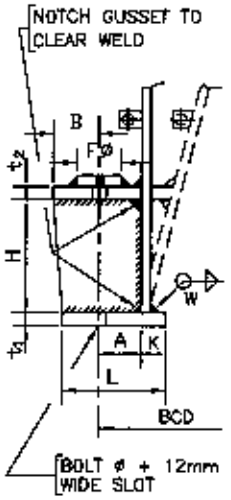
Approved by

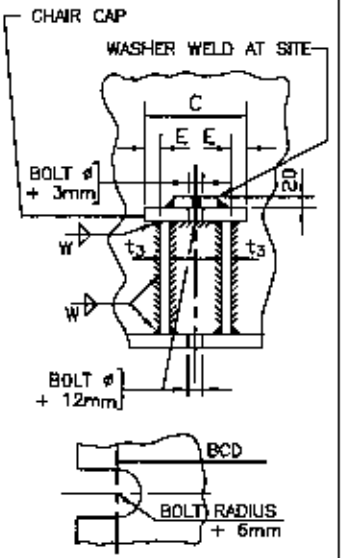
SKIRT BASE DETAILS



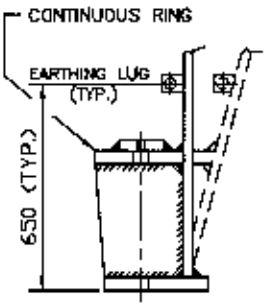
TYPE–1



TYPE–2
(SEE NOTE–6)



SLOT DETAIL



(ALL DIMENSIONS AND DETAILS ARE SAME AS SHOWN FOR TYPE–2 EXCEPT CONTINUOUS RING)

TYPE–3
(FOR CONTINUOUS RING ONLY)

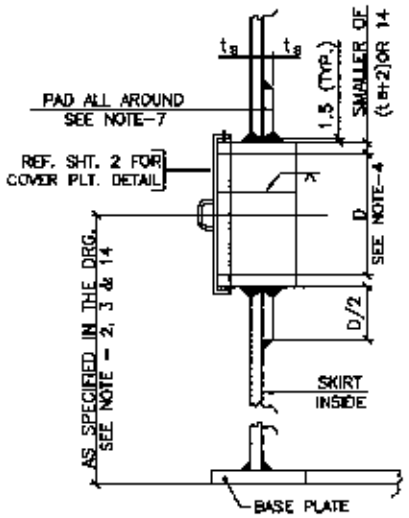
BOLT ø	t_1 *	t_2 *	t_3 *	A ▼	B	C	E	F	H	K	L *	W	TYPE	REMARKS
24	20	–	10	60	–	–	–	–	250	75	165	10	1	
27	20	–	10	60	–	–	–	–	250	80	170	10		
30	25	25	12	55	60	150	12	60	300	80	180	10		
33	25	25	12	58	65	150	12	70	300	80	185	10		
36	25	25	12	66	70	150	12	80	300	90	200	10		
39	32	25	12	70	70	160	14	80	300	95	215	12		
42	32	25	12	72	70	160	14	90	300	100	230	12		
45	32	25	12	80	75	160	14	90	300	105	245	12	2	
48	32	30	14	83	75	180	16	100	380	110	260	14	AND	
52	38	30	14	87	80	180	16	110	380	110	275	14	3	
56	38	30	16	91	85	180	18	120	380	115	280	14		
60	38	35	18	95	85	200	20	120	430	125	285	14		
64	38	35	18	104	90	200	25	130	430	135	300	16		
68	42	40	20	108	90	220	25	140	450	145	320	16		
72	42	40	20	112	95	220	25	150	450	150	340	16		

NOTES

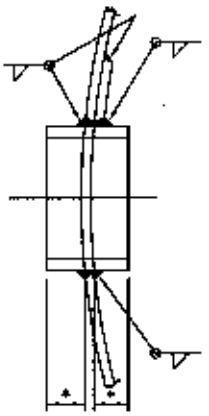
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. BOLT CIRCLE DIAMETER (BCD), NUMBER AND SIZE OF THE BOLTS SHALL BE AS PER ENGINEERING DRAWING.
* 3. DIMENSIONS t1, t2, t3 AND 'L' ARE TO BE CHECKED IN EVERY CASE.
4. IN CASE OF ANY CONFLICT THE ENGINEERING DRAWING SHALL GOVERN.
5. NUMBER OF BOLTS USED IS TO BE A MULTIPLE OF 4 AND BOLTS SHALL STRADDLE VESSEL NORTH–SOUTH CENTRE LINE IN PLAN.
6. USE CONTINUOUS RING (CHAIR CAP) IF DISTANCE BETWEEN CONSECUTIVE BOLTS IS LESS THAN 400 mm.
7. CIRCULAR WASHER SHALL BE SHIPPED LOOSE AND WELDED AT SITE AFTER ANCHOR BOLTS ARE IN POSITION.
▼ 8. PREFERRED DIMENSION 'A'
9. EARTHING LUG SHALL BE LOCATED BETWEEN THE ANCHOR BOLTS AND SHALL BE AS PER STANDARD 7–12–0026.
10. WHEN THE ANCHOR CHAIR CAP IS NOT CONTINUOUS, THE BASE PLATE SHALL BE SUITABLY STIFFENED USING REMOVABLE STRUCTURAL SECTIONS (BEAM/SPIDER) AT SITE DURING ERECTION.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NS	TK	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

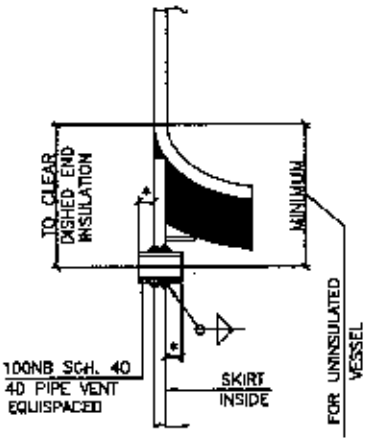
SKIRT OPENING DETAILS



ACCESS OPENING

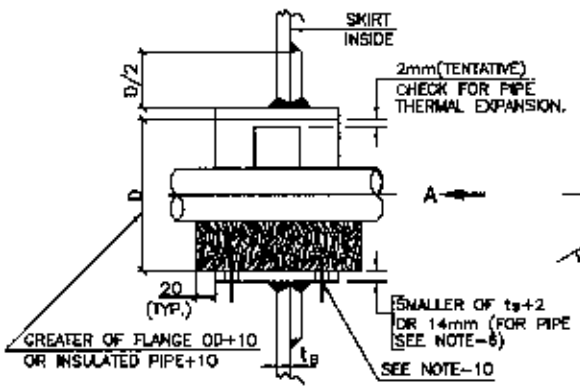


PLAN

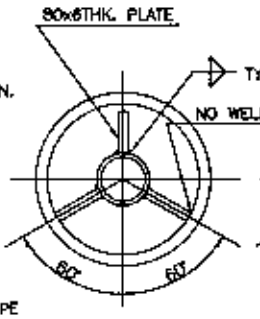


VENT
(SEE NOTE-5)

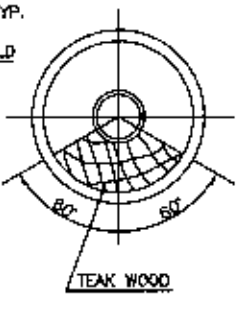
ACCESS OPENING/PIPE OPENING/ VENT OPENING (TYPICAL)



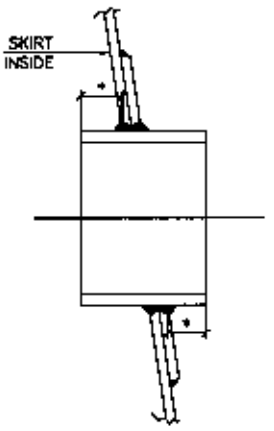
PIPE OPENING



VIEW A
(HOT TYPE VESSEL)

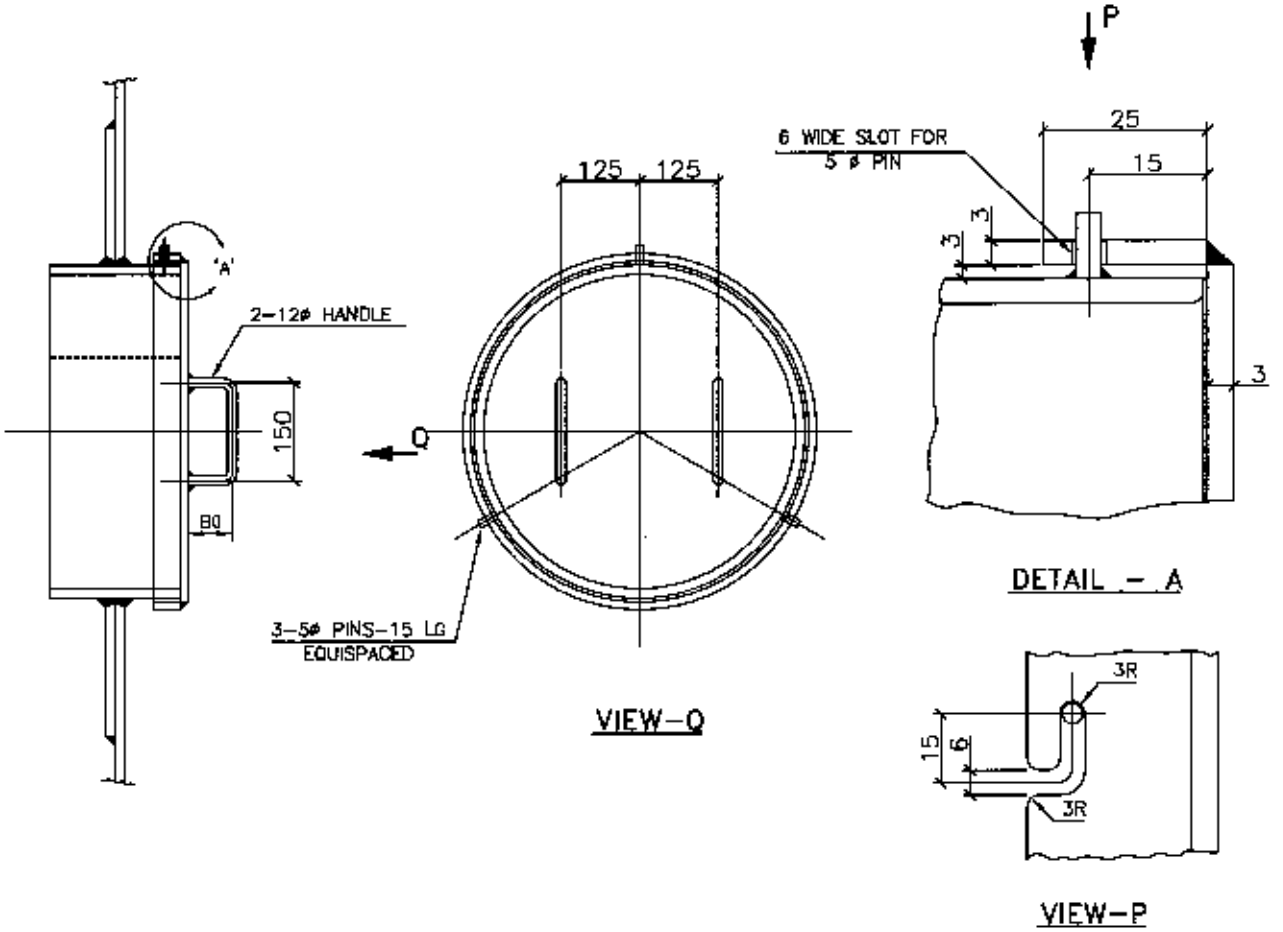


VIEW A
(COLD TYPE VESSEL)



FLARED SKIRT

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	FK	NK	BM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN



NOTES

		(HOT TYPE VESSEL)	(COLD TYPE VESSEL)

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ACCESS OPENING SHALL BE LOCATED BETWEEN ANCHOR BOLTS WHEREVER POSSIBLE.
3. ACCESS OPENING IS NOT TO BE BLOCKED BY BOTTOM HEAD.
4.

SKIRT DIAMETER	ACCESS OPENING DIA.(D)	NO. OF ACCESS OPENING
UP TO 1000	400	1
OVER 1000 UPTO 1500	450	1
OVER 1500 UPTO 3000	500	1
OVER 3000	500	2

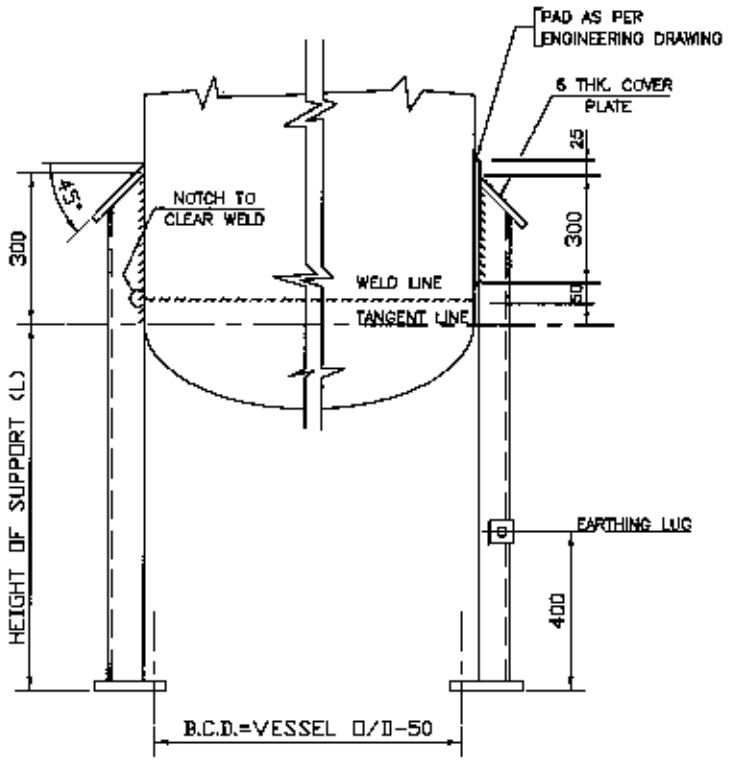
5.

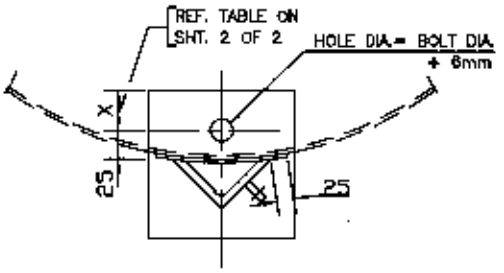
SKIRT DIAMETER	NO. OF VENT HOLES
UP TO 1000	2
OVER 1000 UPTO 2000	3
OVER 2000	4

6. MINIMUM SIZE OF PIPE SLEEVE IS 150NB SCH 40. USE SCH 40 UPTO 250NB PIPE SLEEVE. FOR 300NB AND ABOVE, PIPE SLEEVE SHALL BE FABRICATED FROM PLATE.
7. ALL OPENINGS 300 DIA. AND ABOVE SHALL BE PROVIDE WITH REINFORCEMENT PADS ON INNER SURFACE OF SKIRT.
8. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
9. IN FLARED SKIRT, OPENING DETAIL IS SAME AS THAT FOR CYLINDRICAL SKIRT.
10. WOODEN BLOCK SHALL BE FIXED TO SLEEVE WITH TWO NO. OF WOOD SCREWS.
11. ACCESS OPENING/PIPE OPENING/VENT SHALL BE OF SAME MATERIAL AS THAT OF SKIRT.
12. ALL FILLET WELDS SHALL BE 6 mm MINIMUM.
- *13. PROJECTION OF SLEEVE/NECK SHALL BE GREATEST OF (30+INSULATION THK.), (30+FIRE PROOFING) & 50mm.
14. CENTER LINE OF ACCESS OPENING SHALL BE 850 MM (MINIMUM) ABOVE BOTTOM BASE RING FOR ANCHOR BOLTS OF SIZE M45 & BELOW AND 1100 MM (MINIMUM) FOR ANCHOR BOLTS OF SIZE ABOVE M45. IF ANCHOR CHAIR HEIGHT IS MORE THAN THAT OF GIVEN IN STANDARD, LOCATION OF ACCESS OPENING SHALL BE ESTABLISHED SUITABLY.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

ANGLE LEG SUPPORT





SUPPORT BASE DETAIL

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. THIS STD. IS APPLICABLE FOR VESSEL DIAMETER UPTO AND INCLUDING 2000mm, MAXIMUM SHELL THICKNESS OF 20mm AND MAXIMUM LENGTH (T.L. TO T.L.) OF 3000mm VESSELS BEYOND ABOVE RANGE REQUIRE SPECIAL CONSIDERATION.
3. FOR CALCULATION, FOLLOWINGS PARAMETERS HAVE BEEN CONSIDERED.
   a) WIND PRESSURE 200 kg/m^2
      SHAPE FACTOR 0.7
      BASIC SEISMIC CO-EFFICENT (α_0) 0.08
      SOIL FOUNDATION SYSTEM FACTOR (β) 1.5
      IMPORTANCE FACTOR (I) 2.0
   b) EMPTY WEIGHT WITH WIND LOADING OR HYDROSTATIC WEIGHT WITH SEISMIC LOADING.
4. HEIGHT AND NUMBER OF LEG SUPPORTS AND SIZE OF ANCHOR BOLTS SHALL BE AS PER ENGINEERING DRAWING.
5. MINIMUM BOLT SIZE SHALL BE M 20.
6. MAXIMUM INSULATION THICKNESS CONSIDERED IS 150 mm.
7. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
8. ALL FILLET WELDS SHALL BE 6 mm MINIMUM.
9. MATERIALS SHALL BE AS PER ENGINEERING DRAWING.
10. EARTHING LUG SHALL BE AS PER STANDARD 7-12-0026.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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Approved by

LEG SUPPORT SIZES

VESSEL O/D(mm)	NO.OF LEGS	LEG SIZE			BASE PLATE SIZE (mm)	X (mm)	MAXIMUM ALLOWABLE LOAD OF VESSEL (Kg.)
		MAX. VESSEL LENGTH (T.L. TO T.L.) UP TO AND INCLUDING 3.0 M					
		L = 1.5 M	L = 2.0 M	L = 2.5 M			
500	3	ISA 100x100x8	ISA 100x100x10	ISA 110x110x15	170x170x16 THK.	40	1500
800	4	ISA 100x100x10	ISA 130x130x8	ISA 130x130x12	200x200x16 THK.	45	3150
1000	4	ISA 100x100x12	ISA 130x130x10	ISA 150x150x12	230x230x16 THK.	45	4600
1250	4	ISA 110x110x15	ISA 150x150x10	ISA 150x150x12	230x230x16 THK.	45	6750
1600	4	ISA 130x130x15	ISA 150x150x15	ISA 150x150x18	230x230x16 THK.	60	9500
1750	4	ISA 150x150x12	ISA 150x150x18	ISA 200x200x12	300x300x16 THK.	60	12700
2000	4	ISA 150x150x18	ISA 200x200x12	ISA 200x200x15	300x300x20 THK.	75	16400

NOTES

FOR A VESSEL WITH MAXIMUM SUPPORT LEG HEIGHT OF 1500mm, FOLLOWING ALTERNATIVE LEG SIZES MAY BE USED :-

a) ISA 65x65x8 WITH HYDROSTATIC WEIGHT UPTO 500 Kg.

b) ISA 80x80x8 WITH HYDROSTATIC WEIGHT 501 Kg. TO 1000 Kg.

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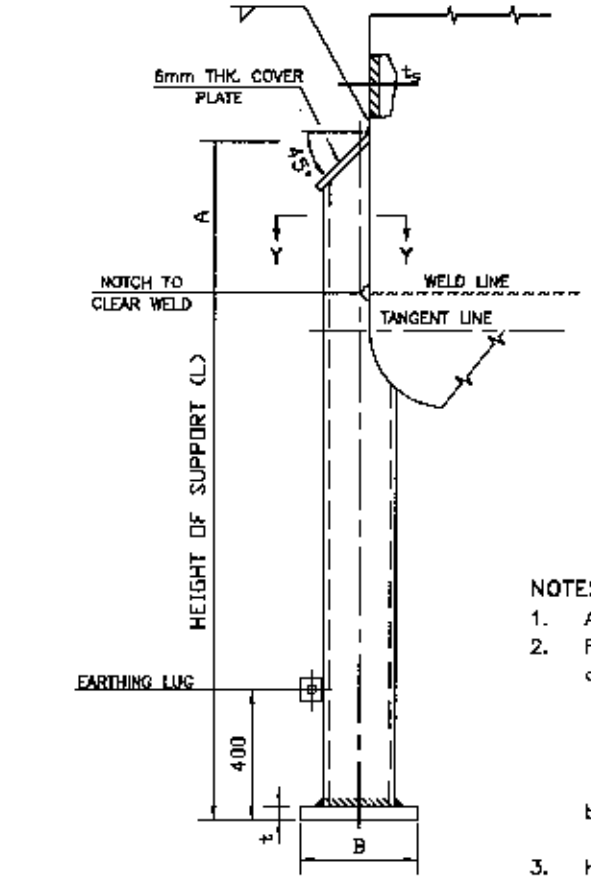
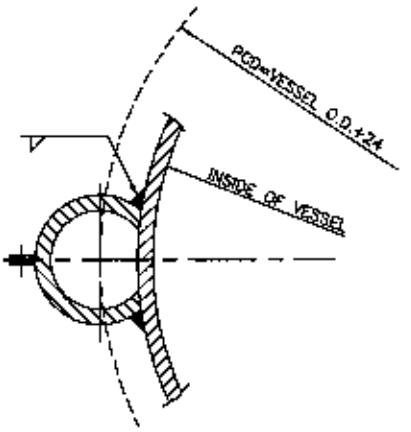
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

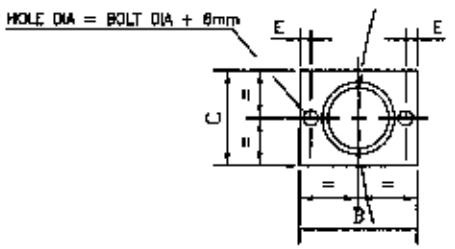
Approved by

PIPE LEG SUPPORT





SECTION–YY



SUPPORT BASE DETAIL

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. FOR DESIGN OF SUPPORT, FOLLOWINGS PARAMETERS HAVE BEEN CONSIDERED.
   a) WIND PRESSURE 200 Kg/m²
      SHAPE FACTOR 0.7
      BASIC SEISMIC CO–EFFICENT (α_0) 0.08
      SOIL FOUNDATION SYSTEM FACTOR (β) 1.5
      IMPORTANCE FACTOR (I) 2.0
   b) EMPTY WEIGHT WITH WIND LOADING OR HYDROSTATIC WEIGHT WITH SEISMIC LOADING.
3. HEIGHT AND NUMBER OF LEG SUPPORTS AND SIZE OF ANCHOR BOLTS SHALL BE AS PER ENGINEERING DRAWING.
4. MINIMUM BOLT SIZE SHALL BE M 20.
5. MAXIMUM INSULATION THICKNESS CONSIDERED IS 150 mm.
6. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
7. ALL FILLET WELDS SHALL BE 6 mm MINIMUM.
8. MATERIALS SHALL BE AS PER ENGINEERING DRAWING.
9. EARTHING LUG SHALL BE AS PER STANDARD 7–12–0026.
10. SUITABLE PAD FOR SS VESSEL SHALL BE PROVIDED.

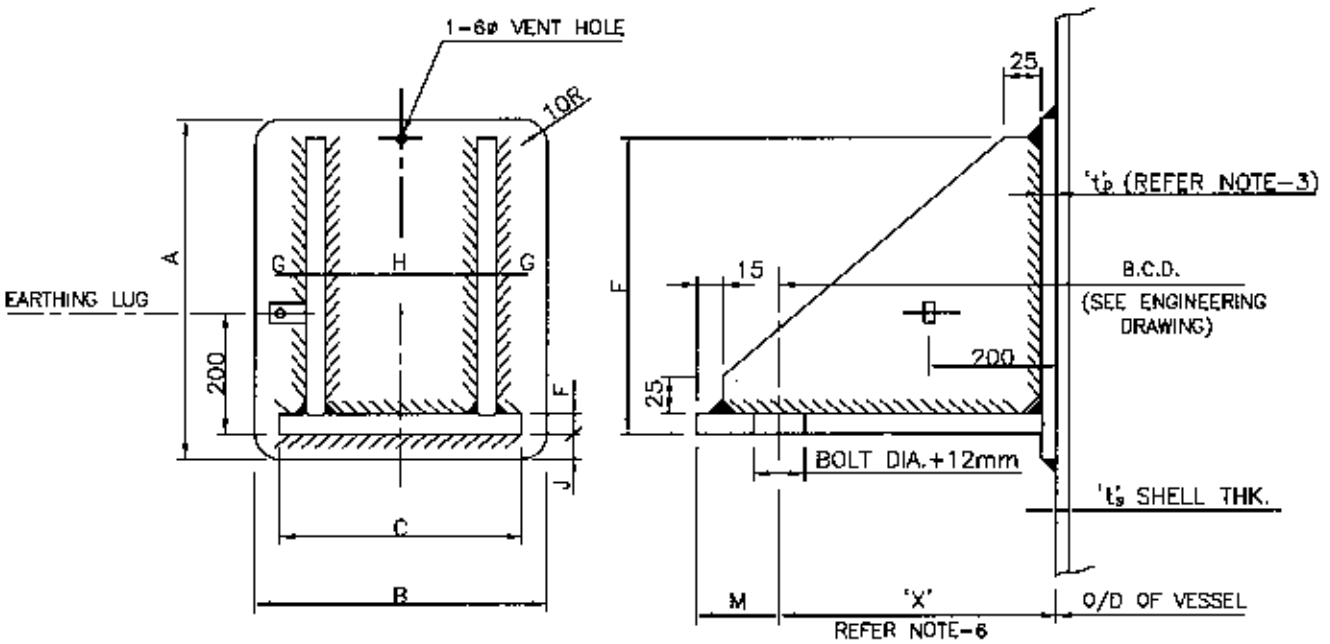
LEG PIPE SIZE	A	B	C	E	t	MAXIMUM ALLOWABLE LOAD PER LEG (Kgs) MAXIMUM HEIGHT OF SUPPORT (L) IN METERS		
						2.0	2.5	3.0
50NB x EXTRA STRONG	120	230	140	36	20	2300	2050	1800
80NB x EXTRA STRONG	180	250	160	36	25	5700	5500	4900
100NB x EXTRA STRONG	230	310	185	42	25	9000	8600	8300
150NB x EXTRA STRONG	320	370	235	44	25	16500	18000	17500

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

BRACKET SUPPORT FOR VERTICAL VESSEL

VESSEL OUTSIDE DIA.	A	B	C	E	F	G	H	J	M (SEE ENGINEERING DRAWING 60 (MINIMUM))	ANCHOR BOLT DIA. (SEE ENGINEERING DRAWING M30 (MINIMUM))	'X' MAXIMUM	MAXIMUM ALLOWABLE VESSEL WEIGHT (TONNE)
1801 – 2000	650	500	400	550	25	14	350	50			550	60
1601 – 1800	600	450	350	500	25	14	300	50			540	55
1401 – 1600	550	400	300	450	25	14	250	50			540	50
1201 – 1400	500	350	250	450	25	12	200	25			470	40
1001 – 1200	450	320	220	400	20	12	180	25			450	30
801 – 1000	450	280	200	400	20	12	150	25			450	25

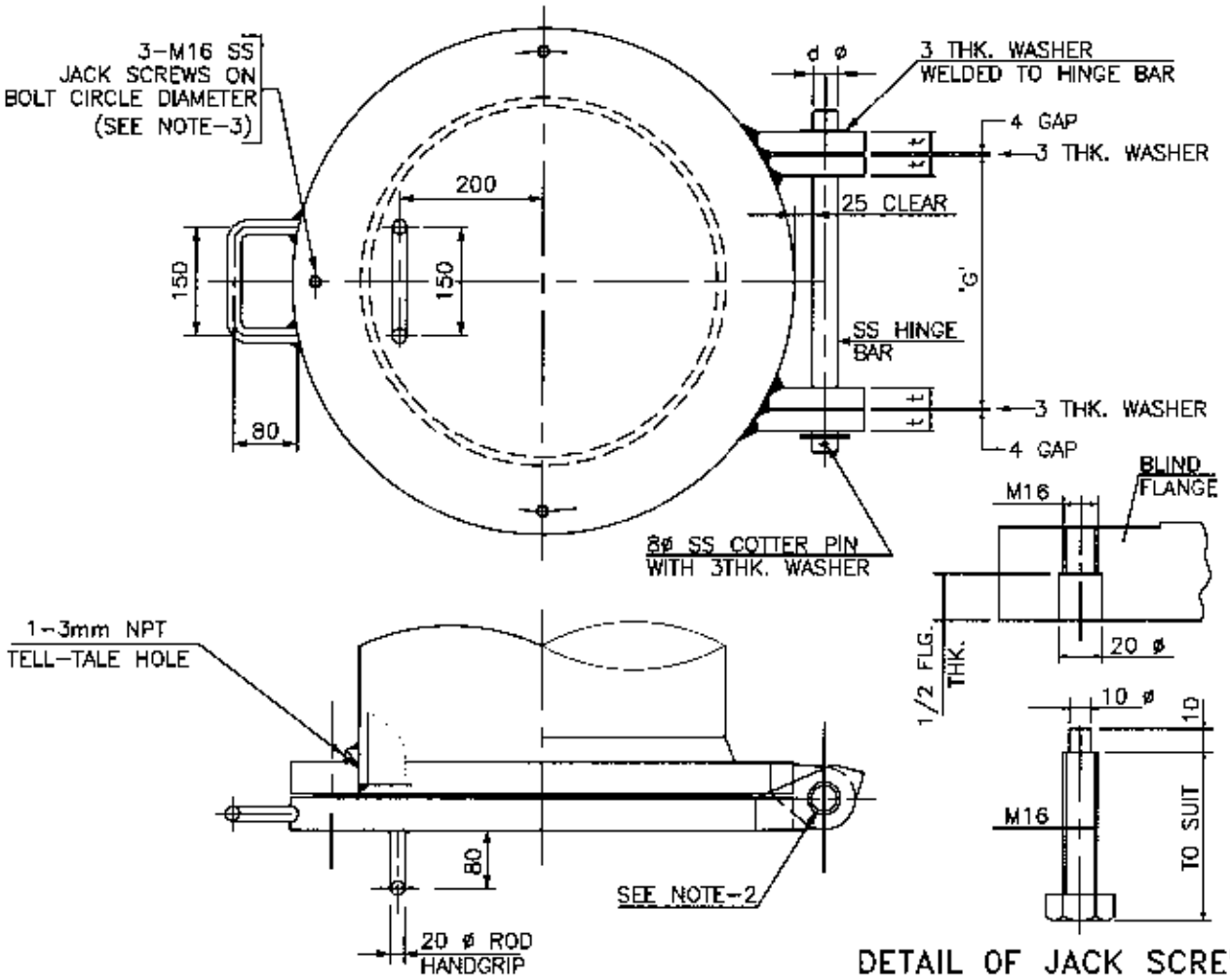


NOTES

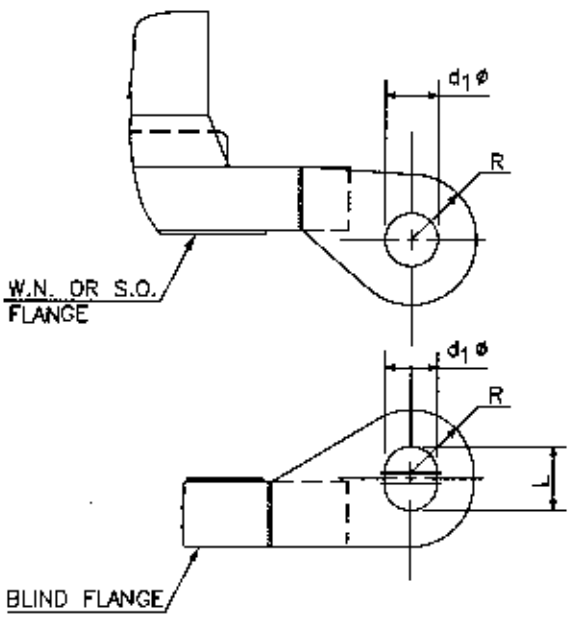
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. NUMBER OF BRACKETS SHALL BE FOUR PER VESSEL.
3. PAD THICKNESS SHALL BE AS PER ENGINEERING DRAWING.
4. FOR VESSELS UPTO 800 mm DIA. REFER ENGINEERING DRAWING.
5. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
6. DISTANCE 'X' IS TO BE FINALISED CONSIDERING INSULATION THICKNESS, BOLT SIZE AND ERECTION REQUIREMENT AND SHALL BE KEPT MINIMUM.
7. EARTHING LUG SHALL BE AS PER STANDARD 7–12–0026.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NS		NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

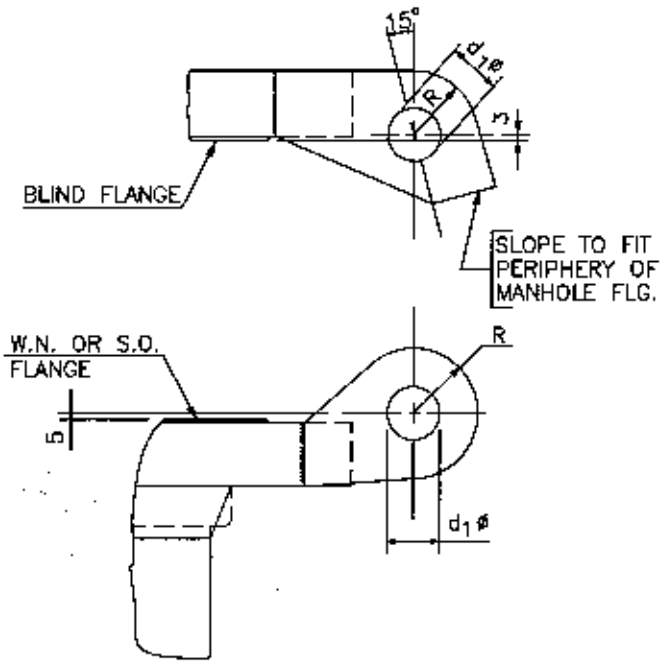
Approved by



DETAIL OF JACK SCREW



SIDE AND BOTTOM MANHOLE TABS DETAILS



TOP MANHOLE TABS DETAILS

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

FLANGE RATING	NOMINAL BORE	G	t	d	R	d_1	L
CLASS 150	400	298	28	35	55	36	42
	450	318	28	35	55	36	42
	500	348	28	35	55	36	42
	600	406	28	35	55	36	42
CLASS 300	400	324	28	35	55	36	42
	450	355	28	35	55	36	42
	500	386	30	35	55	36	42
	600	458	30	35	55	36	42
CLASS 600	400	342	32	40	55	41	47
	450	372	32	40	60	41	47
	500	406	36	40	60	41	47
	600	470	36	40	75	41	47
CLASS 900	400	352	32	40	60	41	47
	450	394	32	40	65	41	47
	500	428	40	40	70	41	47
	600	520	40	40	90	41	47

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. WELD HINGE TABS AFTER TIGHTENING THE COVER WITH GASKET IN PLACE AND MAINTAIN A LOOSE FIT OF HINGE BAR IN HINGE TABS.
3. BCD OF JACK SCREWS IS TO BE SUITABLY CHANGED IF MANHOLE STUDS INTERFERE WITH JACK SCREWS.
4. IF SQUARE RODS ARE USED FOR HANDLES, THEIR EDGES SHALL BE ROUNDED OFF.
5. IN CASE OF CONFLICT, ENGINEERING DRAWING SHALL GOVERN.
6. ALL FILLET WELDS SHALL BE 6mm MINIMUM.
7. TELLTALE HOLE SHALL NOT BE PLUGED AND SHALL BE FILLED WITH HARD GREASE ONLY.
8. THE MATERIAL OF COMPONENTS SHALL GENERALLY BE IS : 2062 UNLESS OTHERWISE SPECIFIED ON ENGINEERING DRAWING. FOR LOW TEMPERATURE SERVICES AND SERVICES ABOVE 425°C THE HINGE TABS AND HANDLE SHALL BE OF SAME MATERIAL AS THAT OF SHELL.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	SM
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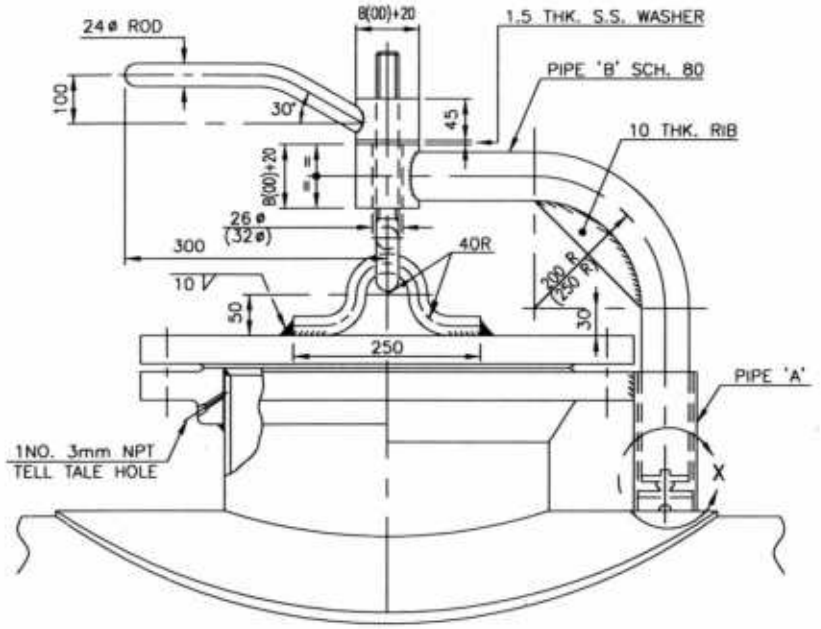
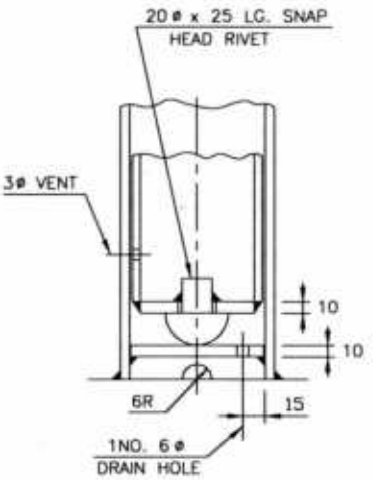
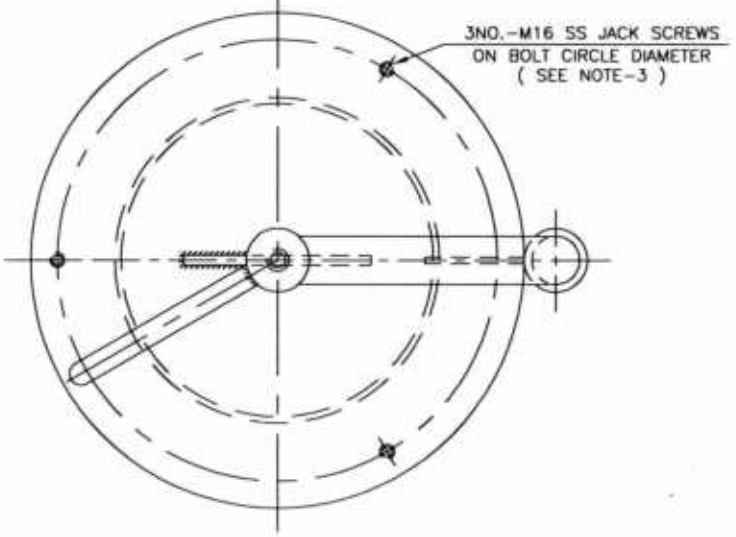
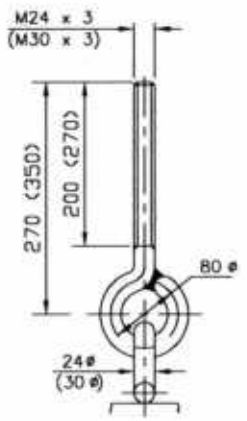


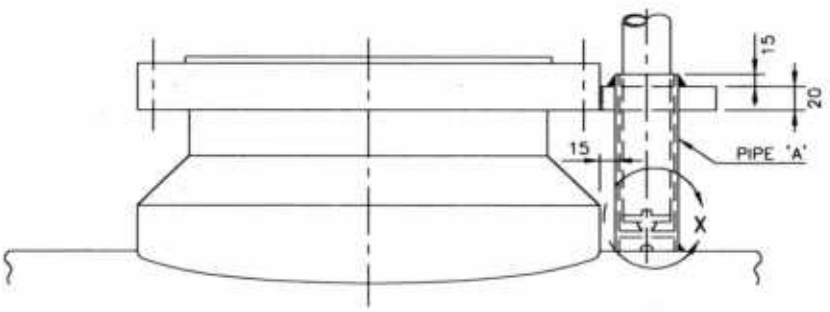


DETAIL 'X'

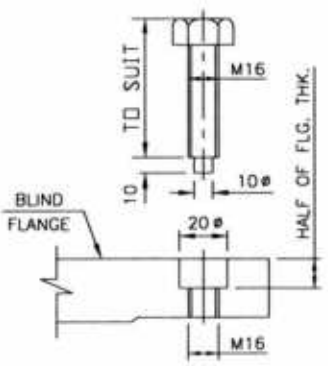




DETAIL OF EYE BOLT



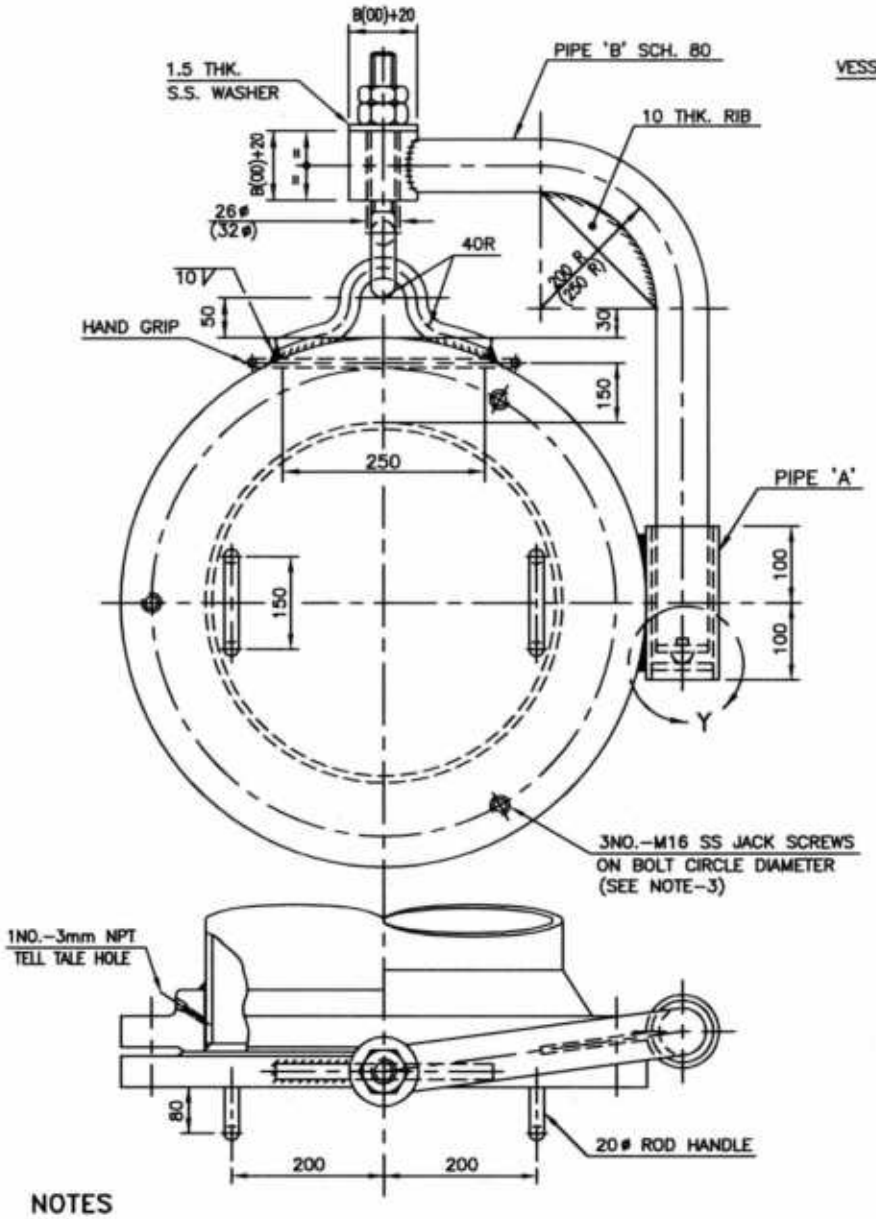
TYP. DETAIL FOR SR MANHOLE

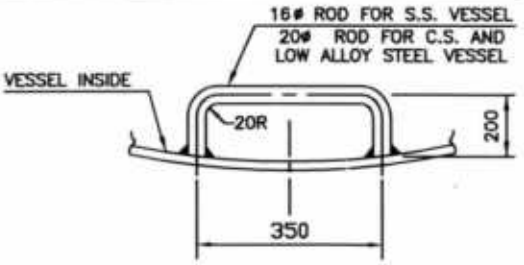


DETAIL OF JACK SCREW

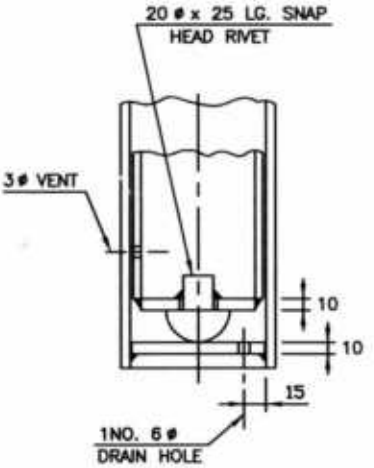
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	07.07.2022	REVISED AND REISSUED AS STANDARD	JIT SINGH	PVSSARMA	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

MANHOLE WITH DAVIT





DETAIL OF HAND GRIP



DETAIL 'Y'

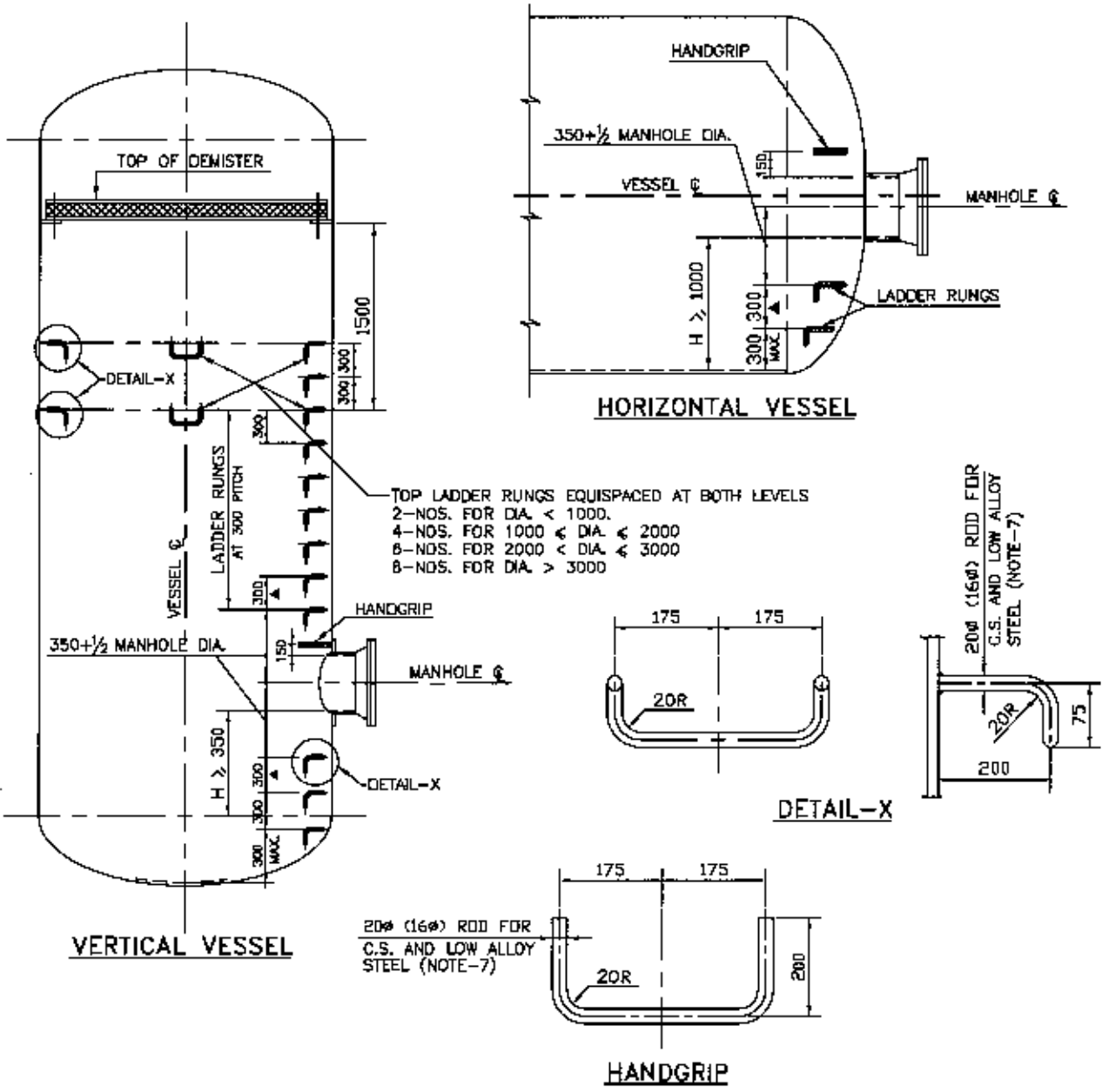
CLASS	SIZE (NB)	A (NB)	B (NB)
150	400	50 NB SCH. 80	40
	450	50 NB SCH. 80	40
	500	65 NB SCH. 40	50
	600	65 NB SCH. 40	50
300	400	65 NB SCH. 40	50
	450	65 NB SCH. 40	50
	500	65 NB SCH. 40	50
	600	90 NB SCH. 40	80
600	400	80 NB SCH. 40	65
	450	90 NB SCH. 40	80
	500	125 NB SCH. 80	100
	600	125 NB SCH. 80	100
900	400	125 NB SCH. 80	100
	450	125 NB SCH. 80	100
	500	150 NB SCH. 80	125
	600	150 NB SCH. 80	125

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DIMENSIONS IN BRACKETS ARE FOR CLASS 900.
3. B.C.D. OF JACK SCREWS IS TO BE SUITABLY CHANGED IF MANHOLE STUDS INTERFERE WITH JACK SCREWS.
4. THE SLEEVE PIPE 'A' SHOULD BE IN TRUE VERTICAL POSITION WITHIN A TOLERANCE OF 2 ½ DEGREE, AFTER WELDING TO THE FLANGE.
5. EDGES SHALL BE ROUNDED OFF IF SQUARE ROD IS USED FOR HANDGRIP.
6. THE COMPONENTS WHICH ARE DIRECTLY WELDED TO MANHOLE SHALL BE OF SAME METALLURGY AS THAT OF EQUIPMENT. MATERIAL FOR OTHER DAVIT COMPONENTS SHALL BE C.S. UNLESS OTHERWISE SPECIFIED IN ENGINEERING DRAWING.
7. ALL FILLET WELDS SHALL BE 6mm MINIMUM.
8. THIS STANDARD IS NOT APPLICABLE FOR LOW TEMPERATURE SERVICES.
9. MP/DP TEST SHALL BE CARRIED OUT FOR ALL THE WELD JOINTS.
10. VENDOR TO ENSURE PROPER FUNCTIONING OF DAVIT AND GUARANTEE THEIR HOLDING CAPACITY WITHOUT ANY FAILURE OF WELDED JOINTS/FILLETS/ EYEBOLTS/LINKS ETC. BY TESTING AT VENDOR'S SHOP AS BELOW:-KEEP THESE HANDLING ITEMS IN HANGED POSITION ALONG WITH CONNECTED BLIND FLANGES/ASSEMBLY ETC. KEPT OPENED & HANGED FOR A CONTINUOUS DURATION OF 8 HOURS MINIMUM.
11. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
8	07.07.2022	REVISED AND REISSUED AS STANDARD	JIT SINGH	PVSS/KA	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by



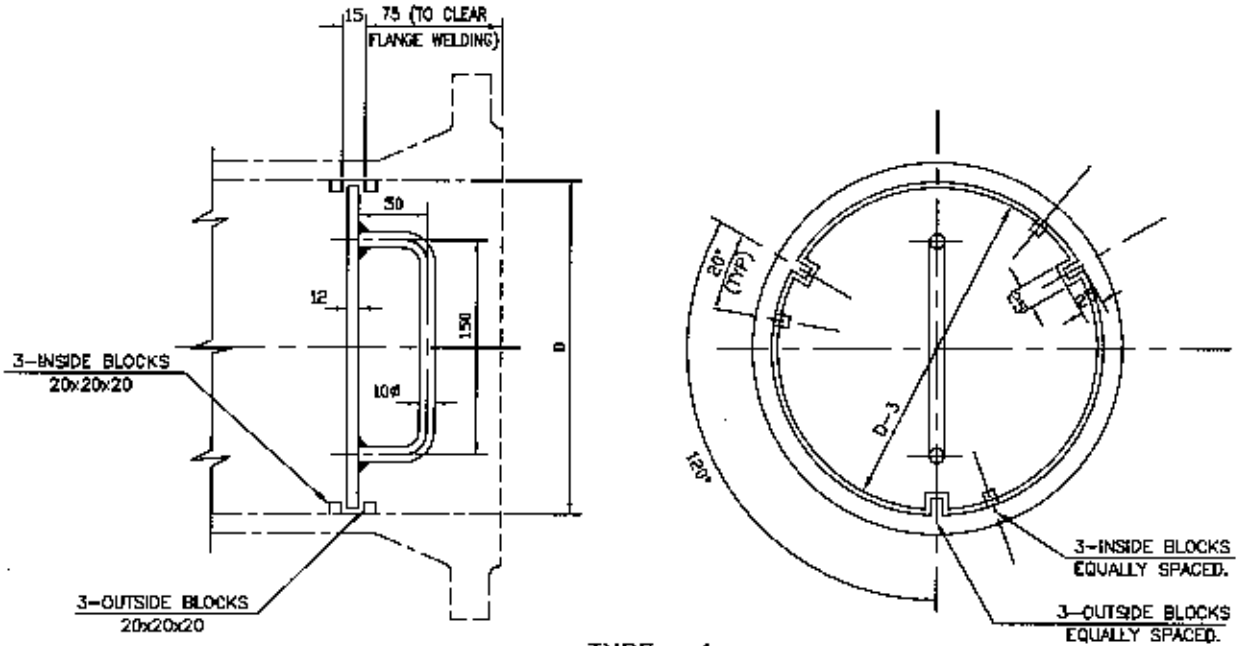
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ▲ VARIATION IN SPACING BETWEEN LADDER RUNGS IS PERMITTED IN CASE OF INTERFERENCE WITH SOME NOZZLE OR INTERNALS. HOWEVER THE SPACING OF RUNGS SHALL BE EQUAL.
3. SQUARE RODS MAY BE USED FOR HANDGRIP / LADDER RUNGS. IF FABRICATED FROM PLATE THE EDGES ARE TO BE ROUNDED OFF.
4. MATERIAL SHALL BE AS PER ENGINEERING DRAWING.
5. ALL FILLET WELDS SHALL BE 6 mm MINIMUM.
6. ORIENTATION OF LADDER RUNGS SHALL BE SAME AS OF MANHOLE.
7. DIMENSIONS SHOWN IN BRACKETS ARE FOR STAINLESS STEEL MATERIAL.

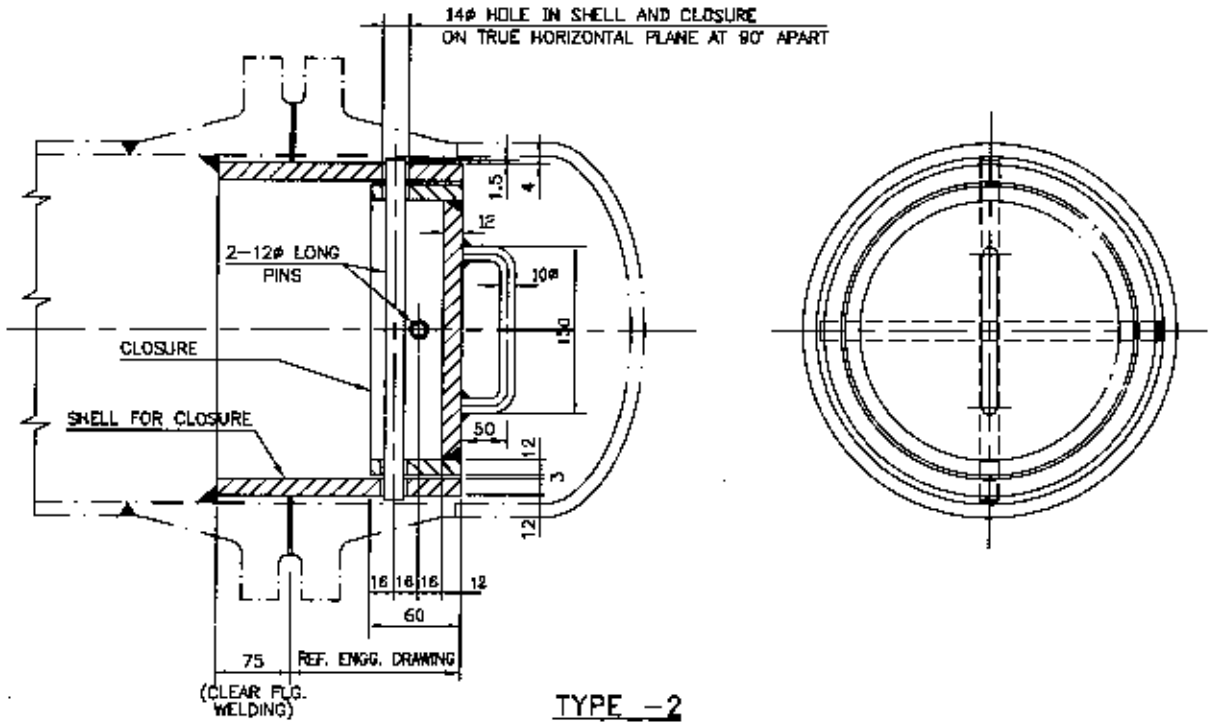
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NS	TK	NK	BM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

RETAINING PLATE



TYPE -1



TYPE -2

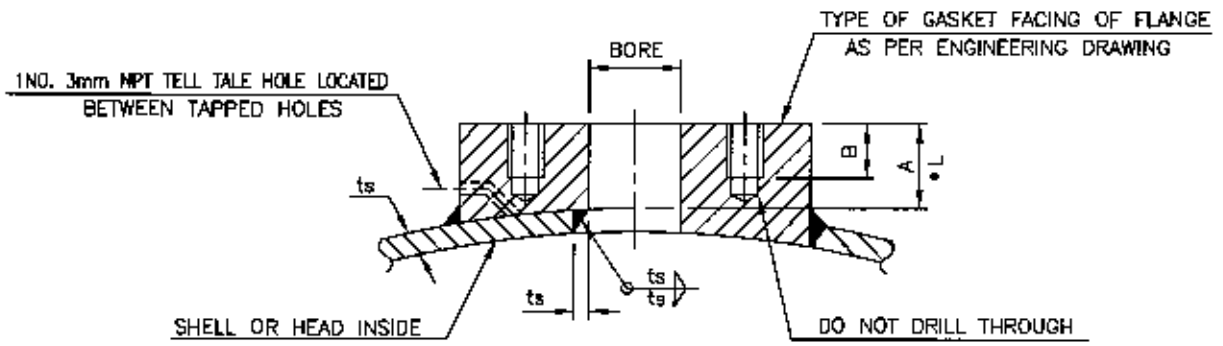
NOTE

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

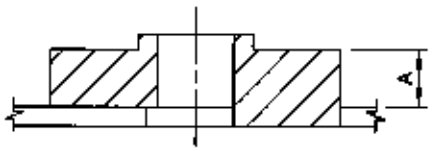
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

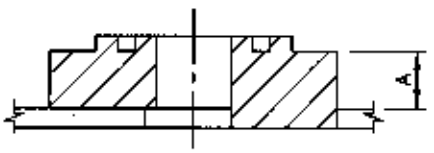
PAD NOZZLES FOR VESSELS



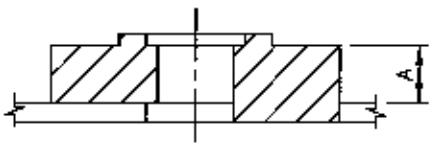
TYPE – 1 TYPE – 2



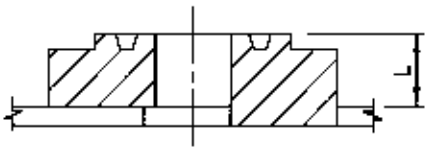
RAISED FACE TYPE



GROOVE TYPE



FEMALE TYPE



RING JOINT TYPE

NOMINAL PIPE SIZE OR BORE	CLASS 150		CLASS 300		CLASS 600			CLASS 900		
	A	B	A	B	A	B	L	A	B	L
40	28	20	36	28	40	32	46	46	38	54
50	34	24	36	28	40	32	46	48	38	54
65	34	24	36	28	42	34	48	50	38	56
80	34	24	38	30	44	34	52	50	40	58
100	34	24	40	30	48	38	54	56	44	62
150	38	30	44	34	52	42	60	58	48	66
200	40	30	46	36	58	48	66	64	54	72
250	44	34	48	38	64	54	72	70	60	78
300	44	34	50	40	68	58	76	74	64	82
350	48	38	54	44	70	60	78	86	76	98
400	48	38	58	48	76	66	84	88	78	100
450	54	44	58	48	82	72	91	102	92	115
500	54	44	58	48	88	78	99	108	98	122
600	58	48	66	56	102	92	113	120	130	156

NOTES

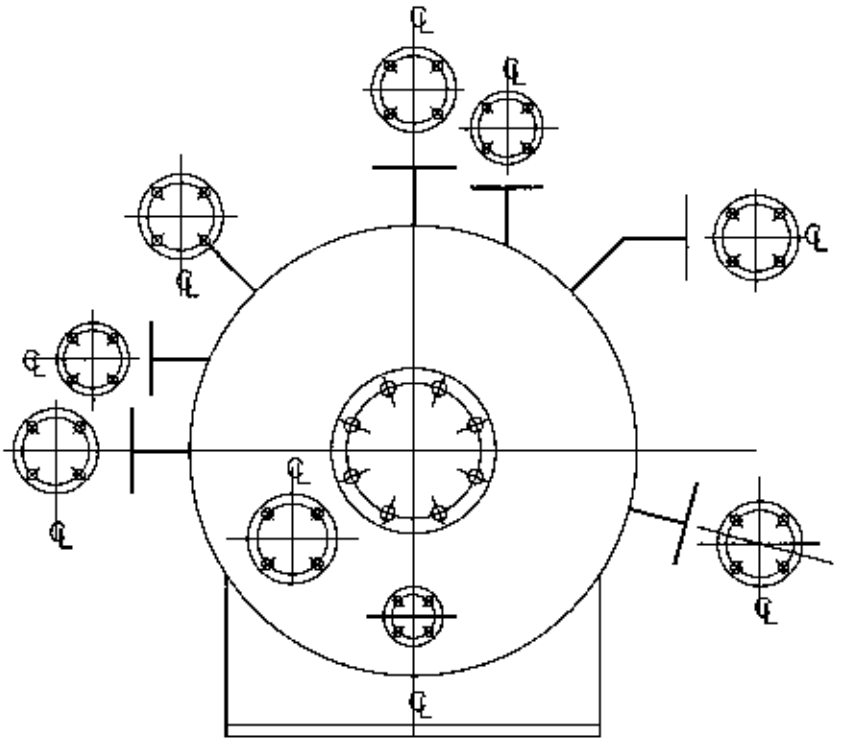
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. PAD NOZZLE OUTSIDE DIAMETER, FACING, STUD CIRCLE DIAMETER, NUMBER AND SIZE OF STUDS AND TOLERANCES SHALL BE AS PER ASME B 16.5 LATEST EDITION.
3. MATERIAL SHALL BE AS PER ENGINEERING DRAWING.
4. FABRICATOR SHALL SUPPLY REQUIRED NUMBER OF GASKETS AND STUDS.
5. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.

*6. DIMENSION 'L' INCLUDES HEIGHT OF RAISED FACE.

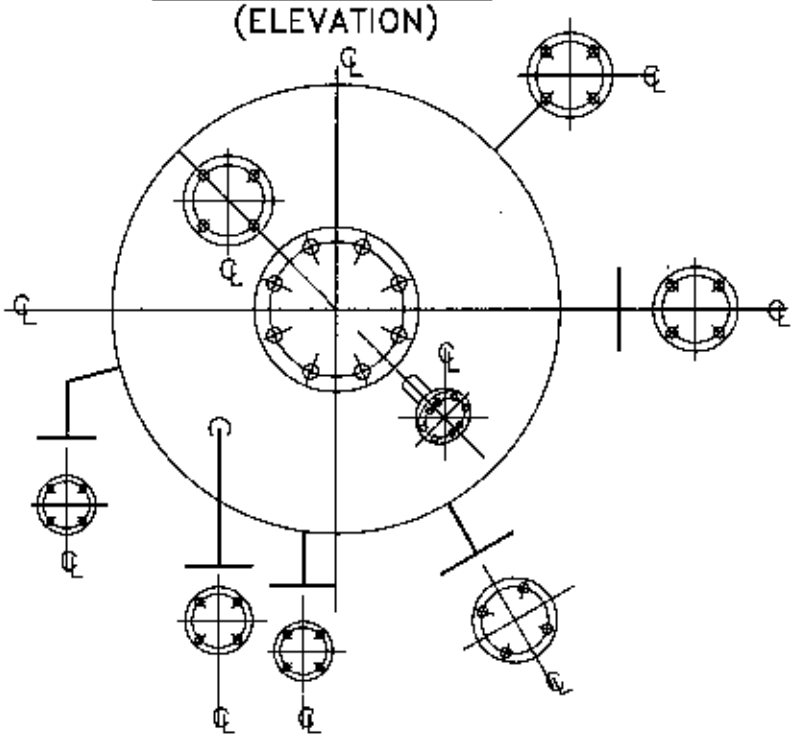
7. THESE TYPE OF NOZZLES ARE NOT TO BE USED FOR HYDROGEN SERVICE, UNLESS SPECIFICALLY REQUIRED BY LICENSOR.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by



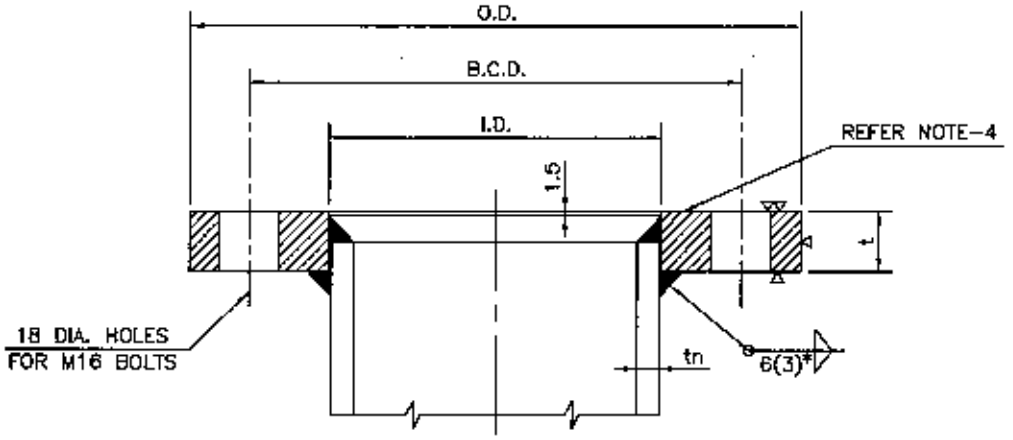
HORIZONTAL VESSEL
(ELEVATION)



VERTICAL VESSEL
(PLAN)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

INTERNAL FLANGES



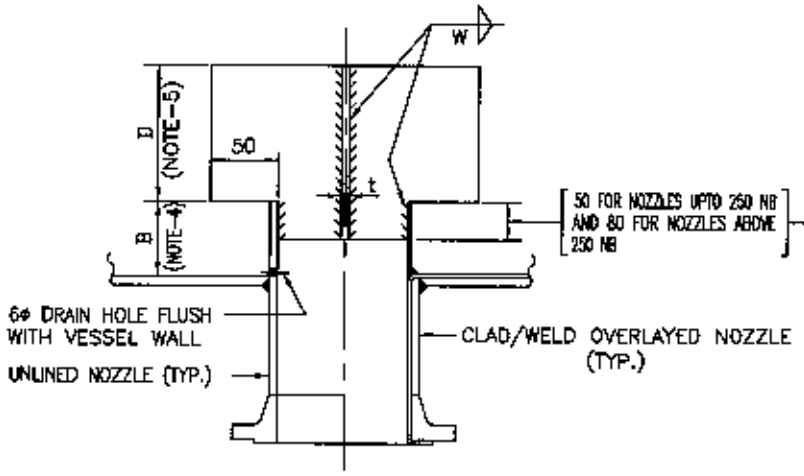
NOMINAL PIPE SIZE (mm)	I.D.	B.C.D.	O.D.	NUMBER OF BOLTS	THICKNESS OF FLANGE t	
					CARBON STEEL	S. STEEL OR MONEL
40	51	110	160	4	16	10
50	63	120	170	4	16	10
80	92	150	200	4	16	10
100	117	180	230	4	16	10
150	171	240	290	4	16	10
200	222	290	340	8	20	12
250	276	350	400	8	20	12
300	327	400	450	8	20	12
350	358	430	480	12	24	16
400	409	480	530	12	24	16
450	460	530	580	12	24	16
500	511	580	630	12	24	16
600	612	680	730	12	24	16

NOTES

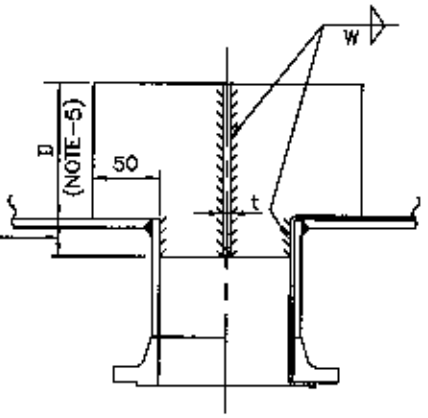
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
3. FILLET SIZE IN BRACKET ARE FOR STAINLESS STEEL / MONEL.
4. FULL FACED GASKETS SHALL BE USED.
5. DIMENSIONS EXCEPT THICKNESS FOR INTERNAL FLANGES OF SIZE 25NB OR LESS SHALL BE AS PER ASME B16.5 CLASS 150. FLANGE THICKNESS AND FACING SHALL BE EQUIVALENT TO 40NB FLANGE COVERED IN THIS STANDARD.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

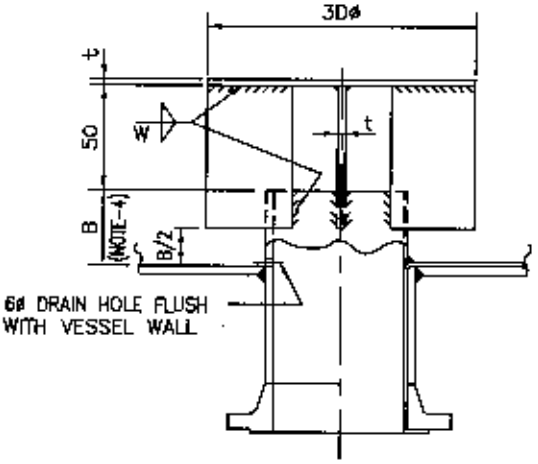


TYPE – 1A

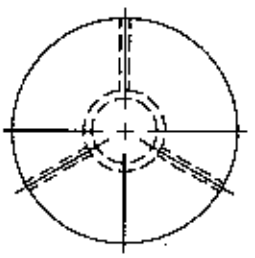


TYPE – 2A

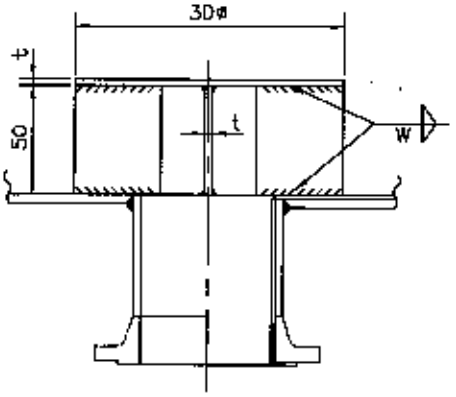
FOR NOZZLE NB ≥ 100



TYPE – 1B



PLAN VIEW FOR 1B AND 2B



TYPE – 2B

FOR NOZZLE NB < 100

VESSEL MATERIAL	CARBON STEEL/LOW ALLOY STEEL				ALLOY / ALLOY CLAD/ ALLOY LINED (NOTE–3a)	CONCRETE LINED (NOTE–3b)
CORROSION ALLOWANCE	1.5	3	4.5	6	–	–
THICKNESS 't'	6	8	12	14	5	5
WELD SIZE 'W'	6	6	8	8	5	5

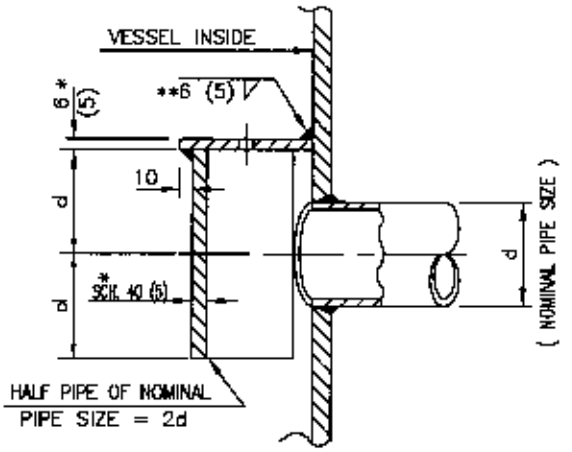
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
3. a) FOR ALLOY LINED VESSELS, THE BAFFLE MATERIAL SHALL BE SAME AS ALLOY LINING.
   b) FOR CONCRETE LINED VESSELS, THE BAFFLE MATERIAL SHALL BE ALLOY AS SPECIFIED IN ENGINEERING DRAWING.
4. REFER ENGINEERING DRAWING FOR DIMENSION 'B'.
5. 'D' DENOTES NOMINAL BORE SIZE OF SUBJECT NOZZLE.

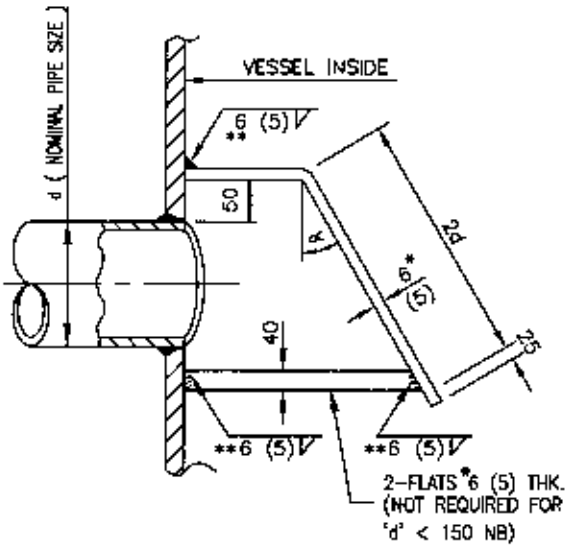
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

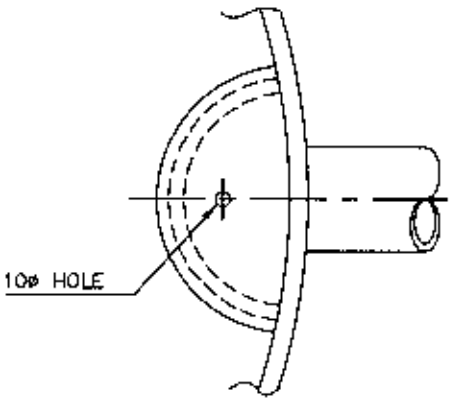
Approved by

INLET DEFLECTOR BAFFLE



TYPE-1





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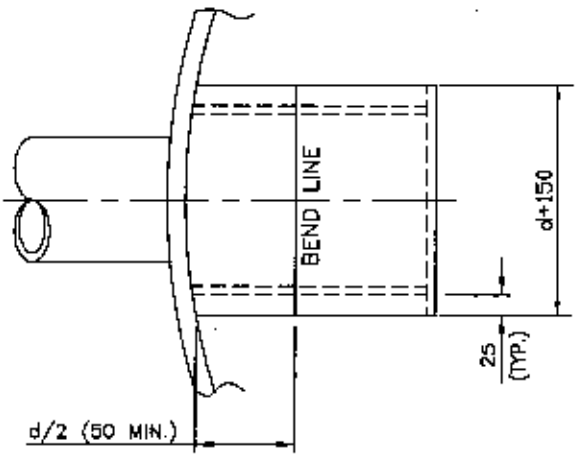
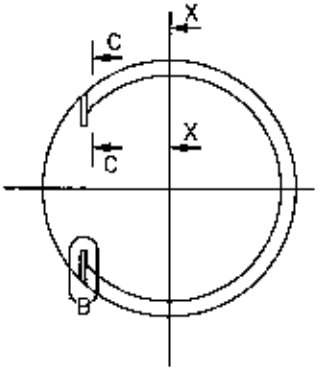


TYPE-2

NOTES

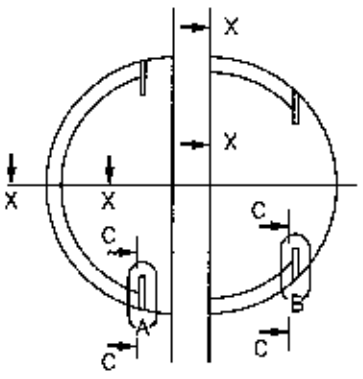
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. α = 30° UNLESS OTHERWISE STATED (TO BE ADJUSTED TO PREVENT BLOWING INTO SEAL PAN).
3. MATERIALS SHALL BE AS PER ENGINEERING DRAWING.
4. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
5. DIMENSIONS IN BRACKETS ARE FOR STAINLESS STEEL.
- * 6. INDICATED THICKNESS OF INTERNAL BAFFLE PLATE IS MINIMUM TO WHICH TWICE THE CORROSION ALLOWANCE IS TO BE ADDED.
- **7. ALL FILLET WELD SIZE SHALL BE OF 6MM MINIMUM TO WHICH THE CORROSSION ALLOWANCE IS TO BE ADDED.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN



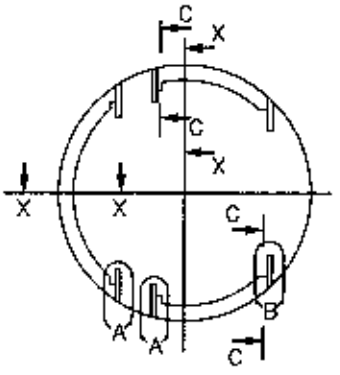
SIDE DOWNCOMER

SINGLE PASS TRAY

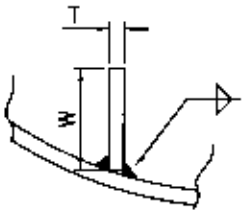


CENTRAL DOWNCOMER SIDE DOWNCOMER

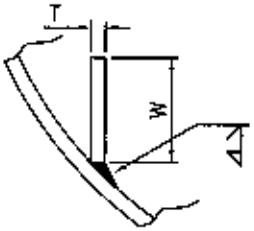
DOUBLE PASS TRAY



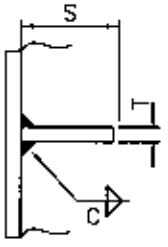
THREE PASS TRAY



DETAIL – A

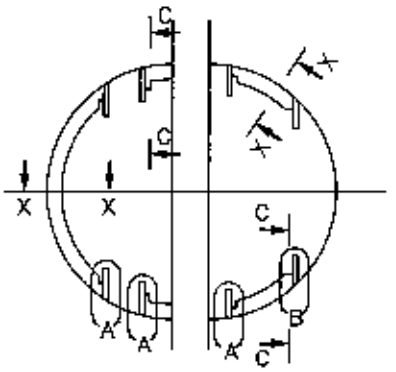


DETAIL – B



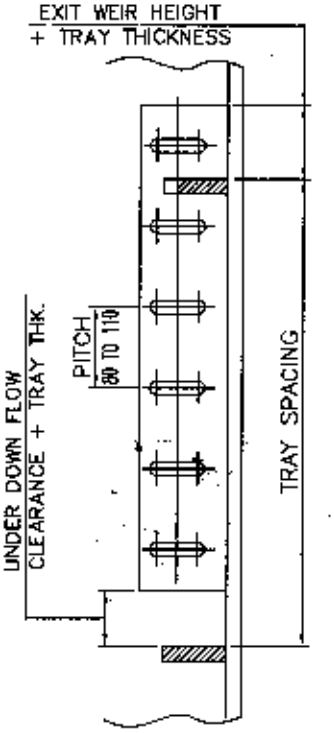
SECTION–XX

SUPP. RING THICKNESS MM	FILLET SIZE–C MM
UPTO 12	6
ABOVE 12 –UPTO 16	10
ABOVE 16	0.7 T



CENTER & OFFCENTER DOWNCOMER FOUR PASS TRAY

VESSEL I/D.	BOLTING BAR (WXT) **		SUPPORT RING (SXT) **
UPTO 1200	85 X 6	SIDE DOWNCOMER FOR SINGLE PASS AND MULTI PASS TRAYS	40 X 6 *
1201 TO 2000	110 X 6		50 X 6
2001 TO 3000	125 X 6		65 X 6
3001 TO 4500	150 X 10		75 X 10
4501 TO 6000	175 X 10		90 X 10
6001 TO 7500	200 X 10		90 X 10
7501 TO 9000	200 X 10		100 X 10
9001 TO 12000	225 X 10		110 X 10
12001 TO 14000	225 X 10		125 X 10
UPTO 1200	–	CENTRE AND OFF CENTRE DOWNCOMERS FOR MULTI PASS TRAYS	–
1201 TO 2000	125 X 6		50 X 6
2001 TO 3000	150 X 6		65 X 6
3001 TO 4500	175 X 10		75 X 10
4501 TO 6000	200 X 10		90 X 10
6001 TO 7500	225 X 10		90 X 10
7501 TO 9000	235 X 10		100 X 10
9001 TO 12000	280 X 10		110 X 10
12001 TO 14000	305 X 10		125 X 10



SECTION –CC

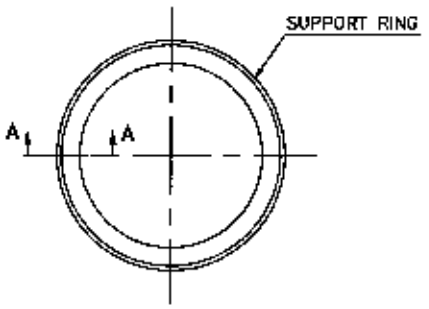
NOTES :

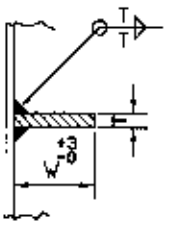
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. THIS STANDARD IS FOR THE PURPOSE OF QUOTATION / INFORMATION ONLY.
**3. FINAL DETAIL, SIZES OF TRAY SUPPORT RING, BOLTING BAR ETC. SHALL BE AS PER TRAY DRAWING.
4. INDICATED THICKNESS OF TRAY SUPPORT RINGS AND BOLTING BARS IS MINIMUM TO WHICH TWICE THE CORROSION ALLOWANCE IS TO BE ADDED.
*5. SUPPORT RING WIDTH SHALL BE 50mm WHEREVER VESSEL CORROSION ALLOWANCE IS 6mm OR MORE.
6. MATERIAL OF CONSTRUCTION SHALL BE AS PER ENGG. DRAWING.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TR	NK	BM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJR	RKT	RN

Approved by

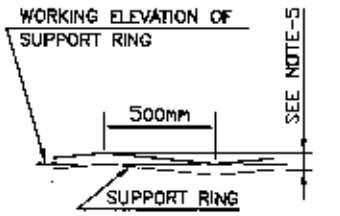
SUPPORT RING SIZES FOR PACKED TOWER'S INTERNALS

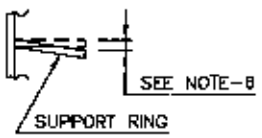




SECTION AA

TOWER INTERNAL DETAILS		INSIDE DIAMETER OF TOWER								
		250 TO 500	501 TO 900	901 TO 1600	1601 TO 3000	3001 TO 4500	4501 TO 7500	7501 TO 9000	9001 TO 12000	12001 TO 14000
TYPE OF INTERNALS	MATERIAL OF CONSTRUCTION	SIZE OF SUPPORT RING (W X T) **								
PACKING SUPPORT PLATE	METAL	* 25 X 4	* 35 X 6	50 X 6	65 X 6	75 X 10	90 X 10	100 X 10	110 X 10	125 X 10
	CERAMIC	30 X 4	50 X 6	65 X 6	–	–	–	–	–	–
LIQUID DISTRIBUTOR	METAL	* 25 X 4	* 35 X 6	50 X 6	65 X 6	75 X 10	90 X 10	100 X 10	110 X 10	125 X 10
	CERAMIC	30 X 4	50 X 6	65 X 6	–	–	–	–	–	–
REDISTRIBUTOR	METAL	* 25 X 4	* 35 X 6	50 X 6	65 X 6	75 X 10	90 X 10	100 X 10	110 X 10	125 X 10
BED LIMITER	METAL	* 45 X 4	* 45 X 6	50 X 6	65 X 6	75 X 10	90 X 10	100 X 10	110 X 10	125 X 10





NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. INDICATED THICKNESS OF SUPPORT RING IS MINIMUM TO WHICH TWICE THE CORROSION ALLOWANCE IS TO BE ADDED.
3. THIS STANDARD IS FOR PURPOSE OF QUATATION & INFORMATION ONLY. SIZE AND THICKNESS SHALL BE CHECKED FOR THE LOAD APPLIED (SUPPORTED INTERNALS + DIFFERENTIAL PRESSURE).

** 4. FINAL SIZE OF THE RING SHALL BE AS SPECIFIED ON ENGINEERING DRAWING FOR INTERNALS.

5. SUPPORT RING SHALL NOT HAVE WAVINESS EXCEEDING 1.5 mm FOR ANY 500 mm OF CIRCUMFERENTIAL LENGTH.
6. INCLINATION OF SUPPORT RING OVER ITS WIDTH SHALL NOT EXCEED 0.75 mm.

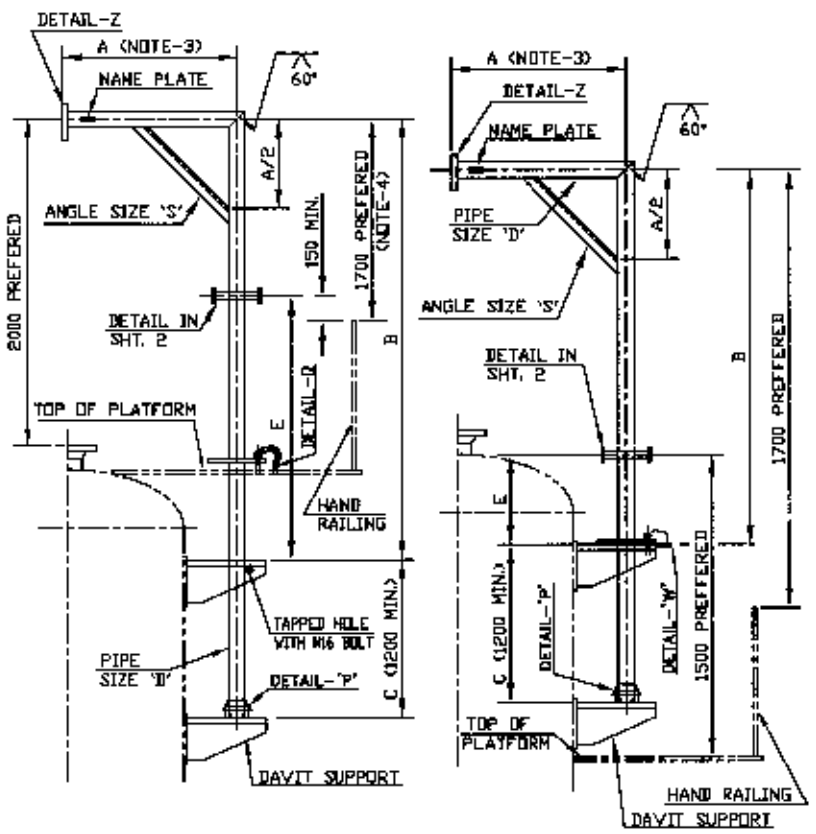
* 7. SUPPORT RING WIDTH SHALL BE MIN. 50MM WHEREVER VESSEL CORROSION ALLOWANCE IS 6.0MM OR MORE.

8. MATERIAL OF CONSTRUCTION SHALL BE AS PER ENGG. DRAWING.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

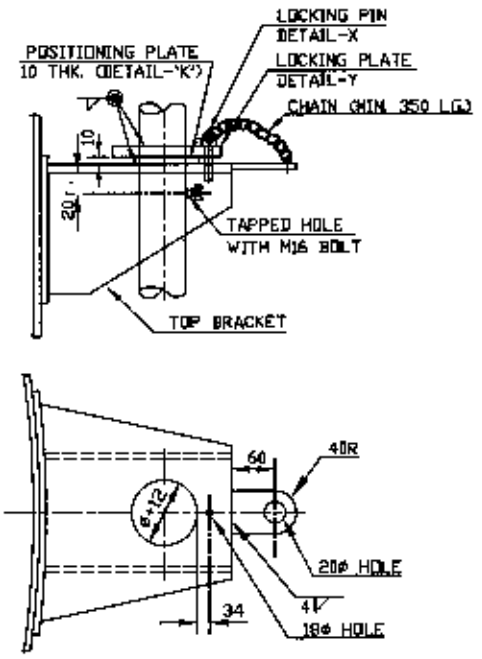
PIPE DAVIT



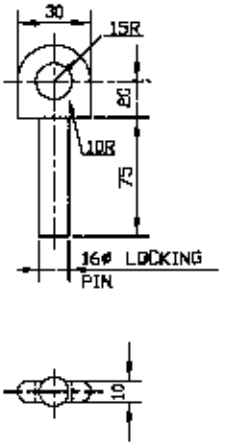
(TYPE-1)
DEVIT FOR TOP MOUNTED PLATFORM

(TYPE-2)
DEVIT FOR SIDE MOUNTED PLATFORM

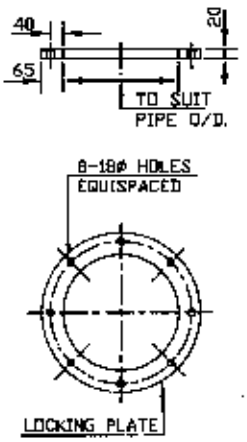
A (MAX) (mm)	B (mm)	CAPACITY (kgs.)	PIPE SIZE D	ANGLE SIZE S	R1	R2	r	t
1000	≤4000 (NOTE-13)	500	100NBxSCH.160	75x75x6	75	60	10	20
		1000	150NBxSCH.80	100x100x8	110	60	12	25
2000		500	150NBxSCH.80	100x100x8	110	60	10	20
		1000	200NBxSCH.80	150x150x10	140	60	12	25
3000		500	200NBxSCH.80	150x150x10	140	60	10	20
		1000	200NBxSCH.160	150x150x12	140	60	12	25



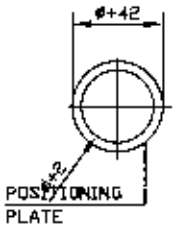
DETAIL – W



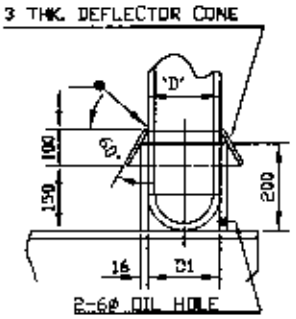
DETAIL-X



DETAIL-Y

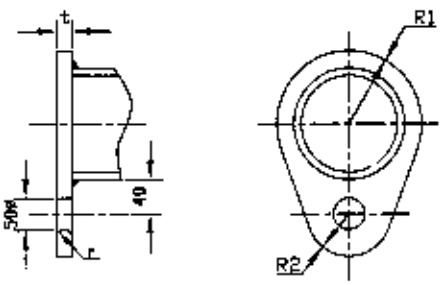


DETAIL-K



D (NB)	D1
100	120
150	175
200	225

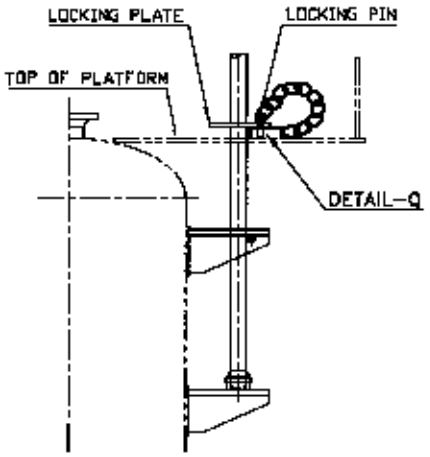
DETAIL-P



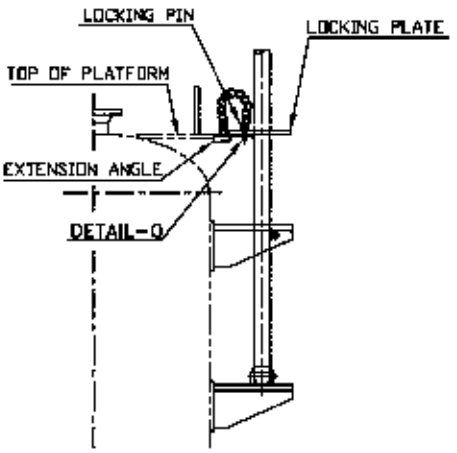
DETAIL-Z (DAVIT EYE)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

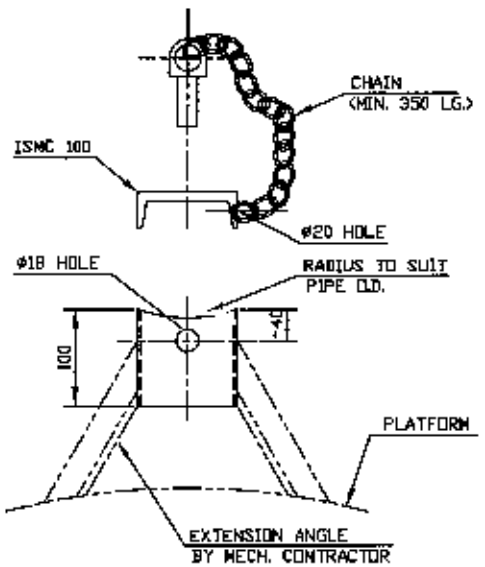
Approved by



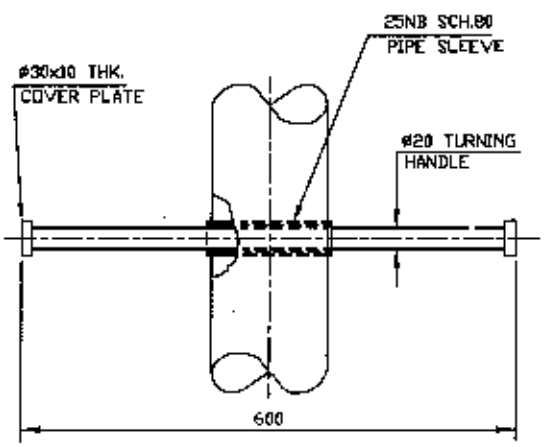
LOCKING ARRANGEMENT OF DAVIT PIPE PASSING THROUGH PLATFORM



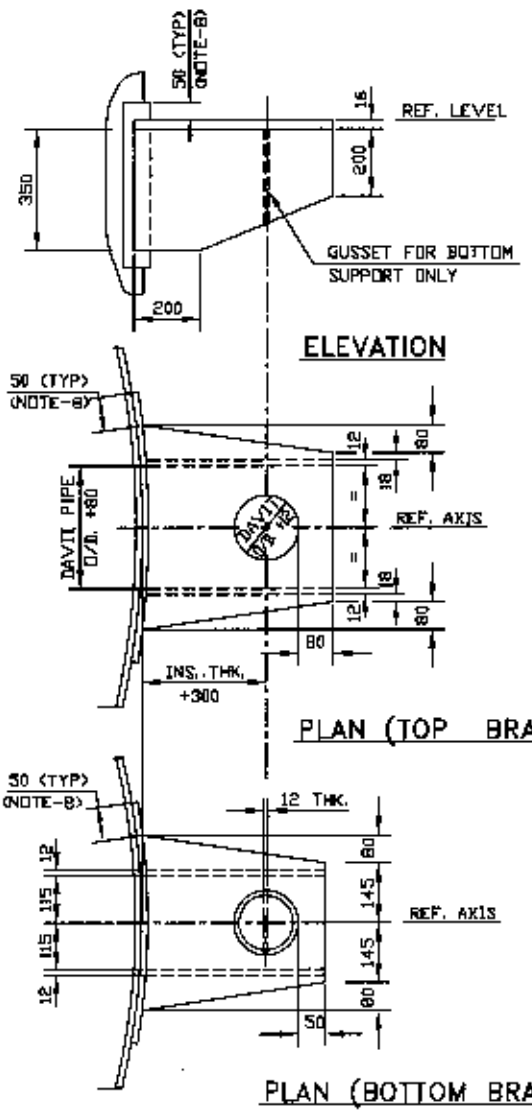
LOCKING ARRANGEMENT OF DAVIT PIPE PASSING THROUGH SIDE OF PLATFORM



DETAIL – Q

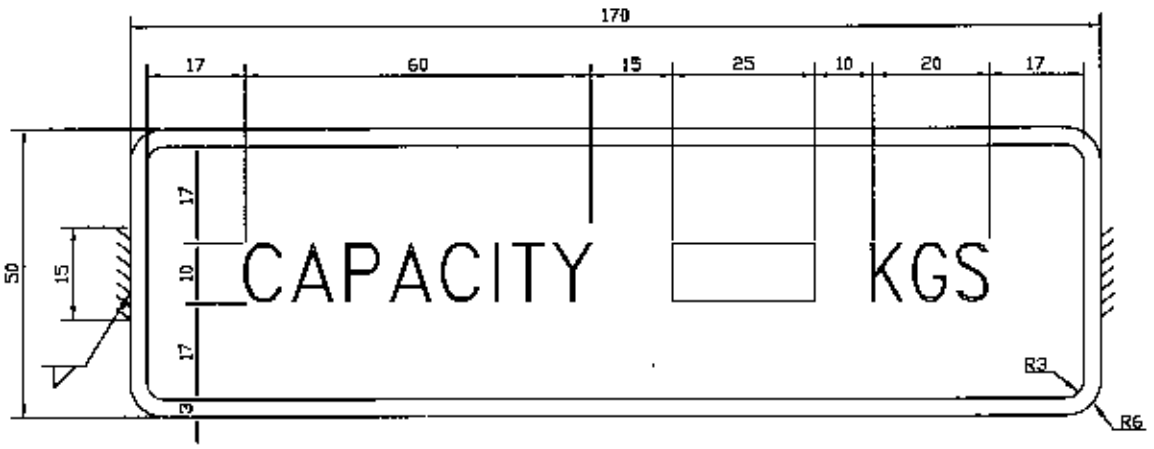


TURNING HANDLE DETAIL



DAVIT SUPPORTS

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	KK	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN



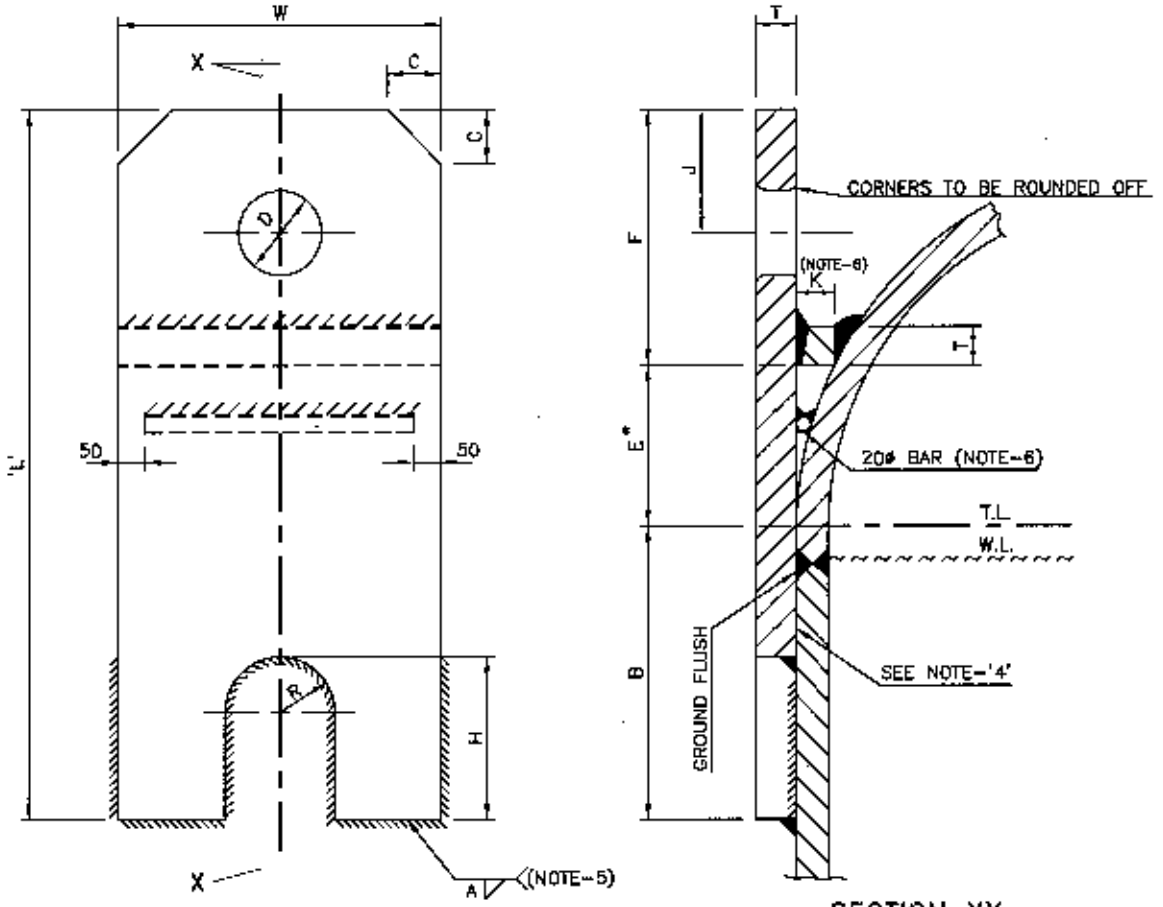
NAME PLATE

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. NAME PLATE
   a) MATERIAL STAINLESS STEEL 2mm THICK.
   b) NAME PLATE IS TO BE TACK WELDED TO THE DAVIT PIPE.
   c) THE LETTERS AND NUMBERS SHALL HAVE RAISED POLISHED FACE.
   d) BACKGROUND SHALL BE BLACK.
3. DIMENSION 'A' SHALL BE SUCH THAT THE DAVIT EYE EXTENDS PREFERABLY BY 900 mm OUTSIDE PLATFORM.
4. REFER ENGINEERING DRAWING FOR DIMENSIONS A, B, C, E, CAPACITY OF DAVIT AND INSULATION THICKNESS.
5. THE DAVIT USED SHALL CLEAR HANDRAIL OF THE EQUIPMENT.
6. MATERIAL OF PIPE SHALL BE A-53 / IS:1978 OR EQUIVALENT AND STRUCTURAL PARTS SHALL BE IS:2062 GR.B OR EQUIVALENT.
7. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
8. FOR THIN WALLED EQUIPMENT, DESIGNER SHALL ANALYSE THE STIFFNESS OF SHELL AT THE BRACKET LOCATIONS.
9. DETAIL DIMENSIONS AND NOTES IN ENGINEERING DRAWING TAKE PRECEDENCE OVER THOSE SHOWN HERE.
10. LOCKING PLATE (DETAIL -Y), LOCKING PIN (DETAIL -X) WITH CHAIN, POSITIONING PLATE (DETAIL -K), DEFLECTOR CONE (DETAIL-P) AND LOCKING SUPPORT CHANNEL (DETAIL -Q) SHALL BE SUPPLIED LOOSE BY FABRICATOR AND WELDED AT SITE BY MECHANICAL CONTRACTOR.
11. ALL FILLET WELDS SHALL BE 6 mm MINIMUM.
12. FOR LOW TEMPERATURE SERVICE, BRACKET DETAILS SHALL BE AS PER EIL STD. 7-12-0034
13. IN CASE DIMENSIONS 'B' IS BEYOND THIS STANDARD, IT IS RECOMMENDED TO INSTALL PIPE DAVIT ON STRUCTURAL PLATFORM.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by



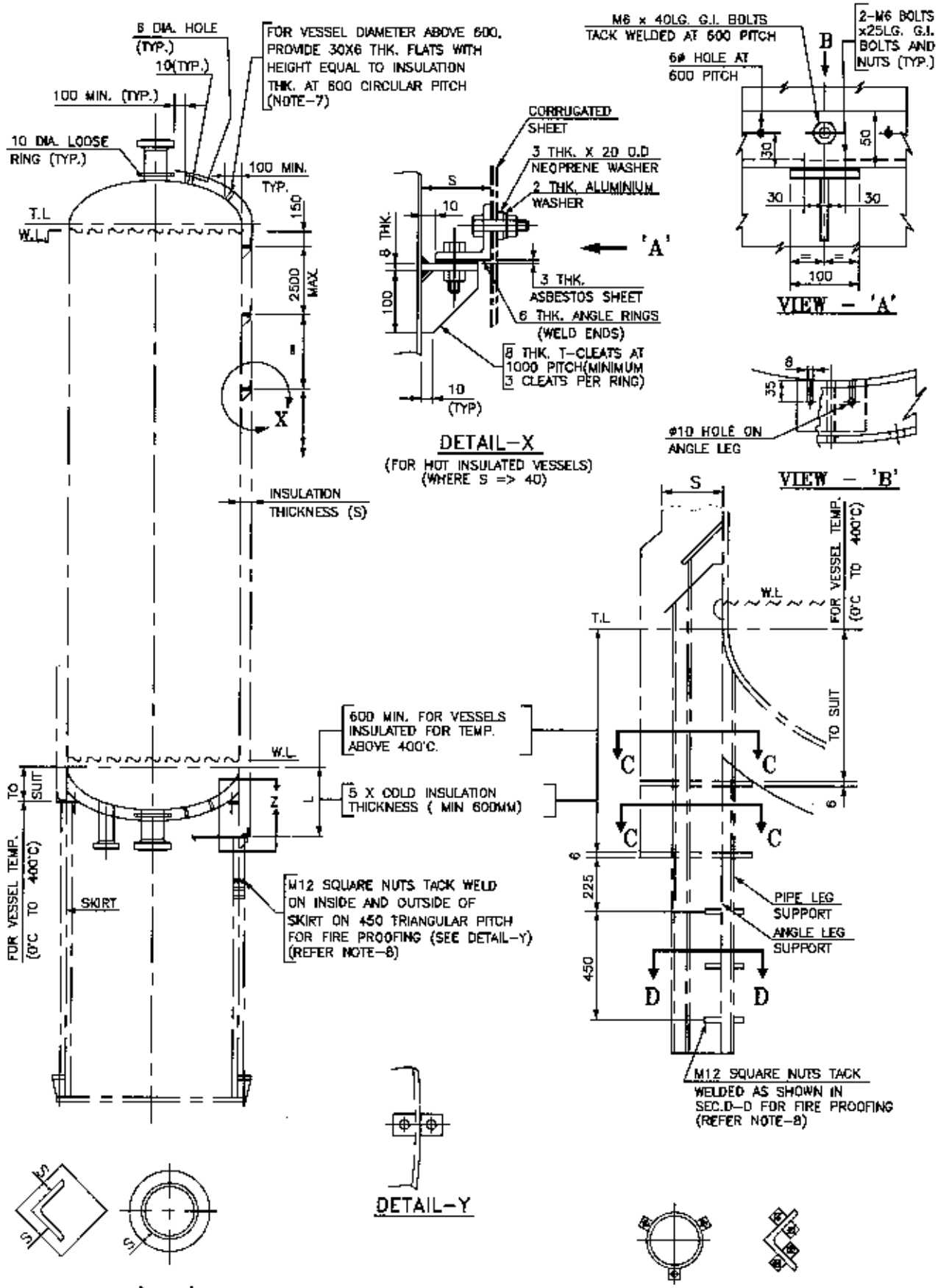
SECTION XX

MAX. ERECTION WT. OF VESSEL (TONNES)		≤10	25	45	90	140	180
THICKNESS OF PLATE (MINIMUM)	T	12	28	40	50	70	80
WIDTH	W	200	230	300	400	500	610
LENGTH	L	400+E	460+E	580+E	750+E	900+E	1080+E
DIAMETER OF HOLE	D	60	75	75	100	130	150
HEIGHT OF NOTCH & SIDE WELD	H	130	130	150	200	250	300
RADIUS OF NOTCH	R	40	40	50	75	90	100
WELD SIZE (SEE NOTE 5)	A	10	14	20	30	38	46
BOTTOM OF BRACE TO TOP OF LUG	F	200	230	300	400	500	600
BOTTOM OF BRACE TO T.L. OF HEAD	E	SEE NOTE 2					
T.L. OF VESSEL TO BOTTOM OF LUG	B	200	230	280	350	400	480
	C	30	40	50	70	90	100
TOP OF LUG TO ℄ OF HOLE	J	90	90	115	150	180	230
	K	30	40	50	70	80	100
NO. OF LUGS		2	2	2	2	2	2

NOTES

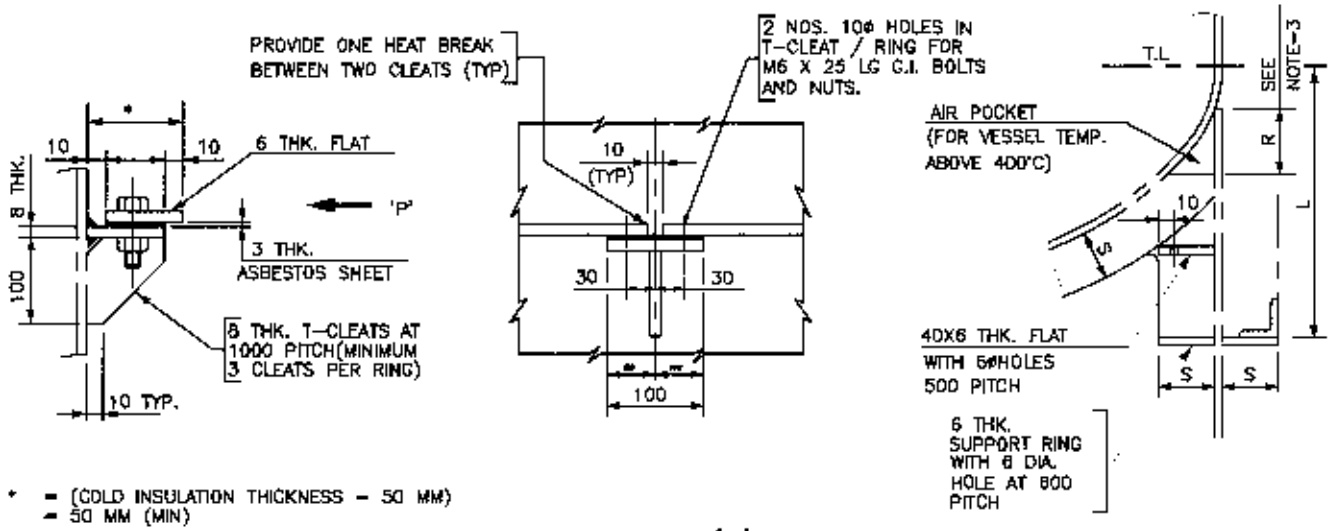
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
*2. DIMENSION 'E' IS TO BE DETERMINED BY THE SHAPE OF HEAD IN CONJUNCTION WITH DIMENSION 'K'.
3. DETAIL DIMENSIONS AND NOTES GIVEN IN ENGINEERING DRAWING TAKE PRECEDENCE OVER THOSE SHOWN HERE.
4. FOR THIN WALLED EQUIPMENTS, DESIGNER SHALL ANALYSE THE STIFFENESS OF SHELL AT THE LIFTING LUG LOCATION.
5. IF PADS ARE USED ON STAINLESS STEEL EQUIPMENTS THE SIZE OF FILLET WELD BETWEEN SHELL AND STAINLESS STEEL PAD SHALL BE ANALYSED.
6. MATERIAL SHALL BE COMPATIBLE WITH HEAD MATERIAL.
7. FOR INTERMEDIATE ERECTION WEIGHT, NEXT HIGHER SIZE OF LIFTING LUG SHALL BE USED.
8. LIFTING LUG SHALL BE MACHINED TO COVER OFFSET BETWEEN OUTER DIAMETERS OF SHELL AND HEAD.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
9	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	KR	NK	SM
8	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN



Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	KSM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

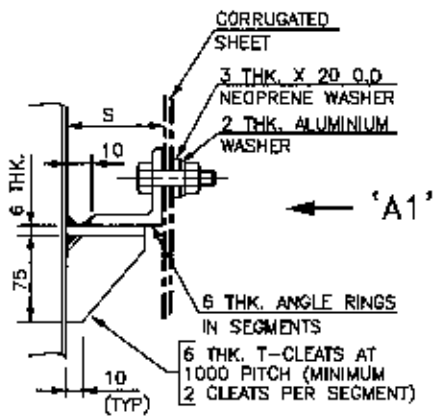


* = (COLD INSULATION THICKNESS − 50 MM)
= 50 MM (MIN)

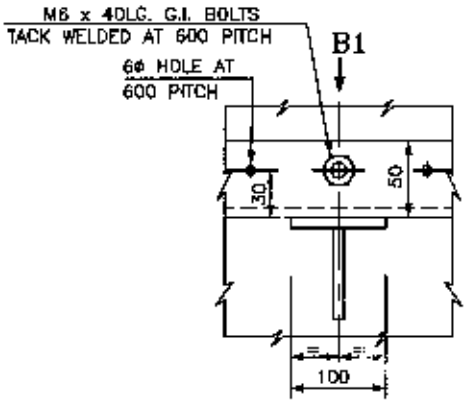
VIEW − 'P'

DETAIL − 'Z'

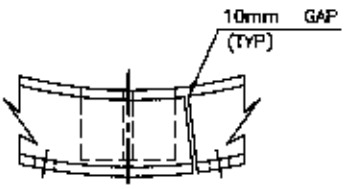
DETAIL−X
(FOR COLD INSULATED VESSELS)



DETAIL−X
(FOR HOT INSULATED VESSELS)
(WHERE S < 40)



VIEW − 'A1'



VIEW − 'B1'

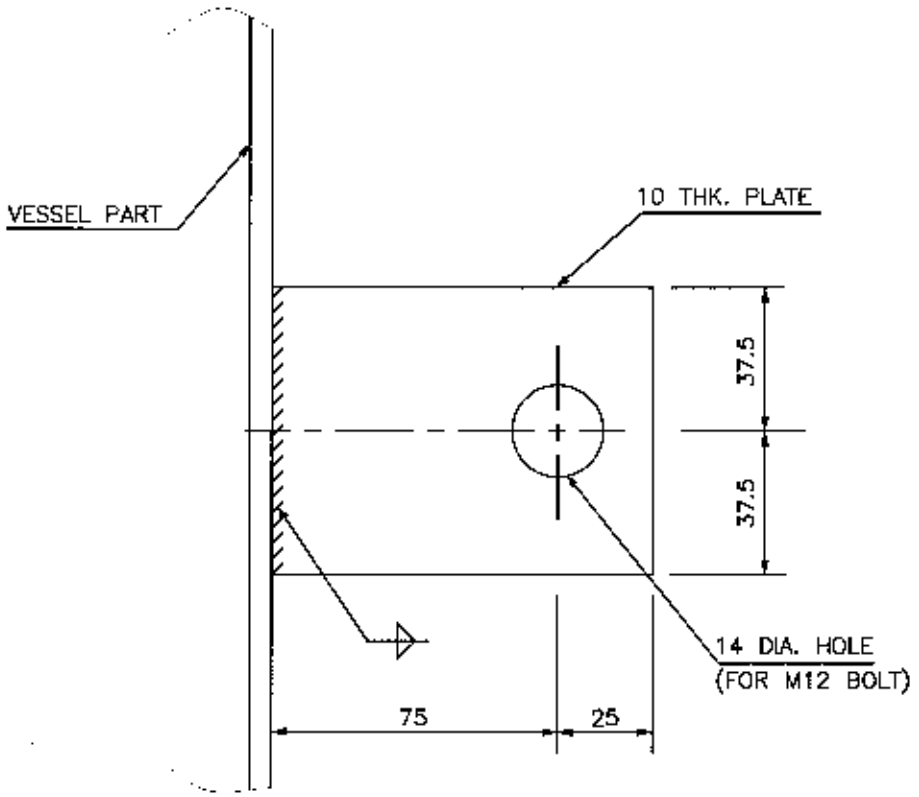
NOTES

1. ALL DIMENSIONS ARE IN mm.
2. FOR MATERIAL SPECIFICATION REFER ENGINEERING DRAWING.
3. 'R' SHALL BE EQUAL TO 175mm FOR VESSELS UPTO 3000mm DIAMETER AND 300mm FOR VESSELS ABOVE 3000mm DIAMETER.
4. DETAILS, DIMENSIONS AND NOTES ON ENGINEERING DRAWING SHALL TAKE PRECEDENCE OVER THOSE SHOWN HEREIN.
5. CLIPS SHALL CLEAR WELD SEAMS AND INSULATION RINGS SHALL BE SUITABLY NOTCHED INCASE OF INTERFERENCE WITH NOZZLES/ATTACHMENTS.
6. ONLY T−CLEATS WITH ASBESTOS SHEET AND G.I. BOLTINGS, ANGLE RING ALONG WITH TACK WELDED BOLTS, INSULATION SUPPORT CLEATS WELDED TO EQUIPMENT, LOOSE RINGS & M12 NUTS SHALL BE SUPPLIED BY EQUIPMENT FABRICATOR.
7. a) FOR COLD INSULATED VESSELS CLEATS ON DISHED ENDS ARE NOT REQUIRED.
   b) FOR COLD INSULATED VESSELS CLEATS ON SHELL ARE TO BE PROVIDED IF COLD INSULATION THICKNESS IS MORE THAN 60mm.
8. FOR UNINSULATED VESSELS SQUARE NUTS SHALL BE PROVIDED FOR ENTIRE HEIGHT OF SUPPORT (SKIRT, PIPE/ANGLE LEG).

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TR	NK	
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

EARTHING LUG



NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL EQUIPMENTS SHALL BE PROVIDED WITH TWO(2) EARTHING LUGS, UNLESS OTHERWISE STATED.

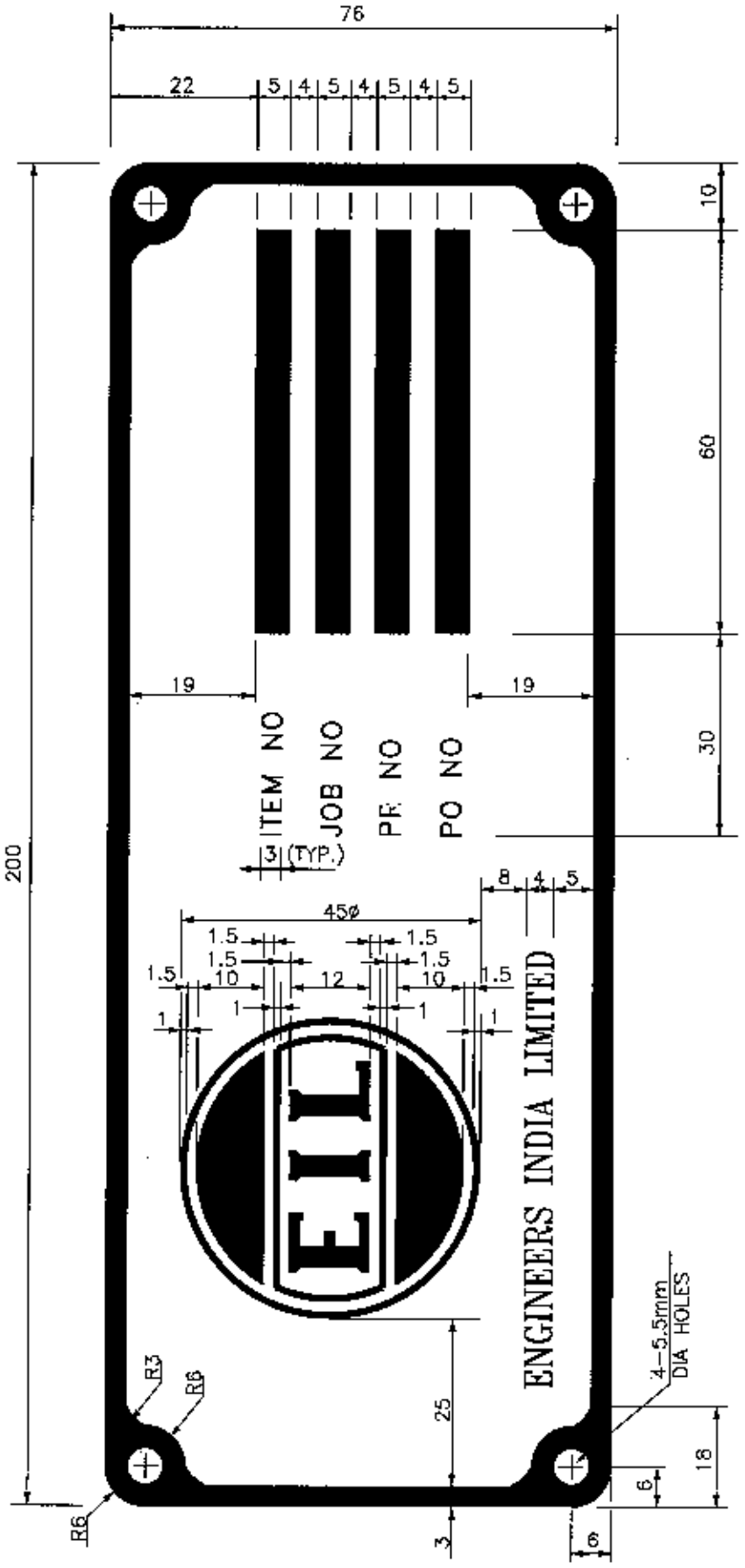
3.(a) EARTHING LUGS SHALL BE LOCATED DIAMETRICALLY OPPOSITE ON NORTH–SOUTH CENTER LINE ON SKIRT SUPPORTED EQUIPMENTS, ON ANY TWO(2) LEGS OF THREE(3) LEG SUPPORTED VERTICAL VESSEL, ON DIAMETRICALLY OPPOSITE LEGS OF FOUR(4) LEG SUPPORTED VERTICAL VESSEL AND ON EACH SADDLE OF HORIZOTAL VESSEL.

(b) TWO(2) EATHING LUGS ARE TO BE LOCATED ON EACH SADDLE OF HORIZONTAL VESSEL OF LENGTH GREATER THAN 20 METERS.

(c) FOR SPHERE, TOTAL 4–NOS. OF EARTHING LUGS SHALL BE PROVIDED PREFERABLY ON DIAMETRICALLY OPPOSITE AND EQUALLY SPACED LEGS. (SPHERES ARE USUALLY PROVIDED WITH LEGS IN NUMBERS WHICH ARE MULTIPLE OF 4 FOR THE SYMMETRY)

4. DO NOT WELD EARTHING LUG ON PRESSURE PART.
5. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
6. MATERIAL OF CONSTRUCTION SHALL BE CARBON STEEL.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairmen
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN



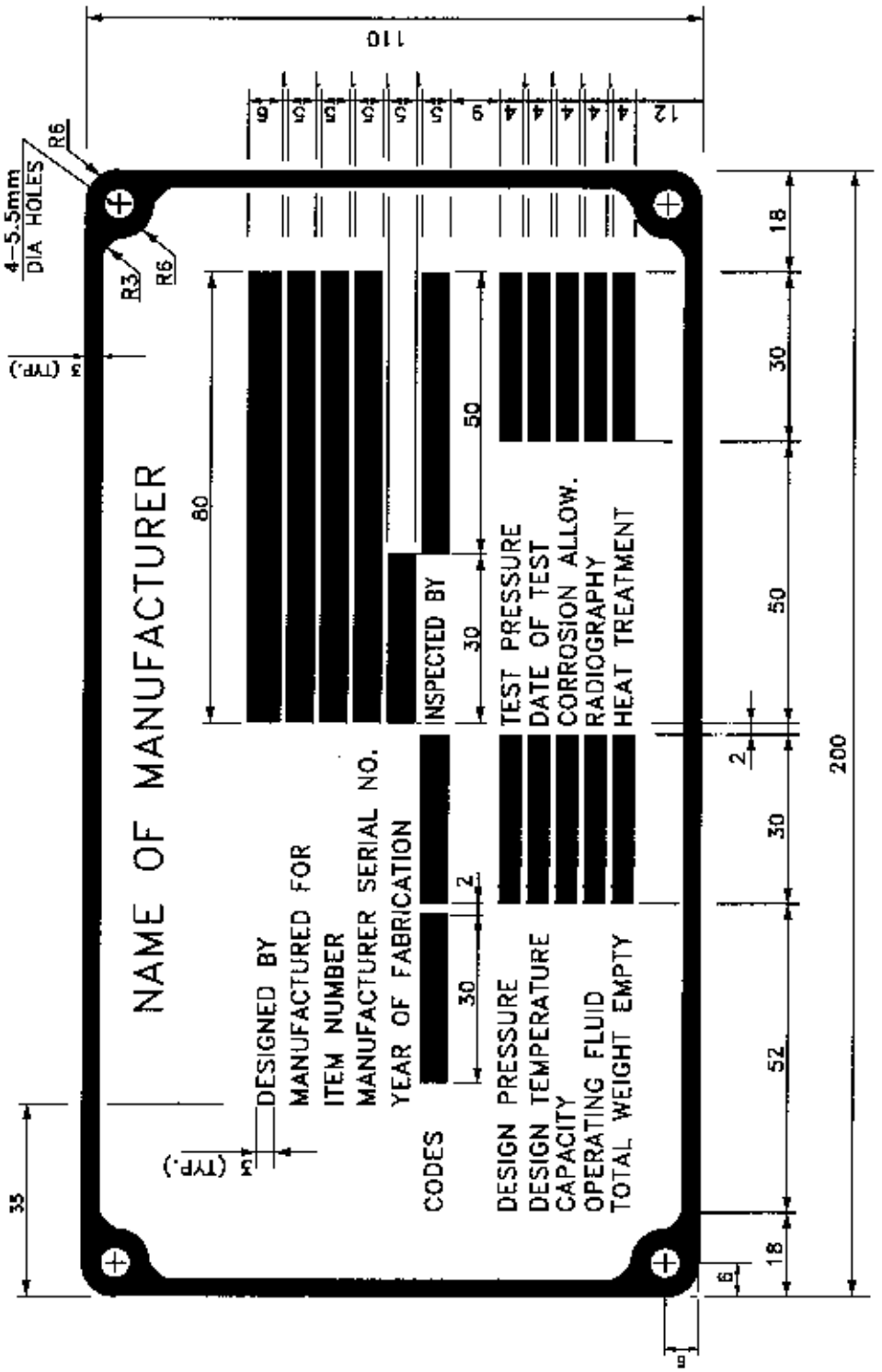
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL LETTERS, BLOCKS AND BORDER SHALL BE OF RAISED POLISHED FACE.
3. BACK GROUND SHALL BE BLACK.
4. NAME PLATE SHALL BE TACK–WELDED TO THE BRACKET. WHERE NOT POSSIBLE IT MAY BE RIVETTED.
5. REFER STANDARD 7–12–029 FOR BRACKET DETAIL OF NAME PLATE.
6. NAME PLATE SHALL BE OF STAINLESS STEEL OF 2mm THICK.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	PK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

MANUFACTURER NAME PLATE



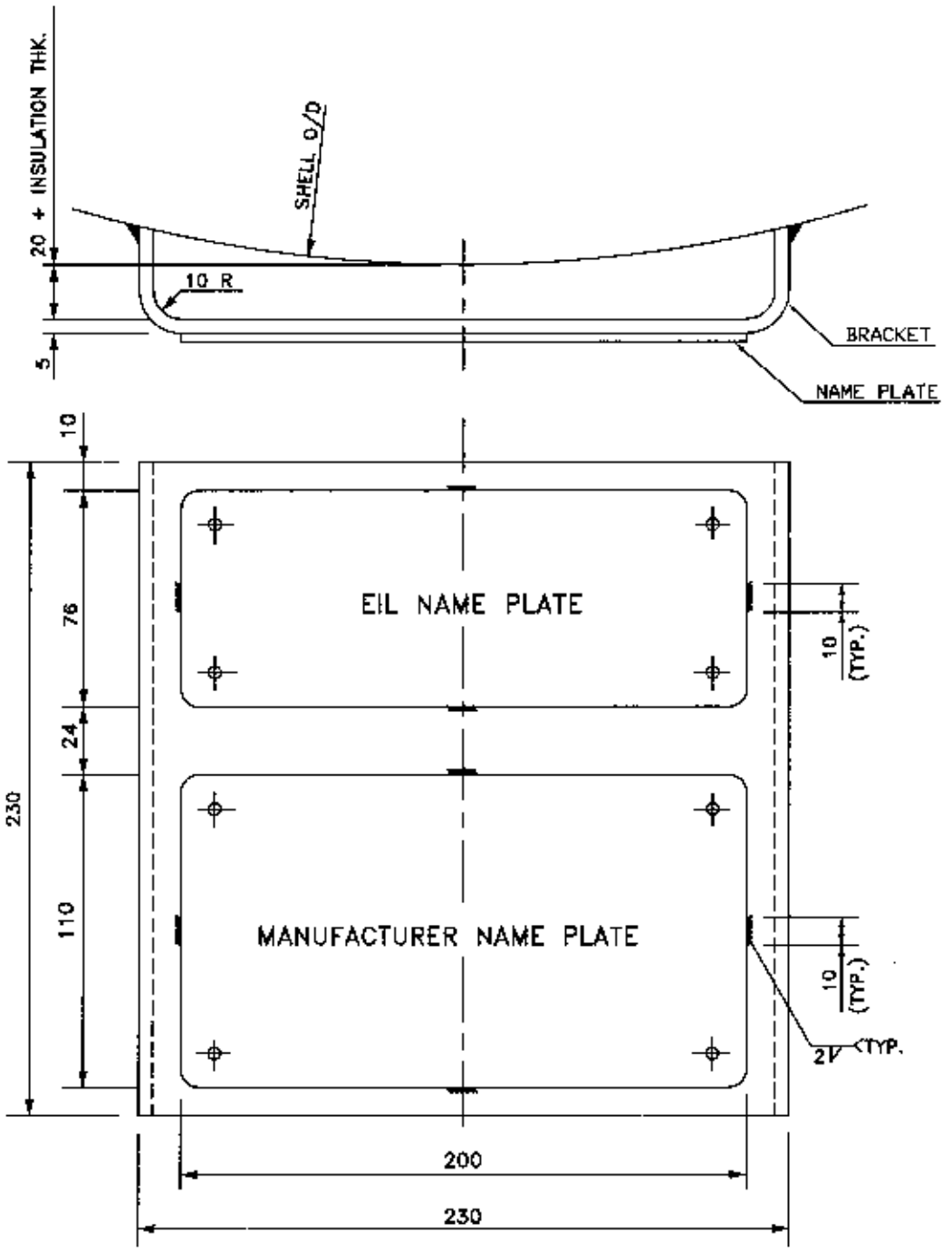
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL LETTERS, BLOCKS AND BORDER SHALL BE OF RAISED POLISHED FACE.
3. BACK GROUND SHALL BE BLACK.
4. NAME PLATE SHALL BE TACK-WELDED TO THE BRACKET. WHERE NOT POSSIBLE IT MAY BE RIVETTED.
5. REFER STANDARD 7-12-029 FOR BRACKET DETAIL OF NAME PLATE.
6. NAME PLATE SHALL BE OF STAINLESS STEEL OF 2mm THICK.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

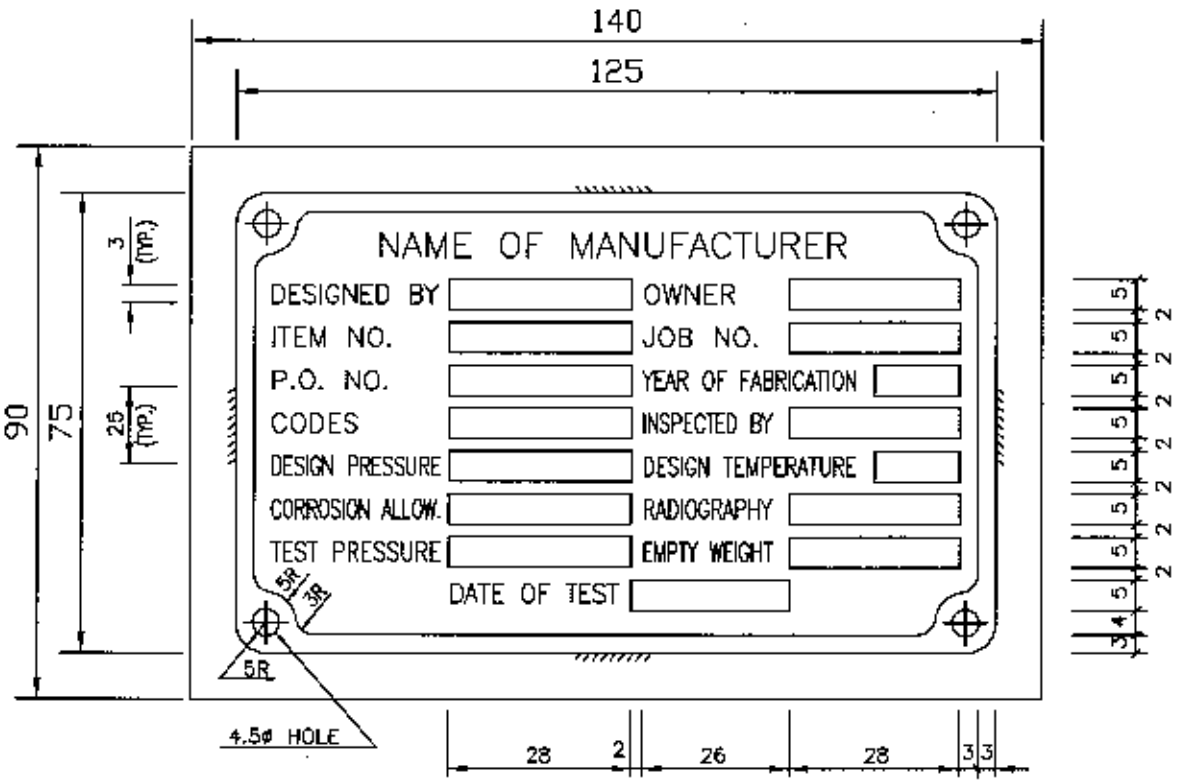
BRACKET FOR NAME PLATE

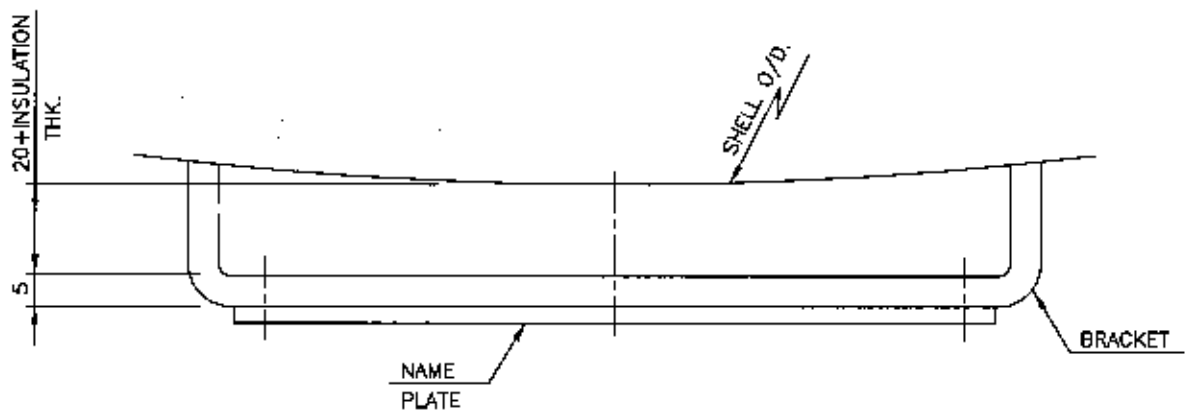


NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. BRACKET MATERIAL SHALL BE SAME AS SHELL MATERIAL.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJK	RKT	RN



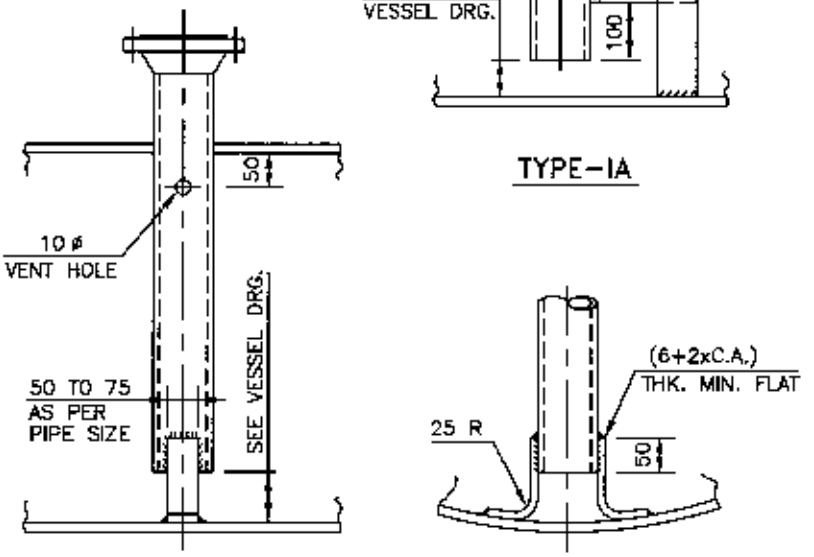


NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. ALL LETTERS, BLOCKS AND BORDERS SHALL BE RAISED POLISHED FACE.
3. BACKGROUND SHALL BE BLACK.
4. NAME PLATE SHALL BE TACK–WELDED TO THE BRACKET. WHERE NOT POSSIBLE IT MAY BE RIVETTED.
5. NAME PLATE SHALL BE OF STAINLESS STEEL OF 2mm THICK.
6. BRACKET MATERIAL SHALL BE SAME AS SHELL MATERIAL.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	BM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

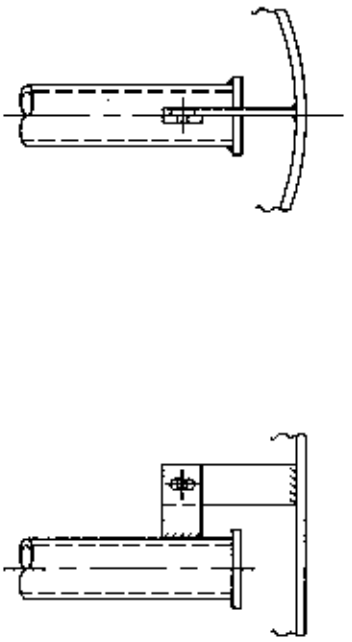


TYPE–IA

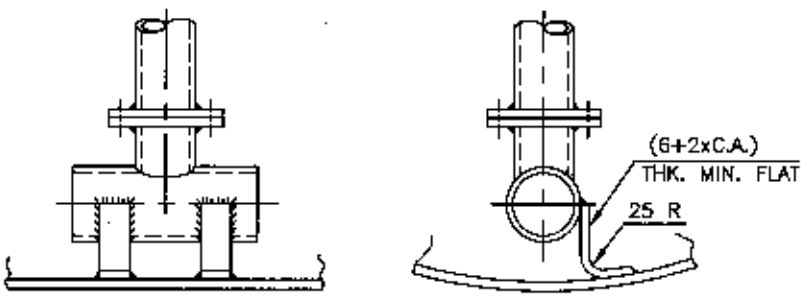
TYPE–I

INTERNAL FEED PIPE FOR HORIZONTAL VESSEL

NOTE TYPE–IA IS APPLICABLE FOR LARGE THERMAL EXPANSION

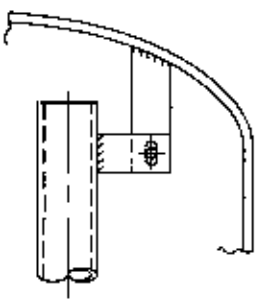


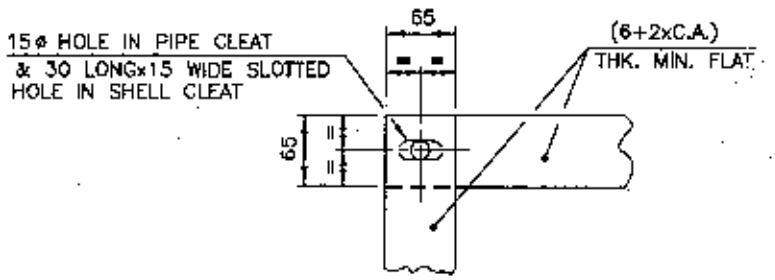
SPARGER/FEED PIPE SUPPORT (AIR / GAS SERVICE)



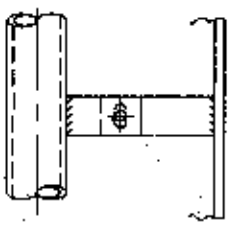
TYPE–2

INTERNAL SPLASH FEED PIPE FOR HORIZONTAL VESSEL





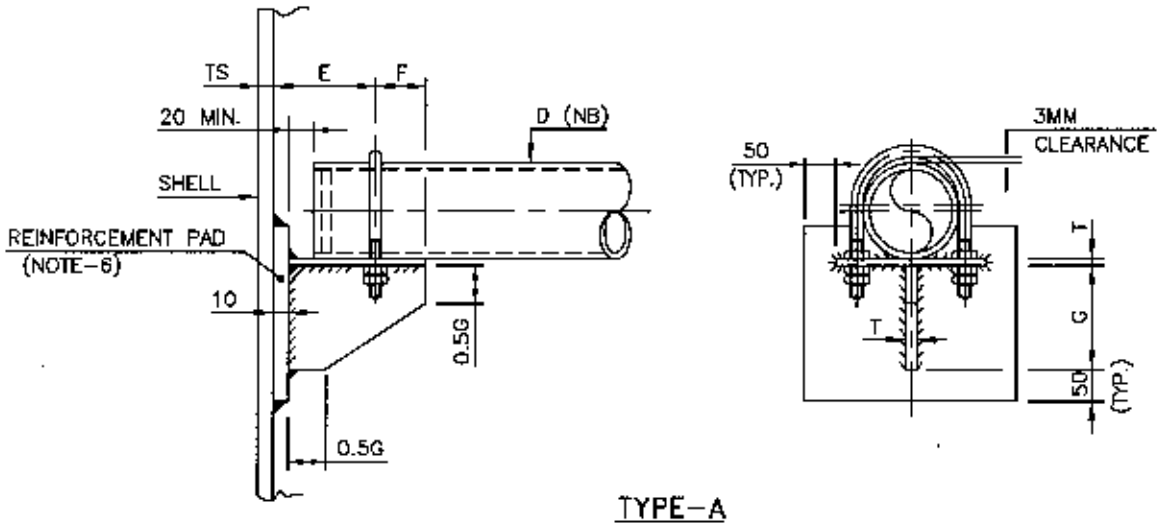
TYPICAL DETAIL OF BOLTING CLEATS



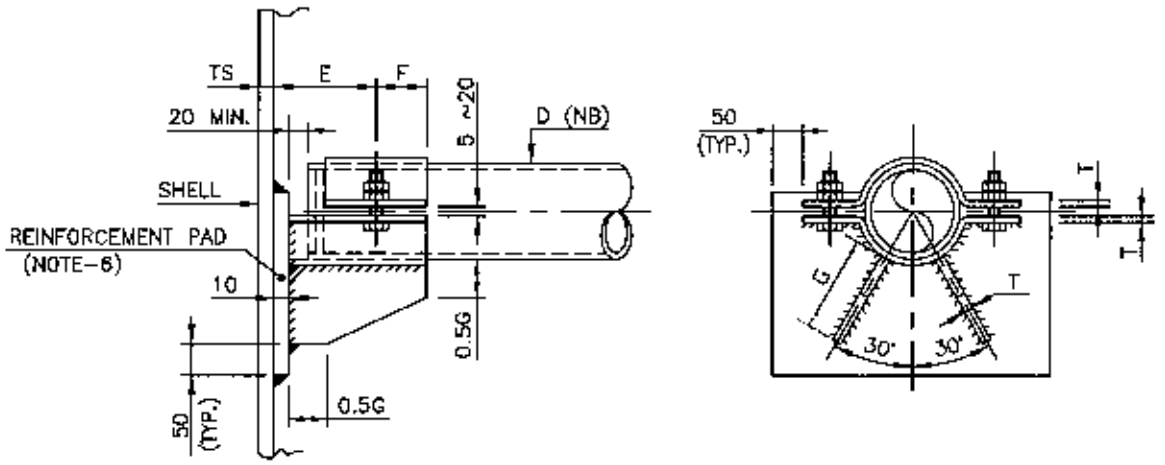
SUPPORT CLEAT FOR VERTICAL VESSEL

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by



TYPE-A
(FOR PIPES UPTO 250NB)



TYPE-B
(FOR PIPES ABOVE 250NB)

INTERNAL FEED PIPE FOR VERTICAL VESSEL/COLUMN

PIPE N.B. D	BOLT SIZE	T					E	F	G
		CA=0	CA=1.5	CA=3	CA=5	CA=7			
50 – 80	M 12	6	10	12	16	20	60	40	60
100 – 200	M 16	10	14	16	20	25	100	50	100
250 ~ OVER	M 16	14	18	20	25	28	150	100	150

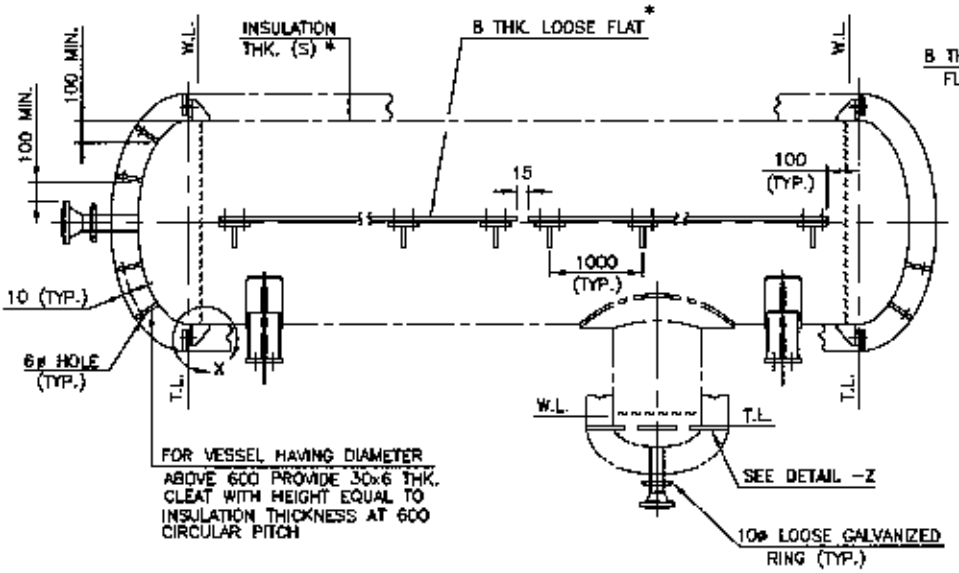
NOTES

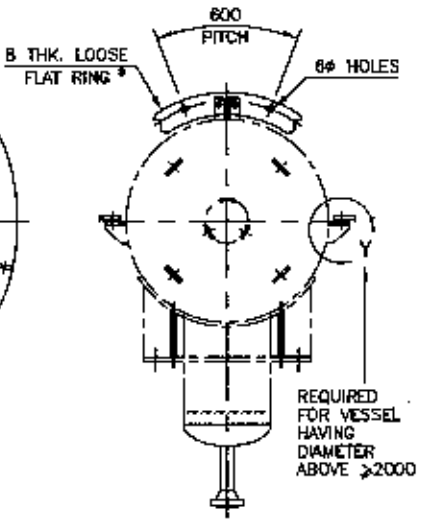
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT VESSEL ENGG. DRAWING SHALL GOVERN.
3. MATERIAL OF CLEATS SHALL BE AS PER VESSEL ENGG. DRAWING.
4. ALL FILLET WELDS TO BE ALL AROUND & SIZE OF WELDS ARE (6+1xC.A.) MINIMUM UNLESS OTHERWISE STATED.
5. ALL INTERNAL BOLTS SHALL BE MIN. M 12 SIZE AND OF STAINLESS STEEL WITH DOUBLE NUTS.
6. REINFORCING PAD SHALL BE LARGER BY 50mm ALL AROUND THAN BRACKET CLEATS. NO PAD IS REQUIRED FOR VESSELS WITH WALL THICKNESS GREATER THAN 25mm.

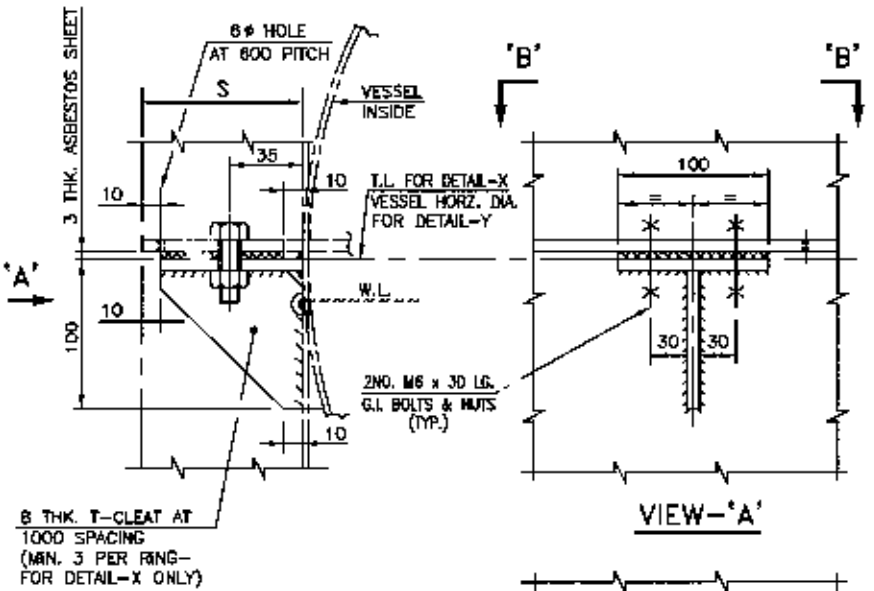
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJK	RKT	RN

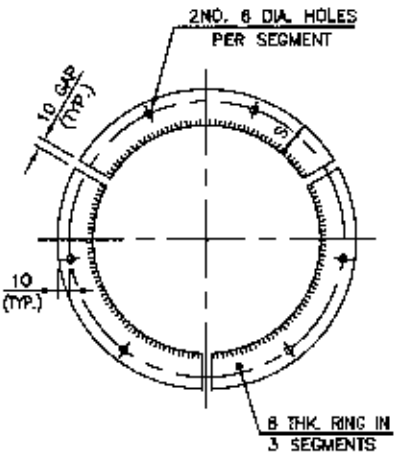
Approved by

HOT INSULATION SUPPORTS FOR HORIZONTAL VESSEL



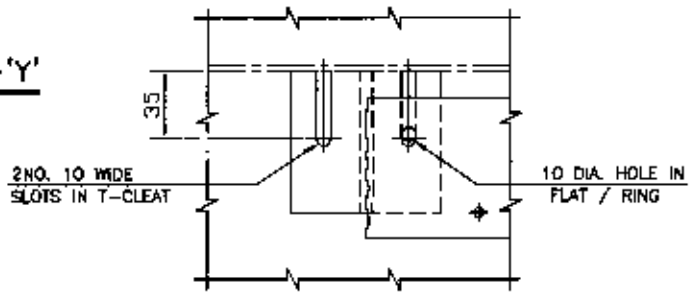






DETAIL-'Z' (PLAN)

DETAIL-'X'/ DETAIL-'Y'
(SEE NOTE-6)



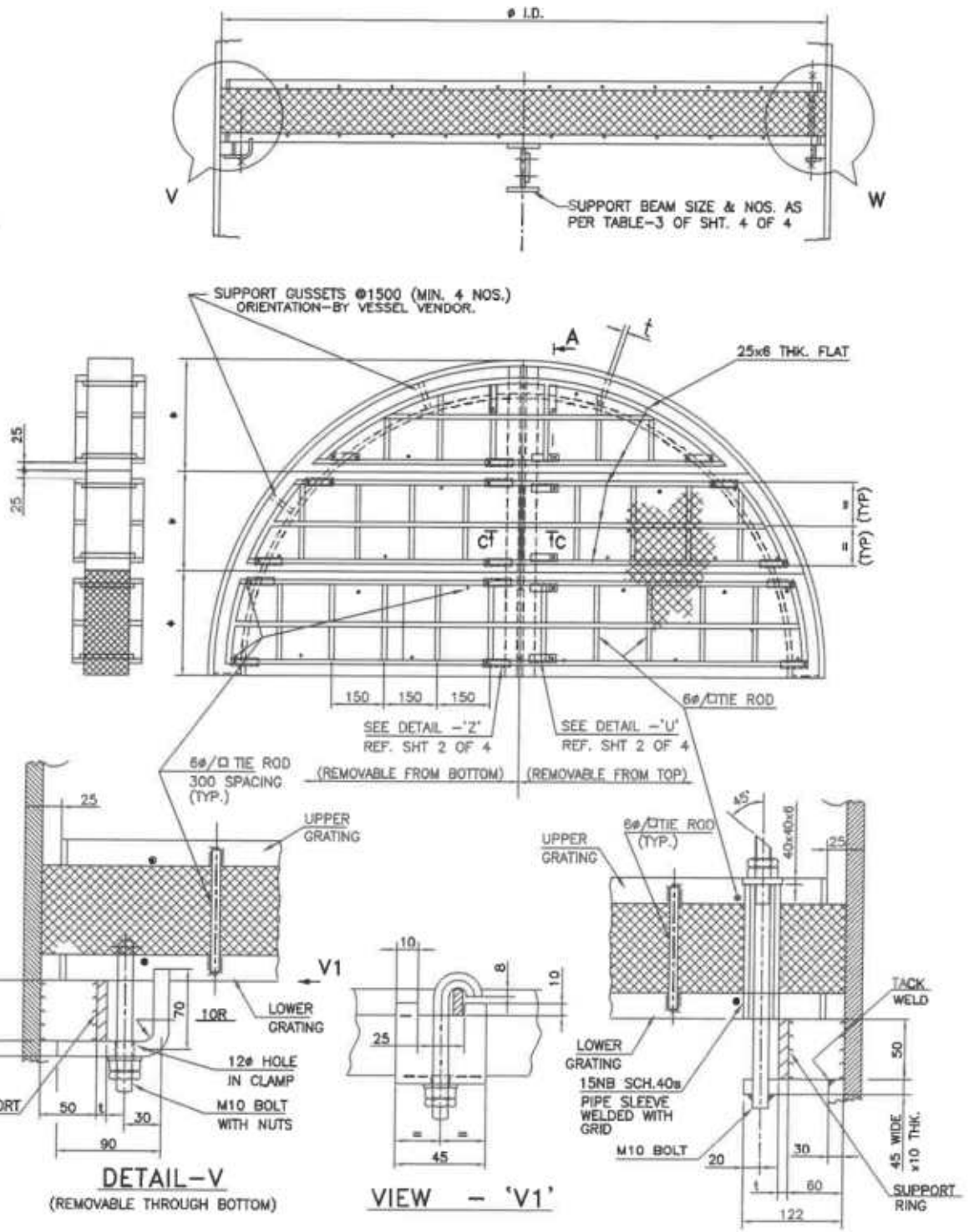
VIEW 'B-B'

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. FOR MATERIAL SPECIFICATION REFER ENGINEERING DRAWING.
3. DETAILS, DIMENSIONS AND NOTES ON ENGINEERING DRAWING SHALL TAKE PRECEDENCE OVER THOSE SHOWN HEREIN.
4. CLEATS SHALL CLEAR WELD SEAMS AND IN CASE OF INTERFERENCE WITH NOZZLES/ATTACHMENTS, INSULATION RINGS SHALL BE NOTCHED/MODIFIED SUITABLY.
5. ONLY T-CLEATS WITH ASBESTOS SHEET, G.I. BOLTING, INSULATION SUPPORT CLEATS AND LOOSE RING/FLAT SHALL BE SUPPLIED BY THE EQUIPMENT FABRICATOR.
- * 6. FOR INSULATION THICKNESS (S) 40mm AND LESS, ONLY RINGS AND FLATS IN PIECES SHALL BE DIRECTLY WELDED TO SHELL/HEAD, AS SHOWN IN DETAIL-'Z'.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	UNIKHIL	TK	NK	SM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

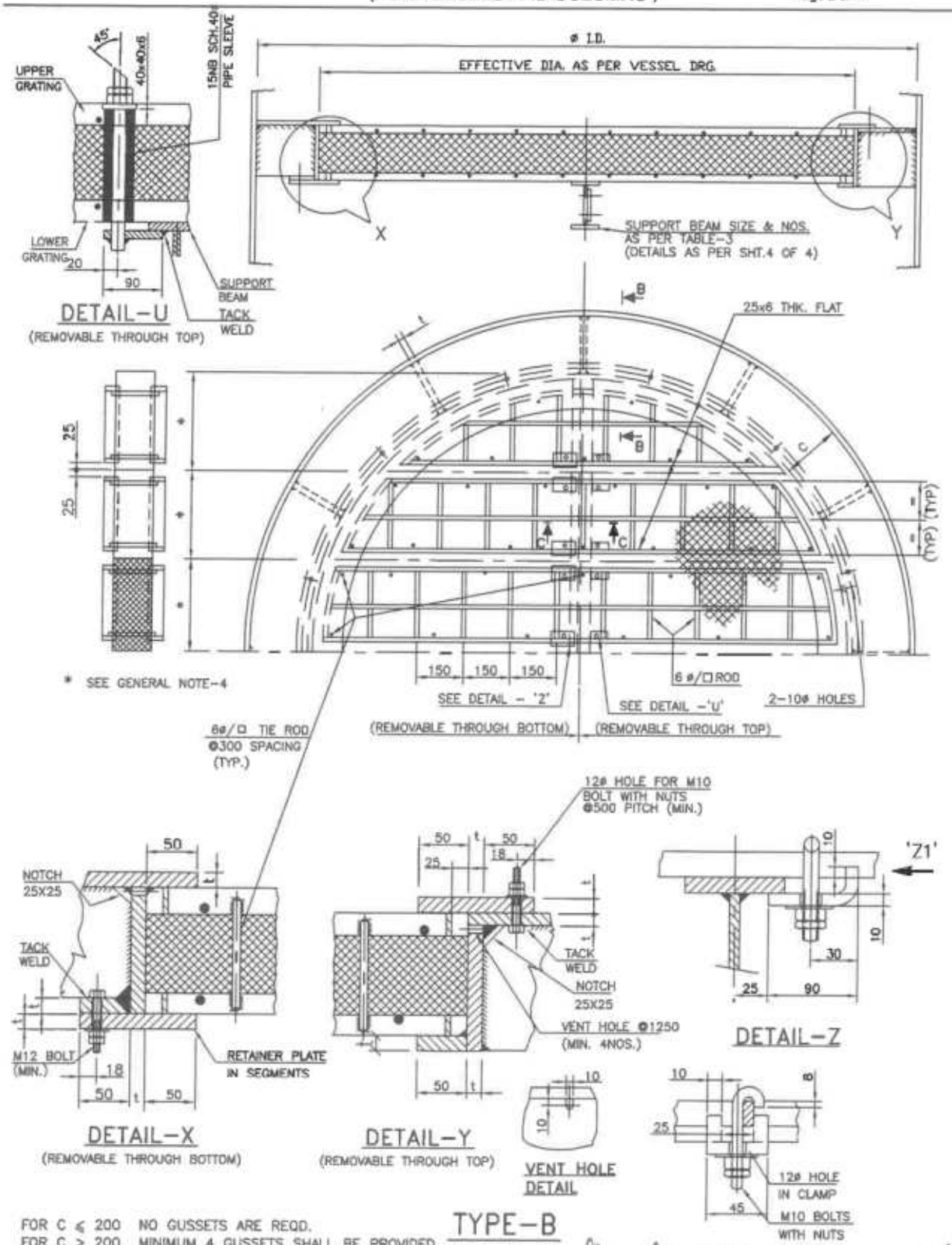
Approved by



* SEE GENERAL NOTE-4

TYPE-A

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKh	KA/NK	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

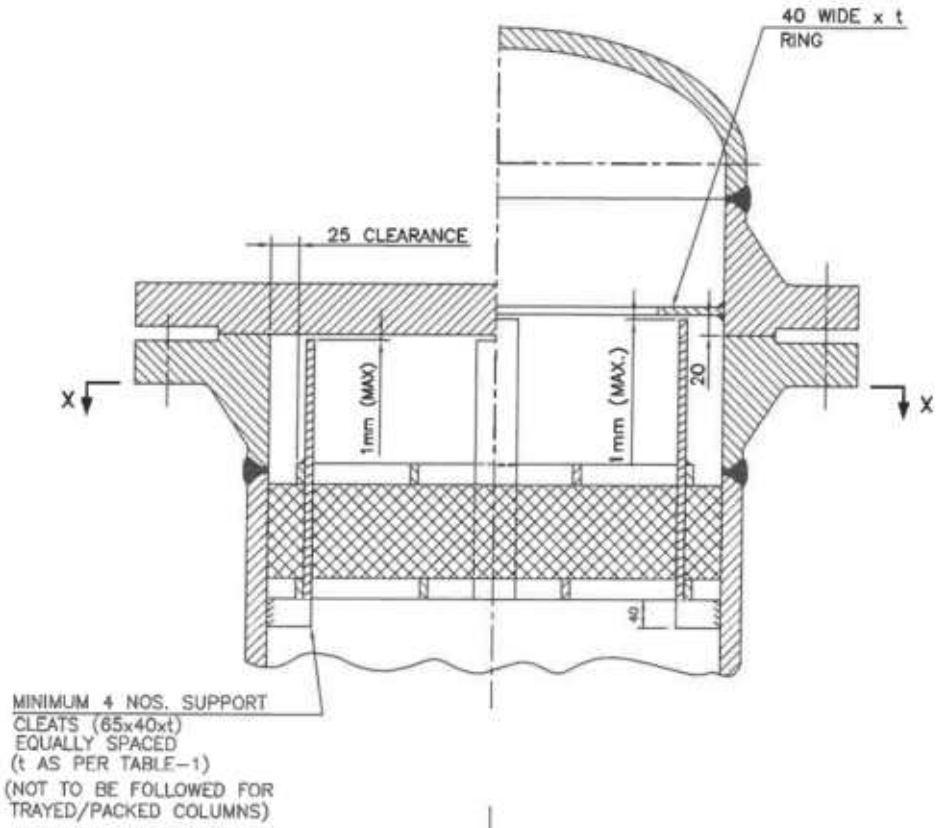


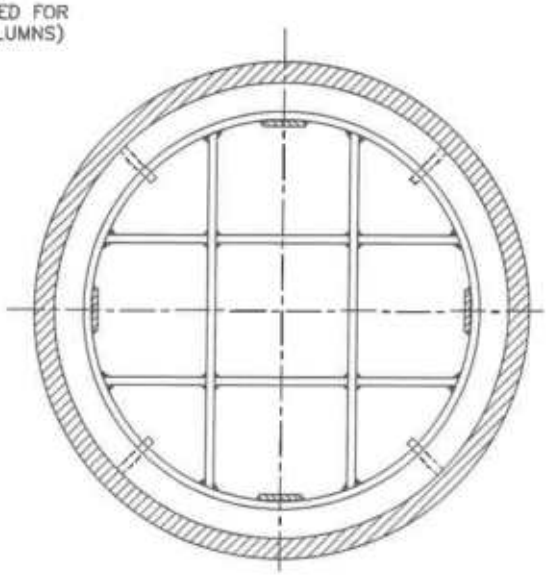
FOR C ≤ 200 NO GUSSETS ARE REQD.
FOR C > 200 MINIMUM 4 GUSSETS SHALL BE PROVIDED. @1250 (MIN. 4 NOS.)

TYPE-B

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKh	FRANK Nalin	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

Approved by





SECTION X-X

TYPE-C

NOTES

1. THIS TYPE IS APPLICABLE FOR VESSELS WITH REMOVABLE COVERS.
2. GRATING FRAME AND HOLD DOWN BARS TO BE MADE FROM 25 X 6 THK. PLATE.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKh	KJH/NK/Nalin	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

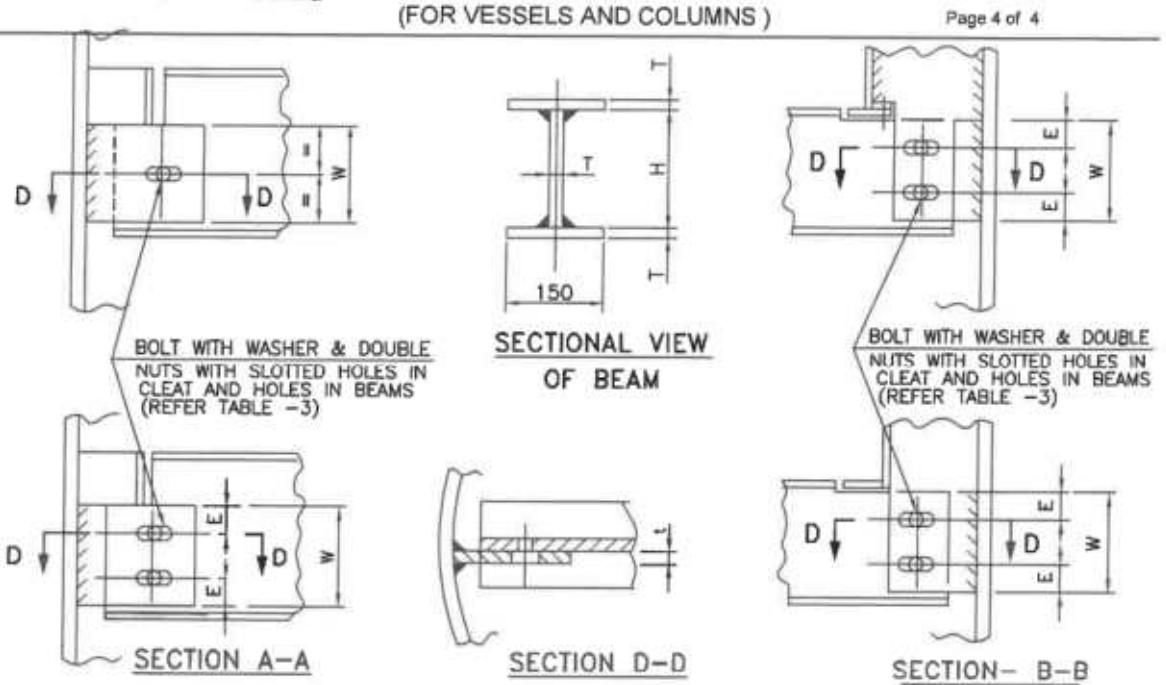


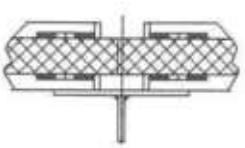
TABLE-1

CORROSION ALLOWANCE	SUPPORT CLEAT/RING THICKNESS (t)			
	CARBON & LOW ALLOY		STAINLESS STEEL⊕	
	UPTO 3000 ø	ABOVE 3001 ø	UPTO 3000 ø	ABOVE 3001 ø
0	6	10	6	10
1.5	10	14		
3.0	12	16		
6.0	18	22		

⊕ IF CORROSION ALLOWANCE IS SPECIFIED IN VESSEL DRG. THEN ADD 2xCA

TABLE-2

CORROSION ALLOWANCE	MIN. FILLET WELD SIZE
0	6
1.5	8
3.0	10
6.0	12



SECTION- C-C
(REFER NOTE-4)

TABLE-3

VESSEL I.D.(D)/ DEMISTER EFFECTIVE DIA.	NO. OF SUPPORT BEAM	T						BOLT SIZE	SLOTTED HOLE	HOLE SIZE (ø)	NO OF BOLT		E	W
		H	CARBON STEEL AND LOW-ALLOY STEEL CORROSION ALLOWANCE				S. STEEL (ADD 2xC.A.)				TYPE-A	TYPE-B		
			0.0	1.5	3.0	6.0								
UPTO 1800	–													
1801 ≤ 3600	1	150	6	10	12	18	6	M16	18X30	20	1	2	30	90
3601 ≤ 5400	2	200						M16	18X30	20	2		35	125
5401 ≤ 7200	3	300						M20	22X36	24			50	175
7201 ≤ 9000	4	400						M24	26X40	28			50	325

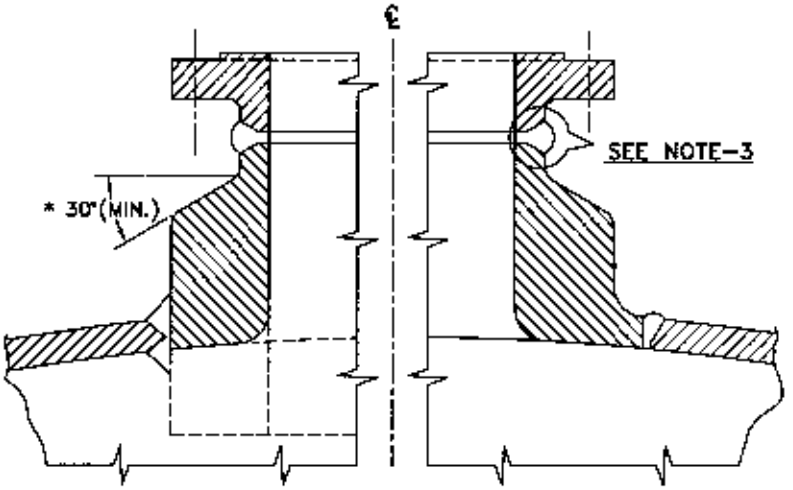
GENERAL NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DEMISTER TYPE AND MATERIAL SHALL BE AS PER VESSEL DRAWING.
3. ALL INTERNAL BOLTS SHALL BE STAINLESS STEEL, OTHER MATERIALS SHALL BE AS PER VESSEL DRAWING.
4. WIDTH AND LENGTH OF EACH DEMISTER PIECE SHALL BE DECIDED BY VENDOR. HOWEVER THE WIDTH OF EACH PIECE SHALL BE SUCH THAT THE SAME CAN PASS THROUGH THE MANHOLE. THE LENGTH OF EACH PIECE SHALL NOT EXCEED 2.5 M.
5. ANY DETAIL SHOWN IN VESSEL DRAWING SHALL BE GIVEN PREFERENCE TO THAT OF STANDARD.
6. WIDTH OF SUPPORTING RING SHALL BE DECIDED BY VENDOR BASED ON LOADINGS.
7. DEMISTER PAD SHALL BE SUPPLIED SUITABLY OVER SIZED FOR SNUG FITTING.

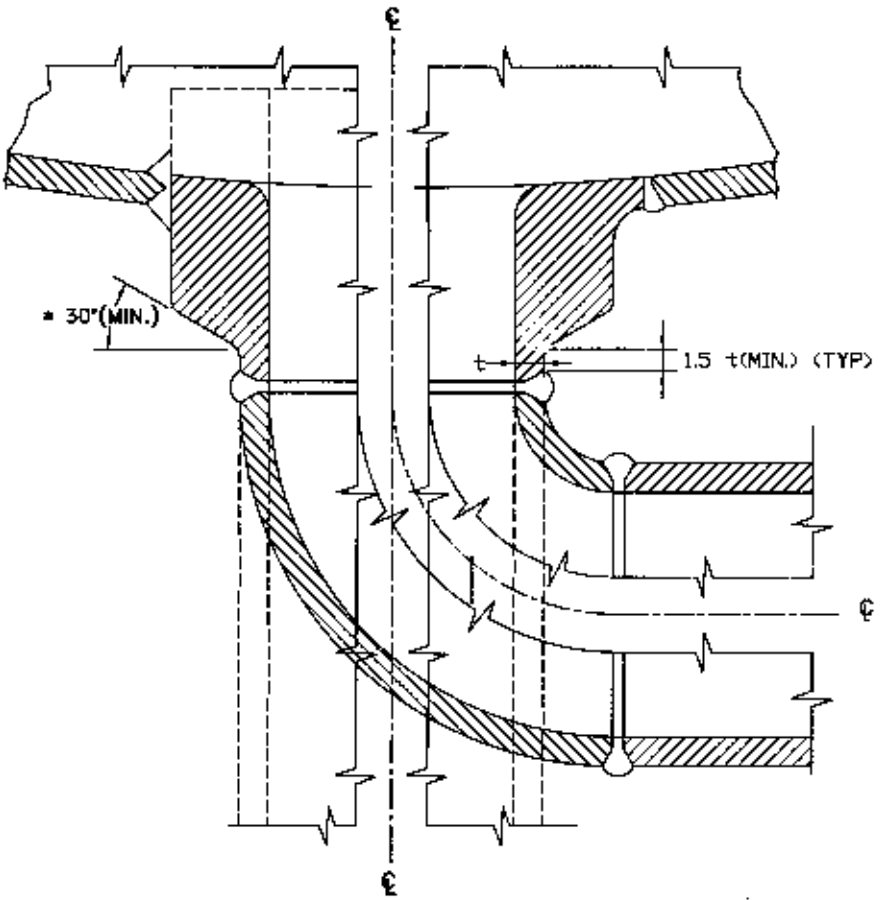
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKH	RAINK	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

Approved by

S. R. NOZZLE NECK



SELF REINFORCED NOZZLE



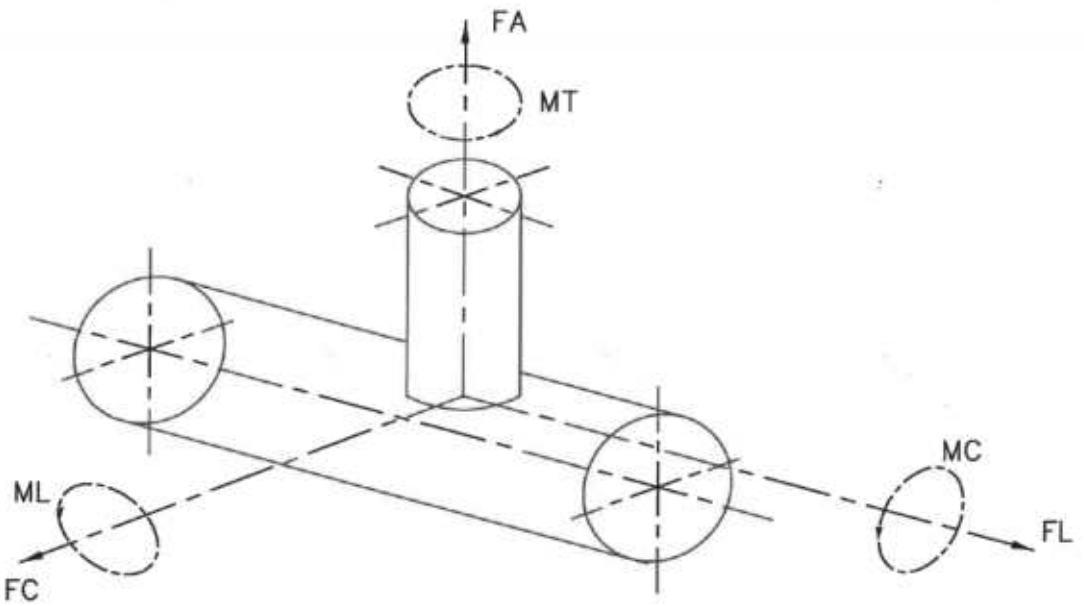
SELF REINFORCED WELD ENDS

NOTES :-

1. DESIGN CALCULATION FOR ALL THE DIMENSIONS OF S.R. NOZZLES / WELD ENDS SHALL BE APPROVED BY EIL.
2. ANY DEVIATION IN THE OVERALL PROJECTION FROM THE SPECIFIED DESIGN DATA SHALL BE MADE ONLY AFTER OBTAINING PRIOR APPROVAL FROM EIL.
3. FLANGES MAY BE FORGED INTEGRALLY WITH S.R. NOZZLE NECK.
4. I.D. OF FORGING SHALL BE AS SPECIFIED ON ENGG. DATA SHEET.
5. * APPLICABLE FOR ASME SEC. VIII DIV.1 EQUIPMENT ONLY.
6. ALL SHARP CORNERS SHALL BE ROUNDED-OFF SMOOTH.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
5	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SK
4	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by



NOTES: –

1. THIS STANDARD COVERS ALLOWABLE NOZZLE LOADS FOR PRESSURE VESSELS & COLUMNS ONLY.
2. EACH PROCESS NOZZLE OF VESSELS SHALL BE ANALYZED FOR THE LOADS PROVIDED IN THIS STANDARD.
3. THESE LOADS SHALL BE CONSIDERED TO BE ACTING SIMULTANEOUSLY WITH INTERNAL/EXTERNAL DESIGN PRESSURE. ALLOWABLE STRESS SHALL BE AS PER APPLICABLE DESIGN CODE.
4. STRESS CALCULATIONS SHALL BE CARRIED OUT AS PER WRC BULLETIN NO. 537/ 297 (AS APPLICABLE). WRC 537 SHALL BE USED FOR NOZZLES ON DISHED ENDS AND WRC 297 SHALL BE USED FOR NOZZLES ON CYLINDRICAL SHELL.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
2	02.12.2024	REVISED AND REISSUED AS STANDARD	JS/SM	TKh	KA/NK	MN
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.14	ISSUED AS STANDARD	GCP	KA	RKT	SC

CARBON STEEL AND LOW ALLOY STEEL EQUIPMENTS (CLASS 150 AND CLASS 300)

NOZZLE SIZES (DN)	FA (Kgf)	FL (Kgf)	FC (Kgf)	MT (Kgf–m)	ML (Kgf–m)	MC (Kgf–m)
50	135	200	200	50	40	30
80	202	300	300	112	90	67
100	270	400	400	200	160	120
150	405	600	600	450	360	270
200	540	800	800	800	640	480
250	675	1000	1000	1250	1000	750
300	810	1200	1200	1800	1440	1080
350	945	1400	1400	2450	1960	1470
400	1080	1600	1600	3200	2560	1920
450	1215	1800	1800	4050	3240	2430
500	1350	2000	2000	5000	4000	3000
600	1620	2400	2400	7200	5760	4320
650	1755	2600	2600	8450	6760	5070
700	1890	2800	2800	9800	7840	5880
750	2025	3000	3000	11250	9000	6750
800	2160	3200	3200	12800	10240	7680
850	2295	3400	3400	14450	11560	8670
900	2430	3600	3600	16200	12960	9720
950	2565	3800	3800	18050	14440	10830
1000	2700	4000	4000	20000	16000	12000
1050	2835	4200	4200	22050	17640	13230
1100	2970	4400	4400	24200	19360	14520
1150	3105	4600	4600	26450	21160	15870
1200	3240	4800	4800	28800	23040	17280
1250	3375	5000	5000	31250	25000	18750
1300	3510	5200	5200	33800	27040	20280
1350	3645	5400	5400	36450	29160	21870
1400	3780	5600	5600	39200	31360	23520
1450	3915	5800	5800	42050	33640	25230
1500	4050	6000	6000	45000	36000	27000

CARBON STEEL AND LOW ALLOY STEEL EQUIPMENTS (CLASS 600 AND ABOVE)

NOZZLE SIZES (DN)	FA (Kgf)	FL (Kgf)	FC (Kgf)	MT (Kgf–m)	ML (Kgf–m)	MC (Kgf–m)
50	168	250	250	62	50	37
80	253	375	375	140	112	84
100	337	500	500	250	200	150
150	506	750	750	562	450	337
200	675	1000	1000	1000	800	600
250	843	1250	1250	1562	1250	937
300	1012	1500	1500	2250	1800	1350
350	1181	1750	1750	3062	2450	1837
400	1350	2000	2000	4000	3200	2400
450	1518	2250	2250	5062	4050	3037
500	1687	2500	2500	6250	5000	3750
600	2025	3000	3000	9000	7200	5400
650	2193	3250	3250	10562	8450	6337
700	2362	3500	3500	12250	9800	7350
750	2531	3750	3750	14062	11250	8437
800	2700	4000	4000	16000	12800	9600
850	2868	4250	4250	18062	14450	10837
900	3037	4500	4500	20250	16200	12150
950	3206	4750	4750	22562	18050	13537
1000	3375	5000	5000	25000	20000	15000
1050	3543	5250	5250	27562	22050	16537
1100	3712	5500	5500	30250	24200	18150
1150	3881	5750	5750	33062	26450	19837
1200	4050	6000	6000	36000	28800	21600
1250	4218	6250	6250	39062	31250	23437
1300	4387	6500	6500	42250	33800	25350
1350	4556	6750	6750	45562	36450	27337
1400	4725	7000	7000	49000	39200	29400
1450	4893	7250	7250	52562	42050	31537
1500	5062	7500	7500	56250	45000	33750

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
2	02.12.2024	REVISED AND REISSUED AS STANDARD	JS/SM	TKh	KA/NK	MN
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.14	ISSUED AS STANDARD	GCP	KA	RKT	SC

Approved by

STAINLESS STEEL EQUIPMENTS
(ALL CLASSES)

NOZZLE SIZES (DN)	FA (Kgf)	FL (Kgf)	FC (Kgf)	MT (Kgf–m)	ML (Kgf–m)	MC (Kgf–m)
50	135	200	200	50	40	20
80	202	300	300	112	90	45
100	270	400	400	200	160	80
150	405	600	600	450	360	180
200	540	800	800	800	640	320
250	675	1000	1000	1250	1000	500
300	810	1200	1200	1800	1440	720
350	945	1400	1400	2450	1960	980
400	1080	1600	1600	3200	2560	1280
450	1215	1800	1800	4050	3240	1620
500	1350	2000	2000	5000	4000	2000
600	1620	2400	2400	7200	5760	2880
650	1755	2600	2600	8450	6760	3380
700	1890	2800	2800	9800	7840	3920
750	2025	3000	3000	11250	9000	4500
800	2160	3200	3200	12800	10240	5120
850	2295	3400	3400	14450	11560	5780
900	2430	3600	3600	16200	12960	6480
950	2565	3800	3800	18050	14440	7220
1000	2700	4000	4000	20000	16000	8000
1050	2835	4200	4200	22050	17640	8820
1100	2970	4400	4400	24200	19360	9680
1150	3105	4600	4600	26450	21160	10580
1200	3240	4800	4800	28800	23040	11520
1250	3375	5000	5000	31250	25000	12500
1300	3510	5200	5200	33800	27040	13520
1350	3645	5400	5400	36450	29160	14580
1400	3780	5600	5600	39200	31360	15680
1450	3915	5800	5800	42050	33640	16820
1500	4050	6000	6000	45000	36000	18000

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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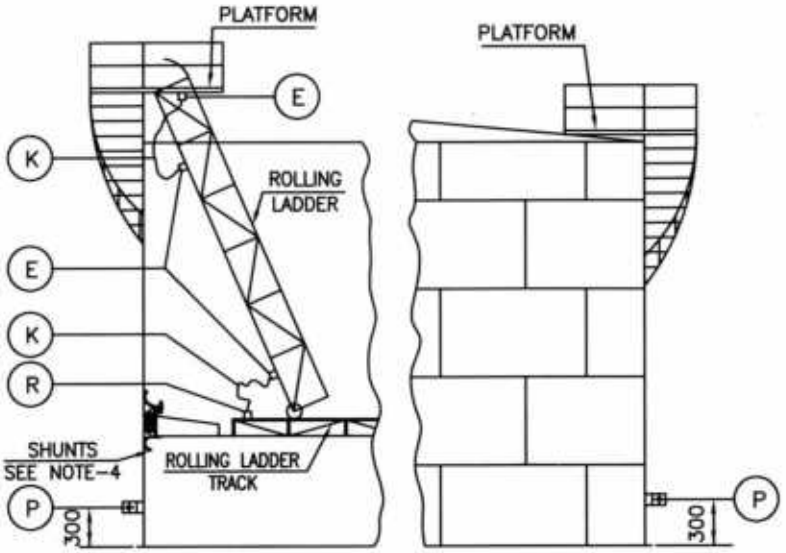
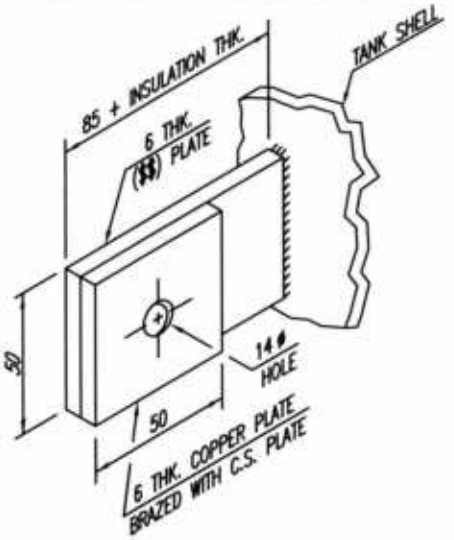
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.2014	ISSUED AS STANDARD	GCP	KA	RKT	SC

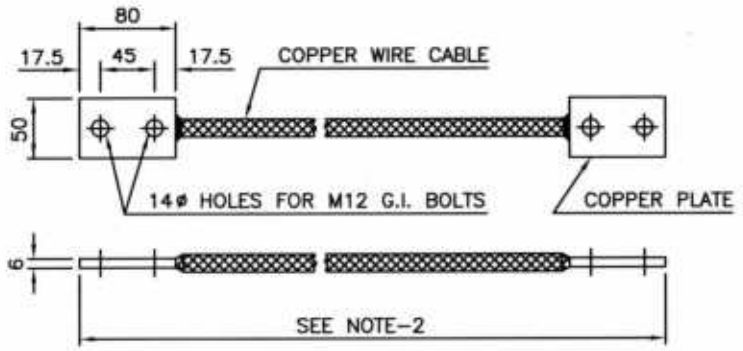


FLOATING ROOF TANK FIXED ROOF TANK

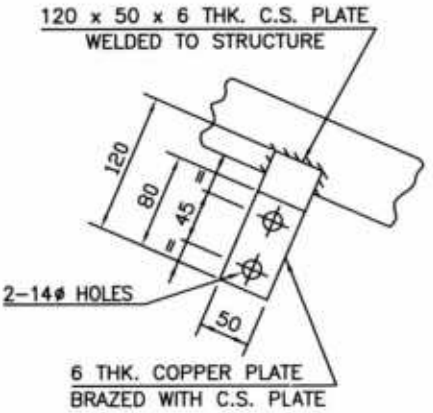


DETAIL – P

($$) AUSTENITIC STAINLESS STEEL WHEN ATTACHED TO C.S./LAS. WHEN ATTACHED TO OTHER MATERIALS, MOC SHALL BE SAME AS SHELL MOC.

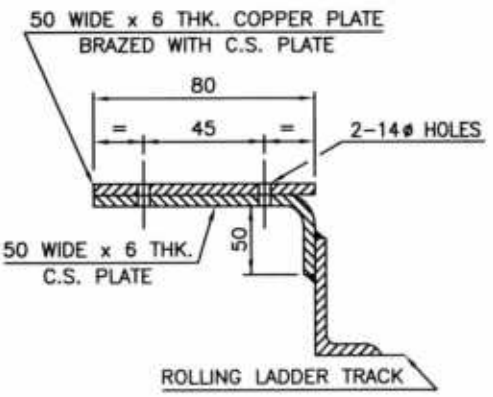


DETAIL – K



DETAIL – E

TABLE – A	
NO. OF EARTH CONNECTIONS (P) REQUIRED	
TANK DIAMETER (D) (IN MTRS)	EARTHING CONNECTION
<15	4 AT 90°
<=15 D < 25	4 AT 90°
<=25 D < 35	4 AT 90°
<=35 D < 45	5 AT 72°
<=45 D < 55	6 AT 60°
<=55 D < 65	7 AT 51.43°
<=65 D < 75	8 AT 45°
<=75 D < 85	9 AT 40°
<=85 D < 95	10 AT 36°



DETAIL – R

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	20.03.2024	REVISED AND REISSUED AS STANDARD	JIT SINGH	TKh	KJH/NK	MN
7	02.08.2018	REVISED AND REISSUED AS STANDARD	JIT SINGH	RKK	KJH	RKT