भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

TCN - 15

Ref: PSER:SCT:KLN-M1857:TCN-15 Date: 20-01-2018

Sub	Tender Change Notice -TCN-15	
Job	Design, Engineering, Manufacturing, Supply, (Including Mandatory Spares) Erection & Commissioning, Etc. Of Fuel Oil Handling System & Miscellaneous Tanks Package For 2x660 MW Maitree Super Thermal Power Project, Rampal, Bangladesh.	
Ref	1.0	Tender no PSER:SCT:KLN-M1857:17
	2.0	BHEL's NIT, vide reference no PSER:SCT:KLN-M1857: 6119 Dated 05-10-2017
	3.0	BHEL's TCN-01 vide ref PSER:SCT:KLN-M1857:TCN-01 dated 26-10-2017
	4.0	BHEL's TCN-02 vide ref PSER:SCT:KLN-M1857:TCN-02 dated 06-11-2017
	5.0	BHEL's TCN-03 vide ref PSER:SCT:KLN-M1857:TCN-03 dated 13-11-2017
	6.0	BHEL's TCN-04 vide ref PSER:SCT:KLN-M1857:TCN-04 dated 16-11-2017
	7.0	BHEL's TCN-05 vide ref PSER:SCT:KLN-M1857:TCN-05 dated 20-11-2017
	8.0	BHEL's TCN-06 vide ref PSER:SCT:KLN-M1857:TCN-06 dated 02-12-2017
	9.0	BHEL's TCN-07 vide ref PSER:SCT:KLN-M1857:TCN-07 dated 04-12-2017
	10.0	BHEL's TCN-08 vide ref PSER:SCT:KLN-M1857:TCN-08 dated 06-12-2017
	11.0	BHEL's TCN-09 vide ref PSER:SCT:KLN-M1857:TCN-09 dated 16-12-2017
	12.0	BHEL's TCN-10 vide ref PSER:SCT:KLN-M1857:TCN-10 dated 23-12-2017
	13.0	BHEL's TCN-11 vide ref PSER:SCT:KLN-M1857:TCN-11 dated 02-01-2018
	14.0	BHEL's TCN-12 vide ref PSER:SCT:KLN-M1857:TCN-12 dated 05-01-2018
	15.0	BHEL's TCN-13 vide ref PSER:SCT:KLN-M1857:TCN-13 dated 11-01-2018
	16.0	BHEL's TCN-14 vide ref PSER:SCT:KLN-M1857:TCN-14 dated 12-01-2018
	17.0	All other pertinent issues till date.

With reference to above, following points/ documents, relevant to tender, may please be noted and complied with while submitting offer.

1.0 Extension of due date of submission of offer from 22-01-2018 to 29-01-2018 (15:00 hrs).
2.0 Amendment -01 to Technical Specification no :PE:TS:421:166:A001 issued alongwith this TCN-15.
3.0 Reply to bidder's queries vide Annexure-A to TCN-15 .
4.0 Revised `No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.
5.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HYEAVY ELECTRICALS LTD

DY MGR (SCT)

Encl : As above

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091
फैक्स/Fax : (033) 23211960 फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

ANNEXURE-2

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	Design, Engineering, Manufacturing, Supply, (Including Mandatory Spares) Erection & Commissioning, Etc. Of Fuel Oil Handling System & Miscellaneous Tanks Package For 2x660 MW Maitree Super Thermal Power Project, Rampal, Bangladesh.	
Ref	1.0	Tender no PSER:SCT:KLN-M1857:17
	2.0	BHEL's NIT, vide reference no PSER:SCT:KLN-M1857:6119, Dated 05-10-2017
	3.0	BHEL's TCN-01, vide reference PSER:SCT:KLN-M1857:TCN-01, dated 26-10-2017.
	4.0	BHEL's TCN-02, vide reference PSER:SCT:KLN-M1857:TCN-02, dated 06-11-2017.
	5.0	BHEL's TCN-03, vide reference PSER:SCT:KLN-M1857:TCN-03, dated 13-11-2017.
	6.0	BHEL's TCN-04, vide reference PSER:SCT:KLN-M1857:TCN-04, dated 16-11-2017.
	7.0	BHEL's TCN-05, vide reference PSER:SCT:KLN-M1857:TCN-05, dated 20-11-2017
	8.0	BHEL's TCN-06, vide reference PSER:SCT:KLN-M1857:TCN-06, dated 01-12-2017
	9.0	BHEL's TCN-07, vide reference PSER:SCT:KLN-M1857:TCN-07, dated 04-12-2017
	10.0	BHEL's TCN-08, vide reference PSER:SCT:KLN-M1857:TCN-08, dated 06-12-2017
	11.0	BHEL's TCN-09, vide reference PSER:SCT:KLN-M1857:TCN-09, dated 16-12-2017
	12.0	BHEL's TCN-10, vide reference PSER:SCT:KLN-M1857:TCN-10, dated 23-12-2017
	13.0	BHEL's TCN-11, vide reference PSER:SCT:KLN-M1857:TCN-11, dated 02-01-2018
	14.0	BHEL's TCN-12, vide reference PSER:SCT:KLN-M1857:TCN-12, dated 05-01-2018
	15.0	BHEL's TCN-13, vide reference PSER:SCT:KLN-M1857:TCN-13, dated 11-01-2018
	16.0	BHEL's TCN-14, vide reference PSER:SCT:KLN-M1857:TCN-13, dated 12-01-2018
	17.0	BHEL's TCN-15, vide reference PSER:SCT:KLN-M1857:TCN-13, dated 20-01-2018
	18.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)

ANNEXURE-A TO TCN-1				
Sr.No.	**REFERENCE CLAUSE OF TENDER**	**EXISTING PROVISION**	**BIDDER'S QUERY**	**BHEL'S CLARIFICATION**
1	**BIDDER'S QUERY :** Please inform which painting system number to be followed for HSD tanks & Piping and Misc. Tanks in the referred clause. Also internal and underneath paint for HSD tanks and Misc. tanks is not available in the referred clause. Please provide the same.	**BHEL REPLY VIDE TCN 02** Bidder to comply specification requirements as mentioned under Volume II /Sect ion I / Sub section IA / clause 2.0.0 / page no. 105 of 633. Specific issues pertaining to internal and underneath paint will be discussed and finalised during detailed engineering.	In the referred clause for painting, client has said that anySpecific issues pertaining to internal and underneath paint will be d iscussed and finalised during detailed engineering. However, we have huge area of internal and underneath painting for both HSD and MISC tanks. Hence this clause needs to be clarified in the tendering stage only. Please provide the same.	We have already communicated our response.Specific issues pertaining to internal and underneath paint will be discussed and finalised during detailed engineering while taking approval from end customer/BIFPCL.
2	**BIDDER'S QUERY** : Customer specification calls for stainless steel material for tank internals for all the Misc tanks where as in the BHEL specification only condensate storage tank and DM water storage tank internals are stainless steel material, remaining tanks are of carbon steel. Please clarify.	**BHEL 'S REPLY VIDE TCN 02** Bidder to follow the datasheet of Misc tanks	From BHEL clarification we understood that tank internals means **fasteners** which are coming inside the tank will be Stainless steel material and any nozzle extensions will be as same as nozzle material and structural steel if any will be ASTM A 36 or equivalent. Please confirm.	Refer GA drawings of tanks released in **Amendment no.1** to technical specification **issued along with this TCN 15** for MOC of tank internals.
3	**BIDDER'S QUERY** : Plate material called for galvanised steel. We never come across using of Galvanised steel plates for tank construction. Please check and confirm.	**BHEL'S REPLY VIDE TCN 02** :Bidder to comply specification requirements. Specific issues. If any, will be taken up while taking approval of tank drawings during detailed Engineering.	Galvanised plates are not available in the market. BHEL Approved vendors like Uttam value steels, Jindal, RINL etc has regretted to quote forthe same. Hence we are considering plate material with out galvanisation. Please confirm. Also provide painting specificaton for tank internal , external and underneath.	Galvanized plate are not applicable now as the potable water tank is deleted from bidder's scope. Pls refer **Amendment no.1** to technical specification **issued along with this TCN 15**
4	**BIDDER'S QUERY** : Please provide the grade for ASTM A671 and also provide the Schedule / thickness to be considered for specified pipes.	**BHEL's REPLY VIDE TCN 02** Refer BHEL reply at S.No.31 . Piping grade & MOC shall be furnished in Amendm ent to technical specfication to be issued later as TCN	We have not received the Amendment to technical specification. Awaiting for the same.	**Amendment no.1** is issued alongwith this **TCN 15**
5	**BIDDER'S QUERY :**With respect to referred clause, we request you to mention the number of instruments in PID itself to avoid confusion on the redundancy.	**BHEL's reply vide TCN 02** Bidder to follow the specification in totality.	Please clarify / confirm the following points regarding redundancy given in clause no. 28, pg 522 of 633 (Vol-II). 1. In the given BHEL P&ID, one no. DPIT is shown for each duplex strainer. However as per referred BHEL redundancy clause , whether DPIT should be one no. for each strainer or 2 nos for each strainer. 2. Pressure Transmitters (2 nos) shown in the UL pump common discharge line whereas as per the redundancy clause clarify whether PTs should be 3 nos or 2 nos. Also 1 no. PT is shown in oil recovery pumps common discharge line whereas as per the redundancy clause clarify whether PTs should be considered 1 no. or 2 nos or 3 nos. 3. On each HSD Stroage tank and on oil pit, 2 nos LTs are shown. We presume that LTs are for control functions and alarms hence consdering the same quantity of LTs for the tanks and pit.	Please consider the instruments as shown under P&ID of HSD unloading and storage system, issued under **Amendment no.1 to technical specification issued alongwith TCN-15**
6	**BIDDER'S QUERY** : We prefer to transport / deliver the items to site by road ways, hence sea worthy packing is not applicable for the items transported by road ways. Please confirm.	**BHEL's reply vide TCN 02** Plant material shall be sent in sea-worthgy packing due to saline environment at site. However, other material such as structural steel, pipes, etc. shall be suitably packed in weather proof packing for tropical & saline conditions. The packing shall be strong and efficient enough to ensure safe preservation of the materials.	From the referred BHEL clarification we understood that raw materials like steel plates, structural steel, pipes, fittings, gratings, flanges etc shall be weather proof packing. Kindly provide the specification for the same.	All raw materials like steel plates, structural steel, pipes, fittings, gratings, flanges etc to be wrapped in tarpauline / transparent polythene for effective weather Proofing.
7	**BIDDER'S QUERY :** Storage tanks (HSD and MISC tanks) minimum thickness to be considered is no where mentioned in the tender specification / data sheets. However in the standard specifciation (referred clause) says that plate thickness should be minimum 8mm thk. Please clarify whether we can consider the thickness as per our design calculations or we have to go as per the referred clause only.	**BHEL 's reply vide TCN 02** Thickness to be considered shall be furnished under Amendment to technical spe cfication to be issued later as TCN	We have not received the Amendment to technical specification. Awaiting for the same.	**Amendment no.1 To Technical Specification** is issued alongwith this TCN-15

ANNEXURE-A TO TCN-1				
Sr.No.	**REFERENCE CLAUSE OF TENDER**	**EXISTING PROVISION**	**BIDDER'S QUERY**	**BHEL'S CLARIFICATION**
8	General		Structural steel plates of ASTM A36 is not available in the market. All the BHEL Approved vendors have regretted to quote for the same. Hence we are considering Structural steel of IS 2062 Gr.A which is equivalent to ASTM A36. Please approve for IS code.	Pls refer **Amendment no.1** to Technical Specification regarding material of steel plates issued alongwith this TCN-15
9	TCN-09-CURRENCY MATRIX FOR BOP PACKAGE-R01 SL NO1	In the mentioned document and sr no it is mentioned that cost of tender is not applicable.	Pl Clarify Whether Tender Cost Is Applicable Or Not	The word “Not Applicable” mentioned in the context of applicability of “Exchange Rate" For submission of Tender Cost in INR ,Exchange Rate is not applicable. As such Tender Cost is applicable for this tender.
10	VOLUME -II/SCOPE/ TECHNICAL SPECIFICATION ETC,/B0.6.5/PAGE NO B 0-99 TO B0-100	Coating System of Tanks	Painting specifications of external surfaces only is mentioned in the referred document .Please furnish details of internal surfaces also.	Shall be discussed and finalized during detailed engineering
11	Bidder will raise Tax Invoice by charging applicable GST on BHEL Kolkata, who may avail		Who will be the Exporter to Bangladesh, whether Bidder or BHEL Kolkata Please clarify	BHEL Kolkata shall be exporter on official records.
12	The benefit of notification 40/2017-central Tax rate dated 23.10.2017 may be availed by the merchant exporter only		The Bidder procuring material from manufacturer and Bill to BHEL Kolkata, how and who will avail such benefit of concessional payment of GST, Please clarify.	The bidder shall be the “registered supplier” even if the goods are procured from actual manufacturer. The “registered supplier” shall charge concessional GST to BHEL.
13	The Owner, Consignee, Notify Party and place of delivery has been clarify		Who will be the Exporter to Bangladesh, Whether Bidder or BHEL Kolkata, Please clarify	Pl refer Sl No 12 of this Annexure A to TCN -15

The following revisions w.r.t technical Specification no. **PE-TS-421-166-A001** for **Fuel oil system & Misc tanks** shall apply. Bidder to note that the following existing clauses/details as appearing in the specification stands deleted and clauses/details as mentioned in "Modified to or Read as" column shall be applicable and complied by the bidder.

MODIFIED CLAUSES/PAGE NUMBERS.

S.N	Section/ Description	Clause no	Page no	Existing clause/details	Modified to or Read as
1.	Section – IA	ANNEXURE-V	500, 501 of 632	P&ID for HSD unloading & storage system **stands deleted.**	P&ID for HSD unloading & storage system given under **Annexure-I** to this Amendment no.1 to be considered by bidder.
2.	Section – IC	Datasheet-A	503 to 510 of 632	Datasheets for all Misc tanks **stands deleted.**	GA drawings of Condensate storage tanks (cap. 350m3 each), DM water storage tanks (cap. 2000 m3 each), Service water tank (cap. 1440 m3) and Desalinated water tank (cap. 12250 m3) given under **Annexure-II** to this Amendment no.1 to be considered by bidder.
3.		C&I specification for Fuel oil unloading & storage system	516 to 563 of 632	C&I specification **stands deleted.**	C&I specification given under **Annexure-III** to this Amendment no.1 to be considered by bidder.
4.	Section-IA	1.1.1, (e), S.N. (i)	100 of 632	Two (2) Nos. vertical cylindrical carbon steel DM Water Storage Tanks of net effective **capacity of 750 M3** complete with all accessories as indicated in relevant Data sheet & sketch.	Two (2) Nos. vertical cylindrical carbon steel DM Water Storage Tanks of net effective **capacity of 2000 M3** complete with all accessories as given under **GA drawing of DM water tank , SH 2 of 4** under **Annexure -II to this Amendment no.1.**
5.	Section-IA	1.1.1, (e), S.N. (ii)	100 of 632	Two (2) Nos. vertical cylindrical carbon steel Condensate Storage Tanks of net effective **capacity of 350 M3** complete with all accessories as indicated in relevant Data sheet & sketch.	Two (2) Nos. vertical cylindrical carbon steel Condensate Storage Tanks of net effective capacity of 350 M3 complete with all accessories as given under **GA drawing of CST , SH 1 of 4** under **Annexure -II to this Amendment no.1.**

6.	Section-IA	1.1.1, (e), S.N. (iii)	100 of 632	One (1) Nos. vertical cylindrical carbon steel Desalination Water Storage Tank of net effective **capacity of 12000 M3.**	One (1) Nos. vertical cylindrical carbon steel Desalination Water Storage Tank of net **effective capacity of 12250 m3** as given under **GA drawing of Desalinated water tank, SH 4 of 4** under **Annexure -II to this Amendment no.1.**
7.	Section-IA	1.1.1, (e), S.N. (iv)	100 of 632	One (1) Nos. vertical cylindrical carbon steel service water Storage Tank of net **effective capacity of 400 M3.**	One (1) Nos. vertical cylindrical carbon steel service water Storage Tank of net **effective capacity of 1440 m3** as given under **GA drawing of Service water storage tank, SH 3 of 4** under **Annexure -II to this Amendment no.1.**
8.	Section-IA	1.1.1, (e), S.N. (v)	100 of 632	One (1) Nos. vertical cylindrical carbon steel potable water Storage Tank of net **effective capacity of 400 M3.**	Potable water tank **stands deleted.**
9.	Section-IA	2.2.1.4, Oil hoses, S.N. 1	119 of 632	Type- Flexible neoprene-rubber hose confirming to BS1435	Flexible neoprene-rubber hose confirming to BS1435, **type-S-7.**
10.	Section-IA	2.2.1.4, Oil hoses, S.N. 4	119 of 632	Type of end connection - To match road truck unloading nozzle.	Type of end connection - To match road truck unloading nozzle. **Both the end connection shall be galvanized in accordance with BS:729/zinc sprayed as per BS:2569, part-1.**
11.	Section – IC	Datasheet for pipes, fittings, flanges & accessories, S.N. 1.2	512 of 632	65 NB and above - Stainless steel pipe as per ASTM A-312, Gr. TP-304, **Seamless**, Sch.10S	65 NB and above - Stainless steel pipe as per ASTM A-312, Gr. TP-304, **ERW,** Sch.10S
12.				**Additional technical requirement**	**Valve specification for Fuel oil unloading & storage system** is given under **Annexure-IV to this Amendment no.1.** Bidder to follow the same in addition to requirements given under technical specification for valves.
13.				**Additional technical requirement**	Plate material as **SA/IS 2062 or IS 2062 in place of ASTM A36** is **also acceptable.** Bidder to note the same.
14.				**Additional technical requirement**	**The dimensional details etc. of Road Truck** used for transporting HSD in Bangladesh are to be **collected by bidder at their end** from the relevant sources in Bangladesh.

ANNEXURE I

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

LEGEND

SYMBOL	DESCRIPTION
~~	HOSE
——	LDO PIPE LINE
—≺—	COIL HEATER
	PUMP
	LOCAL DRAIN
M	MOTOR
LTS	LIMIT SWITCH
PI	PRESSURE INDICATOR
PT	PRESSURE TRANSMITTER
DPT	DIFFERENTIAL PRESSURE INDICATOR TRANSMITTER
LT	LEVEL TRANSMITTER(RADAR/ULTRASONIC TYPE)
LI	LEVEL INDICATOR
TI	TEMPERATURE INDICATOR
TS	TEMPERATURE SWITCH
TE	TEMPERATURE ELEMENT
	SIGNAL TO DCS
T	STEAM TRAP
PS	PRESSURE SWITCH.
CS	STEAM CONTROL VALVE
	GLOBE VALVE (NORMALLY OPEN/ NORMALLY CLOSED)
	PLUG VALVE (NORMALLY OPEN/ NORMALLY CLOSED)
	BALL VALVE (NORMALLY OPEN/ NORMALLY CLOSED)
	GATE VALVE (NORMALLY OPEN/ NORMALLY CLOSED)
	MOTORIZED VALVE
	NON RETURN VALVE
	RELIEF VALVE
	DUPLEX STRAINER
FM	CORIOLIS MASS FLOWMETER

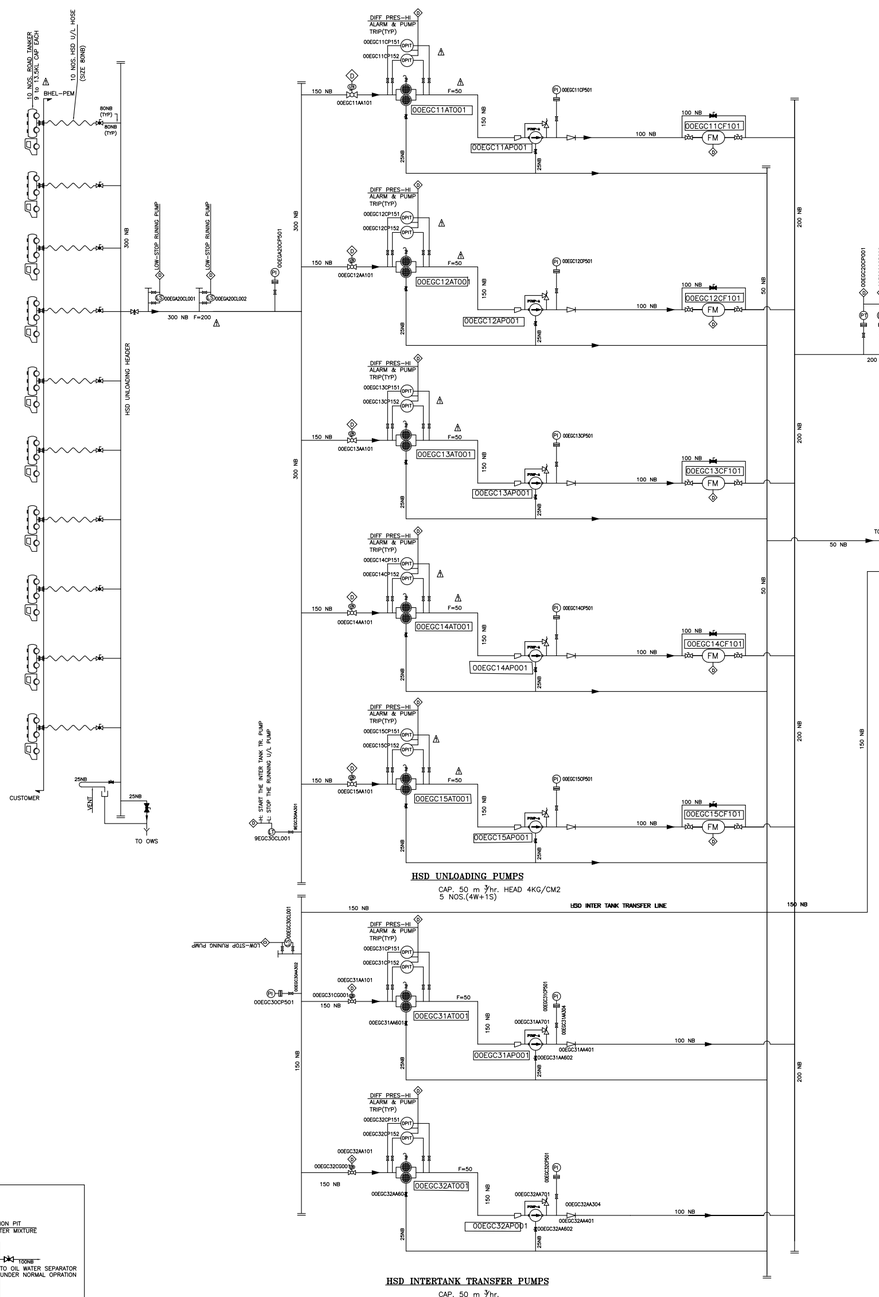
ABBREVATIONS:

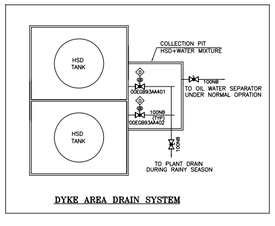
1. PESD – PROJECT ENGINEERING SERVICE DIVISION, HYDERABAD
2. ISG – INDUSTRIAL SECTOR GROUP, BANGALORE
3. F – FLOW in m3/hr

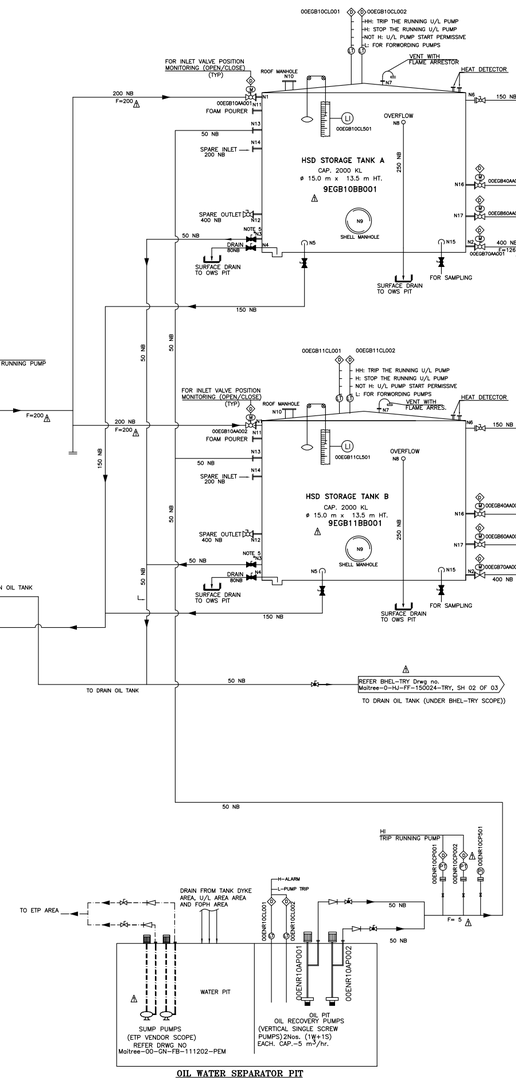
KKS NOMENALATURE

00	EGA	10	AA	001

- Instrument number key
- Equipment/Instrument Key
- Area key
- Function key
- Unit number identifier







NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DESIGN MEMORANDUM FOR FUEL OIL HANDLING SYSTEM, DOC NO. MAITREE-0-EG-DB-111701-PEM.
2. VENTS AND DRAINS SHALL BE PROVIDED AT THE HIGHEST AND LOWEST POINTS RESPECTIVELY.
3. ALL INSTRUMENTS ISOLATION VALVES SHALL BE GLOBE VALVE.
4. ALL DRAIN & VENT VALVES ARE IN NORMALLY CLOSE CONDITION.
5. NOZZLE N3 SHALL BE KEPT BELOW LOW-LOW LEVEL OF HSD TANKS.
6. OPERATION & CONTROL OF MOTORIZED VALVES AT INLET AND OUT OF HSD TANK:
   - A. AFTER SELECTION OF TANK TO BE FILLED WITH HSD, THE INLET VALVE OF THE SELECTED TANK SHALL BE OPENED AND ALL THE OUTLET VALVES OF THE SELECTED TANK SHALL BE CLOSED.
   - B. AFTER ENSURING THE ABOVE START PERMISSIVES ALONG WITH OTHERS, THE HSD UNLOADING PUMPS SHALL BE STARTED.
   - C. THE INLET VALVE OF THE UN-SELECTED TANK SHALL REMAIN CLOSED AND OUTLET VALVE SHALL REMAIN OPEN TO ENSURE HSD SUPPLY TO BOILER AND OTHER AUXILIARY HSD CONSUMERS.
   - D. THE CONTROL & OPERATION OF VALVES OF HSD TANKS SHALL BE WITH HSD UNLOADING SYSTEM OPERATOR ONLY.

REV	DATE	ALT	CHD	APP	NOTE
01	17.01.18	PK	HK	PK	REVISED IN LINE WITH BIFCPL/OE COMMENTS

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
BANGLADESH–INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

	DATE	NAME
DRAWN BY	13.06.17	PK
DESIGN BY	13.06.17	PK
CHECKED BY	13.06.17	HK
APPROVED BY	13.06.17	PK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM: HSD UNLOADING SYSTEM		

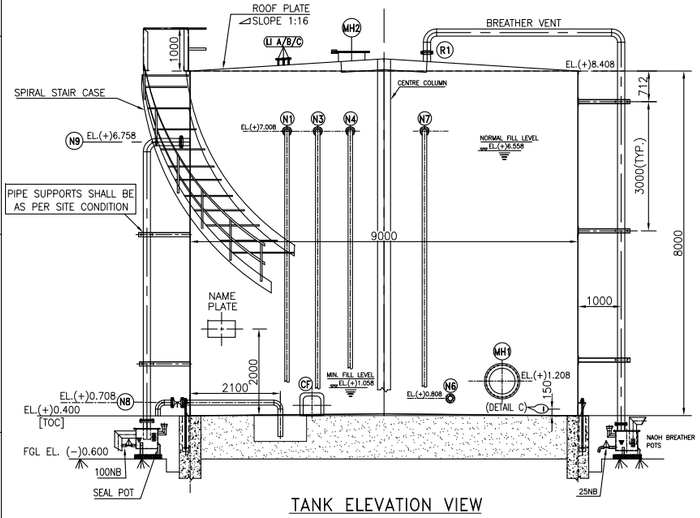
SCALE:
SHEET 1 OF 1

TITLE
PROCESS & INSTRUMENTATION DIAGRAM OF HSD UNLOADING AND STORAGE SYSTEM

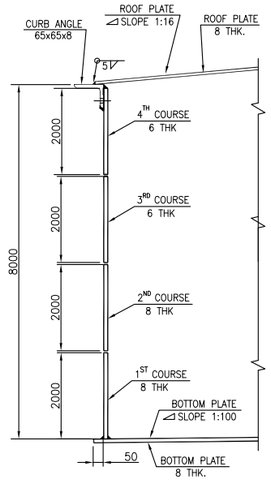
SIZE: A2 | PROJECT NO.: 421 | FILE:
ANNEX:
DRWG NO.: MAITREE-00-EG-FB-421166A001-PEM-A | REV-01

SIZE-A1

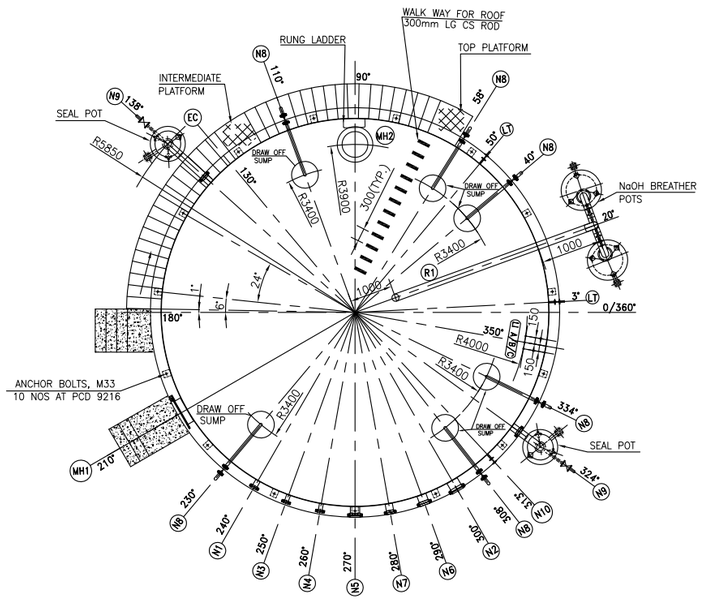
ANNEXURE II



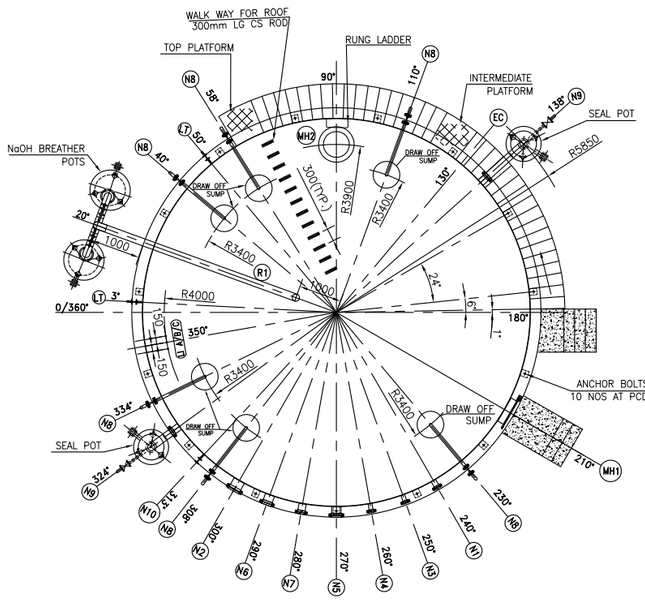
TANK ELEVATION VIEW



SHELL ARRANGEMENT FOR 1ST TO 04TH COURSE



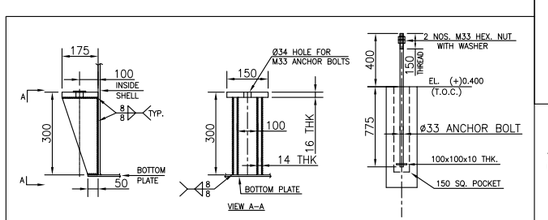
NOZZLE ORIENTATION OF CS TANK#2



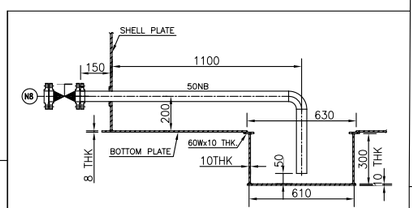
NOZZLE ORIENTATION OF CS TANK#1

NOTES:−

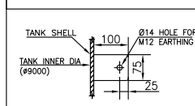
1. ALL DIMENSIONS ARE IN MM., ELEVATIONS ARE IN METRE UNLESS OTHER WISE SPECIFIED.
2. EL. (+)0.00 CORRESPONDS TO FINISH FLOOR OF STG. BUILDING I.E. RL.(+)5.60M.
3. TANK SURFACE SHOULD BE CLEANED THOUGHLY AFTER FABRICATION FROM LOOSE SUBSTANCES AND FOREIGN MATERIALS SUCH AS DIRT, RUST, SCALE, OIL, GREASE AND WELDING FLUX ETC.
4. VERTICAL SHELL JOINTS SHALL BE OFFSET FROM EACH OTHER WITH A MINIMUM DISTANCE OF 5 TIMES THE THICKNESS OF SHELL COURSE UNDER CONSIDERATION.
5. BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION. THREE PLATE JOINTS IN BOTTOM PLATE SHALL NOT BE CLOSER THAN 300mm FROM EACH OTHER AND ALSO FROM THE TANK SHELL.
6. EARTHING LUG AND NAME PLATE SHALL BE WELDED TO THE TANK AS PER SITE REQUIREMENT.
7. ALL THE INLET PIPING SHALL BE EXTENDED UPTO BOTTOM OF TANK AND CLEARANCE BETWEEN THE BOTTOM OF TANK AND THE THE EDGES OF INLET PIPING SHALL BE 500 MM MAXIMUM.
8. WEIR PLATE SHALL BE PROVIDED AT THE BOTTOM OF ALL THE INLET PIPES INSIDE TANK TO AVOID EROSION OF BOTTOM PLATE.
9. TREAD AND RISE FOR STAIRCASE OF THE TANK SHALL BE 250 AND 200 MM RESPECTIVELY.
10. LEVEL INDICATOR SUPPORTS SHALL BE PROVIDED ON THE SHELL & ROOF.
11. PAD PLATES FOR SUPPORTING ALL INLET PIPING OF TANK SHALL BE PROVIDED BY TANK VENDOR
12. FINAL PAINTING SHALL BE CARRIED OUT AS PER APPROVED PAINTING SCHEDULE AFTER HYDRO TEST OF TANK.
13. TANK NOZZLE FLANGES SHALL BE PROVIDED WITH COUNTER FLANGES ALONG WITH NUTS & BOLTS BY TANK VENDOR.
14. FABRICATION, ERECTION AND TESTING SHALL BE AS PER API650.
15. FOR MANUAL WELDING PROCESSES, FILLET WELD LEGS OR GROOVE WELD DEPTHS GREATER THAN 6MM SHALL BE MULTIPASS.
16. ALL TANK SHELL WELD INTERSECTIONS WHERE VERTICAL JOINTS MEET THE HORIZONTAL JOINTS SHALL BE RADIOGRAPHED, REGARDLESS OF THICKNESS.
17. ALL RADIOGRAPHY OR OTHER NDE AND ANY WELDING SHALL BE COMPLETED PRIOR TO HYDROSTATIC TESTING.
18. THE TANK HYDROSTATIC TEST SHALL BE CONDUCTED BEFORE PERMANENT EXTERNAL PIPING IS CONNECTED TO THE TANK EXCEPT FOR PIPING THAT IS NECESSARY TO FILL AND EMPTY THE TANK, WHICH SHOULD HAVE A FLEXIBLE COMPONENT TO ALLOW FOR SETTLEMENT.
19. ALL INLET PIPING TO THE TANK SHALL BE PROVIDED WITH SUITABLE SIPHON BREAKER.
20. MANHOLE FOR ROOF AND SHELL OF TANK SHALL BE HINGED TYPE.
21. NOZZLE ORIENTATION OF TANK#1 IS MIRROR IMAGE OF TANK#2.
22. A 10CM HIGH KICK PLATE, TIGHTLY WELDED AROUND THE ENTIRE TANK PERIMETER AND ACTING AS A GUTTER IS TO BE ARRANGED ON THE TANK TOP EDGE. FOR EACH TANK, FOUR RAIN DOWN PIPES, CONNECTED TO THE KICK PLATE AND PROVIDED AT THEIR BOTTOM ENDS WITH 45 DEG BEND, ARE TO BE PROVIDED.
23. SEAL POT AND NAOH BREATHER POTS SHALL BE PLACED ON CIVIL FOUNDATION BY USING THE ANCHOR FASTENER BY TANK SUPPLIER. NO POCKETS BY CIVIL AGENCY WILL BE PROVIDED IN FOUNDATION OF SEAL POT AND NAOH BREATHER.



DETAIL OF ANCHOR CHAIR AND ANCHOR BOLT



DRAW OFF SUMP
AS PER FIG 5.21 OF API650



DETAIL−C
EARTHING CLIT
AS PER FIG 5.23 OF API650

Name of Manufacturer: BHEL

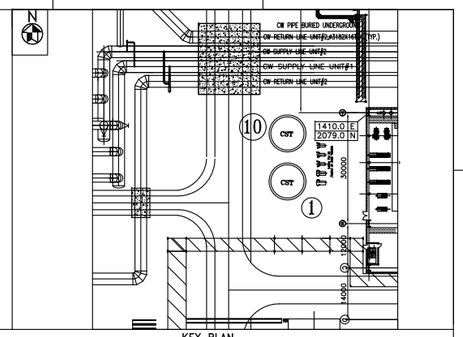
TANK NOMINAL DIAMETER	9.0 M
TANK NOMINAL HEIGHT	8.0 M
MAXIMUM WORKING CAPACITY	397 M3
DATE OF MANUFACTURE	2017
DESIGN LIQUID LEVEL	6.25 M
DESIGN CODE	API650
MAXIMUM OPERATING PRESS.	AMBIENT
MAXIMUM OPERATING TEMP.	AMBIENT
DESIGN TEMPERATURE	50 DEGC
MATERIAL OF TANK	ASTM A36

3 MM THK. MATERIAL − SS

150

200

NAME PLATE DETAIL



KEY PLAN

DESIGN DATA

DESCRIPTION	UNIT	DETAIL
DESIGN CODE	−	API 650
STORED PRODUCT	−	CONDENSATE
DENSITY OF PRODUCT STORED	kg/m3	1000
TYPE OF TANK	−	VERTICAL CYLINDRICAL, SUPPORTED CONE ROOF
NUMBER OF TANKS	no	TWO (2)
DIAMETER OF TANK (ID)	mm	9000
HEIGHT OF TANK	mm	8000
TANK EMPTY WEIGHT	kg	25006
TANK FILLED WEIGHT	kg	422006
NET WORKING CAPACITY	m3	350 (AS PER FIG 5.4 OF API650)
MAXIMUM TANK CAPCITY	m3	397 (AS PER FIG 5.4 OF API650)
BASIC WIND SPEED	m/s	73
DESIGN TEMPERATURE	°C	50
INTERNAL DESIGN PRESSURE	KPa	18 AS PER API650
OPERATING PRESSURE	−	ATMOSPHERIC
CORROSION ALLOWANCE	mm	2.0
SEISMIC FACTORS	−	AS PER SITE SPECIFIC SEISMIC STUDY
SEISMIC MOMENTS	KNM	RING WALL MOMENT −689.36, SLAB MOMENT − 1004.21
WIND LOAD	KN	VERTICAL − 118.8, HORIZONTAL − 174.86
WIND MOMENT	KNM	1262.07
ROOF LOAD (UNIFORM LIVE)	kg/m2	150
TESTING	−	AS PER CL.7.3 AND SECTION 8 OF API650
RATE OF FILLING OF TANK (MAX)	m3/hr	100, FOR TWO NOS DM MAE UP PUMPS (50M3/HR)
RATE OF EMPTYING OF TANK (MAX)	m3/hr	280 , FOR ONE BOILER FILL UP (200 M3/HR) + ONE CONDENSATE TRANSFER PUMP (80 M3/HR)

SHELL NOZZLES & APPURTENANCES FOR TANK#2

MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE ELE FROM TOP OF BOTTOM PLATE AS PER TABLE 5.6a OF API650	PROJ. DIST. FROM SHELL PLATE AS PER TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
N1	100	1	SORF,150#	6600	175	8.56	DM WATER INLET
N2	250	1	SORF,150#	400	225	12.70	CONDENSATE OUTLET
N3	80	1	SORF,150#	6600	175	7.62	RECIRCULATION LINE
N4	80	1	SORF,150#	6600	175	7.62	RECIRCULATION LINE
N5	200	1	SORF,150#	6600	200	12.7	EXCESS CONDENSATE DUMP
N6	200	1	SORF,150#	400.0	200	12.7	OUTLET SPARE WITH VALVE
N7	150	1	SORF,150#	6600.0	200	10.97	INLET SPARE WITH VALVE
N8	50	6	SORF,150#	300.0	150	5.54	DRAIN WITH VALVE
N9	150	2	SORF,150#	6350	200	10.97	OVERFLOW
N10	25	1	SORF,150#	400	150	6.35	SAMPLING CONNECTION WITH VALVE
MH1	600	1	AS PER FIG 5.16 OFAPI650	800.0	150	6.0	SHELL MANHOLE WITH BLIND FLANGE
CF	−	1	AS PER FIG 5.12 OFAPI650	AS PER FIG 5.12 OFAPI650	AS PER FIG 5.12 OFAPI650	AS PER FIG 5.12 OFAPI650	FLUSH TYPE CLEAN OUT FITTING
EC	−	2	AS PER DETAIL C	−	−	−	EARTHING CLIT
LT A/B	25	2	SORF,150#	400	150	6.35	LT CONNECTIONS

ROOF NOZZLES & APPURTENANCES FOR TANK#2

MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE DISTANCE FROM ROOF CENTRE	PROJ. DIST. FROM SHELL PLATE AS TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
R1	150	1	SORF, #150	1000	200	12.7	BREATHER VENT
LI A/B/C	25	3	SORF, #150	4000	150	6.35	LEVEL INDICATOR (FLOAT & ARROW TYPE)
MH2	600	1	AS PER FIG 5.16 OFAPI650	3900	150	6	ROOF MANHOLE WITH COVER

MATERIAL SPECIFICATION

ITEM	MATERIAL
SHELL, BOTTOM, ROOF, RF PL	IS 2062 GR B (EQUIVALENT TO EN10025)
NOZZLES	STAINLESS STEEL TO A312 GR. TP-304 (SW END FOR PIPE SIZES 50NB & BELOW AND BW ENDS FOR PIPE SIZES ABOVE 50 NB)
MANHOLE NECK	IS 2062 GR B (EQUIVALENT TO EN10025)
NOZZLE FLANGES	STAINLESS STEEL TO A182 GR. F-304 FOR PIPE SIZES 50NB & BELOW AND TO A403 GR. 304 FOR PIPE SIZES ABOVE 50 NB)
HAND RAILING (40NB)	BS1387 OR EQUIVALENT MS GALVANIZED (MEDIUM CLASS)
GASKETS	TEFLON
BOLTING (NUTS & BOLTS)	AISI 304 / EQUIVALENT
STRUCTURALS	IS 2062 GR A (EQUIVALENT TO EN10025)
FITTINGS OF 50 NB & BELOW (SW END)	STAINLESS STEEL TO A182 F304, SW TO ANSI B16.11
FITTINGS ABOVE 50 NB (BW END)	STAINLESS STEEL TO A403 GR. WP-304, BW TO ANSI B16.9
NAME PLATE AND EARTHING CLIT	SS 304

REFERENCE DRAWINGS

S.N	DRAWING NO.	TITLE
1.	MAITREE-00-LA-ED-111851-PEM-0	DESIGN CALC OF MISCELLANEOUS TANKS
2.	MAITREE-00-LCR-MF B-421100N109-PEM	P&ID FOR CONDENSATE TRANSFER SYSTEM
3.	MAITREE-0-MA-LD-4 21100M001-PEM	PLOT PLAN
4.	MAITREE-00-UTX-ED -421602C002-PEM	SITE SPECIFIC SEISMIC STUDY REPORT

CUSTOMER STAMP

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart, GERMANY

OWNER:
BANGLADESH−INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

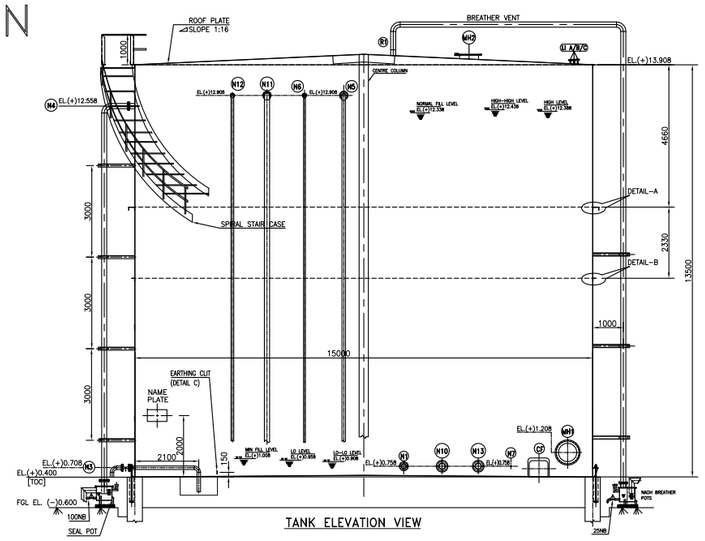
REV	DATE	DESN.	CHD.	APPD.
01	17.01.18	PK	HK	SKB

JOB NO. : 421
STATUS : CONTRACT
SCALE:
SHEET 1 OF 4

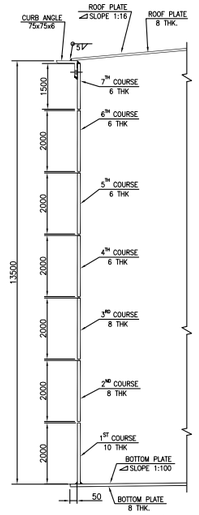
	DATE	NAME
DRAWN BY	26.09.17	PK
DESIGN BY	26.09.17	PK
CHECKED BY	26.09.17	HK
APPROVED BY	26.09.17	PK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE
GA DRAWING OF MISCELLANEOUS TANKS− CONDENSATE STORAGE TANKS− CAP 350 M3

SIZE: | PROJECT NO: 421 | FILE:
ANNEX: | DRAWING NO. Maitree-0-LA-DA-111852-PEM | REV 1
SIZE−A1



TANK ELEVATION VIEW



SHELL ARRANGEMENT FOR 1ST TO 07TH COURSE

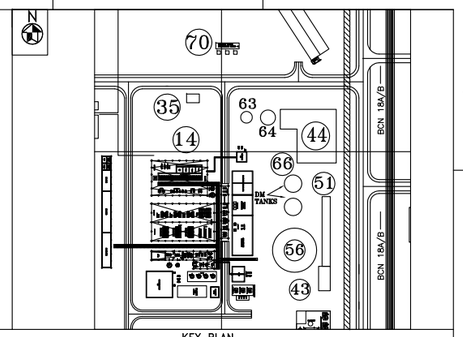
Name of Manufacturer:	BHEL
TANK NOMINAL DIAMETER	15.0 M
TANK NOMINAL HEIGHT	13.5 M
MAXIMUM CAPACITY	2125 M3
DATE OF MANUFACTURE	2018
DESIGN LIQUID LEVEL	12.030 M
DESIGN CODE	API650
MAXIMUM OPERATING PRESS.	AMBIENT
MAXIMUM OPERATING TEMP.	AMBIENT
DESIGN TEMPERATURE	50 DEGC
MATERIAL OF TANK	IS 2062 GR. B

150

3 MM THK.
MATERIAL - SS

200

NAME PLATE DETAIL



KEY PLAN

DESIGN DATA

DESCRIPTION	UNIT	DETAIL
DESIGN CODE	-	API 650
STORED PRODUCT	-	DM WATER
SPECIFIC GRAVITY OF PRODUCT STORED	kg/m3	1000
TYPE OF TANK	-	VERTICAL CYLINDRICAL, SUPPORTED CONE ROOF
NUMBER OF TANKS	no	TWO (2)
DIAMETER OF TANK (ID)	mm	15000
HEIGHT OF TANK	mm	13500
TANK EMPTY WEIGHT	kg	67392
TANK FILLED WEIGHT	kg	2192392
NET WORKING CAPACITY	m3	2000 (AS PER FIG 5.4 OF API650)
MAXIMUM TANK CAPCITY	m3	2125 (AS PER FIG 5.4 OF API650)
BASIC WIND SPEED	m/s	73
DESIGN TEMPERATURE	°C	50
INTERNAL DESIGN PRESSURE	KPa	18 AS PER API650 FOR SEISMIC CALCULATION
OPERATING PRESSURE	-	ATMOSPHERIC
CORROSION ALLOWANCE	mm	2.0
SEISMIC FACTORS	-	AS PER SITE SPECIFIC SEISMIC STUDY
SEISMIC MOMENTS	KNM	RING WALL MOMENT -6962, SLAB MOMENT - 9800
WIND LOAD	KN	VERTICAL - 334.13, HORIZONTAL - 485.72
WIND MOMENT	KNM	5898.28
ROOF LOAD (UNIFORM LIVE)	kg/m2	150
TESTING	-	AS PER CL7.3 AND SECTION 8 OF API650
RATE OF FILLING OF TANK (MAX)	m3/hr	204, FOR THREE (3) NOS, 2W +1S , MB FEED PUMPS (CAP. 68 M3/HR EACH)
RATE OF EMPTYING OF TANK (MAX)	m3/hr	210, FOR THREE(3) NOS, 2W+1S, DM MAKE UP WATER PUMPS (CAP. 70 M3/HR EACH)

SHELL NOZZLES & APPURTENANCES FOR TANK#2

MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE ELE FROM TOP OF BOTTOM PLATE AS PER TABLE 5.6a OF API650	PROJ. DIST. FROM SHELL PLATE AS PER TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
N1	150	1	SORF,150#	350	200	10.97	DM WATER OUTLET
N3	50	6	SORF,150#	300	150	5.54	DRAIN
N4	150	2	SORF,150#	12150	200	10.97	OVERFLOW
N5	100	1	SORF,150#	12500	175	8.56	DM INLET
N6	50	1	SORF,150#	12500	150	5.54	RE-CIRCULATION OF DM WATER MAKE UP PUMPS
N10	200	1	SORF,150#	350	200	12.70	OUTLET SPARE WITH VALVE
N11	150	1	SORF,150#	12500	200	10.97	INLET SPARE WITH VALVE
N12	80	1	SORF,150#	12500	175	7.62	RECIRCULATION LINE FROM CPU REGEN. PUMPS
N13	200	1	SORF,150#	350	200	12.70	SUCTION LINE OF CPU REGEN. PUMPS WITH VALVE
N7	25	1	SORF,150#	350	150	6.35	SAMPLING CONNECTION WITH VALVE
MH1	600	1	AS PER FIG 5.16 OF API650	800	150	6.0	SHELL MANHOLE WITH BLIND FLANGE
CF	-	1	AS PER FIG 5.12 OF API650	AS PER FIG 5.12 OF API650	AS PER FIG 5.12 OF API650	AS PER FIG 5.12 OF API650	FLUSH TYPE CLEAN OUT FITTING
EC	-	2	AS PER DETAIL C	-	-	-	EARTHING CLIT
LT A/B	25	2	SORF,150#	350	150	6.35	LT CONNECTIONS

ROOF NOZZLES & APPURTENANCES FOR TANK#2

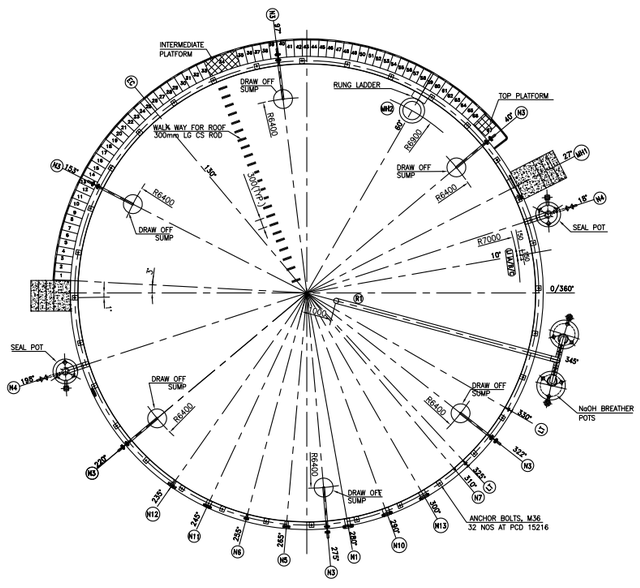
MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE DISTANCE FROM ROOF CENTRE	PROJ. DIST. FROM SHELL PLATE AS TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
R1	150	1	SORF, #150	1000	200	12.7	BREATHER VENT
LI A/B/C	25	3	SORF, #150	7000	150	6.35	LEVEL INDICATOR (FLOAT & ARROW TYPE)
MH2	600	1	AS PER FIG 5.16 OF API650	6900	150	6	ROOF MANHOLE WITH COVER

MATERIAL SPECIFICATION

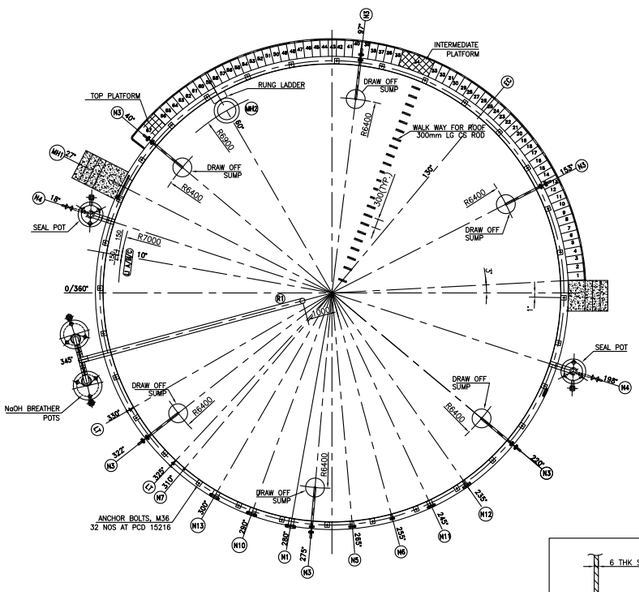
ITEM	MATERIAL
SHELL, BOTTOM, ROOF, RF PL	IS 2062 GR B (EQUIVALENT TO EN10025)
NOZZLES	STAINLESS STEEL TO A312 GR. TP-304 (SW END FOR PIPE SIZES 50NB & BELOW AND BW ENDS FOR PIPE SIZES ABOVE 50 NB)
MANHOLE NECK	IS 2062 GR B (EQUIVALENT TO EN10025)
NOZZLE FLANGES	STAINLESS STEEL TO A182 GR. F-304 FOR PIPE SIZES 50NB & BELOW AND TO A403 GR. 304 FOR PIPE SIZES ABOVE 50 NB)
HAND RAILING (40NB)	BS1387 OR EQUIVALENT MS GALVANIZED (MEDIUM CLASS)
GASKETS	TEFLON
BOLTING (NUTS & BOLTS)	AISI 304 / EQUIVALENT
STRUCTURALS	IS 2062 GR A (EQUIVALENT TO EN10025)
FITTINGS OF 50 NB & BELOW	STAINLESS STEEL TO A182 F304, SW TO ANSI B16.11
FITTINGS ABOVE 50 NB	STAINLESS STEEL TO A403 GR. WP-304, BW TO ANSI B16.9
NAME PLATE AND EARTHING CLIT	SS 304

REFERENCE DRAWINGS

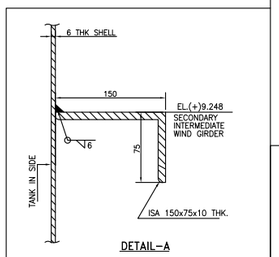
S.N	DRAWING NO.	TITLE
1.	MAITREE-00-LA-ED-111851-PEM-0	DESIGN CALC OF MISCELLANEOUS TANKS
2.	MAITREE-00-LCR-MF B-119110-PEM	P&ID FOR DM MAKE UP WATER SYSTEM
3.	MAITREE-00-GCB-PF B-200001-RPT	PROCESS FLOW DIAGRAM (UF-RO-MB PLANT)
4.	MAITREE-00-UTX-ED-421602C002-PEM	SITE SPECIFIC SEISMIC STUDY REPORT
5.	MAITREE-0-MA-LD-4 21100M001-PEM	PLOT PLAN



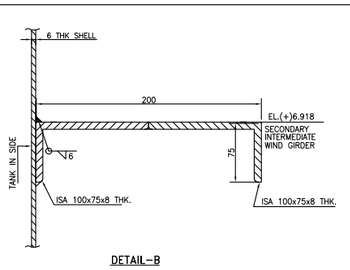
NOZZLE ORIENTATION OF DM TANK#2



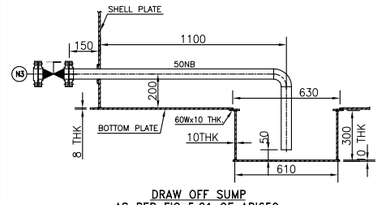
NOZZLE ORIENTATION OF DM TANK#1



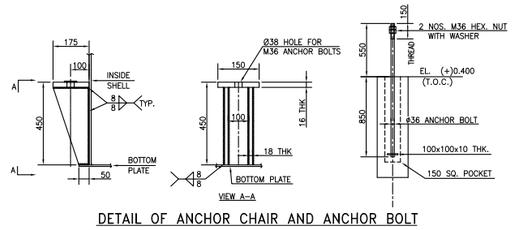
DETAIL-A



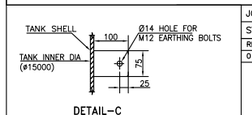
DETAIL-B



DRAW OFF SUMP
AS PER FIG 5.21 OF API650



DETAIL OF ANCHOR CHAIR AND ANCHOR BOLT



DETAIL-C
EARTHING CLIT
AS PER FIG 5.23 OF API650

NOTES:-

1. ALL DIMENSIONS ARE IN MM., ELEVATIONS ARE IN METRE UNLESS OTHER WISE SPECIFIED.
2. EL. (+)0.00 CORRESPONDS TO FINISH FLOOR OF STG. BUILDING I.E. RL(+)5.60M.
3. TANK SURFACE SHOULD BE CLEANED THOUGHLY AFTER FABRICATION FROM LOOSE SUBSTANCES AND FOREIGN MATERIALS SUCH AS DIRT, RUST, SCALE, OIL, GREASE AND WELDING FLUX ETC.
4. VERTICAL SHELL JOINTS SHALL BE OFFSET FROM EACH OTHER WITH A MINIMUM DISTANCE OF 5 TIMES THE THICKNESS OF SHELL COURSE UNDER CONSIDERATION.
5. BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION. THREE PLATE JOINTS IN BOTTOM PLATE SHALL NOT BE CLOSER THAN 300mm FROM EACH OTHER AND ALSO FROM THE TANK SHELL.
6. EARTHING LUG AND NAME PLATE SHALL BE WELDED TO THE TANK AS PER SITE REQUIREMENT.
7. ALL THE INLET PIPING SHALL BE EXTENDED UPTO BOTTOM OF TANK AND CLEARANCE BETWEEN THE BOTTOM OF TANK AND THE THE EDGES OF INLET PIPING SHALL BE 500 MM MAXIMUM.
8. WEIR PLATE SHALL BE PROVIDED AT THE BOTTOM OF ALL THE INLET PIPES INSIDE TANK TO AVOID EROSION OF BOTTOM PLATE.
9. TREAD AND RISE FOR STAIRCASE OF THE TANK SHALL BE 250 AND 200 MM RESPECTIVELY.
10. LEVEL INDICATOR SUPPORTS SHALL BE PROVIDED ON THE SHELL & ROOF.
11. PAD PLATES FOR SUPPORTING ALL INLET PIPING OF TANK SHALL BE PROVIDED BY TANK VENDOR
12. FINAL PAINTING SHALL BE CARRIED OUT AS PER APPROVED PAINTING SCHEDULE AFTER HYDRO TEST OF TANK.
13. TANK NOZZLE FLANGES SHALL BE PROVIDED WITH COUNTER FLANGES ALONG WITH NUTS & BOLTS BY TANK VENDOR.
14. FABRICATION, ERECTION AND TESTING SHALL BE AS PER API650.
15. FOR MANUAL WELDING PROCESSES, FILLET WELD LEGS OR GROOVE WELD DEPTHS GREATER THAN 6MM SHALL BE MULTIPASS.
16. ALL TANK SHELL WELD INTERSECTIONS WHERE VERTICAL JOINTS MEET THE HORIZONTAL JOINTS SHALL BE RADIOGRAPHED, REGARDLESS OF THICKNESS.
17. ALL RADIOGRAPHY OR OTHER NDE AND ANY WELDING SHALL BE COMPLETED PRIOR TO HYDROSTATIC TESTING.
18. THE TANK HYDROSTATIC TEST SHALL BE CONDUCTED BEFORE PERMANENT EXTERNAL PIPING IS CONNECTED TO THE TANK EXCEPT FOR PIPING THAT IS NECESSARY TO FILL AND EMPTY THE TANK, WHICH SHOULD HAVE A FLEXIBLE COMPONENT TO ALLOW FOR SETTLEMENT.
19. ALL INLET PIPING TO THE TANK SHALL BE PROVIDED WITH SUITABLE SIPHON BREAKER.
20. MANHOLE FOR ROOF AND SHELL OF TANK SHALL BE HINGED TYPE.
21. NOZZLE ORIENTATION OF TANK#1 IS MIRROR IMAGE OF TANK#2.
22. SEAL POT AND NAOH BREATHER POTS SHALL BE PLACED ON CIVIL FOUNDATION BY USING THE ANCHOR FASTENER BY TANK SUPPLIER. NO POCKETS BY CIVIL AGENCY WILL BE PROVIDED IN FOUNDATION OF SEAL POT AND NAOH BREATHER.
22. A 10CM HIGH KICK PLATE, TIGHTLY WELDED AROUND THE ENTIRE TANK PERIMETER AND ACTING AS A GUTTER IS TO BE ARRANGED ON THE TANK TOP EDGE. FOR EACH TANK, FOUR RAIN DOWN PIPES, CONNECTED TO THE KICK PLATE AND PROVIDED AT THEIR BOTTOM ENDS WITH 45 DEG BEND, ARE TO BE PROVIDED.

CUSTOMER STAMP

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart, GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

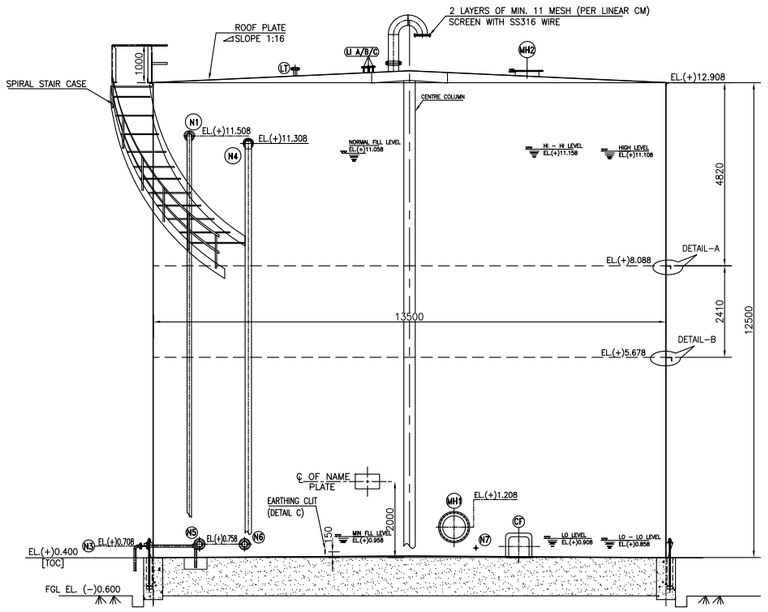
JOB NO. : 421
STATUS : CONTRACT

REV	DATE	DESN.	CHD.	APPD.
01	17.01.18	PK	HK	SKB

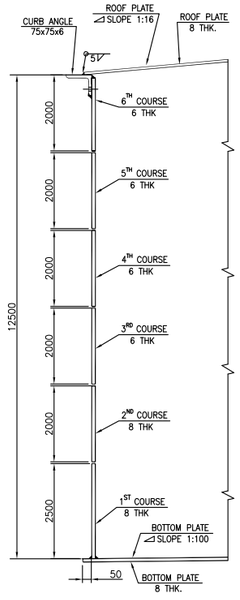
	DATE	NAME
DRAWN BY	26.09.17	PK
DESIGN BY	26.09.17	PK
CHECKED BY	26.09.17	HK
APPROVED BY	26.09.17	PK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE
GA DRAWING OF MISCELLANEOUS TANKS- DM WATER STORAGE TANKS- CAP 2000 M3

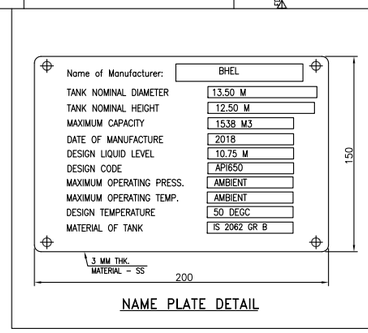
SCALE:
SHEET 2 OF 4
SIZE: PROJECT NO.: 421 FILE:
ANNEX: DRAWING NO. Maitree-0-LA-DA-111852-PEM REV 1



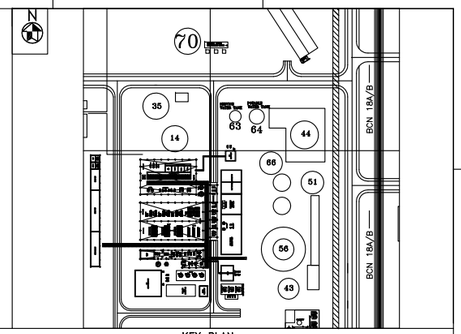
TANK ELEVATION VIEW



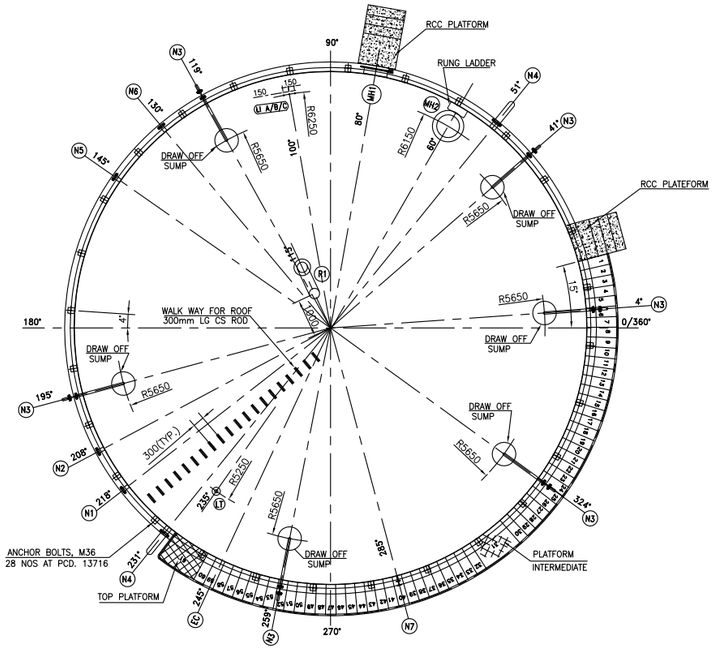
SHELL ARRANGEMENT FOR 1ST TO 6TH COURSE



NAME PLATE DETAIL



KEY PLAN



NOZZLE ORIENTATION OF SERVICE WATER TANK

DESIGN DATA

DESCRIPTION	UNIT	DETAIL
DESIGN CODE	–	API 650
STORED PRODUCT	–	SERVICE WATER
SPECIFIC GRAVITY OF PRODUCT STORED	kg/m3	1000
TYPE OF TANK	–	VERTICAL CYLINDRICAL, SUPPORTED CONE ROOF
NUMBER OF TANKS	no	ONE(1)
DIAMETER OF TANK (ID)	mm	13500
HEIGHT OF TANK	mm	12500
TANK EMPTY WEIGHT	kg	53390
TANK FILLED WEIGHT	kg	1591390
NET WORKING CAPACITY	m3	1445 (AS PER FIG 5.4 OF API650)
MAXIMUM TANK CAPCITY	m3	1538 (AS PER FIG 5.4 OF API650)
BASIC WIND SPEED	m/s	73
DESIGN TEMPERATURE	°C	50
INTERNAL DESIGN PRESSURE	KPa	18 AS PER API650 FOR SEISMIC CALCULATION
OPERATING PRESSURE	–	ATMOSPHERIC
CORROSION ALLOWANCE	mm	2.0
SEISMIC FACTORS	–	AS PER SITE SPECIFIC SEISMIC STUDY
SEISMIC MOMENTS	KNM	RING WALL MOMENT -4521.73, SLAB MOMENT - 6367.54
WIND LOAD	KN	VERTICAL - 278.44, HORIZONTAL - 393.44
WIND MOMENT	KNM	4395.97
ROOF LOAD (UNIFORM LIVE)	kg/m2	150
TESTING	–	AS PER CL7.3 AND SECTION 8 OF API650
RATE OF FILLING OF TANK (MAX)	m3/hr	90
RATE OF EMPTYING OF TANK (MAX)	m3/hr	180, FOR TWO NOS (1W+1S) SERVICE WATER BOOSTER PUMP (cap. 90 m3/hr)

SHELL NOZZLES & APPURTENANCES

MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE ELE FROM TOP OF BOTTOM PLATE AS PER TABLE 5.6a OF API650	PROJ. DIST. FROM SHELL PLATE AS PER TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
N1	100	1	SORF,150#	11100	175	8.56	SERVICE WATER INLET
N2	100	1	SORF,150#	11100	175	8.56	SPARE INLET WITH BLIND FLANGE
N3	50	6	SORF,150#	300	150	5.54	DRAW OFF SUMP
N4	150	2	SORF,150#	10900	200	10.97	OVERFLOW
N5	150	1	SORF,150#	350.0	200	10.97	SPARE OUTLET WITH VALVE
N6	150	1	SORF,150#	350.0	200	10.97	SERVICE WATER OUTLET
N7	25	1	SORF,150#	250	150	6.35	SAMPLING CONNECTION WITH VALVE
MH1	600	1	AS PER FIG 5.16 OFAP1650	800.0	150	6.0	SHELL MANHOLE WITH BLIND FLANGE
CF	–	1	AS PER FIG 5.12 OFAP1650	AS PER FIG 5.12 OFAP1650	AS PER FIG 5.12 OFAP1650	AS PER FIG 5.12 OFAP1650	FLUSH TYPE CLEAN OUT FITTING
EC	–	2	AS PER DETAIL C	–	–	–	EARTHING CLIT

ROOF NOZZLES & APPURTENANCES FOR

MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE DISTANCE FROM ROOF CENTRE	PROJ. DIST. FROM SHELL PLATE AS TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
R1	150	1	SORF, #150	1000	200	10.97	VENT
LI A/B/C	25	3	SORF, #150	6250	150	6.35	LEVEL INDICATOR (FLOAT & ARROW TYPE)
MH2	600	1	AS PER FIG 5.16 OFAP1650	6150	150	6	ROOF MANHOLE WITH COVER
LT	80	1	SORF,150#	5250	175	7.62	LT CONNECTIONS

MATERIAL SPECIFICATION

ITEM	MATERIAL
SHELL, BOTTOM, ROOF, RF PL	IS 2062 GR B (EQUIVALENT TO EN10025)
NOZZLES	STAINLESS STEEL TO A312 GR. TP-304 (SW END FOR PIPE SIZES 50NB & BELOW AND BW ENDS FOR PIPE SIZES ABOVE 50 NB)
NOZZLES FLANGES	STAINLESS STEEL TO A182 GR. F-304 FOR PIPE SIZES 50NB & BELOW AND TO A403 GR. 304 FOR PIPE SIZES ABOVE 50 NB)
MANHOLE NECK	IS 2062 GR B (EQUIVALENT TO EN10025)
HAND RAILING (40NB)	BS:1387 OR EQUIVALENT MS GALVANIZED (MEDIUM CLASS)
GASKETS	TEFLON
BOLTING (NUTS & BOLTS)	AISI 304 / EQUIVALENT
STRUCTURALS	IS 2062 GR A (EQUIVALENT TO EN10025)
FITTINGS OF 50 NB & BELOW (SW END)	STAINLESS STEEL TO A182 F304, SW TO ANSI B16.11
FITTINGS ABOVE 50 NB (BW END)	STAINLESS STEEL TO A403 GR. WP-304, BW TO ANSI B16.9
NAME PLATE AND EARTHING CLIT	SS 304

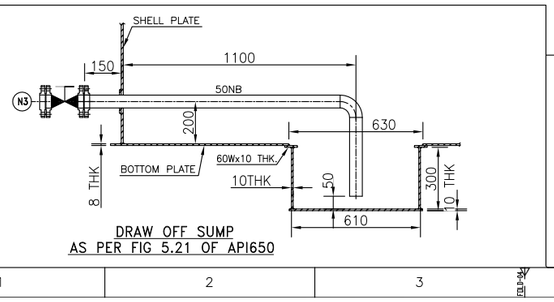
REFERENCE DRAWINGS

S.N	DRAWING NO.	TITLE
1.	MAITREE-00-LA-ED-111851-PEM	DESIGN CALC OF MISCELLANEOUS TANKS
2.	MAITREE-00-P-MFB-116001-PEM	P&ID FOR PLANT WATER SYSTEM
3.	MAITREE-00-MA-LD-421100M001-PEM	PLOT PLAN
4.	MAITREE-00-UTX-ED-421602C002-PEM	SITE SPECIFIC SEISMIC STUDY REPORT

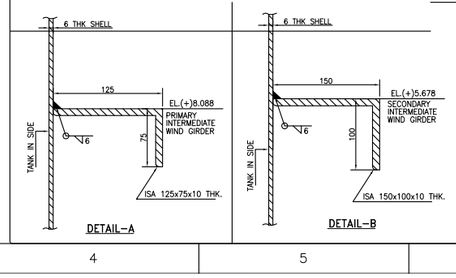
NOTES:–

1. ALL DIMENSIONS ARE IN MM., ELEVATIONS ARE IN METRE UNLESS OTHER WISE SPECIFIED.
2. EL. (+)0.00 CORRESPONDS TO FINISH FLOOR OF STG. BUILDING I.E. RL.(+)5.60M.
3. TANK SURFACE SHOULD BE CLEANED THOUGHLY AFTER FABRICATION FROM LOOSE SUBSTANCES AND FOREIGN MATERIALS SUCH AS DIRT, RUST, SCALE, OIL, GREASE AND WELDING FLUX ETC.
4. VERTICAL SHELL JOINTS SHALL BE OFFSET FROM EACH OTHER WITH A MINIMUM DISTANCE OF 5 TIMES THE THICKNESS OF SHELL COURSE UNDER CONSIDERATION.
5. BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION. THREE PLATE JOINTS IN BOTTOM PLATE SHALL NOT BE CLOSER THAN 300mm FROM EACH OTHER AND ALSO FROM THE TANK SHELL.
6. EARTHING LUG AND NAME PLATE SHALL BE WELDED TO THE TANK AS PER SITE REQUIREMENT.
7. ALL THE INLET PIPING SHALL BE EXTENDED UPTO BOTTOM OF TANK AND CLEARANCE BETWEEN THE BOTTOM OF TANK AND THE THE EDGES OF INLET PIPING SHALL BE 500 MM MAXIMUM.
8. WEIR PLATE SHALL BE PROVIDED AT THE BOTTOM OF ALL THE INLET PIPES INSIDE TANK TO AVOID EROSION OF BOTTOM PLATE.
9. TREAD AND RISE FOR STAIRCASE OF THE TANK SHALL BE 250 AND 200 MM RESPECTIVELY.
10. LEVEL INDICATOR SUPPORTS SHALL BE PROVIDED ON THE SHELL & ROOF.
11. PAD PLATES FOR SUPPORTING ALL INLET PIPING OF TANK SHALL BE PROVIDED BY TANK VENDOR
12. FINAL PAINTING SHALL BE CARRIED OUT AS PER APPROVED PAINTING SCHEDULE AFTER HYDRO TEST OF TANK.
13. TANK NOZZLE FLANGES SHALL BE PROVIDED WITH COUNTER FLANGES ALONG WITH NUTS & BOLTS BY TANK VENDOR.
14. FABRICATION, ERECTION AND TESTING SHALL BE AS PER API650.
15. FOR MANUAL WELDING PROCESSES, FILLET WELD LEGS OR GROOVE WELD DEPTHS GREATER THAN 6MM SHALL BE MULTIPASS.
16. ALL TANK SHELL WELD INTERSECTIONS WHERE VERTICAL JOINTS MEET THE HORIZONTAL JOINTS SHALL BE RADIOGRAPHED, REGARDLESS OF THICKNESS.
17. ALL RADIOGRAPHY OR OTHER NDE AND ANY WELDING SHALL BE COMPLETED PRIOR TO HYDROSTATIC TESTING.
18. THE TANK HYDROSTATIC TEST SHALL BE CONDUCTED BEFORE PERMANENT EXTERNAL PIPING IS CONNECTED TO THE TANK EXCEPT FOR PIPING THAT IS NECESSARY TO FILL AND EMPTY THE TANK, WHICH SHOULD HAVE A FLEXIBLE COMPONENT TO ALLOW FOR SETTLEMENT.
19. ALL INLET PIPING TO THE TANK SHALL BE PROVIDED WITH SUITABLE SIPHON BREAKER.
20. MANHOLE FOR ROOF AND SHELL OF TANK SHALL BE HINGED TYPE.
22. A 10CM HIGH KICK PLATE, TIGHTLY WELDED AROUND THE ENTIRE TANK PERIMETER AND ACTING AS A GUTTER IS TO BE ARRANGED ON THE TANK TOP EDGE. FOR EACH TANK, FOUR RAIN DOWN PIPES, CONNECTED TO THE KICK PLATE AND PROVIDED AT THEIR BOTTOM ENDS WITH 45 DEG BEND, ARE TO BE PROVIDED.

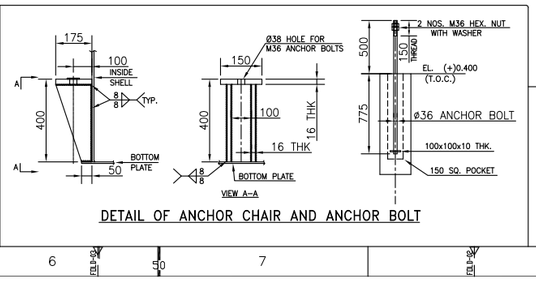
CUSTOMER STAMP



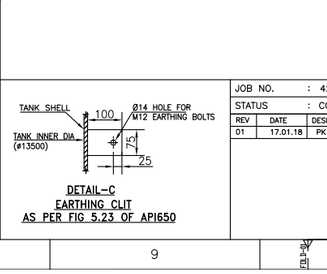
DRAW OFF SUMP AS PER FIG 5.21 OF API650



DETAIL–A DETAIL–B



DETAIL OF ANCHOR CHAIR AND ANCHOR BOLT



DETAIL–C EARTHING CLIT AS PER FIG 5.23 OF API650

JOB NO.	: 421			
STATUS	: CONTRACT			
REV	DATE	DESN.	CHD.	APPD.
01	17.01.18	PK	HK	SKB

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart, GERMANY

OWNER:
BANGLADESH–INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

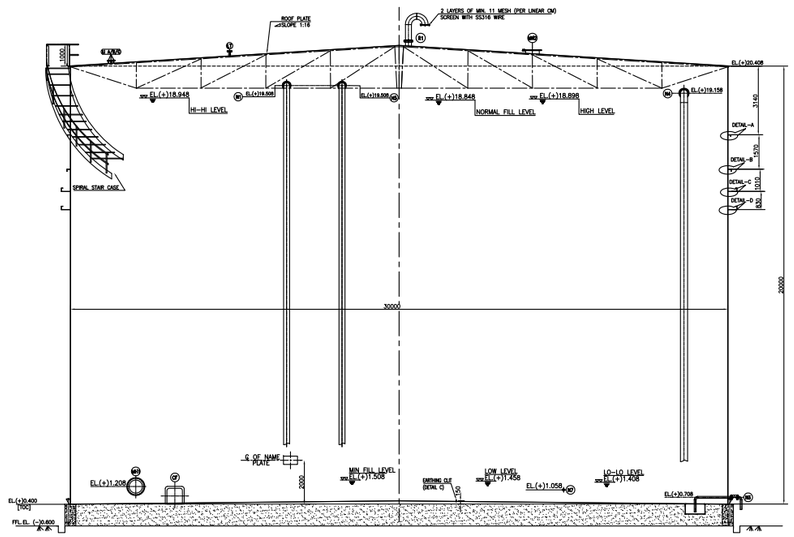
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE:
SHEET 3 OF 4

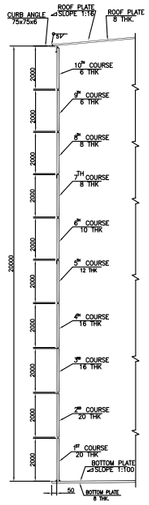
	DATE	NAME
DRAWN BY	04.01.18	PK
DESIGN BY	04.01.18	PK
CHECKED BY	04.01.18	HK
APPROVED BY	04.01.18	PK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE
GA DRAWING OF MISCELLANEOUS TANKS– SERVICE WATER STORAGE TANKS– CAP 1440 M3

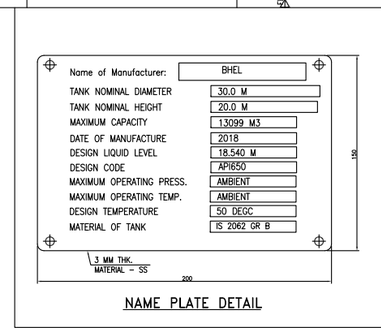
SIZE: | PROJECT NO: 421 | FILE:
ANNEX: | DRAWING NO. Maitree-0-LA-DA-111852-PEM | REV 01



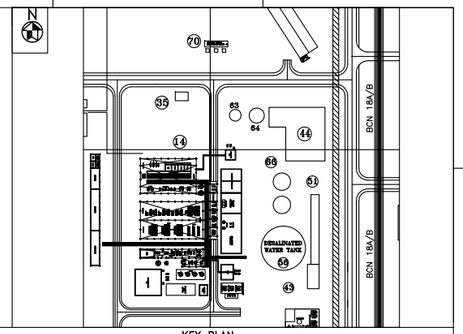
TANK ELEVATION VIEW



SHELL ARRANGEMENT FOR 1ST TO 10TH COURSE



NAME PLATE DETAIL



KEY PLAN

DESIGN DATA

DESCRIPTION	UNIT	DETAIL
DESIGN CODE	-	API 650
STORED PRODUCT	-	DESALINATED WATER
SPECIFIC GRAVITY OF PRODUCT STORED	kg/m3	1000
TYPE OF TANK	-	VERTICAL CYLINDRICAL, SUPPORTED CONE ROOF
NUMBER OF TANKS	no	ONE(1)
DIAMETER OF TANK (ID)	mm	30000
HEIGHT OF TANK	mm	20000
TANK EMPTY WEIGHT	kg	309939
TANK FILLED WEIGHT	kg	13408939
NET WORKING CAPCITY	m3	12250 (AS PER FIG 5.4 OF API650)
MAXIMUM TANK CAPCITY	m3	13099 (AS PER FIG 5.4 OF API650)
BASIC WIND SPEED	m/s	73
DESIGN TEMPERATURE	°C	50
INTERNAL DESIGN PRESSURE	KPa	18 AS PER API650 FORSEISMIC CALCULATIONS
OPERATING PRESSURE	-	ATMOSPHERIC
CORROSION ALLOWANCE	mm	2.0
SEISMIC FACTORS	-	AS PER SITE SPECIFIC SEISMIC STUDY
SEISMIC MOMENTS	KNM	RING WALL MOMENT -59930.59, SLAB MOMENT - 95035.31
WIND LOAD	KN	VERTICAL - 990, HORIZONTAL - 1942.88
WIND MOMENT	KNM	39043.20
ROOF LOAD (UNIFORM LIVE)	kg/m2	150
TESTING	-	AS PER CL7.3 AND SECTION 8 OF API650
RATE OF FILLING OF TANK (MAX)	m3/hr	439, FROM REMINERALISATION PLANT
RATE OF EMPTYING OF TANK (MAX)	m3/hr	2630,TWO(2) NOS., 1W+1S, HVAC PUMP (CAP. 190 m3/hr) + THREE (3) NOS.,2W+1S, APH WASH/ESP WASH (3) PUMPS (CAP. 410 m3 hr each) + TWO(2) NOS., 1W+1S, AHP PUMP (CAP. 105 m3/hr) + THREE(3) NOS.,2W+1S, FGD PUMPS (270 m3/hr each)

SHELL NOZZLES & APPURTENANCES

MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE ELE FROM TOP OF BOTTOM PLATE AS PER TABLE 5.6a OF API650	PROJ. DIST. FROM SHELL PLATE AS PER TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
N1	250	1	SORF,150#	19100	225	12.70	DESALINATED WATER INLET
N2	500	1	SORF,150#	650	275	12.70	DESALINATED WATER OUTLET
N3	50	6	SORF,150#	300	150	5.54	DRAW OFF SUMP (DRAIN)
N4	300	2	SORF,150#	18750	225	12.7	OVERFLOW
N5	250	1	SORF,150#	19100	225	12.7	SPARE INLET WITH BLIND FLANGE
N6	500	1	SORF,150#	650	275	12.70	SPARE OUTLET WITH VALVE
N7	25	1	SORF,150#	650	150	6.35	SAMPLING CONNECTION WITH VALVE
MH1	600	1	AS PER FIG 5.16 OFAPI650	800.0	150	6.0	SHELL MANHOLE WITH BLIND FLANGE
CF	-	1	AS PER FIG 5.12 OFAPI650	AS PER FIG 5.12 OFAPI650	AS PER FIG 5.12 OFAPI650	AS PER FIG 5.12 OFAPI650	FLUSH TYPE CLEAN OUT FITTING
EC	-	2	AS PER DETAIL C	-	-	-	EARTHING CLIT

ROOF NOZZLES & APPURTENANCES FOR

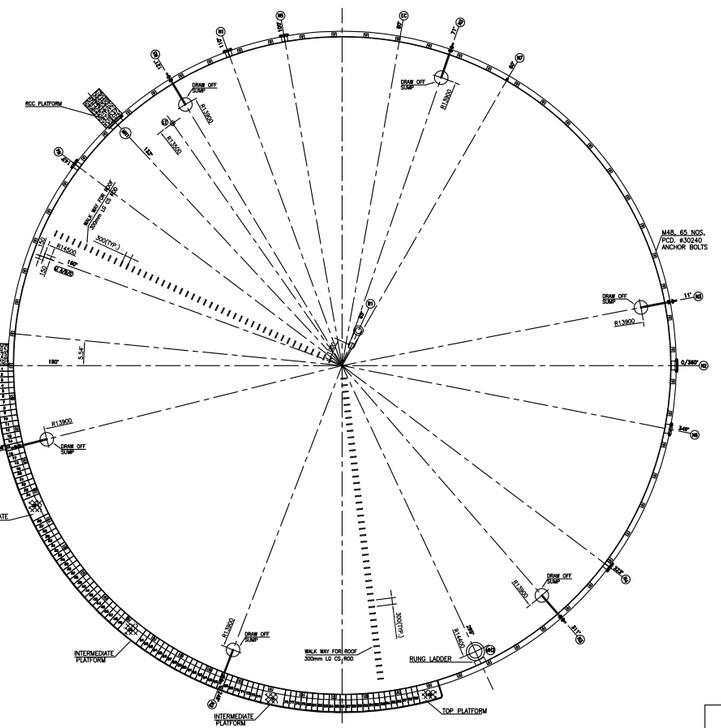
MARK	SIZE NB	QTY. (NO.)	FLANGE TYPE, RATING	NOZZLE CENTRE DISTANCE FROM ROOF CENTRE	PROJ. DIST. FROM SHELL PLATE AS TABLE 5.6a OF API650	NOZZLE THK IN MM AS PER TABLE 5.6a OF API650	SERVICE
LI A/B/C	25	3	SORF, #150	14500	150	6.35	LEVEL INDICATOR (FLOAT & ARROW TYPE)
R1	250	1	SORF, #150	1000	225	12.7	VENT
MH2	600	1	AS PER FIG 5.16 OFAPI650	14400	150	6	ROOF MANHOLE WITH COVER
LT	80	1	SORF,150#	13500	175	7.62	LT CONNECTION

MATERIAL SPECIFICATION

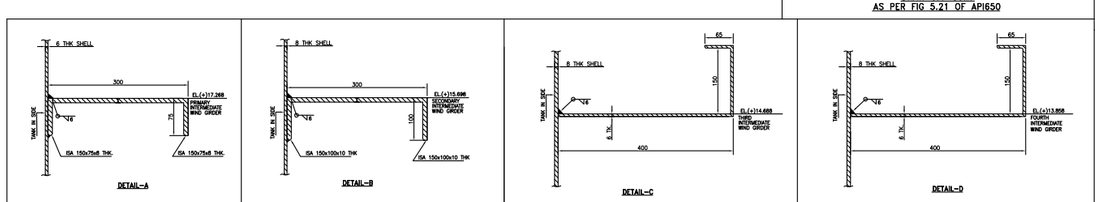
ITEM	MATERIAL
SHELL, BOTTOM, ROOF, RF PL	IS 2062 GR B (EQUIVALENT TO EN10025)
NOZZLES	STAINLESS STEEL TO A312 GR. TP-304 (SW END FOR PIPE SIZES 50NB & BELOW AND BW ENDS FOR PIPE SIZES ABOVE 50 NB)
NOZZLES FLANGES	STAINLESS STEEL TO A182 GR. F-304 FOR PIPE SIZES 50NB & BELOW AND TO A403 GR. 304 FOR PIPE SIZES ABOVE 50 NB)
MANHOLE NECK	IS 2062 GR B (EQUIVALENT TO EN10025)
HAND RAILING (40NB)	BS:1387 OR EQUIVALENT MS GALVANIZED (MEDIUM CLASS)
GASKETS	TEFLON
BOLTING (NUTS & BOLTS)	AISI 304 / EQUIVALENT
STRUCTURALS	IS 2062 GR A (EQUIVALENT TO EN10025)
FITTINGS OF 50 NB & BELOW (SW END)	STAINLESS STEEL TO A182 F304, SW TO ANSI B16.11
FITTINGS ABOVE 50 NB (BW END)	STAINLESS STEEL TO A403 GR. WP-304, BW TO ANSI B16.9
NAME PLATE AND EARTHING CLIT	SS 304

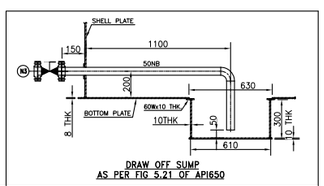
REFERENCE DRAWINGS

S.N	DRAWING NO.	TITLE
1.	MAITREE-00-LA-ED-111851-PEM-0	DESIGN CALC OF MISCELLANEOUS TANKS
2.	MAITREE-00-P-MFB-116001-PEM	P&ID FOR PLANT WATER SYSTEM
3.	MAITREE-00-MA-LD-421100M001-PEM	PLOT PLAN
4.	MAITREE-00-UTX-ED-421602C002-PEM	SITE SPECIFIC SEISMIC STUDY REPORT

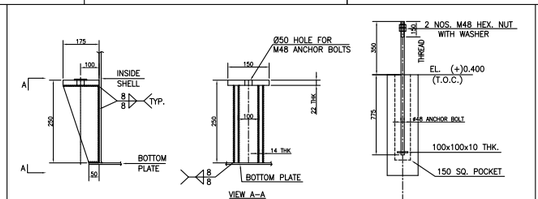


NOZZLE ORIENTATION OF DESALINATED WATER TANK

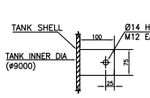




DRAW OFF SUMP AS PER FIG 5.21 OF API650



DETAIL OF ANCHOR CHAIR AND ANCHOR BOLT



DETAIL-C EARTHING CLIT AS PER FIG 5.23 OF API650

NOTES:-

1. ALL DIMENSIONS ARE IN MM., ELEVATIONS ARE IN METRE UNLESS OTHER WISE SPECIFIED.
2. EL. (+)0.00 CORRESPONDS TO FINISH FLOOR OF STG. BUILDING I.E. RL.(+)5.60M.
3. TANK SURFACE SHOULD BE CLEANED THOUGHLY AFTER FABRICATION FROM LOOSE SUBSTANCES AND FOREIGN MATERIALS SUCH AS DIRT, RUST, SCALE, OIL, GREASE AND WELDING FLUX ETC.
4. VERTICAL SHELL JOINTS SHALL BE OFFSET FROM EACH OTHER WITH A MINIMUM DISTANCE OF 5 TIMES THE THICKNESS OF SHELL COURSE UNDER CONSIDERATION.
5. BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION. THREE PLATE JOINTS IN BOTTOM PLATE SHALL NOT BE CLOSER THAN 300mm FROM EACH OTHER AND ALSO FROM THE TANK SHELL.
6. EARTHING LUG AND NAME PLATE SHALL BE WELDED TO THE TANK AS PER SITE REQUIREMENT.
7. ALL THE INLET PIPING SHALL BE EXTENDED UPTO BOTTOM OF TANK AND CLEARANCE BETWEEN THE BOTTOM OF TANK AND THE THE EDGES OF INLET PIPING SHALL BE 500 MM MAXIMUM.
8. WEIR PLATE SHALL BE PROVIDED AT THE BOTTOM OF ALL THE INLET PIPES INSIDE TANK TO AVOID EROSION OF BOTTOM PLATE.
9. TREAD AND RISE FOR STAIRCASE OF THE TANK SHALL BE 250 AND 200 MM RESPECTIVELY.
10. LEVEL INDICATOR SUPPORTS SHALL BE PROVIDED ON THE SHELL & ROOF.
11. PAD PLATES FOR SUPPORTING ALL INLET PIPING OF TANK SHALL BE PROVIDED BY TANK VENDOR
12. FINAL PAINTING SHALL BE CARRIED OUT AS PER APPROVED PAINTING SCHEDULE AFTER HYDRO TEST OF TANK.
13. TANK NOZZLE FLANGES SHALL BE PROVIDED WITH COUNTER FLANGES ALONG WITH NUTS & BOLTS BY TANK VENDOR.
14. FABRICATION, ERECTION AND TESTING SHALL BE AS PER API650.
15. FOR MANUAL WELDING PROCESSES, FILLET WELD LEGS OR GROOVE WELD DEPTHS GREATER THAN 6MM SHALL BE MULTIPASS.
16. ALL TANK SHELL WELD INTERSECTIONS WHERE VERTICAL JOINTS MEET THE HORIZONTAL JOINTS SHALL BE RADIOGRAPHED, REGARDLESS OF THICKNESS.
17. ALL RADIOGRAPHY OR OTHER NDE AND ANY WELDING SHALL BE COMPLETED PRIOR TO HYDROSTATIC TESTING.
18. THE TANK HYDROSTATIC TEST SHALL BE CONDUCTED BEFORE PERMANENT EXTERNAL PIPING IS CONNECTED TO THE TANK EXCEPT FOR PIPING THAT IS NECESSARY TO FILL AND EMPTY THE TANK, WHICH SHOULD HAVE A FLEXIBLE COMPONENT TO ALLOW FOR SETTLEMENT.
19. ALL INLET PIPING TO THE TANK SHALL BE PROVIDED WITH SUITABLE SIPHON BREAKER.
20. MANHOLE FOR ROOF AND SHELL OF TANK SHALL BE HINGED TYPE.
21. TANK INTERNAL PIPES OF LARGER SIZE WHEREVER POSSIBLE SHALL BE PAINTED FROM INSIDE ALSO.
22. A 10CM HIGH KICK PLATE, TIGHTLY WELDED AROUND THE ENTIRE TANK PERIMETER AND ACTING AS A GUTTER IS TO BE ARRANGED ON THE TANK TOP EDGE. FOR EACH TANK, FOUR RAIN DOWN PIPES, CONNECTED TO THE KICK PLATE AND PROVIDED AT THEIR BOTTOM ENDS WITH 45 DEG BEND, ARE TO BE PROVIDED.

CUSTOMER STAMP

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart, GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

JOB NO. : 421
STATUS : CONTRACT

REV	DATE	DESN.	CHD.	APPD.
01	17.01.18	PK	HK	SKB

	DATE	NAME
DRAWN BY	03.01.18	PK
DESIGN BY	03.01.18	PK
CHECKED BY	03.01.18	HK
APPROVED BY	03.01.18	PK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

SCALE: NTS
SHEET 4 OF 4

TITLE
GA DRAWING OF MISCELLANEOUS TANKS- DESALINATED WATER STORAGE TANKS- CAP 12250 M3

SIZE: A1 | PROJECT NO: 421 | FILE:
ANNEX: | DRAWING NO. Maitree-0-LA-DA-111852-PEM | REV 01

ANNEXURE III

C&I SPECIFICATION

FOR

FUEL OIL UNLOADING & STORAGE SYSTEM

Table of Contents

Section C

Section D

SECTION –C

SPECIFIC TECHNICAL REQUIREMENT

1. **The Contractor shall provide complete Instrumentation** for control, monitoring and operation of entire FOHS. The requirements given are to be read in conjunction with detailed Technical specification. Further in case of any discrepancy in the requirement within the same section noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre bid clarification. In absence of any pre bid clarification, the more stringent requirement as per interpretation of customer shall prevail without any commercial and time implication.

2. FUEL OIL UNLOADING & STORAGE SYSTEM shall be operated from DCS (BHEL's scope).

3. The quantity of instruments for the system shall be as per tender P &ID wherever provided of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.

4. The scope of C&I cable shall be referred in Electrical scope split sheet in Electrical portion of the specification.

5. Electrical Actuators shall be with integral starter (For detail please refer Cl. No. B0.6.19.16 under section IA-Customer's general technical specification – B0)

6. Bidder to include all the fittings, accessories and valve manifolds required for the package instruments. All fittings shall use metric threads.

7. All instruments shall be terminated on JB/LCP in field and both instrument and JB/LCP are in bidder scope.

8. The specifications for instruments mentioned in the specification are minimum requirements. Datasheets of instrument shall be subject to customer/owner approval.

9. All transmitters & electronics items including JBs will be explosion proof / intrinsically safe as per hazardous area classification.

10. PG/DPG/PS/PT/LT/LS etc. shall have chemical/diaphragm seal.

11. All transmitters shall be smart type and shall have 4-20mA DC signal with superimposed digital communication (HART). Each Temperature element shall be complemented with temperature transmitters, compensating cable, JB/rack & other erection hardware. All transmitters shall be fitted with a local analog/digital indicator displaying appropriate physical units which may be read clearly from an easily accessible position.

12. **Digital indicators**, to be placed nearby the tanks, for displaying tank level are in bidder's scope.

13. Instruments must have separate tapping lines. Sharing of the same tapping pipe for redundant instruments or various different instruments is not acceptable.

14. Instruments & its accessories shall be complied with weather of the Coastal Area.

15. As a general rule, measuring points and measuring equipment for critical protection shall be separate from and not combined with measuring equipment for the automatic control equipment.

16. The instrumentation and control equipment shall have high electro-magnetic and radio frequency interference immunity and shall not be affected by portable radio transmitters operated in the vicinity of the equipment. Any limitations shall be stated.

17. All instruments shall be protected by cases. The cases shall have enclosure classification not less than IP 42 according to EN 60529 when mounted indoors in totally enclosed rooms with provision for limited ingress of dust, IP 54 else in an enclosed building and IP 55W for mounting outdoors.

18. Electronic instruments shall not be located close to hot lines, vessels or other hot equipment. Ambient temperatures exceeding 80 °C shall not result in calibration difficulties or rapid deterioration of electronic components.

19. The solenoid operated valves, if any, shall have limit switches for open/close feedback.

20. All pneumatic operated regulating control valves (if any) shall be envisaged with smart positioner. (For detail please refer Cl. No. B0.6.19.15 under section IA-Customer's general technical specification – B0)

21. The junction boxes for termination of instruments /actuator limit switches/solenoid valve limit switches etc. are in bidder's scope.

22. 415 V AC/230 V AC supply shall be provided by BHEL at a single point, further distribution to various instruments/Equipments of the system shall be in bidder scope. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Bidder to submit the power requirement along with the bid.

23. Bidder to furnish electrical/UPS load data in his proposal.

24. Power supply derived for Transmitters, contact interrogation, interposing relay and solenoid shall generally be ungrounded 24V D.C only. In all cases redundancy in power modules shall be considered.

25. Bidder to note that all the transmitters/instruments supplied by Bidder shall be rack mounted. The racks shall be preassembled and provided by Bidder. Also no instruments / analyzers & JBs/Racks should be protruding on the walkway.

26. Instrument installation and accessories required and same shall be in Bidder's scope. The requirement indicated in the 'Instrument Installation Diagram', enclosed elsewhere in this specification, is minimal.
Vendor submitted 'Instrument Installation Diagram' shall be subject to customer approval during detail engineering without any commercial and time implication. For instruments for which Installation Diagram is not attached, vendor's Installation Diagram for such items will also be subject to customer approval during detail engineering without any commercial and delivery implication.

27. Bidder to provide erection hardware including junction boxes, canopies, structural steel as required.

28. Redundancy of sensors shall be provided, irrespective of instrumentation shown in the PID, by bidder as per following:
(i) Triple redundancy for all analog and binary inputs required for protection of system /drives.
(ii) For all other control functions & alarms dual redundancy of the sensors shall be provided by the bidder.

29. Each valve/instrument shall be fitted with a stainless steel or aluminum nameplate indicating the valve/instrument service and reference number in accordance with the approved equipment coding system.

30. The equipment shall be of modern, compact design incorporating the latest developments in proven technology. All instruments whether for local indication or remote transmission shall be of good quality and shall have an accuracy and repeatability appropriate to their duty.

31. Bidder shall provide Cable Schedule in BHEL excel format which shall be provided during detailed engineering. Also, Cable Interconnections for Complete System shall be in Bidders' scope. DCS side details for hardwired signals shall be furnished by BHEL during detailed engineering.

32. Generally equipment shall be supplied from one composite range of measurements and control equipment as marketed by a reputable manufacturer of international standing and shall have a minimum of three years operational use on similar projects.

33. For codes & standards refer detailed specification*. Indian standards are not acceptable*. *Chinese standards and Chinese material are also not acceptable.*

34. Local representative of C&I related BOI supplier shall be available in India/Bangladesh.

35. The identification and numbering of equipment, systems, items, etc. of supply, as well as of all documents and drawings shall be in accordance with the **VGB guideline RDS-PP (Reference Designation System for Power Plants - KKS system).**

36. Sea worthy packing capable of performing all necessary functions like prevention of damage to the contents, sufficient to support frequent handling and lengthy period of outdoor storage in adverse weather conditions are required.

37. Drawings/Documents and data to be furnished after award of the contract shall be inline with MDL furnished elsewhere in the specification.

38. Apart from specific design requirement for Fuel Oil Handling System. Design of various systems/sub-systems and all equipments will also strictly meet the stipulation of Part B0 of customer technical specification.

39. *All documents, including the installation and operation and maintenance manuals as well as the related software shall be in fluent, legible English. In addition, operation and maintenance manuals shall be translated into* ***Bangla*** *and provided as paper copies and in electronic format.*

Notes:

1. The above given scope is indicative & minimum. Any item/ equipment not indicated above however required for the completeness of the system is to be supplied by bidder without any technical, commercial and delivery implication to BHEL.

2. Documents of C&I System shall be submitted to end user/owner for approval during detail engineering. Changes, if any, shall be accommodated by the bidder without any price/time implication.

3. In case of any discrepancy in Section-C and Section-D of the specification, Section-C shall prevail.

SECTION-D

INSTRUMENTS, JB & VALVES SPECIFICATIONS

For the following instruments please refer specified clause no. in the specification under **Section-IA**- customer's General Technical Specification – B0:

Transmitters	-	B0.6.19.8
Temperature measurement	-	B0.6.19.9
Pressure measurement	-	B0.6.19.10
Flow measurement	-	B0.6.19.11
Level measurement	-	B0.6.19.12
Control Valves	-	B0.6.19.15
Actuators	-	B0.6.19.16
JB	-	B0.6.19.5

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

1.0 Measuring instruments / equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment. The instrumentation vendor shall be subject to BHEL's / customer's approval. Further, all instruments shall be of proven reliability, accuracy, repeatability requiring a minimum of maintenance. All instrumentation equipment and accessories under this specification shall be furnished as per technical specifications, ranges, makes / numbers as approved by BHEL / customer during detailed engineering.

1.1 Every panel-mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.

1.2 All local gauges as well as transmitters, sensors and switches for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance under the scope of specification shall be provided. The necessary root valves, impulse piping, drain cock, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting / erection of these local instruments shall be furnished even if not specifically asked for. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg / Cm^2.

1.3 Instruments envisaged for sea water application shall be provided with wetted parts made of Monel / Hastelloy C.

1.4 All instruments shall be provided with durable epoxy coating for housing and all exposed surfaces of the instruments.

1.5 Specification for Pr. Gauge, D.P. Gauge, Temp. Gauge and Level Gauge

Sl. No.	Features	Essential / Minimum Requirements		
		Pr. Gauge / D.P. Gauge	**Temp. Gauge**	**Level Gauge**
1	Sensing Element and Material	Bourdon for high pressure, Diaphragm / Bellow for low pr. of 316 SS	Mercury in steel below 450 Deg.C and inert gas actuated for above 450 Deg.C of SS bulb and capillary	Tempered toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel / 304 SS
3	Dial size	150 mm	150 mm	Tubular covering entire range.
4	End connection	½ inch NPT (M)	¾ inch NPT (M)	Process connection as per ASME PTC and drain / vent 15 NB.
5	Accuracy	±1% of span	±1% of span	±2%
6	Scale	Linear, 270 Deg. Arc graduated in metric units.	Linear, 270 Deg. Arc graduated in Deg. C	Linear vertical
7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Test pr. For the assembly shall be 1.5 to the max. design pr. at 38 Deg. C.		
9	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
10	Zero / Span adjustment	Provided	Provided	--
11	Identification	Engraved with service legend or engraved phenolic laminated tag plate	Engraved with service legend or laminated phenolic name plate	Engraved with service legend or laminated phenolic name plate
12	Accessories	Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel / SS as per CS / Alloy process requirement.
13	Material of Bourdon movement	316 SS / 304 SS	316 SS / 304 SS	

1.6 Process Actuated Switches

Sl. No.	Features	Essential / Minimum Requirements Switches devices (Pr., Temp., Flow, Level Switches)			
		Pr. Switch / D.P.	**1 TEMP. SWITCH**	**2 LEVEL SWITCH**	**3 LIMIT SWITCH**
1	Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr. / vacuum	Vapour pressure sensing, liquid filled bellow type with bulb and capillary (10 m minimum)	1.Capacitance types for oil and dirty medium, water, condensate application. Capacitance / conductivity / ultrasonic type for acid / alkali application Radio-frequency / ultrasonic type for ash hopper, ash slurry application Float type for application decided during detailed eng.	Micro switch
2	Material	316 SS	Bulb: 316 SS Capillary: 304 SS	316 SS	Silver plated high conductivity non-corrosive
3	Repeatability	±0.5% for full range	±0.5% for full	±0.5% for full range	±0.5%
4	End connection	½ Inch NPT (F)	½ Inch NPT (F)	1" NB Socket Weld	
5	Over range proof pressure	150% of max. design press.	---	150% of max. design press.	---
6	No. of contacts	2 NO + 2 NC, SPDT snap action dry contact			
7	Rating of contacts	60V DC, 6VA (or more if required by DCS).			
8	Enclosure	Weather and dust proof as per IP-55			
9	Set point / dead	Provided over full range			
10	Accessories	Syphon, snubber, chemical seal, pulsation dampener as required by process	Thermowell of 316 SS and packing glands	All mounting accessories	

11	Mounting	Suitable for enclosure / rack mounting or direct mounting	Direct factory mounting on valves, equipment with provision for adjusting at site.
12	Elect. Connection	Plug in socket	
13	General	Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seal shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.	

1.7 Thermocouple

Sr. No.	Features	Essential/Minimum Requirements
1	Type of Thermocouple. :	16 AWG wire of Chromel-Alumel (Type K) or 24 AWG wire Pt-Rhodium-PT (Type R) depending on operating temperature Range (ungrounded type).
2	No. of element :	Duplex
3	Housing/ Head :	IP-55/ Diecast Aluminium. Plug in connectors are to be provided for external signal cable connection.
4	Sheathing of Thermocouple:	Swaged type magnesium oxide insulation.
5	Calibration and accuracy :	As per IEC-751/ANSI-C-96.1(special class) for T/C.
6	Characteristic :	Linear with respect to temp, within ±1/2 percent of top range value.
7	Accessories :	Thermowell (as specified in sl. no.1.9) and shall be spring loaded for positive contacts with the well.
8	Standard :	ANSI C 96.1 for Thermocouple and ASME PTC-19.3 for Thermo-well.

1.8 Resistance Temperature Detector (RTD)

Sr. No.	Features	Essential/Minimum Requirements
1	Type of RTD. :	Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
2	No. of element:	Duplex
3	Housing/Head:	IP-55/Die cast Aluminium. Plug in connectors are to be provided for external signal cable connection.
4	Sheathing of RTD:	Metal sheathed, ceramic packed
5	Calibration and accuracy:	As per DIN-43760 Class-A for RTD
6	Characteristic:	Linear with respect to temp, within ±1/2 percent of top range value.
7	Accessories:	Thermo well (as specified in sl. no.1.9) and shall be spring loaded for positive contacts With the well.
8	Standard:	DIN-43760 for RTD and ASME PTC-19.3 for Thermo-well.

1.9 Thermo well

Thermo well (for all process temp. elements) shall be one piece solid bored type of 316 SS of step-less tapered design. (As per ASME PTC 19.3 1974).

1.10 Temperature Transmitter

Following types of 2-wire temperature transmitter (directly powered from 4-20 mA input cards of DDCMIS) shall be provided. The temperature transmitter shall be fully compatible with thermocouples and RTDs being provided by the contractor. Temperature compensation of the thermocouples shall be performed in the temperature transmitter itself.

(a) Single Input Head mounted Temperature Transmitter

These shall be suitable for mounting in the head of temperature element itself. The protection class of head of thermo well along with its plug-in connector shall be min. IP 65.

(b) Single Input DIN-rail mounted Temperature Transmitter

These shall be suitable for mounting on DIN-rails in JBs. The specifications of the JBs shall be as specified elsewhere in the spec. CABLE with additional DIN-rails and IP 65 Protection Class. This temperature transmitter shall be the ones, which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category.

(c) Dual-input Temperature Transmitter with Indicator

These shall be suitable for mounting on pipes/support. These shall be provided for temperature measurement which are used for tripping/protection of auxiliaries e.g. for bearing temperature on which trip is envisaged. Indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails. This change over is to be alarmed. Protection class shall be IP 65 minimum.

Common requirements for each of the above type of temperature transmitters:

(i) Output : 2-wire (power supply from input card of Control System) with 4-20 mA output with Superimposed HART protocol signal.
(ii) Input : Same transmitter shall be capable to handle Pt- 100 RTD, Thermocouples-K&R types (input type to be selectable at site through HART terminal).
(iii) Isolation : min. 500 V AC
(iv) EMC : as per EN 61326 compatibility
(v) Operating ambient : 0 to 85 deg C (without indicator) temperature 0 to 70 deg. C (with indicator)
(vi) Power supply : Compatible with input module of Control System
(vii) Accessories : Mounting arrangements including clamps etc.
(viii) Composite Accuracy:

(a) For head mounted and DIN-rail mounted

Accuracy (Refer types note 2)

RTD =<0.4% of 0-250 deg C. span

T/C-K type =<0.4% of 0-600 deg C. span

T/C-R type =<0.4% of 0-1000 deg C. Span

CJC accuracy (for thermocouples) shall be =<1 deg.

(b) For dual input type:

RTD =<0.25% of 0-250 deg C. Span

T/C-K type =<0.2% of 0-600 deg.C span

CJC accuracy (for thermocouples) shall be =< 1 deg. C.

Notes:

1. In case of failure (open or burn-out) of RTD/thermocouple, temp. transmitter shall provide low temperature output.

2. Composite Accuracy is to be calculated as summation of all applicable accuracies of temp. transmitter, for converting sensor input to output in 4-20 mA (e.g. basic accuracy, digital accuracy, D/A accuracy. etc.) and temperature effect on these accuracies at ambient temperature of 50 deg. C. based on the figure / formula given in the standard product catalogue for span as specified above for various types of Temperature Elements specified. All such accuracy/temperature effect figures in catalogue shall be first converted to deg. C, and then percentage of these converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures.

1.11 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, D.P., FLOW AND LEVEL ELECTRONIC TRANSMITTERS:

Sr. No.	Features	Essential/Minimum Requirements
1.	Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible.
2.	Accuracy	± 0.1% of calibrated span (minimum)
3.	Output signal range	4-20 mA DC (Analog) along with superimposed digital signal based on HART protocol
4.	Turn down ratio	10:1 for vacuum/very low pressure applications. 30:1 for other applications.

5.	Stability	± 0.1% of calibrated span for six months for Ranges up to and including70 Kg/cm².
		± 0.25% of calibrated span for six months for Ranges more than 70 Kg/cm² (g).
6.	Zero and span drift	+/- 0.015% per deg.C at max span. +/-0.11% per deg.C at min. span.
7.	Load impedance	500 ohm (min.)
8.	Housing	Weather proof as per IP-55 with durable corrosion resistant Coating.
9.	Over Pressure	150% of max. Operating pressure
10.	Connection (Electrical)	Plug and socket type
11.	Process connection	1/2 inch NPT (F)
12.	Span and Zero	Continuous, tamper proof, Remote as well as adjustability Manual from instrument with zero suppression and elevation facility.
13.	Accessories	-Diaphragm seal, pulsation dampeners, siphon etc. as required by service and operating condition.
		-2 valve manifold for absolute pressure transmitters (3-valve manifold for gauge/ vacuum pressure transmitters) and 5 valve manifold for DP/level/flow transmitters.
		-For hazardous area, explosions proof enclosure as described in NEC article 500.
14.	Diagnostics	Self Indicating feature
15.	Power supply	24V DC ± 10%.
16.	Adjustment/calibration/	Centralized PC based system.

Notes :

In case it becomes necessary to use a DP transmitter for pressure measurement then a 3-valve manifold should be used in place of 2-valve manifold.

LVDT type is not acceptable.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

1.12 Ultrasonic Type Level Transmitter

Sl. No Features	Essential/Minimum requirements
1. Type of Transmitter	Non contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter.
2. Output signal	Galvanically isolated 4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol).
3. Sensor Accuracy	+/- 0.5% of calibrated span.
4. Sensor Repeatability	3 mm or better.
5. Power supply	24 V DC +/- 10%
6. Temperature compensation	To be provided within transducer.
7. Configuration	Sensor unit and Electronic units are to be separate. It shall be possible to mount the Electronic unit at a remote accessible location from the transducer. All cables and weather proof fittings to interconnect transducer to electronic unit shall be provided.
8. Housing	Weather proof as per IP-55 with durable corrosion resistant epoxy coating.
9. Calibration	Through HART Communicator.
10. Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It shall be possible to calibrate the instrument without any level in the tank/sump etc
11. Sensor Material	Corrosion resistant material to suit individual application requirement.
12. False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry
13. Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc
14. Display	Minimum 4 character display with integral keypad, access protected by user code.
15. Diagnostics	Loss of echo alarm etc
16. Load Impedance	500 ohms minimum
17. Electrical Connection	Plug and socket
18. Accessories	• All weather canopy for protection from direct sunlight and direct rain. • All mounting hardware and accessories required for erection and commissioning mounting fittings material shall be SS 316. • For hazardous areas, explosion proof enclosure as described in NEC article 500.

1.13 Guided Wave Radar Type Level Transmitter

Type	Guided wave Radar
Principle	TDR (Time domain reflectometry)
Probe Type & Material	Coaxial, SS316/316L. If required probe shall be suitable for overfill Prevention.
Signal o/p	4-20mA with HART signal suitable for overfill prevention.
Display	Integral
Power supply	24 VDC
Accuracy	5mm
Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and Amdt A1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2
Mounting	External cage mounting

The transmitters shall be provided with IP-55 protection class with durable corrosion resistant coating.

The transmitters shall be able to provide digital signals super imposed on 4-20 mA signal as per HART protocol.

1.14 DEW POINT METER

Sensor

Type :	Capacitance type with change in output proportional to moisture present.
Service :	Dry Air
Range :	-50 to 0 Degree Centigrade Dew-Point
Sensor Accuracy :	Better than +/-0.5^
Operating Temperature:	0 to 50 degree C.
Operating Pressure :	0-10 Kg./Cm2, suitable for process application.

Analyser

Input :	Change in capacitance from dew point sensor.
Display :	Combined enclosure with two three-digit seven segments LED display with decimal point after two digits. LED height shall be 4 inches, clearly legible from a distance of atleast 10 meters.
Range :	-50 to 0 Degree Centigrade Dew-Point
Display Accuracy :	Better than =/-2 Degree C.
Mounting :	Table top/Flush mounting, to be finalised during detailed engineering.
Power supply :	240V AC, 50 Hz to be arranged by the supplier.
Output :	4-20 mA DC capable of driving a load impedance of 500 ohms min.

1.15 IMPACT HEAD TYPE FLOW ELEMENT

The impact head type element shall be tubular insert type with four impact ports facing upstream direction, located precisely for determination of average flow velocity and shall be of SS 316 L.
Accuracy shall be 1.0% of actual value or better.Repeatability shall be + 0.1% of actual value or better.
The elements shall be supplied complete with mounting hardware; end support plugs and CS valve manifold (1/2" NPT connection) for instrument connections. All pertinent data including Employer's instrument tag no. for the flow element shall be punched on a stainless steel plate and affixed to the element.
Flushing arrangement shall be provided.

1.16 FLOW ELEMENTS

ORIFICE PALTE

Features	Essential/Minimum Requirements
Type	Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167
Material	316 SS
Thickness	3 mm for main pipe diameter up to 300 mm and6 mm for main pipe dia above300 mm.
Material of branch pipe	Same as main pipe
Root valve type	Globe
Root valve material	316 SS
Root valve size	1 / 2 inch or 1 inch (as applicable)
Impulse pipe of same material up to root valve	Required
Tappings	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings.
Beta Ratio	0.34 to 0.7
Beta Ratio calculation to be submitted	Yes
Assembly drg. and flow Vs DP Curves	Yes
Accessories	Root valves, flanges, Vent/drain hole(As required)

Contractor shall submit certified flow calculation and differential pressure vs. flow curves for each element for Employer's approval. Sizing calculation, precise flow calculation for all the flow elements, fabrication and assembly drawings and installation drawings shall be submitted for Employer's approval. One Flow element of each type shall be calibrated in the test laboratory for validation of commutated flow calculations.

1.17 ROTAMETERS

Sr. No.	Features	Essential / minimum requirements
1.	Type	Variable Area Metal Tube
2.	Fluid media	Water/oil
3.	Tube body	SS316
4.	Material of float	316 SS
5.	Indicator	Linear scale
6.	Accessories	Flange, orifice in case of bypass Rota meter (for line size above 100 mm)
7.	Housing protection class	IP-55
8.	Accuracy	± 2% of measured value.

1.18 SOLENOID VALVES

1.	Type	Single/Double coil type, corrosion resistant type
2.	Body	SS316
3.	Internals	SS316
4.	Spring	SS316
5.	Size	½inch
6.	Class of insulation	H
7.	Electrical connection	24 V DC from BOP-DCS
8.	Connectivity	Connectivity with BOP-DCS required for operation
9.	Protection Class	IP-65

1.19 ELECTRONIC FLOW METER

The electronic flow meter shall include flow sensor and flow indicator cum integrator / totaliser and shall include all required accessories for satisfactory operation. The flow meter shall be based on full bore ultrasonic / electromagnetic principle and shall be electronic type of proven design, make and model acceptable to the owner. The Bidder shall submit all necessary technical literature and details of selection criteria of the instrument offered to substantiate the model selected. The Bidder shall also furnish list of similar installation along with feedback on satisfactory performance of the instruments. The flow meter shall meet or exceed the following requirement:

(a)	Output	:	4-20 mA DC Isolated output
(b)	Accuracy	:	± 0.5% of calibrated span or better *
(c)	Repeatability	:	± 0.2% of calibrated span or better
(d)	Ambient Temp. &	:	4 deg.C to 55 deg.C.
	Humidity		5% to 100% RH
(e)	Power Supply	:	240V AC ± 10%, 50 HZ ± 5%/ 24 V DC, to be arrangec by the contractor.
(f)	Protection class	:	IP-55
(g)	Flow tube		SS304
(h)	liner		Hard Rubber

The flow meter shall provide local indication for instantaneous flow. It should also be possible to get local display for daily and monthly discharge. The flow meter shall indicate totaliser / integrator to get the daily and monthly discharge as stated above.

1.20 LIMIT SWITCH

For offsite plant application, Limit switches shall be gold plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.

MASS FLOW METER

Sensor

01.	Measuring Principle	:	Coriolis Mass flow.
02.	Primary Element	:	Flow Tube of 316SS or better
03.	Heating Arrangement	:	Integral with Flow Element.
04.	Temperature Control For Heating	:	To be provided for heavy fuel oil application.
05.	Process Connection	:	Flanged and rating as per process requirement.
06.	Drain	:	Self-draining facility
07.	Enclosure	:	Stainless steel
08.	Accessories	:	Counter flanges, Mounting nuts, bolts, gaskets, prefab cable etc.

Transmitter

01.	Measured quantities	:	Mass Flow rate, Total Mass Flow, Density, Temperature as minimum.
02.	Input Signal Processing	:	Digital Processing.
03.	Display	:	Digital Display (LCD).
04.	Output	:	2 Nos. isolated output of 4-20mA DC & HART selectable from four measured quantities.
05.	Load	:	< 750 ohms.
06.	Power supply	:	240V AC ±10%, 50 Hz.
07.	Turn Down	:	100:1
08.	Accuracy	:	± 0.2% of measured value
09.	Housing	:	Epoxy coated Die cast aluminium. IP-65 (Explosion proof for NEC Class-1, DIVISION-1 area) with ½" NPT (F) cable entry.
10.	Hazardous duty Version	:	FM Standards.

FORM NO. PEM-6666-0

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	SPECIFICATION NO.: PE-SS-421-145-I007 VOLUME II B SECTION D REV. NO. 00 DATE: 06.10.16 SHEET 1 OF 3

Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)		DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL*	* PROJECT	2X660MA BIFPCL, MAITREE BANGLADESH		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	☐ ON / OFF ☐ INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY		
	* OPENING / CLOSING TIME	☐		
	* WORKING PRESSURE	☐		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, DUST TIGHT, WEATHER PROOF, SUITABLE FOR OUTDOOR USE WITHOUT CANOPY, IP:65		
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. **FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM.**		
HANDWHEEL	* REQUIRED	■ YES ☐ NO		
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED		
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SEVEN TIMES THE RATED CURRENT as per IEC-60034-30		
	ACTUATOR APPLICABLE WIRING DIAGRAM	■ ENCLOSED (BIDDER TO CONFIRM) A: ☐ DRG. NO. 3-V-MISC-24227 R00 B: ☐ DRG. NO. 3-V-MISC-24550 R00 C: ■ DRG. NO. 3-V-MISC-24283 R00 D: ☐ DRG. NO. 4-V-MISC-90271 R11 E: ☐ For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram		
	COLOUR SHADE	■ BLUE (RAL 9003) ☐ …….		
	PAINT TYPE **(## Refer Notes)**	☐ ENAMEL ■ EPOXY ☐ …….		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		Starting current shall not exceed 7 times rated current as per IEC 60034 for IE-3 motors.
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	SPECIFICATION NO.: PE-SS-421-145-I007 VOLUME II B SECTION D REV. NO. 00 DATE: 06.10.16 SHEET 2 OF 3

Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ☐ 110 V
	@ ENCLOSURE CLASS OF MOTOR	☐ IP 67 ☐ FLAME PROOF
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B
	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos.,1 IN EACH PHASE) ☐ ----------
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED ☐ NOT REQUIRED
	TYPE OF SWITCHING DEVICE	■ CONTACTORS ☐ THYRISTORS
	TYPE	■ CONVENTIONAL ☐ SMART (NON-INTRUSIVE)
	IF SMART	
	a) SERIAL LINK INTERFACE	☐ INTEGRAL ☐ FIELD MOUNTED
	b) SERIAL LINK PROTOCOL	☐ FOUNDATION FIELD-BUS ☐ PROFI-BUS ☐ DEVICE NET ☐……
	c) SERIAL LINK MEDIA	☐ TWISTED PAIR Cu-CBL ☐ CO-AXIAL Cu-CBL ☐ OFC
	d) HAND HELD PROGRAMMER	☐ REQUIRED ☐ NOT REQUIRED
	e) TYPE OF HAND HELD PROGRAMMER	☐ BLUETOOTH ☐ INFRARED ☐.....
	f) MASTER STATION	☐ REQUIRED ☐ NOT REQUIRED
	g) MASTER STN INTRFACE WITH DCS	☐ MODBUS ☐ TCP/IP
	h) DETAILS OF SPECIAL CABLE	☐ ENCLOSED ☐ NOT REQUIRED
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED
	OPEN / CLOSE PB	■ REQUIRED ☐ NOT REQUIRED
	STOP PB	■ REQUIRED ☐ NOT REQUIRED
	INDICATING LAMPS	■ REQUIRED ☐ NOT REQUIRED
	LOCAL REMOTE S/S	■REQUIRED ☐ NOT REQUIRED
	STATUS CONTACTS FOR MONITORING	■ REQUIRED ☐ NOT REQUIRED
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	■ INTERPOSING RELAY ☐ OPTO COUPLER ☐ EITHER
	QUANTITY	■ 2 NOs. ☐ 3 NOs.
	DRIVING VOLTAGE	■ 20.5 – 24V DC ☐ _____V DC
	DRIVING CURRENT	■ 125mA MAX ☐ _____mA MAX
	LOAD RESISTANCE	■ > 192 ohms - <25 k ohms ☐ > _____ohms - < _____ohms
TORQUE SWITCH (Not Applicable for Smart Actuator) **($$ Refer Notes)**	MFR & MODEL NO.	BIDDER TO SPECIFY
	OPEN / CLOSE	■1 No. ☐2Nos. / ■1 No. ☐2Nos
	CONTACT TYPE	2 NO + 2 NC
	RATING	5A 240V AC AND 0.5A 220V DC
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE
	ACCURACY	+3% OF SET VALUE
LIMIT SWITCH (Not Applicable	MFR & MODEL NO.	BIDDER TO SPECIFY
	OPEN : INT : CLOSE	■1 No ☐2 Nos. : 2 Nos. (ADJ.) : ■1 No. ☐2Nos.

The coils of interposing relays shall be connected to freewheeling diode.

BHEL	**SPECIFICATION FOR MOTORISED VALVE ACTUATOR**	SPECIFICATION NO.: PE-SS-421-145-I007 VOLUME II B SECTION D REV. NO. 00 DATE: 06.10.16 SHEET 3 OF 3

Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
for Smart Actuator) **($$ Refer Notes)**	CONTACT TYPE	2 NO + 2 NC	
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC	

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	■ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☐ ELECTRONIC (2 WIRE) R/I CONVERTER ■ ELECTRONIC (2 WIRE) CONTACTLESS	
	SUPPLY	■ 24V DC ☐ ……	
	OUTPUT	■ 4-20mA	
	ACCURACY	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	@☐ IP 68 @☐……	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET (9 PIN) (FOR COMMD, LS/TS FEED BACK, PoT)	■ REQUIRED ☐ NOT REQUIRED☐ ■ 2 NOS. ☐ ----------	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:----------	
	@ SPACE HEATER CABLE GLAND	SIZE:----------	
	OTHER CONTROL CABLE GLANDS-1	☐ 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE :----------	
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.

NOTES:

1. **SCOPE**: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
2. **CODES & STANDARDS**: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST INTERNATIONAL STANDARD (INDIAN CODES ARE NOT ACCEPTABLE).
3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
5. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION.THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
6. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -6% TO +4% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
7. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.

$$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.

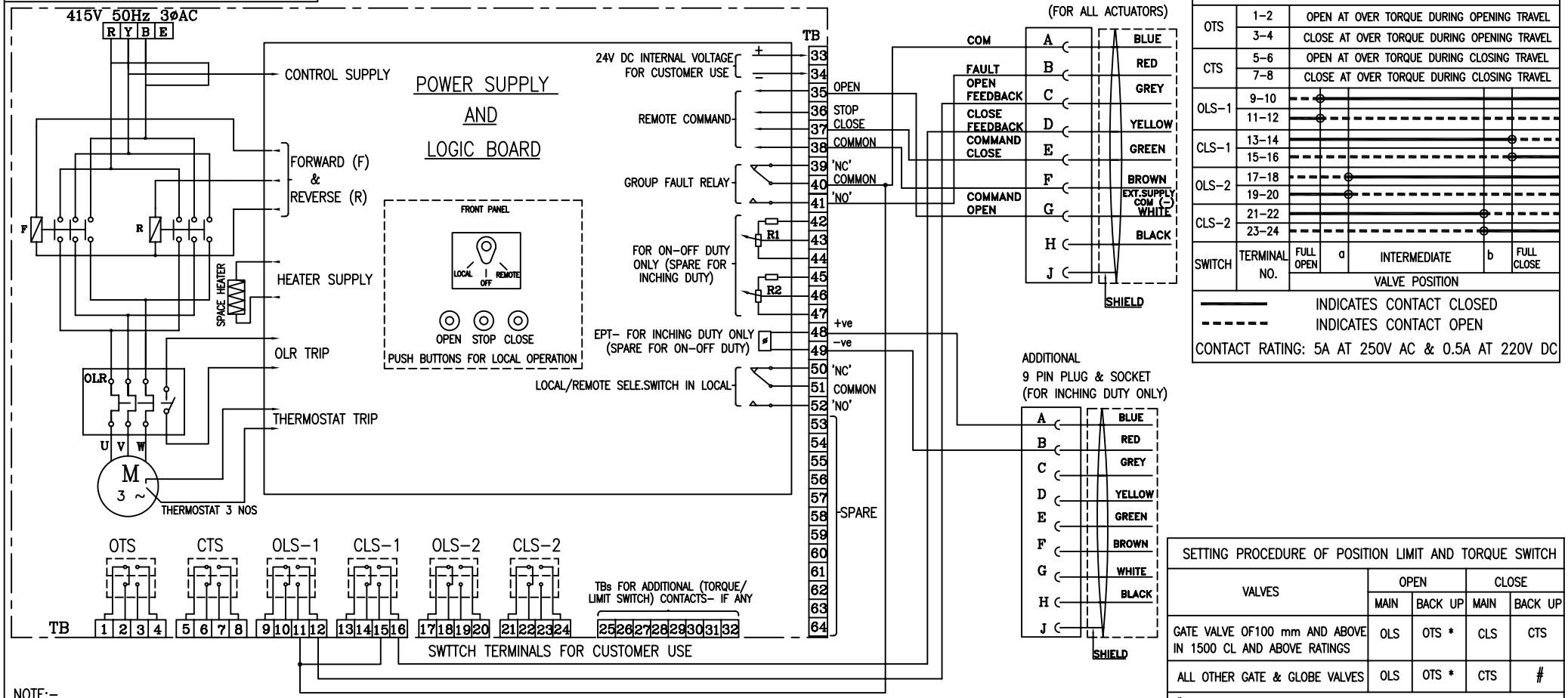
EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.

.

NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-MISC-24283



CONTACT DEVELOPMENT DIAGRAM

OTS	1-2	OPEN AT OVER TORQUE DURING OPENING TRAVEL
	3-4	CLOSE AT OVER TORQUE DURING OPENING TRAVEL
CTS	5-6	OPEN AT OVER TORQUE DURING CLOSING TRAVEL
	7-8	CLOSE AT OVER TORQUE DURING CLOSING TRAVEL
OLS-1	9-10	
	11-12	
CLS-1	13-14	
	15-16	
OLS-2	17-18	
	19-20	
CLS-2	21-22	
	23-24	

SWITCH / TERMINAL NO. — FULL OPEN | a | INTERMEDIATE | b | FULL CLOSE — VALVE POSITION

INDICATES CONTACT CLOSED

INDICATES CONTACT OPEN

CONTACT RATING: 5A AT 250V AC & 0.5A AT 220V DC

SETTING PROCEDURE OF POSITION LIMIT AND TORQUE SWITCH

VALVES	OPEN		CLOSE	
	MAIN	BACK UP	MAIN	BACK UP
GATE VALVE OF100 mm AND ABOVE IN 1500 CL AND ABOVE RATINGS	OLS	OTS *	CLS	CTS
ALL OTHER GATE & GLOBE VALVES	OLS	OTS *	CTS	#

\# - CLS NOT TO BE CONNECTED IN TRIP CIRCUIT

* - BYPASS OTS FOR INITIAL 5% OF TRAVEL(FOR GATE VALVES ONLY)

NOTE:-

1. ALL TORQUE AND LIMIT SWITCHES (OTS,CTS,OLS1&2, CLS1&2) ARE WITH 2NO+2NC CONTACTS '1NO+1NC' IS TERMINATED IN TBS 1-24, REMAINING CONTACTS ARE FOR INTERNAL USE. ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32
2. CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
3. OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
4. OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
5. CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
6. EPT - ELECTRONIC POSITION TRAMSMITTER (CONTACTLESS TYPE, FOR INCHING DUTY)
7. R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
8. FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
9. M - MOTOR 3ø 415V 50 Hz AC SUPPLY
10. TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY.

REV	DATE	ALTERED
		CHD & APPD

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS FOR NTPC PROJECTS (DRAWN FOR INTERMEDIATE POSITION OF VALVES)

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.
365-121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	N.P.ESWAR	N.P	17.03.05	-
CHD	D.DINAKARAN	D.D	17.03.05	
APPD	K.ARUNACHALAM	K.A	17.03.05	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	-		-
CODE	-			

TITLE: WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET FOR NTPC PROJECTS

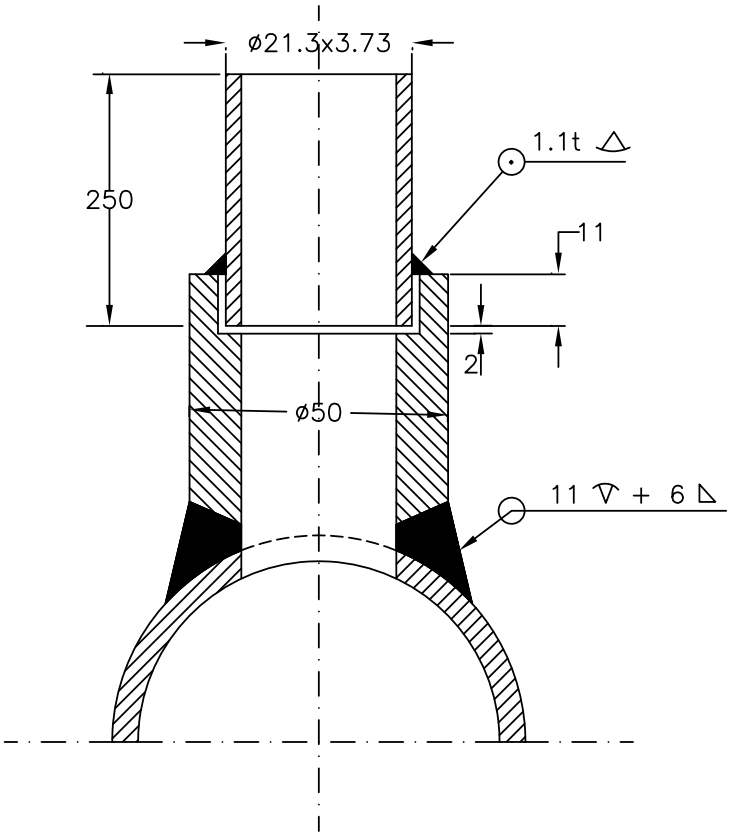
CARD CODE: U 01

DRAWING NO.: 3-V-MISC-24283

REV: 0

Size A3

INSTRUMENT STUB DETAILS



NOTE :

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFORM TO ANSI B16.11.
2. THE LENGTH OF NIPPLE SHALL BE 250 MM.
3. STUB LENGTH SHALL BE 64mm UPTO 200Nb PIPE, 45mm ABOVE 200Nb PIPE SIZE.
4. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED
5. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES
6. FOR PU COATED PIPE REFER SHT NO–9.

भेल BHEL

TITLE :

INSTRUMENT STUB DETAILS FOR PRESSURE MEASUREMENT

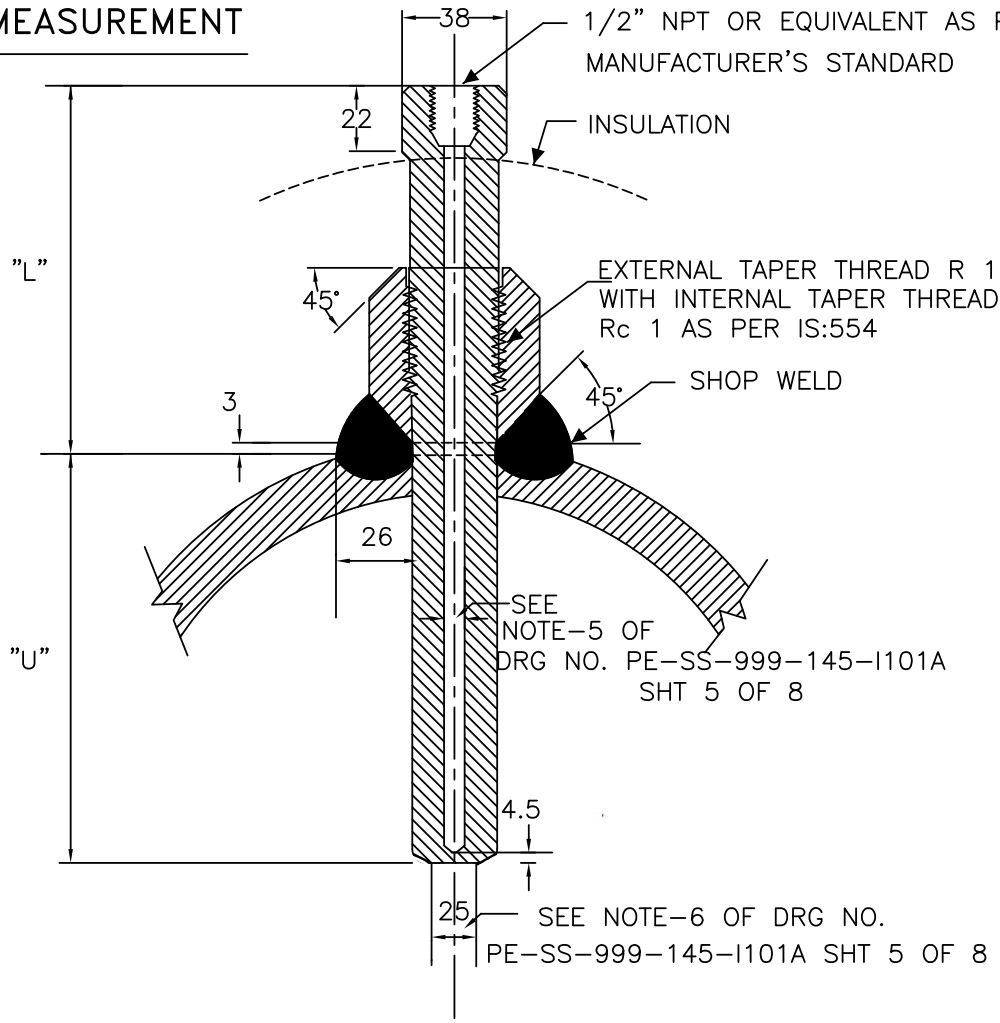
(SYSTEM PRESS UPTO 40Kg/Cm2, CLASS 3000#)

DRG. NO.
PE–SS–999–145–I101A

REV. 00

SH. 04 OF 10 SHS.

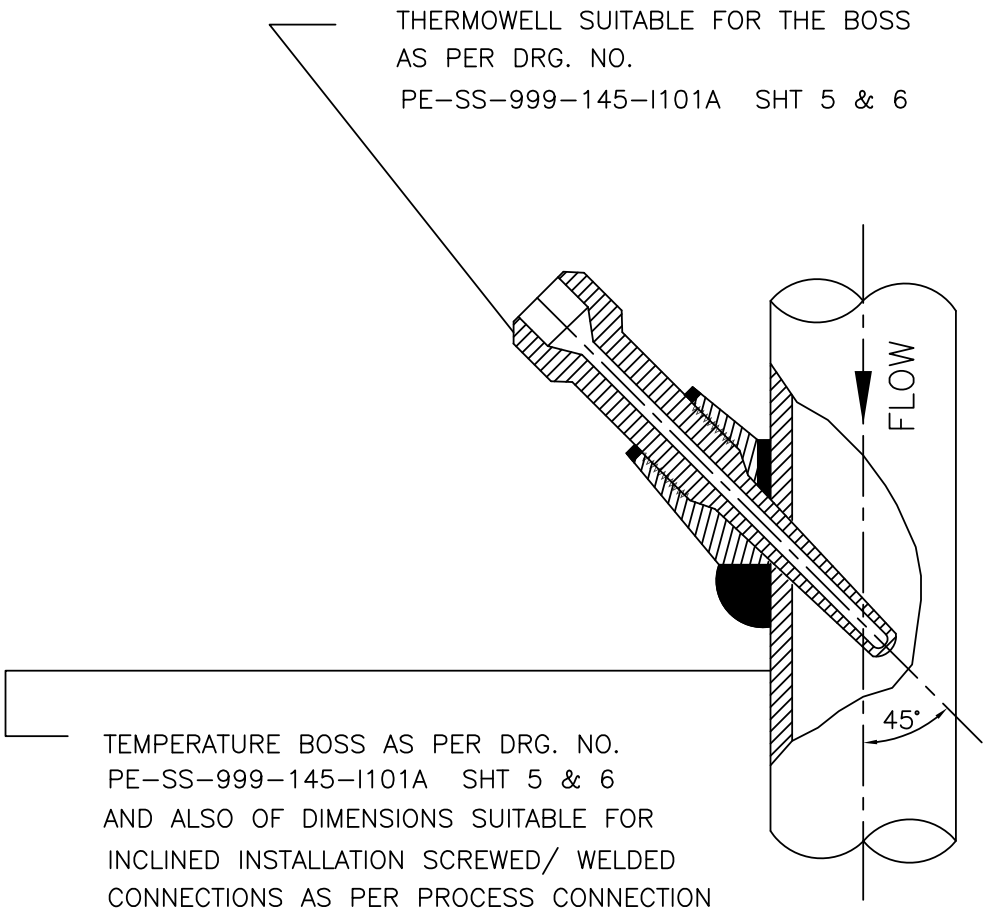
TEMP. MEASUREMENT



NOTES :–

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE PROCESS PRESS/ TEMP. BELOW 40 KG/CM2(g)/400°C.
2. FOR PRESS. TIGHT JOINTS THE BOSS SHOULD HAVE INTERNAL TAPERED PIPE THREAD Rc 1 AS PER IS:554. THE LENGTH OF THREAD ENGAGEMENT SHOULD BE AS PER ABOVE STANDARD.
3. SEE NOTES–2 TO 9 IN SHT. 5 OF 8 OF THIS DRG.
4. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED
5. FOR PU COATED PIPING REFER SHEET NO–10 FOR TEMP STUB DETAILS.

भेल BHEL	TITLE : INST. STUB DETAILS (TEMP) (APPLICABLE FOR PIPE SIZE ABOVE 4") [PROCESS PRESS < 40 Kg/Cm2 (g),TEMP < 400 ℃] SH. 06 OF 10 SHS.	DRG. NO. PE–SS–999–145–I101A REV. 00



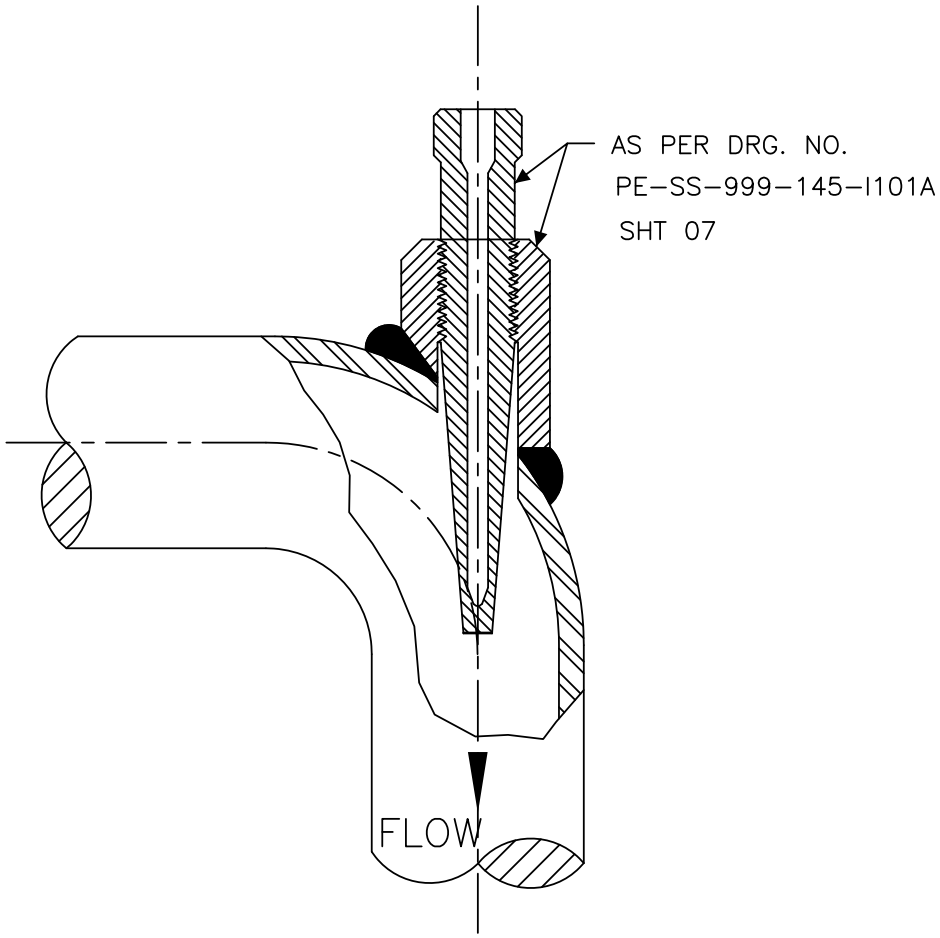
NOTES :–

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF MIN. 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL PIPE SECTION.
4. FOR STEAM SERVICES EXPANDER SECTION TO BE USED ONLY IN VERTICAL RUN.
5. THE EXPANDER SECTION SHALL BE OF ADEQUATE LENGTH (AT LEAST 3–4 TIMES DIA OF THE MAIN PROCESS PIPE AT BOTH SIDES OF THE INSTALLED THERMOWELL).

TITLE :

THERMOWELL INSTALLATION

DRG. NO.
PE–SS–999–145–I101A
REV. 00
SH. 07 OF 10 SHS.



NOTES :-

1. FLOW INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF MINIMUM 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE TO BE USED FOR LIQUID SERVICE. FOR STEAM SERVICES EXPANDER SECTION TO BE USED IN VERTICAL PLANE.

भेल BHEL

TITLE :

THERMOWELL INSTALLATION

DRG. NO.
PE-SS-999-145-I101A
REV. 00
SH. 08 OF 10 SHS.

INSTRUMENTS CHECK LIST

Important notes for Quality assurance and checks shall be as follows:

1) The requirement indicated in the check list is minimal. Vender has to submit Quality Plans/ Checklists for addressing the minimal requirement indicated in the check list and also those indicated under **clause B0.7** in the specification under **Section-IA**- customer's General Technical Specification – B0, as relevant to instruments. Vendor submitted quality plans shall be subject to customer approval during detail engineering without any commercial and time implication. For instruments for which checklist is not attached, vendor's Quality Plan for such items will also be subject to customer approval during detail engineering without any commercial and delivery implication.

2) The inspection agencies indicated in the Checklists in specification may be ignored. These will be aligned in line with approved Inspection categorisation plan during detail engineering without any commercial and delivery implication.

STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR TRANSMITTER

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECKS FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	VISUAL.						
	MODEL/TAG No						
2	PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	REPEATABILITY			P	W	V	
5	HYSTERESIS			P	W	V	
6	EFFECT OF TEMP VARIATION ON ACCURACY			P	W	V	
7	SPAN / ZERO ADJUSTMENT	ONE / TYPE		P	W	V	
8	EFFECT OF SUPPLY VOLTAGE VARIATION			P	W	V	
9	EFFECT OF LOADING (500 OHM METERS)			P	W	V	
10	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
11	BURN-IN TEST	ONE / TYPE		P	W	V	
12	DEGREE OF PROTECTION			P	W	V	
13	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. When material corelation are not available manufacturer's compliance to be provided.
4. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR PRESSURE & DP GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	SENSOR TYPE						
	DIAL SIZE						
	MODEL NO/TAG NO						
	RANGE/SCALE						
	SWITCH CONTACT RATING & NOS.						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	SET POINT ADJUSTMENT						
3	OVER PRESSURE & LEAK TEST			P	W	V	
4	OPERATION OF PRESSURE. RELIEF DEVICE	ONE		P	W	V	
5	REVIEW OF TC FOR	FOR LOT		V	V	V	
	MATERIALS OF SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST		V	V	V	
7	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. Manufacturer to carry out ROUTINE TEST on 100 %.
4. When material corelation is not available, MFR's compliance to be provided
5. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR LEVEL GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS / DRWGS	P	W	V	
	TYPE						
	MODEL/ TAG NO.						
	DAIL SIZE						
	RANGE/SCALE						
	END CONNECTION						
2	DIMENSIONS, PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	MATERIAL TC FOR	ONE / LOT		P	V	V	
	BODY ISO.						
	VALVE						
	GAUGE GLASS						
5	HYD. TEST	SEE NOTE-1 BELOW		P	W	V	
6	ACCESSORIES AS APPLICABLE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. Manufacturer to carry out ROUTINE TEST on 100 %.
4. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

APPLICABLE CABLE TYPES

Cable Sizes for 2X660MW STPP, BIFCL Maitree Project	
Sl no.	Cable Type
G-TYPE	
1	2P X 0.5 sqmm
2	4P X 0.5 sq mm
3	8P X 0.5 sqmm
4	12P X 0.5 sqmm
F-TYPE	
1	4P X 0.5 sqmm
2	8P X 0.5 sqmm
3	12P X 0.5 sqmm
4	20P X 0.5 sqmm
CONTROL CABLE	
1	3C X 2.5 sqmm

APPLICABLE CODES & STANDARDS
(Refer B0.6.2)

Please refer clause no. B0.6.2 in the specification under **Section-IA**- customer's General Technical Specification – B0 for applicable codes and standard.

INSTRUMENT INSTALLATION DIAGRAM

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INSTALLATION NOTES

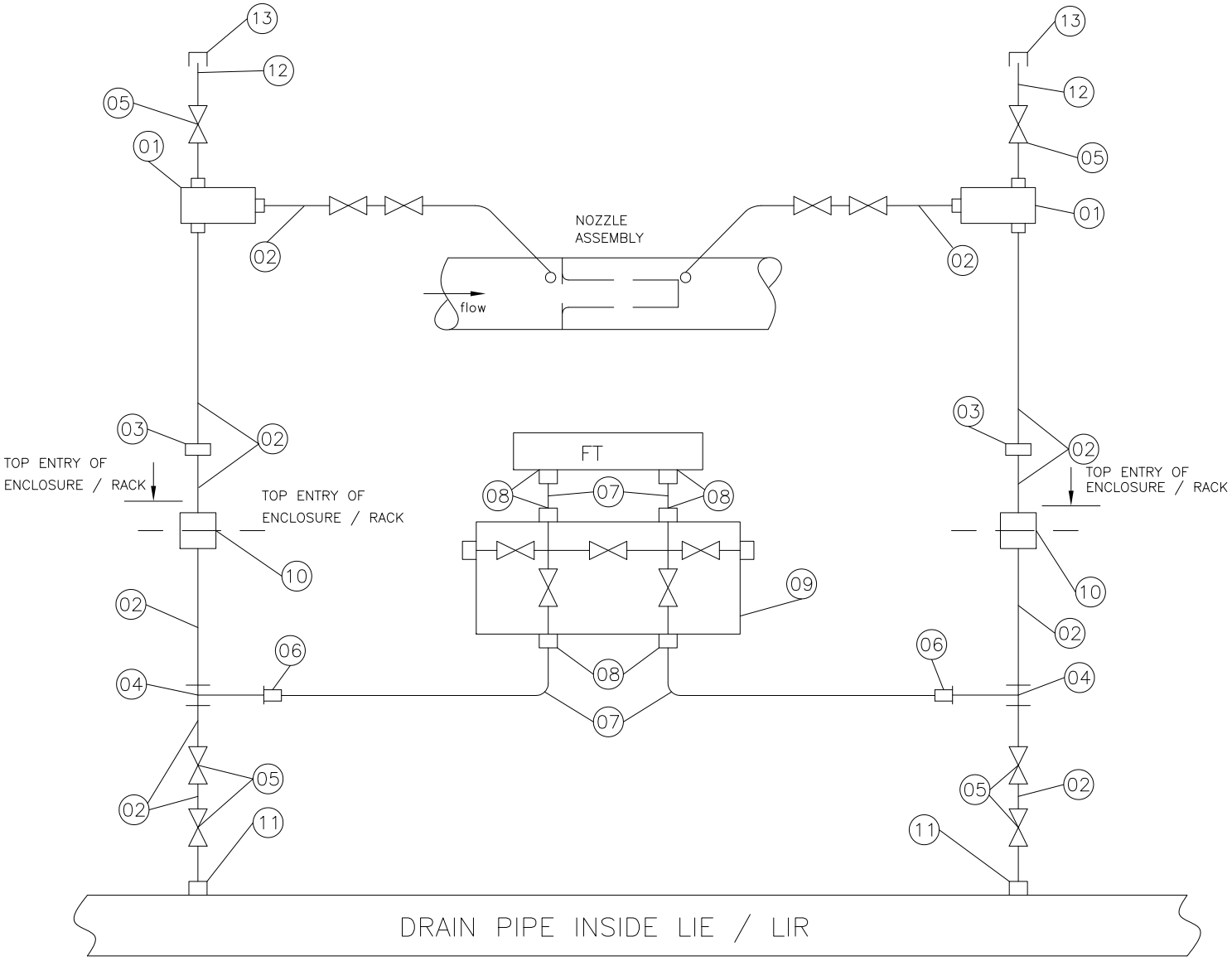
01. HORIZONTAL PIPE RUNS SHALL HAVE A SLOPE OF 50 MM'S IN ONE METER

02. LEGEND/ABBREVATIONS USED IN THE INSTALLATION SCHEMES.

- A/R : AS REQUIRED
- PT : PRESSURE TRANSMITTER
- DPT : DIFFERENTIAL PRESSURE TRANSMITTER (FT or LT or DPT type).
- DFDC : DOUBLE FERRULE DOUBLE COMPRESSION
- INST : INSTRUMENT

03. DRAIN PIPE INSIDE LIE / LIR SHALL BE OF A106 Gr. C– 2" NB Sch. 80 ALONGWITH WITH SUITABLE ADAPTER / ELBOW ON ONE SIDE & CAP ON OTHER SIDE.

04. DRAIN FROM LIE / LIR SHALL BE CONNECTED TO NEAREST PLANT DRAIN THROUGH OPEN FUNNEL (1/2" SIZE).



NOTE:

1. "TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 04

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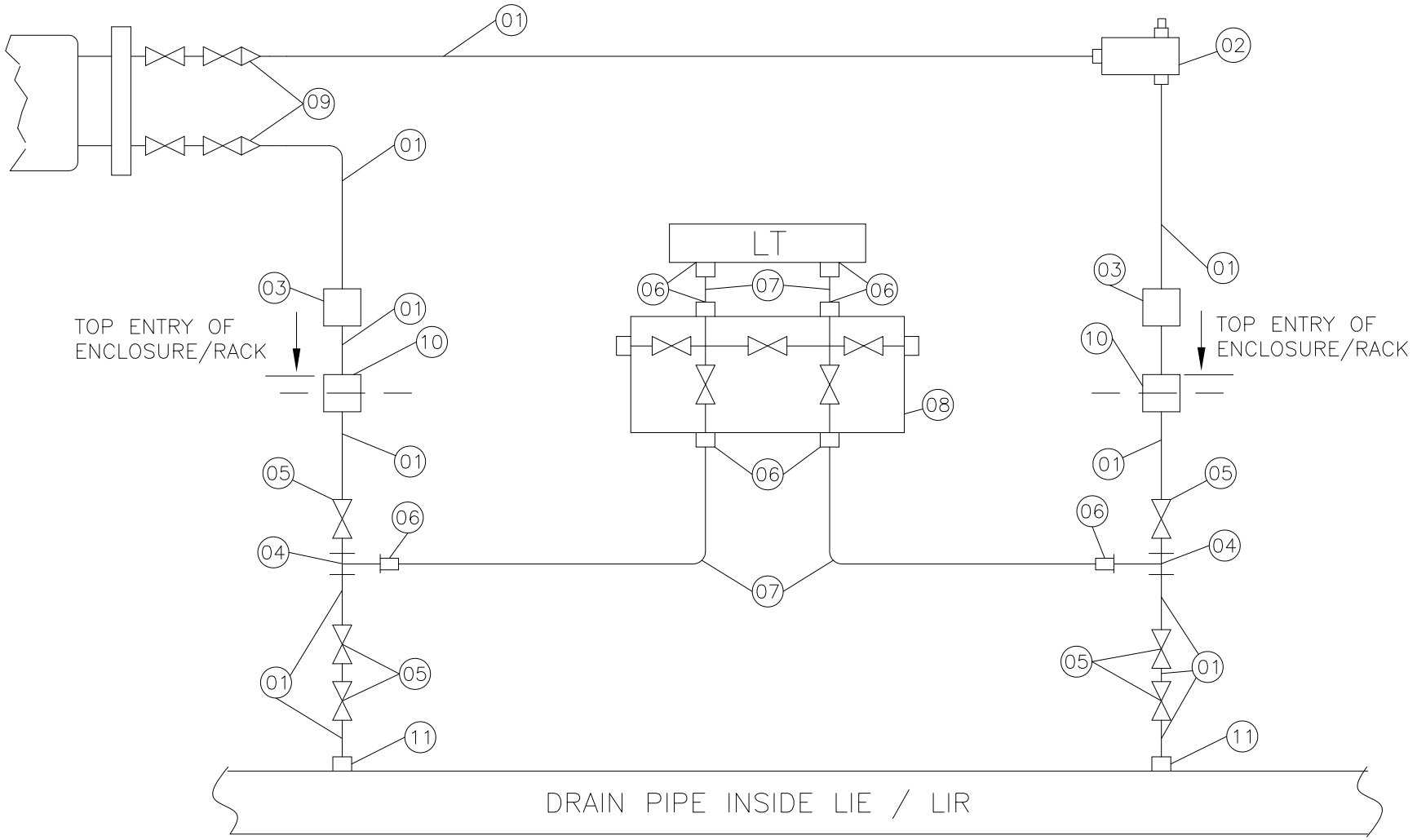
PAGE : 03

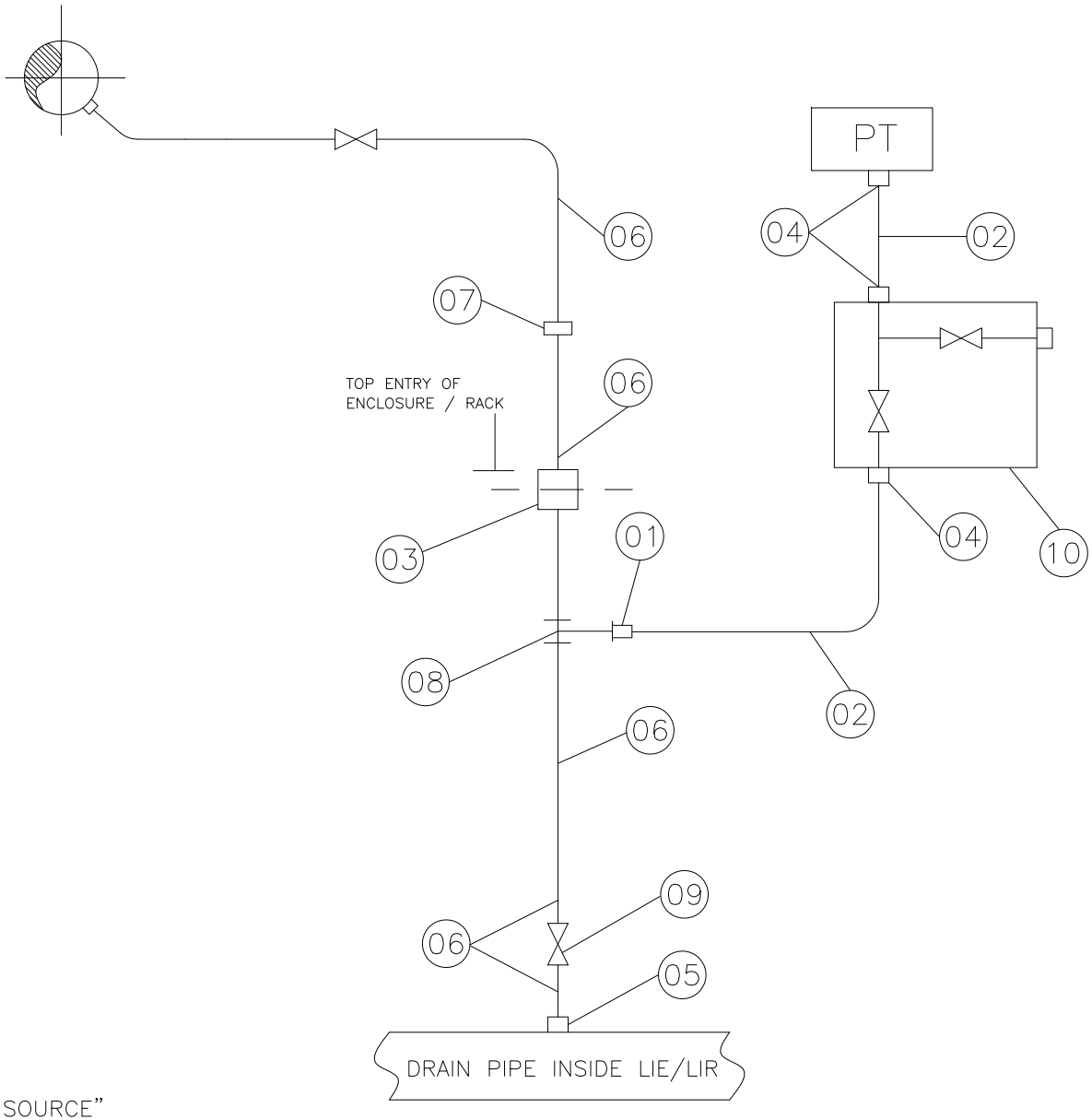
ITEM NO.	ITEM DESCRIPTION	QTY/INST.
13	CAP,MTL : A182 F22 , 1/2" NPTF	02
12	NIPPLE: ½" NB XXS / MATL. : A335 P22 CONN : ONE END PLAIN x OTHER END 1/2" NPTM	02
11	HALF COUPLING / ASTM 182 – F22 /AS PER ANSI B16.11 1/2" NB–SW CL 9000	02
10	BULK HEAD UNION / COUPLING MATL : ASTM A182 F22/AS PER ANSI 16.11 CL : 9000LBS / 1/2" NB–SW	02
09	FIVE VALVE MANIFOLD WITH VENT PLUG PORT SIZE : 1/2" NPTF / BODY : SS316 PR. TESTING : 9000PSI	01
08	TUBE FITTING : DFDC MATERIAL : SS316 SIZE : 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	06
07	TUBE / MAT. : A 213 TP 316H SIZE : 1/2" OD x 2.1 mm THK.	A/R
06	TEE–TUBE UNION SIZE : OD OF 1/2" NB PIPE x TO SUIT TO 1/2" OD SS TUBE MATL. : SS316	02
05	FORGED GLOBE VALVE MTL. BODY : ASTM A182 F22 SIZE : 1/2" NB–SW / CL. 3000 SPL	06
04	FORGED TEE / AS PER ANSI B16.11 MATL : ASTM A182 F22 SIZE : 1/2" NB–SW / CL. 9000	02
03	FORGED COUPLING / AS PER ANSI B16.11 MATL : ASTM A182 F22 SIZE : 1/2" NB–SW / CL 9000	A/R
02	IMPULSE PIPE MATL : ASTM A335 P22 SIZE : 1/2" NB–SCH XXS	A/R
01	CONDENSATE POT/MATL : ASTM A182 F22 SIZE : ø 88.9 x 17.6 mm THK. CONNECTION : PROCESS – 15NB SW / INSTR. : 15NB–SW	02



NOTE:

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 6
3. DRAIN PIPE / 2" NB SCH 80–A106 Gr. C.

ITEM NO.	ITEM DESCRIPTION	QTY/INST.
01	SEAMLESS PIPE MATL. : ASTM A 106 Gr C SIZE : 1/2" NB–SCH 160	A/R
02	CONDENSATE POT MATL.: ASTM A105/ASTM A106 Gr C /SIZE: ø88.9mmx12mm THK. CONNECTION : PROCESS – 15NB SW / INSTR. : 15NB–SW	01
03	FORGED COUPLING / AS PER ANSI B16.11 MATL. : ASTM A 105 SIZE : 1/2" NB–SW / CL. 6000 LBS	A/R
04	FORGED UNEQUAL TEE / AS PER ANSI B16.11 MATL. : ASTM A 105 SIZE : 2x1/2" NB–SW x 1/2" NPTF/ CL. 6000 LBS	02
05	FORGED GLOBE VALVE BODY : ASTM A 105 SIZE : 1/2" NB–SW / CL. 2500	06
06	MALE CONNECTOR MATL. : SS316 SIZE : 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
07	SEAMLESS TUBE MATL. : A 213 TP 316 SIZE : 1/2" OD x 2.1 mm THICK	A/R
08	FIVE VALVE MANIFOLD PORT SIZE : 1/2" NPTF / MATL. : SS316 PR. TESTING : 6000 PSI	01
09	FORGED REDUCER / AS PER ANSI B16.11 MATL. : ASTM A 105 / SIZE : OD OF 1–1/2" NB TO 1/2" NB–SW CL. 6000 LBS	02
10	BULK HEAD UNION/COUPLING / AS PER ANSI B 16.11 MATL. : ASTM A 105 / 1/2" NB–SW CL : 6000 LBS	02
11	HALF COUPLING / AS PER ANSI B16.11 MATL. : ASTM A 105 SIZE : 1/2" NB–SW / CL. 6000	02



NOTE:

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 8

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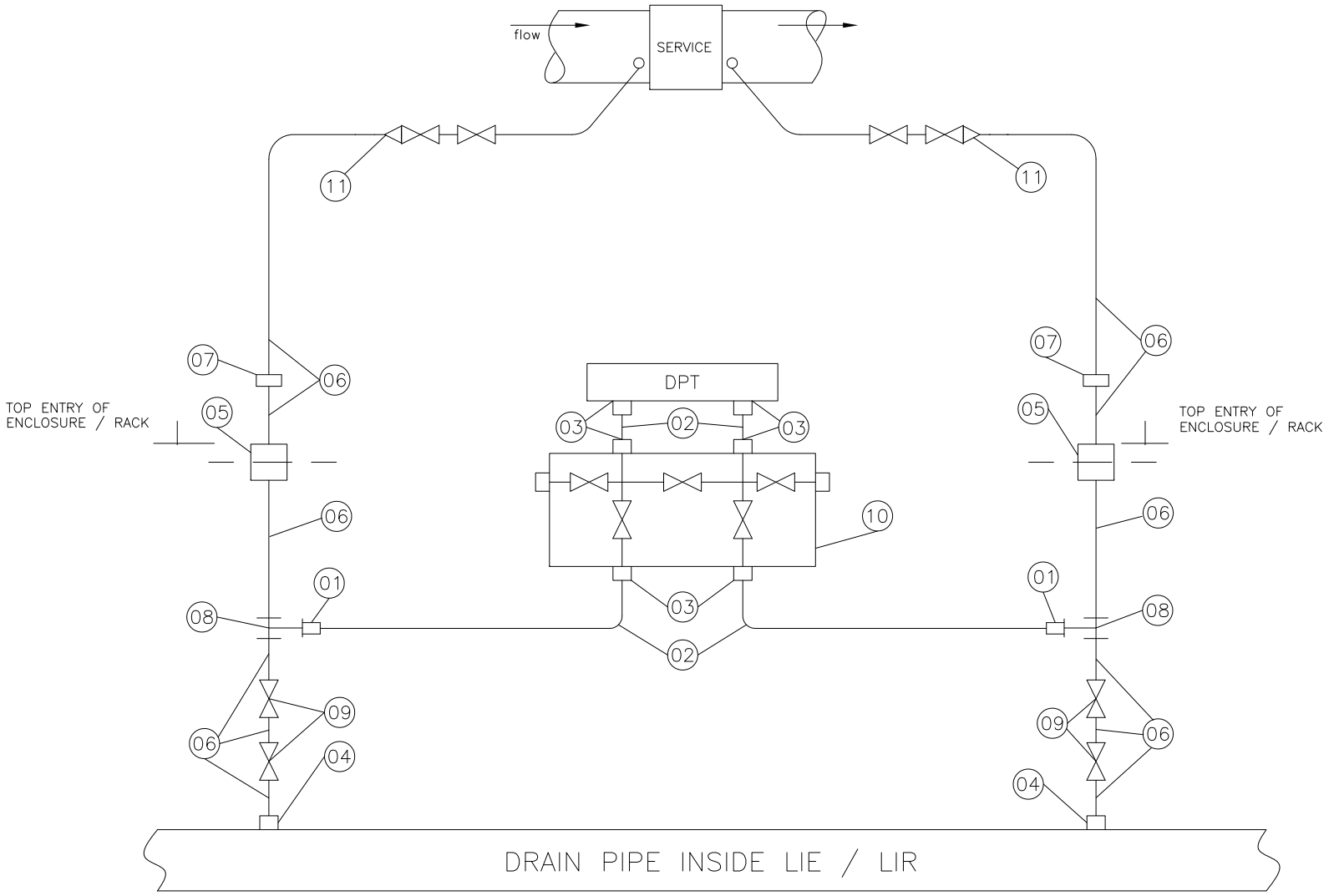
ITEM NO.	ITEM DESCRIPTION	QTY/INST.
10	TWO VALVE MANIFOLD WITH VENT PLUG PORT SIZE : 1/2" NPTF / MATL : SS316 PR. TESTING : 3000PSI	01
09	FORGED GLOBE VALVE BODY : ASTM A105 SIZE : 1/2" NB–SW / CL : 800	01
08	FORGED TEE / AS PER ANSI B16.11 MATL. : ASTM A105 SIZE : 1/2" NB–SW / CL : 3000	01
07	FORGED COUPLING / AS PER ANSI B16.11 MATL : ASTM A105 SIZE : 1/2" NB–SW / CL. 3000	A/R
06	IMPULSE PIPE MATL : ASTM A106 Gr. C SIZE : 1/2" NB–SCH 80	A/R
05	HALF COUPLING / 1/2" NB–SW /AS PER ANSI B16.11 MATL : ASTM A105 /CL. 3000	01
04	TUBE FITTING / DFDC MATL. : SS316 SIZE : 1/2" NPTM X TO SUIT 1/2" OD SS TUBE	03
03	BULK HEAD UNION / COUPLING CL : 3000 LBS / 1/2" NB–SW MATL : ASTM A105/AS PER ANSI B16.11	1No.
02	TUBE / MATL. : SS316 ASTM A 213 TP 316 H SIZE : 1/2" OD X 2.1 mm THK.	A/R
01	TEE TUBE UNION / MATL. : SS316 SIZE : OD OF 1/2" NB – PIPE X TO SUIT TO 1/2" OD SS TUBE	01



NOTE:

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 10

ITEM NO.	ITEM DESCRIPTION	QTY/INST.
11	FORGED REDUCER / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: OD OF 1" NB TO 1/2" NB – SW CL 6000	02
10	FIVE VALVE MANIFOLD WITH VENT PLUG PORT SIZE : 1/2" NPTF / MATL. : SS316 PR. TESTING : 6000PSI	01
09	FORGED GLOBE VALVE BODY MATL : ASTM A105 SIZE : 1/2" NB–SW / CL. 2500	04
08	FORGED TEE / AS PER ANSI B16.11 MATL. ASTM A105 SIZE : 1/2" NB–SW /CL : 6000	02
07	FORGED COUPLING / AS PER ANSI B16.11 MATL. : ASTM A105 SIZE : 1/2" NB–SW / CL. 6000	A/R
06	IMPULSE PIPE MATL. ASTM A106 Gr.C SIZE : 1/2" NB–SCH 160	A/R
05	BULK HEAD UNION COUPLING / AS PER ANSI B16.11 MATL. : ASTM A105/ 1/2" NB–SW CL : 6000	02
04	HALF COUPLING / AS PER ANSI B16.11 MATL. : ASTM A105 / 1/2" NB–SW /CL.6000	02
03	TUBE FITTING / DFDC MATL. : SS316 SIZE : 1/2" NPTM X TO SUIT 1/2" OD SS TUBE	06
02	TUBE / MATL. : ASTM A 213 TP 316 H SIZE : 1/2" OD X 2.1 THK.	A/R
01	TEE– TUBE UNION MATL. : SS316 / SIZE : OD OF 1/2" NB X TO SUIT 1/2" OD SS TUBE	02

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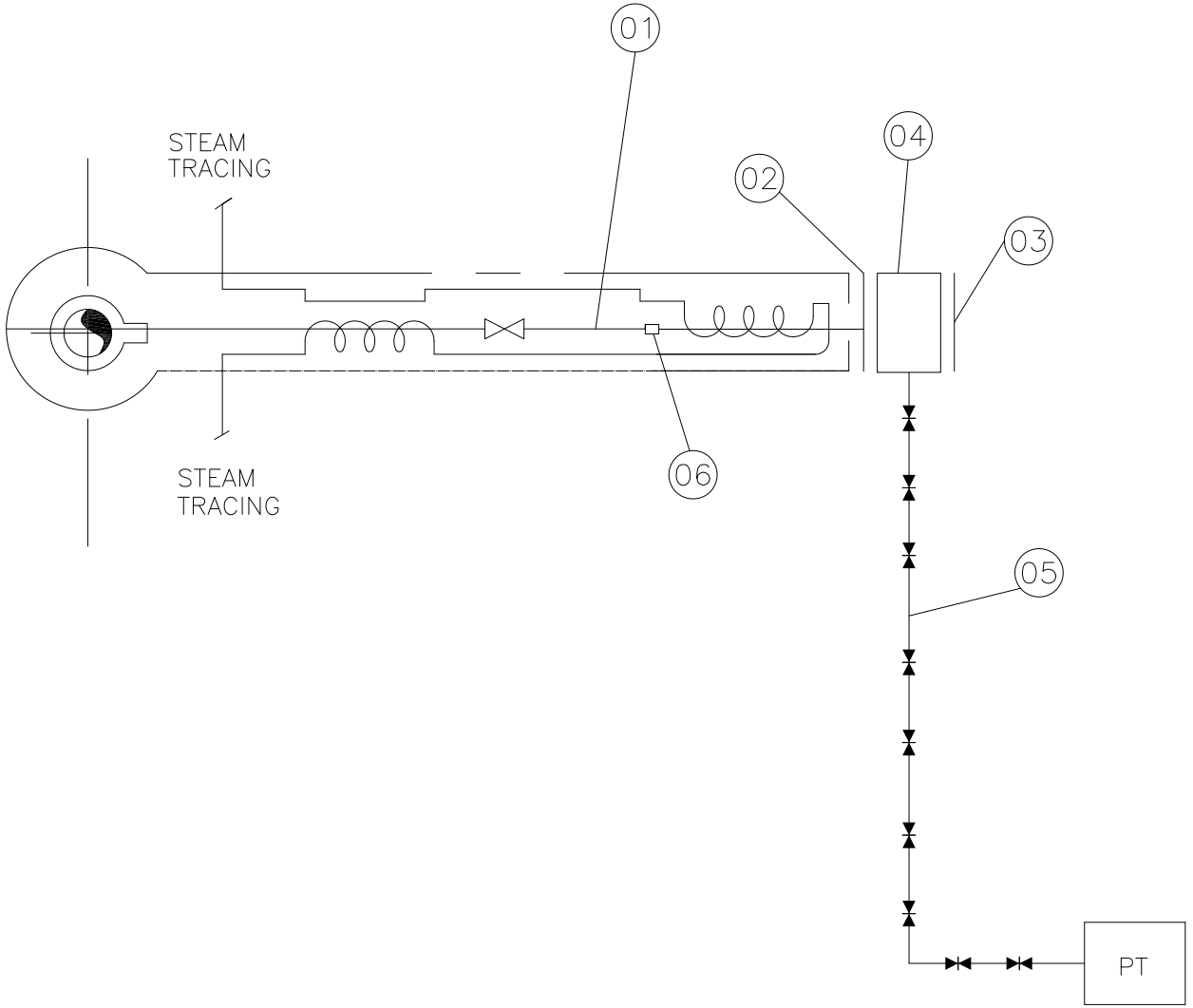

NOTES:

01. FOR BILL OF MATERIAL REFER PAGE 12
02. STEAM TRACING IS APPLICABLE FOR SERVICES WITH MEDIUM AS "HFO"

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REV. NO. 00
PAGE : 11

ITEM NO	ITEM DESCRPTION	QUANTITY/INST. (Nos.)
01	SEAMLESS PIPE / 1" NB – SCH 80 MATL : ASTM A106 Gr. C	A/R
02	RF FLANGE DRILLED AND TAPPED / MTL : ASTM A105 3" / CL : 300 LBS / 1" NPT PIPE	01
03	3" MATCHING BLIND FLANGE MTL : ASTM A105	01
04	WAFER ELEMENT FOR USE WITH 3" ANSI RF FLANGE	01
05	CAPILLARY TUBE OF PRESSURE TRANSMITTER	01
06	FORGED COUPLING / AS PER ANSI B16.11 MATL : ASTM A105 SIZE : 1" NB–SW / CL : 3000 LBS	A/R

REVISION NO	DATE

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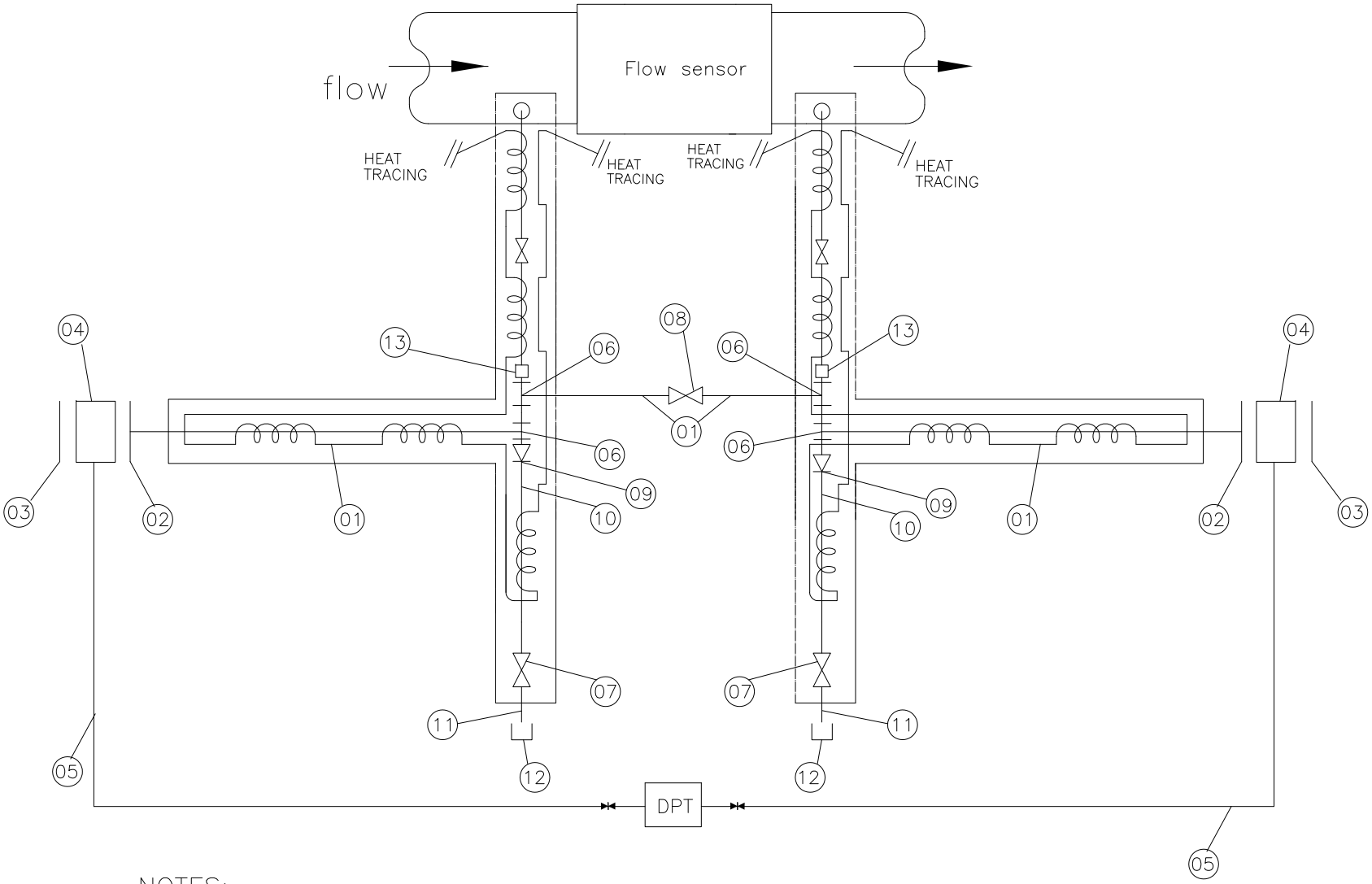

NOTES:

01. THIS IS APPLICABLE FOR "HFO" SERVICES.
02. FOR BILL OF MATERIAL REFER PAGE 14
03. MOUNTING HARDWARE SHALL BE PROVIDED FOR MOUNTING THESE TRANSMITTERS.

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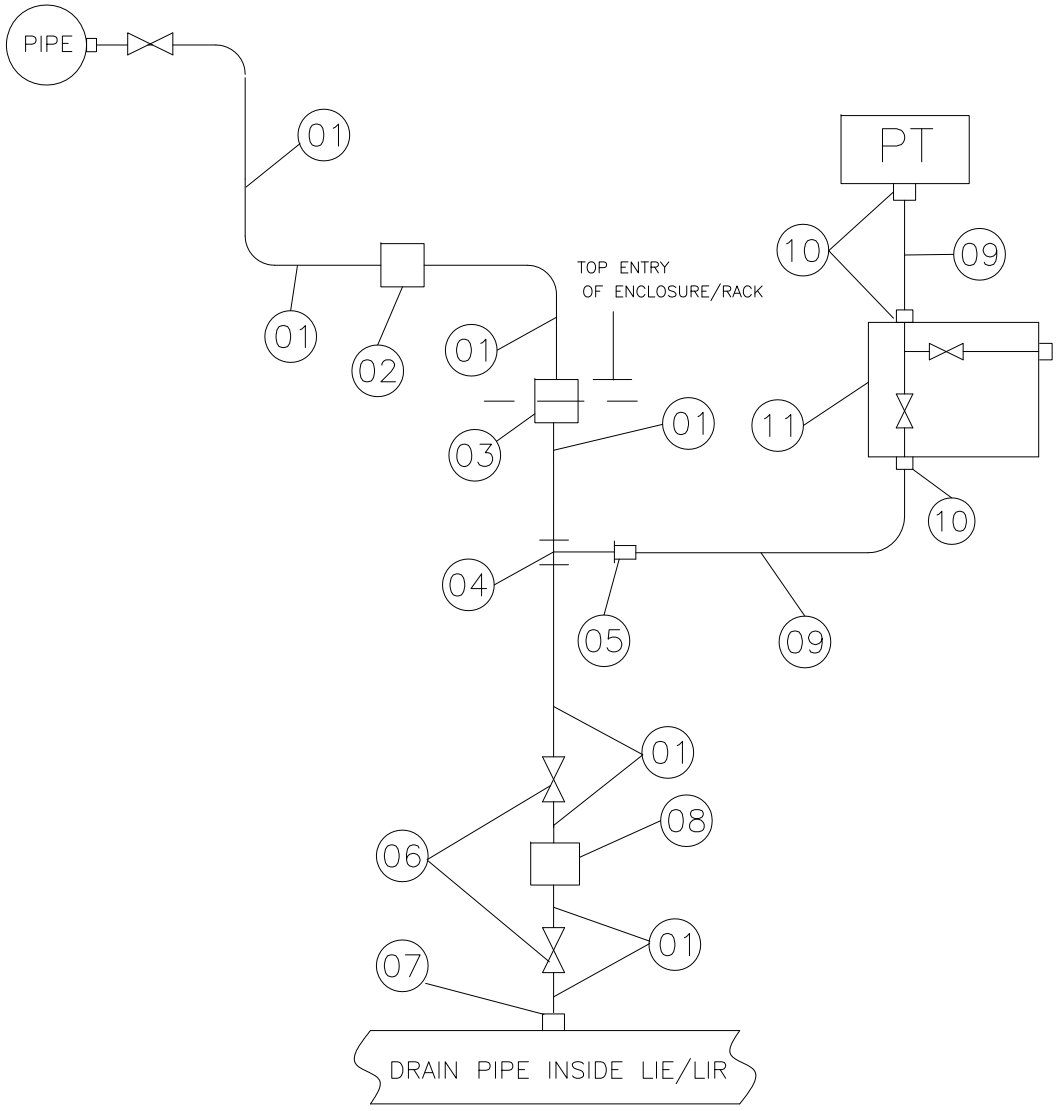
REV. NO. : 00

PAGE : 13

ITEM NO.	ITEM DESCRIPTION	QUANTITY/INST. (Nos.)
01	SEAMLESS PIPE SIZE 1 " NB –SCH 80 MATL : ASTM A106 Gr C	A/R
02	3" 300 LBS ANSI RF FLANGE DRILLED & TAPPED FOR 1" NPT PIPE / MTL : ASTM A105	02
03	3" MATCHING BLIND FLANGE MTL : ASTM A105	02
04	WAFER ELEMENT FOR USE WITH 3" ANSI RF FLANGE	02
05	CAPILLARY TUBE OF PRESSURE TRANSMITTER	02
06	FORGED EQUAL TEE / MATL. : A105 SIZE : 1 " NB SW – CL. 3000 / AS PER ANSI B 16.11	04
07	FORGED GLOBE VALVE / MATL. : A105 / STEM: ASTM A182 Gr. F6a SIZE : 1/2" NB SW – CL. 800	02
08	FORGED GLOBE VALVE / MATL. : A105 / STEM: ASTM A182 Gr. F6a SIZE : 1" NB SW – CL. 800	01
09	FORGED REDUCER / MATL. : A105 / AS PER ANSI B 16.11 SIZE : 1 " NB SW x 1/2" NB SW – CL. 3000	02
10	SEAMLESS PIPE SIZE 1/2" NB –SCH 80 MATL : ASTM A106 Gr C	A/R
11	NIPPLE / MATL. : ASTM A 106 Gr C SIZE : 1/2" NB SCH. 80 / ONE END TREADED : 1/2 " NPTM	02
12	CAP / MATL. : ASTM A 105 SIZE : 1/2 " NPTF	02
13	FORGED COUPLING / MATL. : A105 SIZE : 1 " NB SW – CL. 3000 / AS PER ANSI B 16.11	A/R

REVISION NO | DATE



NOTE:

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 16

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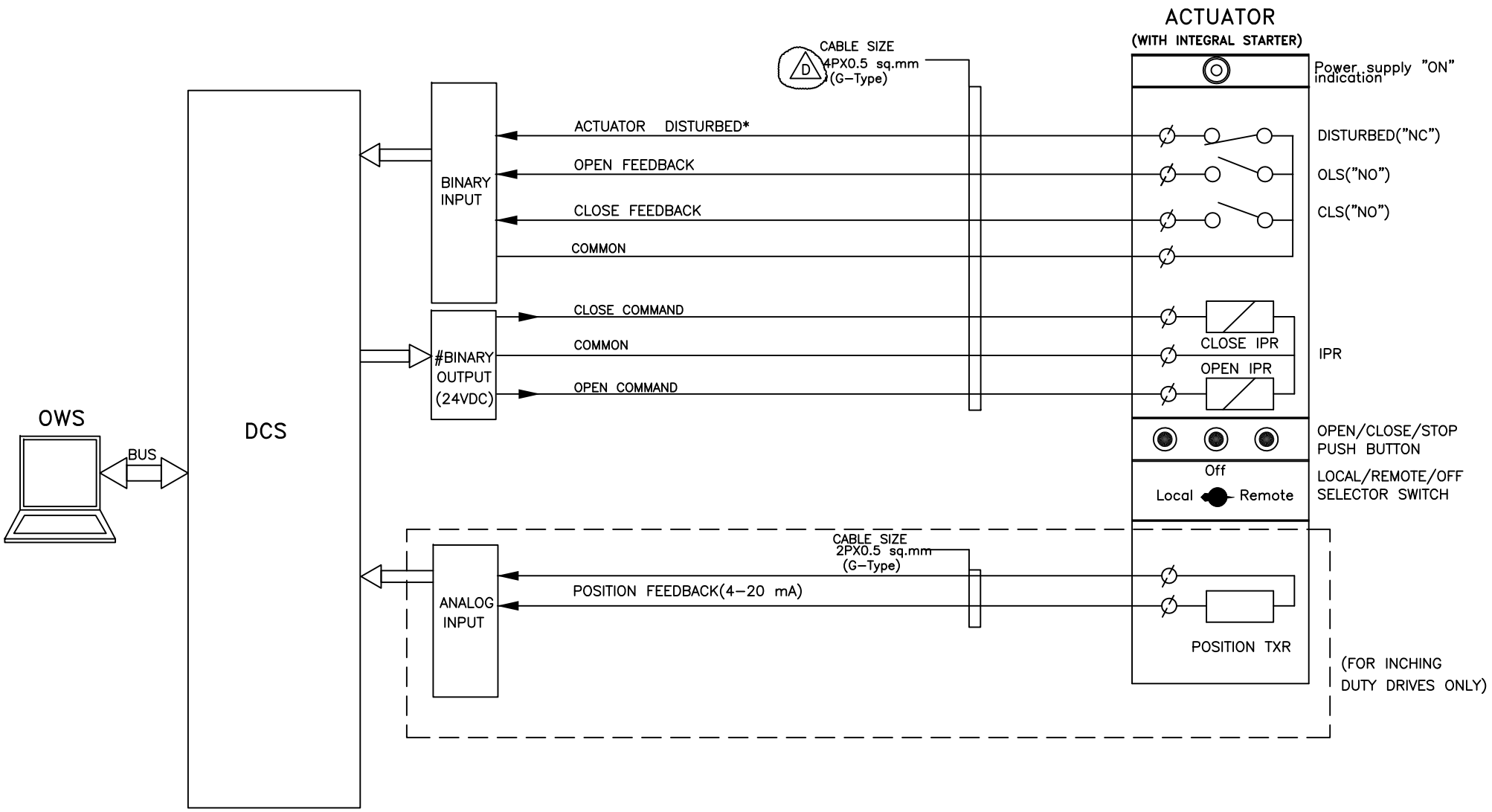
REV. NO. 00

PAGE : 15

ITEM NO.	ITEM DESCRIPTION	QTY/INST.
11	TWO VALVE MANIFOLD + VENT PLUG / PR.TESTING: 3000 PSI MATL. : SS316, PORT SIZE : 1/2" NPTF	01
10	TUBE FITTING/DFDC/, MATL. : SS316 SIZE : 1/2" NPTM x TO SUIT 1/2" OD SS TUBE.	03
09	TUBE MATL. : ASTM A213 TP 316 H SIZE : 1/2" OD x 1.13 mm THK.	A/R
08	DRAIN POT: 2" NB Sch 80 BODY: A106 Gr. C / CONN. 3/4" NB – SW	01
07	HALF COUPLING / 3/4" NB–SW /AS PER ANSI B16.11 MATL : ASTM A105 /CL. 3000	01
06	GLOBE VALVE / CL. 800 SIZE : 3/4" NB–SW BODY: ASTM A105	02
05	TEE TUBE UNION; MATL. : SS316 SIZE : OD OF 3/4" NB PIPE x SUIT TO 1/2" OD – TUBE RATING : 3000	01
04	FORGED EQUAL TEE/AS PER ANSI B16.11/RATING : CL 3000 SIZE : 3/4" NB–SW ; MATL. : ASTM A105	01
03	FORGED BULK HEAD UNION / AS PER ANSI B16.11 RATING : ANSI CL. 3000 SIZE : 3/4" NB – SW/MATL. : ASTM A105	01
02	FORGED COUPLING/AS PER ANSI B16.11 SIZE : 3/4" NB – SW / RATING : ANSI CL 3000 MATL. : ASTM A105	A/R
01	IMPULSE PIPE; SIZE : 3/4" NB – SCH 80 MATL. : ASTM A106 Gr. C	A/R

DRIVE CONTROL PHILOSOPHY

DCS INTERFACE FOR BIDIRECTIONAL DRIVE(WITH INTEGRAL STARTER)



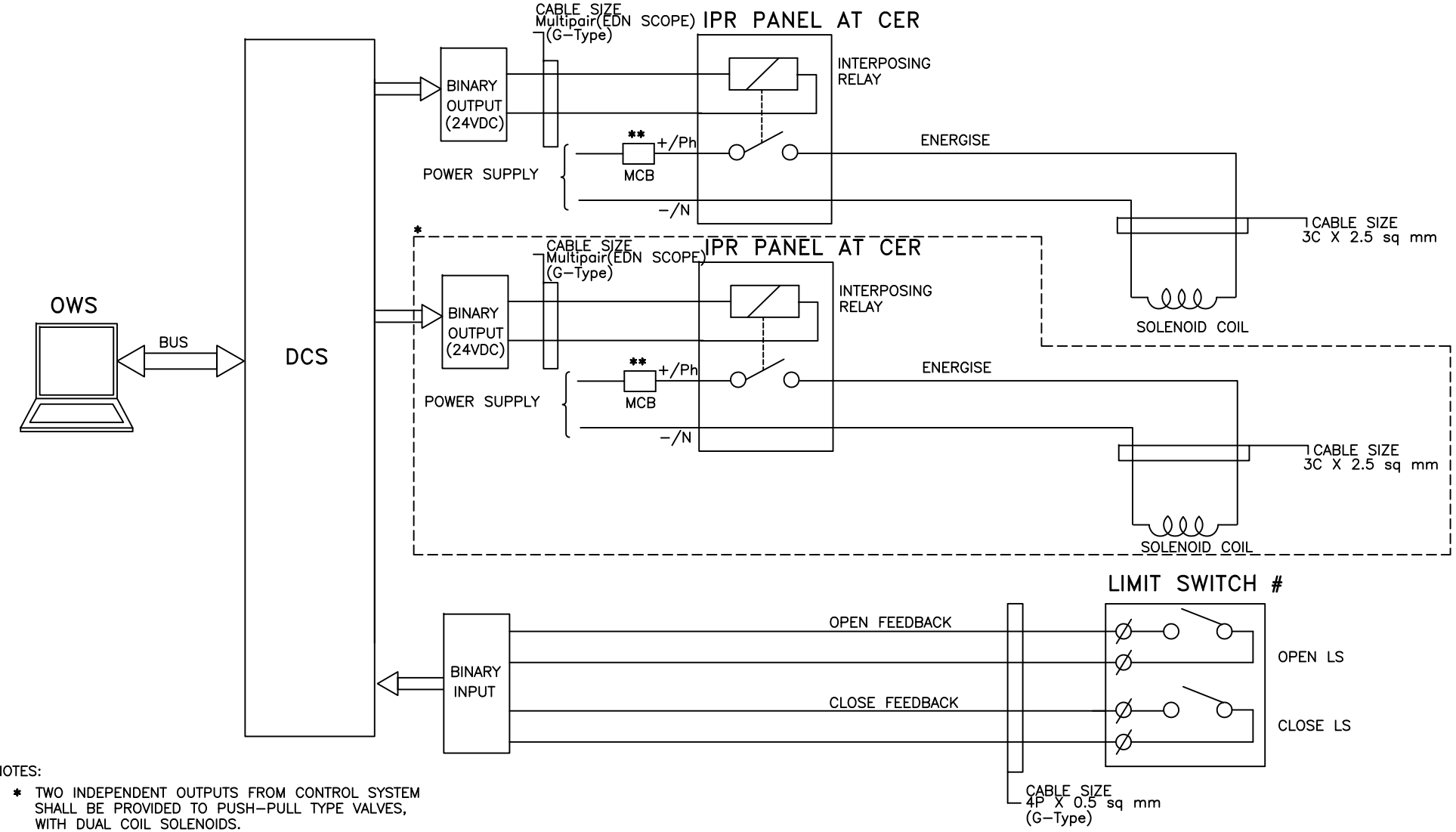
NOTE:

* DISTURBED= Loss of Power supply (1 Phase/3 Phase)/ Loss of control supply/ Motor thermostat trip/ Thermal over load/ Local/Off/Remote Sel. switch in local or off mode/ Stop PB optd.

#BINARY= OUTPUT # Redundant output shall be provided C

BHEL	PROJECT: 2X660MW BIFPCL MAITREE	DRG.NO. Maitree-01-CD-FF-123002-PEM-D
	TITLE: DDCMIS INTERFACE FOR BIDIRECTIONAL DRIVE	DATE: 10.08.2017
		SHT 7 OF 11

DCS INTERFACE FOR SOLENOID DRIVE
(24V DC / 240V AC UPS)



NOTES:

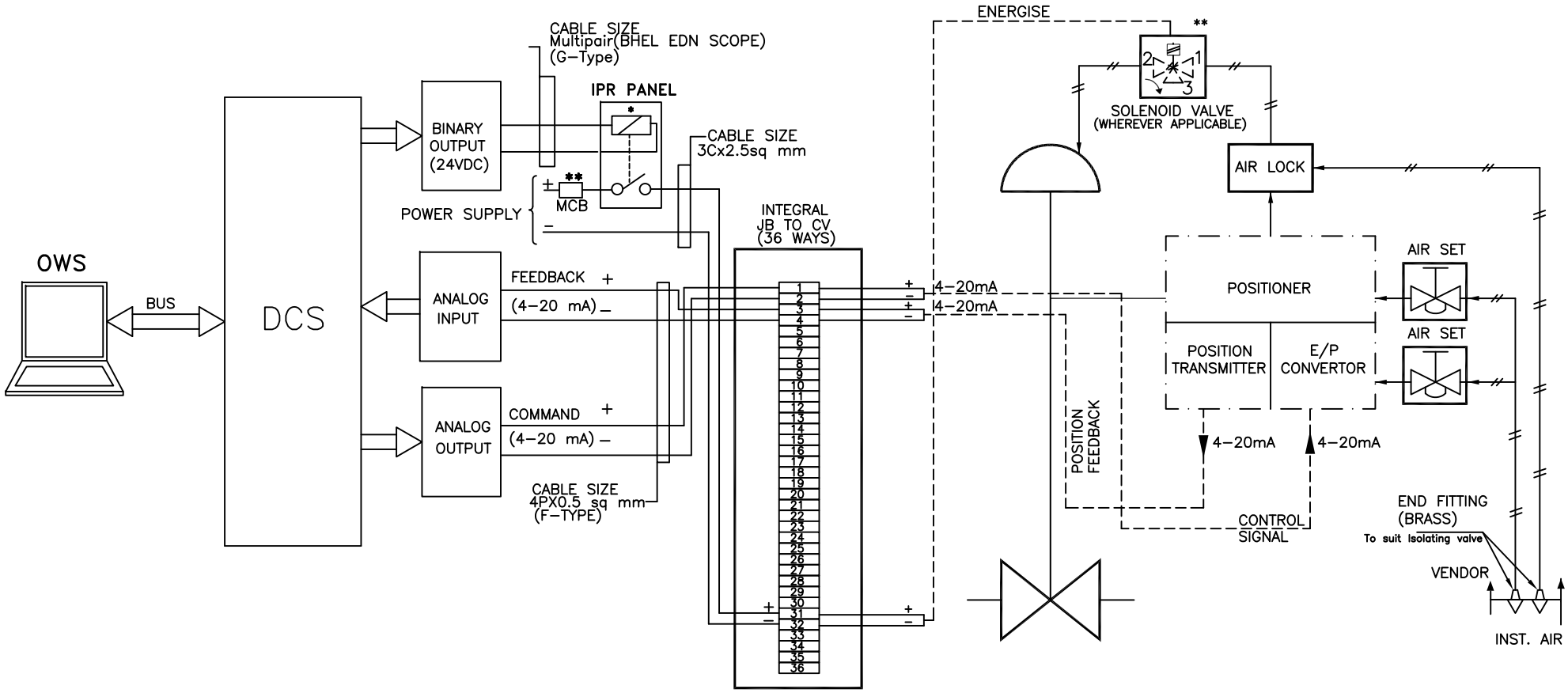
* TWO INDEPENDENT OUTPUTS FROM CONTROL SYSTEM SHALL BE PROVIDED TO PUSH–PULL TYPE VALVES, WITH DUAL COIL SOLENOIDS.

** MCB SHALL BE PROVIDED FOR EACH SOLENOID

\# FOR ON/OFF TYPE, SOLENOID ACTUATED CONTROL VALVE.

BHEL	PROJECT: 2X660MW BIFPCL MAITREE	DRG.NO. Maitree–01–CD–FF–123002–PEM–D
	TITLE: DDCMIS INTERFACE FOR SOLENOID DRIVE	DATE 10.08.2017
		SHT 9 OF 11

DCS INTERFACE FOR ANALOG DRIVE



NOTES:

* APPLICABLE TO VALVES WHERE PROTECTION OPEN/CLOSE ACTION FOR CONTROL DEMAND OVERRIDING IS REQUIRED.

** MCB SHALL BE PROVIDED FOR EACH SOLENOID

BHEL	PROJECT: 2X660MW BIFPCL MAITREE	DRG.NO. Maitree-01-CD-FF-123002-PEM-D
	TITLE: TYPICAL HOOK-UP DIAGRAM ANALOG DRIVE	DATE: 10.08.2017
		SHT 11 OF 11

ANNEXURE IV

ANNEXURE-IV

VALVE SPECIFICATION FOR HSD UNLOADING & STORAGE SYSTEM

S.No.	Type of valve	Technical parameters
1	**General Requirement for all valves**	i) All valves shall be provided with hand wheels, extension spindles and floor stands or any other arrangement wherever required so that they can be operated manually with ease by a single operator from the nearest operating floors either at a lower or higher elevation as the case may be. Wherever necessary for safety purpose, locking devices shall be furnished with valves. Gear Operated valve shall be provided for valves where force applied is more than 25Kgf. In the case of those valves with extended spindles, indicators will be fitted both to the extended spindles and to the valve spindles.
2	**Globe Valves**	i) Globe valves shall be used for regulation purpose for all sizes in oil lines, they shall be provided with hand wheel, position indicator and draining arrangement, if required. ii) Globe valves for sizes up to 50 NB (As per manufacturer's standard) shall be of class 800 forged carbon steel valves with plug disc. Valves internals e.g. bolted bonnet etc. shall be of 13 % chrome steel material. Stem and plug material shall be of ASTM A182 Gr F6a. Body material shall be to ASTM A105 and ends shall be socket welded. iii) For sizes above 50 NB (As per manufacturer's standard), valves shall be class 150/300 (depending on service) Cast Carbon steel globe valves with plug or ball type disc. Valve internals material shall be same as above at S.N ii). Body material shall be ASTM A216 Gr. WCB and ends shall be flanged to ANSI 150/300 Ibs rating with raised face. iv) The valve shall conform to BS, 1873/BS: 2995 and shall be tested to BS EN 12266-1 requirements.
3	**Check Valves.**	i) Check Valves shall be used for non-return services for all sizes in oil lines. ii) For sizes up to 50 NB (As per manufacturer's standard), check valves shall be of class 800 forged Carbon Steel horizontal lift type, with bolted cover, Valves internals such as plug, seat, spring etc. shall be of 13% Chrome Steel material and body material to ASTM A 105, Ends-shall be socket welded. iii) For sizes above 50 NB, check valves shall be of class 150/300 (depending on service) Cast Carbon Steel valves of swing check type having bolted cover. Valve internals

		such as disc seat, body seat etc shall be of 13% Chromium Steel and body material to ASTM A 216 Gr. WCB. Ends shall be flanged to ANSI Class 150/300 Ib rating with raised face. iv) The valves shall conform to BS: 1868 and shall be tested to BS EN 12266-1 / API598
4	**Oil Line Ball / Plug Valves**	i) Ball valves shall be used for isolation purpose in oil lines. These shall have 'port' position indicators with CLOSE/OPEN indications marked on valve body. ii) The ball shall be of SS AISI 316 quality. iii) Ball valves for sizes up to 50 NB (As per manufacturer's standard) shall be of class 800 forged carbon steel valves. Body material shall be to ASTM A105 and ends shall be socket welded. iv) For sizes above 50 NB (As per manufacturer's standard), valves shall be class 150/300 (depending on service) Cast Carbon steel ball valves. Body material shall be ASTM A216 Gr. WCB and ends shall be flanged to ANSI 150/300 Ibs rating with raised face. v) Ball valves shall be of safe patter for internal (line) & external leakage. Ball valves in general shall confirm to BS EN ISO 17292 and to BS EN ISO 10497/API 607/ Equivalent for fire safe test. vi) Plug valves shall be of fire safe pattern for external leakage only. Plug valves in general shall confirm to API 6D/ Equivalent for design &manufacturing standard and to BS EN ISO 10497/ API607/ Equivalent for fire safe test.
5	**Gate Valves**	i) The gate valves shall be provided with handle wheel, position indicator and draining arrangement. ii) Gate Valves for sizes up to 50 NB (As per manufacturer's standard) shall be of class 800, forged carbon steel valves with solid wedge, stem and bolted bonnet, Trim shall be of 13% chrome steel. Body material shall be to ASTM A105 and ends shall be socket welded. STEM and Disc material shall be to ASTM A182 F6a. iii) For sizes above 50 NB (As per manufacturer's standard), valves shall be of class 150/300 (depending on service), Cast Carbon Steel gate valves. Face to face dimensions shall be as per ANSI B 16.10. Body material shall be ASTM A216 Gr. WCB and ends shall be flanged to ANSI 150/300 Ibs rating with raised face.

		iv) Gate valve shall be used in the oil lines for sizes 350NB and above. v) The valves shall conform to API-600/ API-602 and shall be tested to API 598 requirements.