Corrigendum-1 dated Mar 02, 2017 to Tender Specification BHEL PSSR SCT 1660

01. Bidders are requested to fill up their price in the Price bid Revision-01 only.

02. Earnest Money Deposit (EMD) shall also be paid directly to BHEL-PSSR through Online EMD payment portal by following these steps.

1. Visit www.onlinesbi.com -> Go to State Bank Collect (In the tab section)
2. Click Check box to proceed for payment -> Click on Proceed
3. Under State of Corporate/Institution ->Select Tamilnadu
4. Under Type of Corporate/Institution -> Select PSU – Public Sector Undertaking ->Go
5. Under PSU – Public Sector Undertaking Name -> Select BHEL PSSR CHENNAI and Submit
6. Under Select payment Category ->Choose the contract number [Tender specification no.(SCT 1660) for which EMD and Tender fees to be paid]

03. The works mentioned below shall also be executed by the contractor along with the works mentioned in the Technical Conditions of Contract (TCC) booklet :

SCOPE:

Handling at Site Store, Transportation, Erection, alignment, welding, testing and Commissioning, 4mm thick coal-tar tape supply & wrapping , assistance in application of internal PU / Coracoat at the ends after welding, including supply and application of painting of part Circulating Water (CW) and complete ACW (auxiliary cooling water) system.

1. Scope includes CW piping in BHEL scope upto Butterfly valve (BFV) and ACW system upto A row near column 13 & 14, including pipes, including trapping and provision for mounting Ultraflow meter.
2. Tonnages indicated for CW Piping and ACW Piping may vary by + or – 25%, since Engineering is yet to be completed as on date of tender floating. Contractor to quote accordingly.

3. The drawing mentioned below maybe referred for CW and ACW terminal points

Drawing no: PE-DG-423-165-M001 - layout of CW piping local to condenser

CW PIPING SYSTEM

Terminal Points

From Column 3 of A row (approx.), up to Butterfly valve flange.

Weight of CW Piping - 330 MT (approx.)

Tentative details mentioned below on CW piping are for reference only:

Pipe OD3840x20 IS3589 L=140M (265 MT)

Pipe OD2743x20 IS3589 L=48M (65 MT)

Approximate No of joints in pipe NB 3800 – 20 joints (approx.)

Approximate no of joints in pipe NB 2700 – 45 joints (approx.)

ACW PIPING SYSTEM

Terminal Points

From Column 3 of A row (approx.) upto A row near column 13 & 14.

Weight of ACW Piping - 64 MT (approx.)

Tentative details mentioned below on ACW piping are for reference only:

Pipe 900NB, 10mm thick L=290 m (64 MT)

NOTE:

N1. The Information furnished in this section is only a description regarding the item to be erected by the contractor. BHEL reserves the right of adding or excluding any components/ items / systems according to the site requirements/ customer requirements to complete various systems in all respects.

N2. Any other systems / components which are the integral to equipment supplied by the manufacturing units shall also be erected and commissioned by the contractor within the quoted /accepted rate.

N3. Pipes shall be of CS as per IS 3589 fabricated from IS 2062 plates internally lined with corracoat or polyuria coating of 2000 micron DFT (Refer enclosed drawing 4-80-468-80717- shop Coating detail)

N4. External Painting / Protection shall be as follows:
For piping system, refer enclosed Piping Center Doc.No.7311:QPC:12 (Painting Scheme for LP Piping) and Doc.No.7311:QPC:11 (Painting Scheme for Piping)

N5. Drain / Vent Valves
- CW system: 200 NB
- ACW system: 50 NB for sizes above 350NB & 25 NB for lower pipe sizes.
Drain / vent shall be provided as per layout requirements

N6. The straight length of pipes indicated does not include the length of fittings. However the weight includes all fittings. The fittings like Tees, Reducers, Elbows, Mitre bends and other pipe fittings, clamping / trailing length required for bends etc. are to be erected as part of the scope and within the quoted rate.

N7. FOR BURIED PIPING (underground piping) with Concrete encasing :

N7a. The pipe in general shall be laid on the bottom cement encasing and welded. After Hydro test clearance will be given for top end casing of CW piping.

N7b. The scope, quantity & sizes of buried piping are as per BOM and the relevant drawings. Erection welding schedule shall be furnished during erection. 10 % Radiographic test shall be done.

N7c. The civil works for the buried piping are excluded for this scope of work. However the contractor has to ensure that the width of the trench shall be sufficient to give free working space on each side of the pipe.

N7d. Access shall be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained. This type of incidental works are to be carried out by the contractor within quoted rates.

N7e. Prior to lowering and laying pipe in any trench, the contractor shall ensure for the backfill and compact the bottom of the trench or excavation in accordance with IS 5822 / as per drawing to provide an acceptable bed for placing the pipe.

N8. FOR BURIED PIPING (underground piping) with wrapping and coating :

N8a. For buried piping (underground piping) without concrete encasing, for which underground protection is to be provided with anti-corrosive coating and wrapping. This scope of work including supply and application of wrapping & coating is in the scope of the bidder.

N8b. Supply of wrapping and coating Materials including all consumables is included in the scope of the bidder.

N8c. COATING & WRAPPING shall be done as follows.

N8c.1 The external surfaces of the buried pipes shall be thoroughly cleaned, if required by shot / grit blasting method for free of rust, weld scales, burns etc., before start application of anti-corrosive coats. Kerosene, solvent or other cleaning material should not be used for external cleaning of the pipes. The above work shall be carried out to the satisfactory of BHEL engineers or as instructed by BHEL engineers.

N8c.2 The entire length of pipe shall be cleaned and coated leaving the end about 150 mm for joints, which shall be coated manually after laying in the trench, welding and testing the pipe.

N8c.3 Coating & Wrapping of site joints shall be done after completion of weld and / or flanged connections and after completion & approval of Hydro testing. Materials required for coating, wrapping and consumables required for cleaning operations are to be arranged by the contractor within the quoted rate.

N8c.4 The materials used for coating and wrapping are

a) Coating Primer (Coal Tar Primer) – Coal tar primer compatible with coal tar enamel grade. The number of coats shall be two with a DFT of 35 Microns each.

b) Coating Enamel (Coal Tar Enamel) – A single spiral inner wrap of glass fibre tissues shall be applied overlapping atleast 25 mm ensuring impregnation of glass fibre tissues in the first coat. The second coat of enamel and second outer wrap of glass fibre felt, type-I to IS 7193-1974 will be applied in the same way confirming to table-10 of IS 10221-1982

c) Wrapping Materials

N8d. All primer / Coating / Wrapping materials and method of application shall conform to IS 10221

N8e. Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221 and shall be decided based on soil corrosive / resistivity. However the total thickness of completed coating shall not be less than 4.0 mm, including anti corrosive tape of 4 mm thick.

N8f. Alternatively the anti-corrosive protection can consist of anticorrosive protection tapes. Material and application of tapes shall conform to IS 15337:2003. These tapes shall be applied hot over the coal tar primer. The total thickness of the finished protective coating shall be 4 mm minimum. The required above mentioned tapes are to be provided by the contractor at his cost.

N8g. Tests to be carried out after application –

(a) Bond / Adhesion test
(b) Holiday test.

N9. The preservative paint, anti corrosive tape, all the required consumables, T&Ps and the instruments required for the above application and testing are to be arranged by the contractor at his cost.

ERECTION OF ACW & CW PIPING:

E1. Handling at store / yard, transportation to site, fabrication and welding of support, 4mm thick coal-tar tape supply & wrapping , branch pipes, man holes, instrument tapping, flanges etc, (wherever applicable), laying pipe line for supply line & return line of main cooling water piping along with valves, alignment, welding and doing required NDT, completion of permanent hangers & supports, wherever required conducting air test & hydro-test, assisting BHEL to carry out the required tests before the line is taken over by the customer of CW PIPING is in the scope of this contract.

E2. The entire civil work is excluded from the scope of contractor however the required dewatering, well point dewatering to be carried out before and during erection of CW piping. The dewatering requirement for execution of CW piping erection work has to be ensured by deployment of suitable dewatering pumps / Continuous Multi Point Dewatering etc. as per site requirement which is included in the scope of work .

E3. The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

E4. Contractor shall erect pipe line as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineer depending upon the availability of materials, fronts and other inputs etc. No claim for extra payment from contractor will be entertained on the grounds of deviation from the methods of erection adopted in erection of similar piping in other places.

E5. The piping materials shall be supplied as per specification below:

a) Piping 200NB and above shall be carbon steel rolled & welded as per IS : 3589 from CS plates (IS : 2062), internally lined with corracoat/ polyurea coating inside of 2000micron DFT

b) All pipes above 50 NB shall be supplied with edge preparation.

E6. Pre fabricated mitre bends will be supplied. If required, the contractor has to cut and edge prepare before erection.

E7. Transportation Loading at storage yard and transporting to site, unloading at site / pre assembly area or at working area, is in the scope of work. Required cranes for loading & unloading of materials, trailor shall be in the scope of contractor. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, sand bags which are required for temporary supporting of the components at site.

E8. All the pipes / components shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc., shall be used for unloading and / or handling of pipes. The bare pipes shall be lifted with Teflon coated hooks with cranes then loaded / unloaded on / from trailers to avoid bevel damages. It is always safer for the pipes to be lifted at two points.

E9. Pipes shall not be dropped to avoid impact or bump.

E10. The entire consumables, equipments / T & Ps required for successful completion of the work is in the scope of contractor and the quoted rate shall be inclusive of all these, except specifically indicated as free supply by BHEL.

E11. Carrying out piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

E12. Contractor has to draw the material either from BHEL store yard or fabrication yard and transport to his working place.

E13. Welders shall be qualified as per the welder qualification procedures of BHEL/ASME, applicable for this type of job. Only qualified welder shall be deployed for welding.

E14. All dimensions / elevations refer to centerline of pipe unless otherwise specified and the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.

E15. Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges, re-prepare the edges to suit site conditions, which shall be done by the contractor at no extra cost.

E16. Wherever pre-fabricated pipes/bends are supplied, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.

E17. Certain adjustments in length may be necessary while erecting pipelines to suit site condition, for which an extra length of piping is provided on each line. Contractor should remove the extra lengths to suit the final layout and prepare edges afresh is in the scope of work. It may also be required to add extra lengths of pipes to suit final layout for contractor to put spools after edge preparation. All these works are to be carried out by the contractor with in the quoted rate.

E18. Minor adjustments like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL Engineer to suit the layout, with specified procedure to be carried out with in the quoted rate.

E19. Contractor shall arrange all the equipments, alignment bolts, tools, consumables like welding rods, etc. for welding of pipes and consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are also in contractor's scope. All these shall be carried out with in the quoted rate.

E20. Contractor shall use only bolted clamps for achieving alignment of piping, wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subjected to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., and not by hammer. Any burrs left on the equipments / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and subsurface cracks in these ground areas.

E21. All the weld joints on equipments and piping shall be ground or filed on completion of welding as per instructions of BHEL Engineer so as to achieve smooth surface devoid of ripples, undulations etc.,

E22. Pipelines shall be cleaned off welding slag and burrs by hand files, wirebrushes and flexible grinders wherever required.

E23. Temporary lugs / structures meant for transportation is to be removed by the contractor as and when instructed by BHEL Engineer.

E24. Flame cutting of piping and other equipment shall be strictly done as per BHEL Engineer's instructions and in his presence only.

E25. Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

E26. On completion of bottom layer of pipes, contractor has to conduct hydraulic test. For conducting hydro – test both ends of each lines are to be blanked suitably. Raw materials for blanking such as plate / structural items will be given by BHEL on free of charges. Fabrication, welding of dummies and NDT and removal of dummies after successful completion of hydro – test and making edge preparation on the parent pipe after HT is in the scope of contract. For Hydro test to be conducted in stages or to be repeated, the same plates shall be used for blanking by suitably grinding.

E27. Contractor shall arrange all temporary piping, pumps, etc required for the hydraulic test, pressure gauges etc. Required pipes, valves, etc., are to be brought /arranged by contractor. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him once the work is over and could be taken back. The pipes, fittings, valves, etc shall be suitable and withstand the rated hydro test pressure. The pump shall be suitable for pressurization to this test pressure and the volume of water to be used for sectionalized hydro test.

E28. The contractor has to arrange (low pressure) hydro-testing pump for conducting hydraulic test on his own with in the quoted rate. The servicing, installation, electrical connection, erection, testing and dismantling after completion of hydro-test shall be carried out by the contractor as part of this work without any extra charge. The pump would be taken back after completion of the work as certified by BHEL engineer.

E29. Required water filling pump is to be arranged by the contractor.

E30. After completion of hydro test on bottom layer it is to be cleared for Civil agency, after de-watering and removing all temporary supports / scraps.

E31. The BHEL supplied valves as part of CW system will have to be checked, lapped or serviced if required before / after erection. Contractor shall arrange experienced valve technician at his own cost. Any special tools required for lapping only will be arranged by BHEL.

E32. All drains / vents/ relief line etc. from the stubs on the piping to be erected by the contractor, is completely covered in the scope of work.

E33. Fixing / fitting / welding of thermowell stubs, tapping points, root valves for instruments etc is within the scope of work.

E34. The contractor shall conduct nondestructive tests like radiography ultrasonic test for weld defects etc., dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipments etc. as per BHEL Engineer's instructions / welding schedule.

E35. Contractor shall arrange the clearance from the statutory authorities (Labour commissioners etc.,) as required for installation of the plant and equipment and render all assistance, service required in this regard.

E36. Contractor shall cut / open works if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value. During commissioning opening of valves changing of gaskets attending to leakages minor modification rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower with T & Ps in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning, the same has to be rectified by the contractor at his cost.

E37. The contractor shall arrange sufficient quantity of higher capacity pumps with all its accessories within the quoted rate to evacuate the percolating water from the CW trench during erection of piping systems. The water shall be discharged at a location identified by BHEL engineer.

E38. The major civil works like excavation, compaction, sand filling & etc. for the buried piping identified in this contract are excluded from the scope of this work. However the widening of the trench at the weld joint area for giving free working space on each side of the pipe is included in the scope of this work. This type of incidental works are to be carried out by the contractor within quoted rates. The required co-ordination with civil and other agencies shall be extended by the contractor to ensure smooth execution of works.

E39. Box cutting and excavation of earth up to the required depth and width, concreting etc., are not covered in the scope of works of this tender and shall be carried out by others on phased manner as per the site requirement and decided by BHEL site in-charge. As and when the clearance for erection of piping is given, contractor shall carry out erection work promptly without any delay and release for further civil in a phased manner as instructed be site in-charge.

E40. Erection welding schedule shall be furnished during erection. 10 % Radiographic test shall be done.

E41. Once the clearance is given for erection contractor, he has to lay the pipes immediately without any delay and complete erection, alignment, welding & NDT as per the drawing / welding schedule. Pipes are to be lifted and placed only by cranes after dewatering and should strictly follow the lifting procedure / instruction of BHEL Engineers.

E42. CONCRETE ENCASED PIPING

E42.1. The pipe in general shall be laid on the bottom cement encasing and welded. After Hydro test clearance will be given for top end casing of CW piping.

E42.2. The scope, quantity & sizes of buried piping are as per BOM and the relevant drawings.

E42.3. The civil works for the buried piping are excluded for this scope of work. However the contractor has to ensure that the width of the trench shall be sufficient to give free working space on each side of the pipe.

E42.4. Access shall be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained. This type of incidental works are to be carried out by the contractor within quoted rates.

E42.5. Prior to lowering and laying pipe in any trench, the contractor shall ensure for the backfill and compact the bottom of the trench or excavation in accordance with IS 5822 / as per drawing to provide an acceptable bed for placing the pipe. Necessary co-ordination with the BHEL's civil agency shall be carried out by the contractor.

E43. BURIED PIPING

Wherever concrete encasing is not envisaged for underground (buried) piping, underground protection to be provided with Anti-corrosive coating and wrapping. The above scope of work is in the scope of the erection contractor which includes supply of materials and application of the same.

E44. SAFETY PRECAUTION DURING WELDING :

In the larger diameter pipes, welding is to be done from inside and outside the pipe, as per drawing. While doing inside pipe welding, adequate precaution is to be taken by contractor to exhaust the weld gases form affecting the welders doing the work. Suitable exhaust fans are to be provided. Welders and helpers inside should have face mask and other safety equipments and safety ware. Suitable lighting and fan are to be made. Manhole escape arrangement is to be identified. Welding inside pipe should be taken up only after getting clearance from safety engineer and after ensuring that Safety relief measures are made available nearer to work area. A supervisor should be continuously made available in the area of welding throughout.

E45. Also Refer the following tentative drawings (enclosed):

0-80-468-XXXXX - Main Condenser Cooling Water Piping outside TG hall

PE-DG-423-165-N001 - CW & ACW system P&I

04. Some of the bidders had raised queries in the published tender specification. The Clarifications issued by BHEL are furnished below:

No	Ref. clause	Existing provision	Bidder's query	BHEL's clarification
1)	Notice Inviting Tender Annexure -1 PRE-QUALIFICATION CRITERIA - Financial Clause C-1 :	**Turnover** Bidders must have achieved an average annual financial turnover (Audited) of **Rs.15,50,00,0000/-** (Rs.Fifteen crores fifty lakh only) or more over last three Financial Years (FY) i.e 2013-14, 2014-15 and 2015-16.	In words it is mentioned as Rs Fifteen Crores Fifty Lakhs Only whereas in number it is mentioned as Rs.15,50,00,0000/-. Please Clarify.	Clause is revised as below: **Turnover** Bidders must have achieved an average annual financial turnover (Audited) of **Rs.15,50,00,000/-** (Rs.Fifteen crores fifty lakhs only) or more over last three Financial Years (FY) i.e 2013-14, 2014-15 and 2015-16.

No	Ref. clause	Existing provision	Bidder's query	BHEL's clarification
2)	TCC Volume IA, Part-I Chapter –X clause 1.10.4.24.1	Number of utility points (Service / plant air, service ….. …… … …….. ……. …… …….. …….. with 'BILL OF MATERIAL' to BHEL for approval.	Please confirm the scope of erection and weight details for the utility point piping	Vendor to execute as per drawings which will be provided at site during execution.
3)	TCC Volume IA, Part-I Chapter –XIV clause 1.14.2.33	The contractor shall fabricate piping, install lub oil systems …… …. …… …… …. …… ……. test of oil coolers. etc.,	Please Confirm the scope of supply for materials required for the lub oil system	Supply under BHEL scope.
4)	TCC Volume IA, Part-I Chapter –XVII clause 1.17.5	Raw materials for all temporary piping …… ….. …… …….. ……. ……. responsibility of the contractor without any extra charges.	Please confirm the scope of erection for temporary piping. If it is in the contractor's scope please provide the weight details of the pipe and equipments to be erected.	Details cannot be specified at this stage. Bidder to quote in line with standard practice followed in any power project.
5)	TCC Volume IA, Part-I Chapter –XVII clause 1.17.7	Contractor at his cost shall lay all necessary temporary piping, ……. … ……. ……. ……. ….. will be provided by BHEL.		

05. The following clauses are changed / modified as below:

<table>
<tr><th>No</th><th>Ref. clause</th><th>Existing clause</th><th>changed / modified clause</th></tr>
<tr><td>1)</td><td>Technical Conditions of Contract (TCC)

Volume IA, Part-I Chapter –IV Clause 1.4.1.</td><td>
<table>
<tr><th>No</th><th>Description</th><th>Quantity</th></tr>
<tr><td>1</td><td>150 MT Crawler crane
This crane should be made available ……. ……. …….. ……. Hydro test (Drainable)</td><td>1 No.</td></tr>
<tr><td>2</td><td>75 MT Crawler crane
First crane to be made ……. ….. …. Hydro Test (Drainable)
Second crane to be made …….. ……. . Boiler Light Up</td><td>2 No.</td></tr>
<tr><td>3</td><td>40 T Crawler Crane
The crane shall be made …… .. .. …… …. Trial Operation</td><td>1 No.</td></tr>
<tr><td>4</td><td>Pick and carry crane (8 MT-14MT</td><td>As required (minimum 3 nos.)</td></tr>
<tr><td>5</td><td>Tractor Trailer 60T / 30T</td><td>As required (Minimum 1 no. each of 60T and 30T)</td></tr>
<tr><td>6</td><td>DG set-250 KVA (Stand by for P91 welding)</td><td>1 No.</td></tr>
<tr><td>7</td><td>Tube Expander</td><td>1 No</td></tr>
<tr><td>8</td><td>Sky Climber</td><td>2 Nos</td></tr>
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<tr><td>8</td><td>Sky Climber</td><td>2 Nos</td></tr>
<tr><td>9</td><td>Ultrasonic hardness testing machine (Ultrasonic contact impedance (UCI)) - 1 no</td><td>1 No</td></tr>
</table>
</td></tr>
</table>

No	Ref. clause	Existing clause	changed / modified clause
2)	TCC Volume IA, Part-I Chapter –IV Clause 1.4.9.4	EQUOTIP or MICRODUR make or equivalent portable hardness tester.	GE or Kraut Kramer or Microdur make or reputed branded ultrasonic hardness testing machine (Ultrasonic Contact Impedance (UCI))
3)	TCC Volume IA, Part-I Chapter –VII		Clause 1.7.5 and 1.7.6 and their sub clauses are added as mentioned below this table:

1.7.5 Progressive Payment against monthly running bills will be made upto 85 % of the value of the erected tonnage (CW & ACW Piping, Wrapping & Coating) Pro-rata as per Cl no 1.7.5.1 to 1.7.5.7 of the following table.

	PRO RATA PAYMENTS (85%)	
1.7.5.1	On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position)	15%
1.7.5.2	Placement in position	20%
1.7.5.3	Alignment	15%
1.7.5.4	Welding/bolting/fixing	15%
1.7.5.5	Completion of non destructive examination & stress relieving/ heat treatment (if not applicable, then this portion to be paid along with welding)	10%
1.7.5.6	Hangers & supports etc. wherever necessary as per drawing	5%
1.7.5.7	Hydraulic test or pneumatic test	5%
	Total for pro rata payments (total 85%)	**85%**

1.7.6 Further 15 % payment on pro-rata basis common to all PGs of CW & ACW Piping, wrapping & coating shall be released on achievement of the following stage / milestones events (as per Cl no 1.7. 6.1 to1.7.6.12 of the following table) for the tonnage erected.

1.7.6.1	Boiler Light Up	1%
1.7.6.2	Alcali Boil Out / Chemical Cleaning	1%
1.7.6.3	Steam Blowing	1%
1.7.6.4	Safety Valve floating	1%
1.7.6.5	Rolling and Synchronisation	2%
1.7.6.6	Full Load	2%
1.7.6.7	Trial Operation of Unit	2%
1.7.6.8	Painting	1%
1.7.6.9	Area cleaning, temporary structures cutting/removal and return of scrap	1%
1.7.6.10	Punch List points/pending points liquidation	1%
1.7.6.11	Material Reconciliation	1%
1.7.6.12	Completion of Contractual Obligation	1%
	Total for stage/milestone payments (15%)	**15%**
	Total of clause 1.7.5 and 1.7.6	**100%**

06. The Painting Schedule for Boiler mentioned as chapter-3 of Part II of Technical Conditions of Contract (TCC) is erroneously not published in the booklet. Hence the same is enclosed herewith.

All other conditions of the tender specification remain unchanged.
Bidders are requested to consider this corrigendum as part of tender specification and quote accordingly.

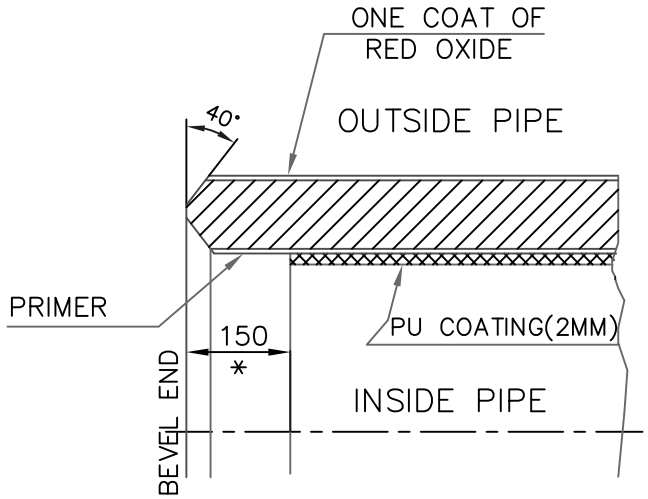
-Sd-
Sr.Manager / Subcontracts

REV	DATE	ALTERED
01		APPROVED

ALL DIMENSIONS ARE IN MILLIMETRES

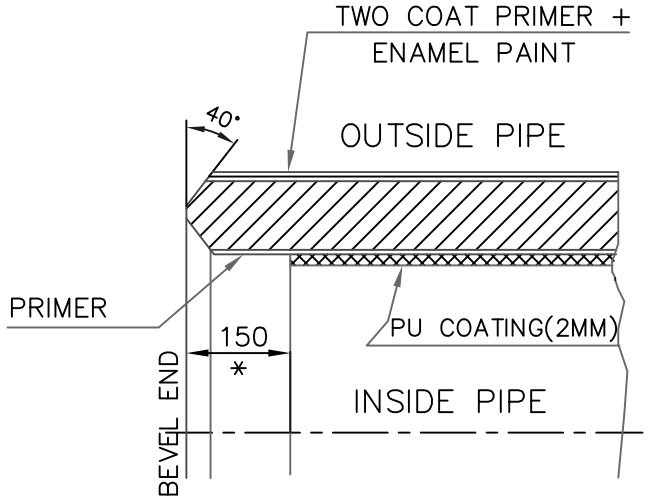
UNDER GROUND PIPING

* COATING TO BE DONE AT SITE AFTER WELDING



OVER GROUND PIPING

* COATING TO BE DONE AT SITE AFTER WELDING



BHARAT HEAVY ELECTRICALS LIMITED PIPING CENTRE CHENNAI 600 017		NAME	SIGN	DATE	NO.OF VAR
	DRN	P SURESH		13.02.17	
	CHD	R SESHAGIRI		13.02.17	
	APPD	R SESHAGIRI		13.02.17	

DEPT / CODE	GRADE OF UNTOL.DIM	SCALE	WEIGHT (KG).	REF. TO ASSY./OLD DRG.	ITEM NO.	NO. OF ITEMS
	C / M / F	N.T.S				

TITLE	CARD CODE	DRAWING NO.	REV
SHOP COATING DETAIL (NEAR BEVEL END)	U 01	4-80-468-80717	00

Size A4

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI– 17
QUALITY ASSURANCE & CONTROL DEPT.

PAINTING SCHEME FOR LP PIPING

(CW / ACW / ECW / Plant water, Air Piping, etc...,)

PROJECT NAME : - NORTH CHENNAI TPS STAGE-III - 1X800 MW
BHEL CUSTOMER Nos : 7311 & 7312(Aux.Boiler).

QPNo: 7311:QPC:12
REV.NO: 00
Dt : 15.02.2017

Sl. NO	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat			Finish coat			Total DFT Microns (Min.)	REMARKS
			Primer	No of coats	Paint	No of coats	Shade	Paint	No of coats	Shade		
1	2	3	4	5	6	7	8	9	10	11	12	13
1	(a) Internal Surface - CW Pipe (for pipe dia - 1000 mm and above)	Blast Cleaning SSPC SP-10 SA 2½ *(Refer Note 1)*	POLY - URETHANE COATING OF 2000 MICRONS DRY FILM THICKNESS . (Refer Note 2)								2000 Microns *(Refer Note 3)*	
	(b) Holiday test (Refer Note 3)	Holiday testing as per AWWA C222 and Paint Manufacturer recommendation. Holiday test Equipment to be calibrated before testing.										
2	External Surface of CW --Buried Piping / Encased in concrete (For pipe dia-1000 mm and above) (Temporary Protection for transportation from works to site). **Further protection to be done by BHEL Erection Group as per Contract requirement.	SSPC-SP3 / Power Tool Cleaning	Red Oxide Zinc Phosphate (Alkyd base to IS 12744)	1 (30 Microns per coat)	-----	-----	-----	-----	-----	-----	30 Microns	
3	External Surface (over ground piping) of CW,ACW.(For all diameters)	SSPC-SP3 / Power Tool Cleaning	Red Oxide - Zinc Phosphate (Alkyd base to IS: 12744)	2 (25 Microns per coat)	-----	-----	-----	Synthetic enamel Long oil Alkyd to IS: 2932	3 ** (35 microns per coat) (2 at shop + 1 at site)	Smoke Grey (Shade No. 692 of IS: 5) Refer Note:4	120 at shop + 35 at site	** 1 coat of DFT-35 microns finish coat at site
4	External Surface of ECW, Plant water (For all diameters)	SSPC-SP3 / Power Tool Cleaning	Red Oxide - Zinc Phosphate (Alkyd base to IS: 12744)	2 (25 Microns per coat)	-----	-----	-----	Synthetic enamel Long oil Alkyd to IS: 2932	3 ** (35 microns per coat) (2 at shop + 1 at site)	Smoke Grey (Shade No. 692 of IS: 5) Refer Note:4	120 at shop + 35 at site	** 1 coat of DFT-35 microns finish coat at site
5	Galvanised and Stainless steel Piping	No painting										

Notes:

1. Blast cleaning to near white metal to obtain roughness as per epoxy paint data sheet.
2. Application of Poly-Urethane coating shall be done as per manufacturer's data sheet / recommendation, meeting the thickness requirements as per this document.
3. Witness by BHEL / BHEL nominated inspection agency.
4. Shade for finish coat to be done at site shall be as per project specification/contract requirement.

PREPARED BY : HARITHA. C, Sr.Engr/QA	APPROVED BY: VIVEKANANDA YELLU, Dy.Mgr/QA	For Customer use :

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI– 17
QUALITY ASSURANCE & CONTROL

PAINTING SCHEME FOR PIPING

PROJECT NAME : - NORTH CHENNAI TPS STAGE-III - 1X800 MW

BHEL CUSTOMER Nos : 7311 & 7312(Aux.Boiler).

QPNo: 7311:QPC:11
REV.NO: 00
DATE : 15.02.2017

Sl. NO	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat			Finish coat				REMARKS
			Primer	No of coats & DFT	Paint	No of coats & DFT	Shade	Paint	No of coats & DFT	Shade	Total DFT Microns (Min.)	
1	2	3	4	5	6	7		9	10	11	12	13
1	Insulated Piping, components (MS / HRH / CRH / Aux Steam lines, Tanks&Vessels..)	SSPC-SP3/ Power Tool Cleaning	Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	2 (30 microns per coat.)	-----	-----	-----	-----	-----	Red Oxide	60	
2	Uninsulated Piping, components (Spray Water / Condensate lines,Tanks&Vessels..,)	Blast cleaning to Sa2½ with surface profile 35-50 microns	Inorganic Ethyl Zinc Silicate Primer.	1 (75 microns per coat)	Epoxy resin with MIO	1 (75 microns per coat.)	-----	Epoxy finish paint to IS14209 + Aliphatic Acryllc Polyurethane finish Paint to IS13213	$2 (35 microns per coat.) + $1 (30 microns per coat.)	Smoke Grey Shade No 692 of IS 5	185 shop + 65 site	Refer Note 4
3	Structures & components other than CLH&VLH	Blast cleaning to Sa2½ with surface profile 35-50 microns	Inorganic Ethyl Zinc Silicate Primer.	1 (75 microns per coat)	Epoxy resin with MIO	1 (75 microns per coat.)	-----	Epoxy finish paint to IS14209 + Aliphatic Acryllc Polyurethane finish Paint to IS13213	$2 (35 microns per coat.) + $1 (30 microns per coat.)	Smoke Grey Shade No 692 of IS 5	185 shop + 65 site	Refer Note 4
4	Hangers & Supports - CLH & VLH	Abrasive Blast cleaning to Sa 2 1/2 (35-50 microns)	Epoxy Zinc rich primer to IS 14589 Gr.II,% VS = 35 Min	1 (40 microns per coat)	-----	-----	-----	Aliphatic Acrylic Polyurethane paint ,%VS = 40 min	1 (30 microns per coat)	Phirozi Blue Shade No.176 of IS 5	70	Refer Note 3
5	Pipe Clamps.	SSPC-SP3/ Power Tool Cleaning	Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	1 (30 microns per coat.)	-----	-----	-----	Synthetic enamel paint long oil alkyd to IS 2932	2 (20 Microns per Coat)	Refer Note 1	70	Refer Note 1
6	Stainless steel / Galvanized items	No paint										
7	Internal surface coating for ECW Tank	Blast cleaning to Sa2½ with surface profile 35-50 microns	Epoxy Zinc rich primer to IS 14589 Gr.II,% VS = 35 Min	2 (35 microns per coat)	-----	-----	-----	Epoxy based Polyamide cured finish paint	2 (65 microns per coat)	Smoke Grey Shade No 692 of IS 5	200	

Note 1 - Smoke grey shade for Carbon Steel ; White shade for Alloy Steel Clamps.

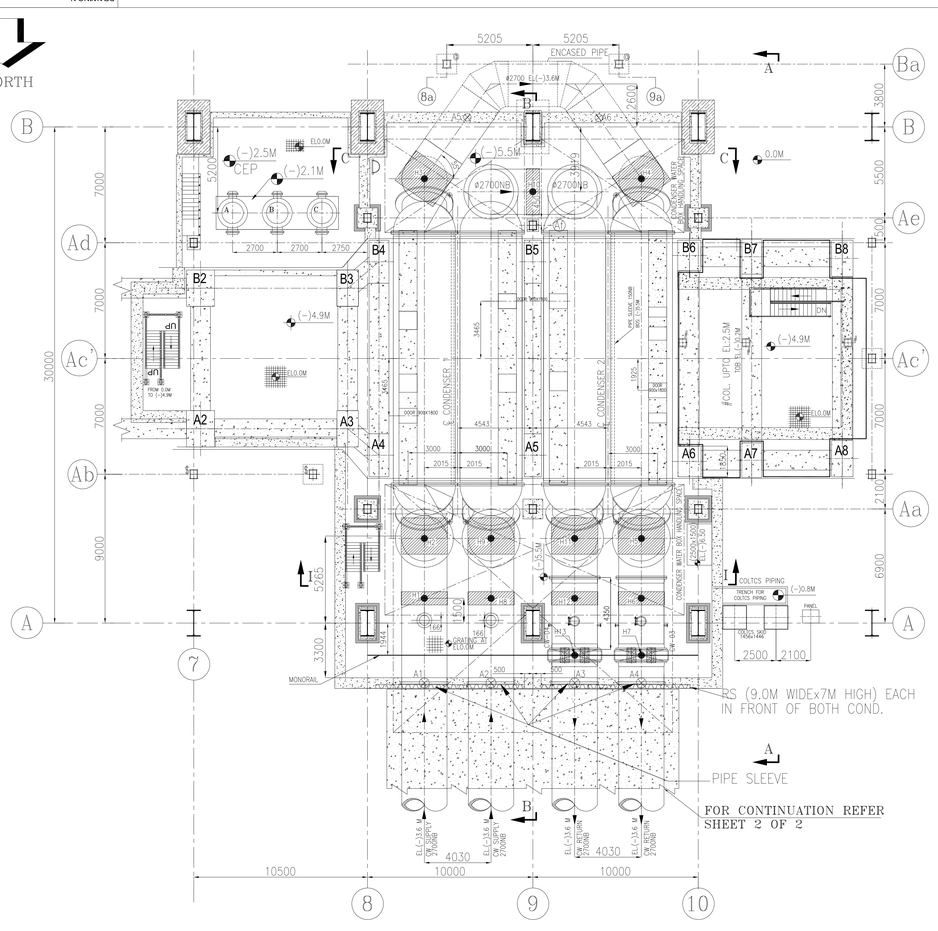
2 - All items (Pipes, Tubes, Plates etc.,) cut to size at site shall be painted with one coat of 30 microns of Red oxide Zinc Phosphate Primer (Surface Preparation :PowerTool Cleaning/ SSPC-SP3).

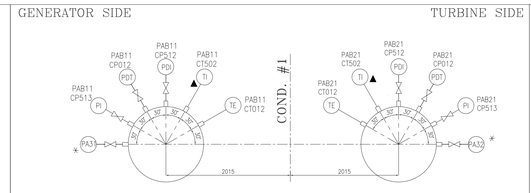
3 - For other than CLH & VLH : Shall be as per sl. No.5 above.

4 - Shade for finish coat to be done at site shall be as per project specification/contract requirement.

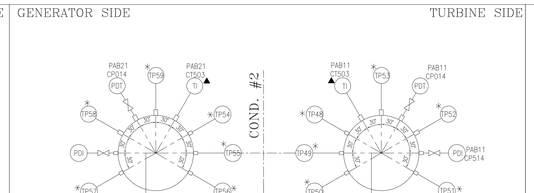
$:- Out of 2 coats of Epoxy based finish paint, one coat shall be given at shop / subcontracting works. Second coat of Epoxy finish and one coat of aliphatic acrylic Polyurethane paint shall be applied at site.

PREPARED BY : HARITHA. C, Sr.Engr/QA	APPROVED BY: VIVEKANANDA YELLU,Dy.Mgr/QA	For Customer use

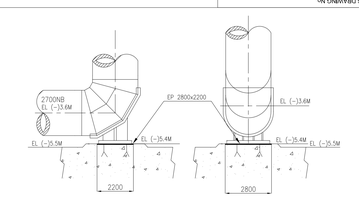




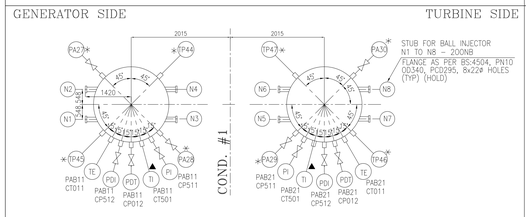
PLAN VIEW
DETAILS OF INSTRUMENT STUBS
ON OUTLET OF CONDENSER #1



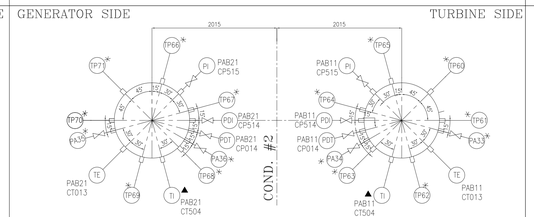
PLAN VIEW
DETAILS OF INSTRUMENT STUBS
ON INLET OF CONDENSER #2



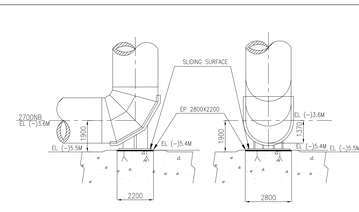
SUPPORT DETAILS for H-2, H-5, H-9, H-11



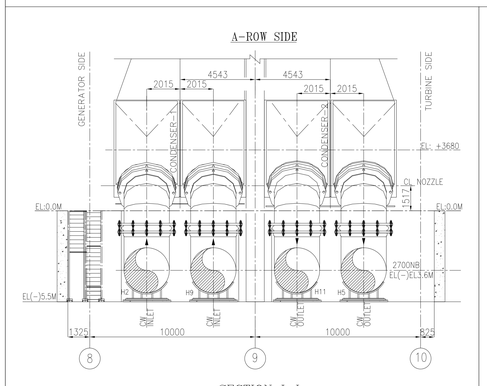
PLAN VIEW
DETAILS OF BALL INJECTION NOZZLES & INST. STUBS
ON INLET OF CONDENSER #1



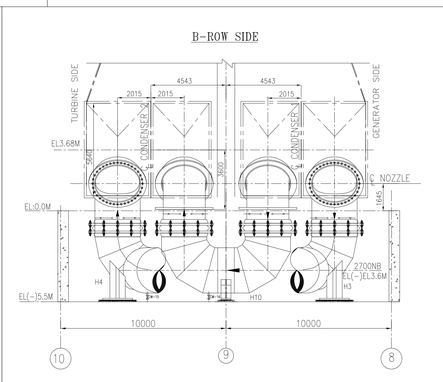
PLAN VIEW
DETAILS OF INSTRUMENT STUBS
ON OUTLET OF CONSENSER #2 AT EL (-)0.25M



SUPPORT DETAILS for H-3, H-4



SECTION I-I



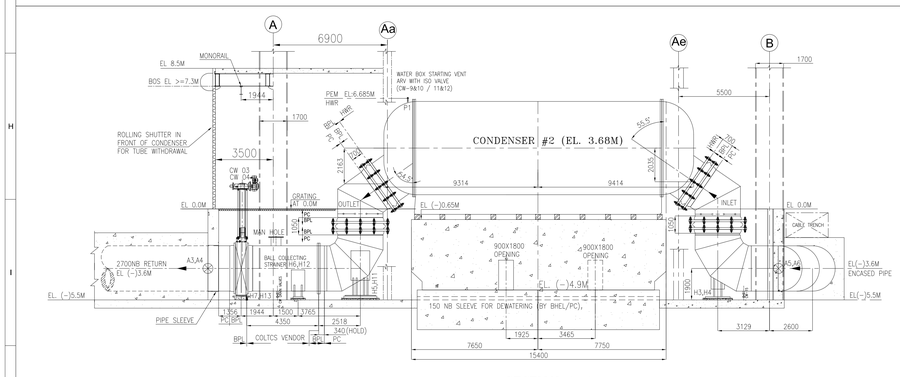
VIEW C-C

LOAD DETAILS (HOLD)								
SL NO	HANGER / SUPPORT NUMBER	LOAD (TONNE)			MOMENTS (T-m)			
		Fx	Fy	Fz	Mx	My	Mz	
1	H1	3	-82	10				
2	H2	2	-59	12				
3	H3	7	-56	-7				
4	H4	-7	-56	-8				
5	H5	1	-59	11				
6	H6	1	-84	20				BOTTOM SLIDING SUPPORTS
7	H7	1	-97	6				
8	H8	1	-82	10				
9	H9	1	-59	11				
10	H10	4	-63	19				
11	H11	2	-59	12				
12	H12	3	-84	20				
13	H13	1	-97	6				
14	H14							
15	H15							
16	H16							
17	H17							
18	ANCHOR A1	4	-18	-39	20	38	-31	
19	ANCHOR A2	1	-18	-39	20	6	-5	
20	ANCHOR A3	5	-3	-57	20	44	-28	
21	ANCHOR A4	1	-3	-58	20	9	-6	

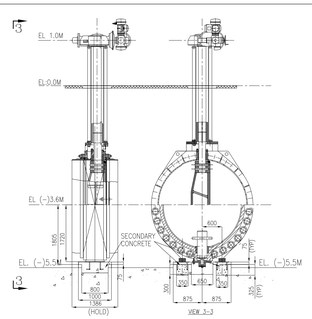
(+)X=>TURBINE to GENERATOR
(+)Y=>VERTICALLY UPWARDS
(+)Z=>"A" ROW to "B" ROW

NOTES:-

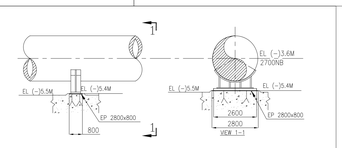
1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS IN METERS UNLESS STATED OTHER WISE.
2. ALL ELEVATIONS ARE MARKED W.R.T. T.G. HALL FINISHED FLOOR LEVEL AS +0.0M WHICH CORRESPONDS TO RL (+)9.5.
3. DESIGN PARAMETERS:
   CW PRESSURE: 5.0 kg /sq.cm (g)
   ACW PRESSURE: 10.0 kg /sq.cm (g)
   CW INLET TEMP. TO COND. & VACUUM PUMP HEAT EXCH.: 32.5°C.
   ACW INLET TEMP. TO PHEx: 39°C.
   DESIGN MECHANICAL TEMPERATURE: 60°C.
4. FOR CW & ACW PIPE SPECIFICATION, REFER P&ID PE-DG-423-165-N001.
5. INSTRUMENTS MARKED ▲ SHALL BE SUPPLIED ALONG WITH THE EQUIPMENTS
6. ALL PRESSURE TAPPING TO BE OF 15NB.
7. CW DRAIN & VENT VALVES IS OF SIZE, 200NB.
8. ALL 2700NB BENDS ARE OF MITRE TYPE WITH RADIUS 0.75D.
9. INSTRUMENTS MARKED WITH * MARK ARE FOR PERFORMANCE GUARANTEE TEST.
10. MATING FLANGES FOR BFVs, AND BALL COLLECTING STRAINERS ARE WITH NECK PIECES AND SHALL BE SUPPLIED WITH BFV ONLY.
11. FOOTINGS OF A-ROW COLUMNS B, 9 & 10 TO BE KEPT BELOW CW PIT LEVEL SUCH THAT NO PART OF BASE-PLATE PROJECTS ABOVE PIT SURFACE.
12. REFER SEPARATE COLTCS VENDOR DRAWING FOR COLTCS PIPING LAYOUT.
(HOLD)13. FLANGED STUB TO BE PROVIDED BY PC - 200 NB PLATE FLANGE-IRS 4504 Pn10 (00240, PCD 295.8X22# HOLES, FF): 8 Nos.
14. FOR PAINTING AND SURFACE PROTECTION REQUIREMENT, KINDLY REFER CW & ACW P&ID.
15. PIPE DETAILS OF PIPING FROM DEBRIS FILTER TO DEBRIS DISCHARGE PIT AND SCS TO DEBRIS DISCHARGE PIT WILL BE FINALIZED ON PLACEMENT OF ORDER FOR DEBRIS FILTER/SCS.



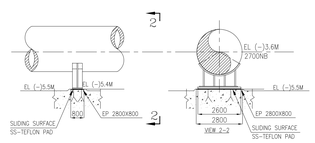
SECTION A-A



2700NB BFV SUPPORT DETAILS for H-7, H-13 (HOLD)



SUPPORT DETAILS for H-1, H-6, H-8, H-12



SUPPORT DETAILS for H-10

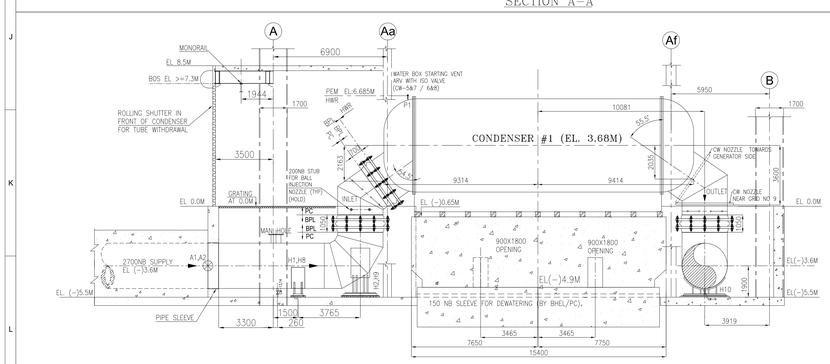
HOLD:-

1. COLTCS.
2. BUTTERFLY VALVE.
3. PG TEST INSTRUMENTATION SCHEME.
4. LOADS ON SUPPORTS
5. GA OF DEBRIS FILTER

LEGENDS:-

CONCRETE
RAIL TRACK
GRATING FLOOR
ROLLING SHUTTER

VALVE DETAILS				
SL NO	VALVE TAG NUMBER	SIZE	TYPE	SCOPE
1	CW-1, 2, 3, 4	2700	BFV (MO)	BPL
2	CW - 5, 7, 9, 11	150	ARV	PEM
3	CW - 6, 8, 10, 12	150	GV	PEM
4	CW - 13, 14, 15, 16	150	GV	PEM
5	ACW-01, 03	800	BFV	BPL
6	CW DRAIN & VENT	200	GV	PEM
7	ACW DRAIN & VENT	25/50	GLV	PEM



SECTION B-B

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

JOB NO.	423
STATUS	CONTRACT
DISTRIBUTION	

CUSTOMER:
TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
5th Floor, Western Wing, NPKRR Maaligai,
144, Anna Salai, Chennai-600002

CONSULTANT:
Fichtner Consulting Engineers (India) Pvt Ltd.
Menon Eternity, 9th Floor, No.165, St. Mary's Road,
Alwarpet, Chennai-600018

PROJECT:
1X800 MW TANGEDCO NORTH CHENNAI TPP
STAGE III-BTG

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
M	DRN	VKS		07.10.2016
	DESN	PS		07.10.2016
	CHD	VJ		07.10.2016
	APPD	BK AGARWAL		07.10.2016

TITLE
LAYOUT OF CW PIPING LOCAL TO CONDENSER

DEPT. | SCALE 1:130 | DRAWING NO. PE-DG-423-165-M001
SIGN | SHEET 1 OF 2 | REV. 0

SIZE-A0

COMPUTER FILE NAME: 423-165-M001_A0

DRAWING No. PE-DG-423-165-M001

CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

COMPUTER FILE NAME: 423-165-M001_R0

NORTH

215.0W
1121.25S

ROAD

1115(S)

RAIL TRACK FOR TRANSFORMER HANDLING

MONO RAIL

G. GENERATOR

CONC. ENCASING (TYP.)

TP
BOP BTG

1103.1S

1098.25S

3800NB

CW RETURN
EL:(-)3.6M

CW SUPPLY
EL:(-)3.6M

900NB
ACW RETURN

900NB
ACW SUPPLY

238.5(W)
CW/ACW

FOR CONTINUATION REFER
TRANSFORMER YARD LAYOUT
PE-DG-423-100-E001

PIT FOR ULTRASONIC
FLOW-METER

MANHOLE

HOLD

14963.80

COLTCS PIPING

TRENCH FOR COLTCS PIPING

PANEL

2500 2100

FOR CONTINUATION REFER PE-DG-423-179-M001

SCF

FOR CONTINUATION REFER PE-DG-423-179-M001

2675

1970

RS (9.0M WIDEx7M HIGH) EACH IN FRONT OF BOTH COND.

PIPE SLEEVE

SCF DEBRIS DISCH. (SUGGESTIVE ROUTING)
REFER NOTE NO.15 (SHEET 1 OF 2)

DEBRIS FILTER (SUGGESTIVE ROUTING)
REFER NOTE NO.15 (SHEET 1 OF 2)

SPACE FOR AIR WASHER (20MX15M)

CAPACITY: 120CuM

SPACE FOR DEBRIS DISCHARGE PIT

(+)X=>TURBINE to GENERATOR
(+)Y=>VERTICALLY UPWARDS
(+)Z=>"A" ROW to "8" ROW

REFERENCE DRGS:			
SL NO	TITLE	NUMBER	UNIT
1	TG EQUIPMENT PLAN AT EL 0.0 M	PE-DG-423-100-M003	PEM
2	P & ID CW AND ACW SYSTEM	PE-DG-423-165-M001	PEM
3	PG TEST INSTRUMENTATION SCHEME	--	PEM
4	CONDENSER ASSY. (G.A.)	0-160-10-70073-C-215	HWR
5	ARRGT. OF 2700NB B.F. VALVE (CW NEAR COND. OUTLET)	--	BPL
6	TRANSFORMER YARD LAYOUT	PE-DG-423-100-E001	PEM/TLEC.
7	INSTRUMENT STUB DETAIL (PRES/TEMP)	--	PEM
8	G.A. OF R.E. JOINT (COND. W/BOX SIDE)	--	BPL
9	G.A. OF R.E. JOINT (PIPING SIDE)	--	BPL
10	G.A. OF COLTCS PIPING INSTALLATION PLAN	--	COLTCS VENDOR/PEM
11	G.A. CW PIT	--	PEM
12	G.A. OF CONDENSER PIT	--	PEM
13	G.A. CEP PIT	--	PEM
14	G.A. OF BALL RECIRCULATION SKID	--	VENDOR/PEM

ARRANGEMENT FOR INSTALLATION OF ULTRASONIC FLOWMTR. (HOLD)

600X600(TYP) MANHOLE
EL:(-)0.1M
EL:(-)2.1M
EL.(-)3.6M
3800NB
CW SUPPLY
CW RETURN
ACW SUPPLY 900NB
ACW RETURN 900NB
PED. 2MX.5MX.5M
SUMP 4.5Mx1Mx1M (TYP)
VIEW L-L

MANHOLE
EL:(-)0.1M
EL:(-)3.6M
3800NB
RUNGS
CW SUPPLY
PED. 2MX.5MX.5M
SUMP
VIEW L1-L1

ARV WITH ISOLATION VALVE 150NB
125 THK ENCASING OVER PIPE SURFACE BY CIVIL (TYP.)
EL(-)0.1M RL +9.4M
EL.(-)3.6M 3800NB
CW SUPPLY
CW RETURN
VIEW M-M
ARRANGEMENT WITH ARV

SECTION J-J

ROOF AT 8.5M
SHED
CW-1/2
ARV WITH ISOLATION VALVE
SADDLE SUPPORT BY PEM-VENDOR
DEBRIS FILTER
EL:(+)2.5M
EL(-)0.1M RL+9.4M
EL(-)2.1M
EL(-)3.6M 3800NB
ROAD
EL:0.0M RL +9.5M
CW SUPPLY 2700NB
FOR CONTINUATION REFER PE-DG-423-165-M001 (SHEET 1 OF 2) EL:(-)5.50M
CEP1200X2800
CW SUPPLY
CW RETURN
CONCRETE ENCASING (TYP) (HOLD)

SECTION K-K

CW-3/4
MANHOLE
EL(-)0.1M RL+9.4M
EL(-)3.6M 3800NB
CW RETURN 2700NB
BALL COLLECTING STRAINER
FOR CONTINUATION REFER PE-DG-423-165-M001 (SHEET 1 OF 2) EL:(-)5.50M
CONCRETE ENCASING (TYP) (HOLD)

CUSTOMER:	TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED 5th Floor, Western Wing, NPKRR Maaligai, 144, Anna Salai, Chennai-600002
CONSULTANT: FICHTNER INDIA	Fichtner Consulting Engineers (India) Pvt Ltd. Menon Eternity, 9th Floor, No.165, St. Mary's Road, Alwarpet, Chennai-600018
PROJECT:	1X800 MW TANGEDCO NORTH CHENNAI TPP STAGE III-BTG
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA

JOB NO.	423
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

DEPT CODE		NAME	SIGN	DATE
M	DRN	VKS		07.10.2016
	DESN	PS		07.10.2016
	CHD	VJ		07.10.2016
	APPD	BK AGARWAL		07.10.2016

TITLE: LAYOUT OF CW PIPING LOCAL TO CONDENSER

DEPT. | SCALE 1:200 | SIGN

DRAWING NO. PE-DG-423-165-M001

SHEET 2 OF 2 REV. 0

SIZE-A0

0-80-468-07096

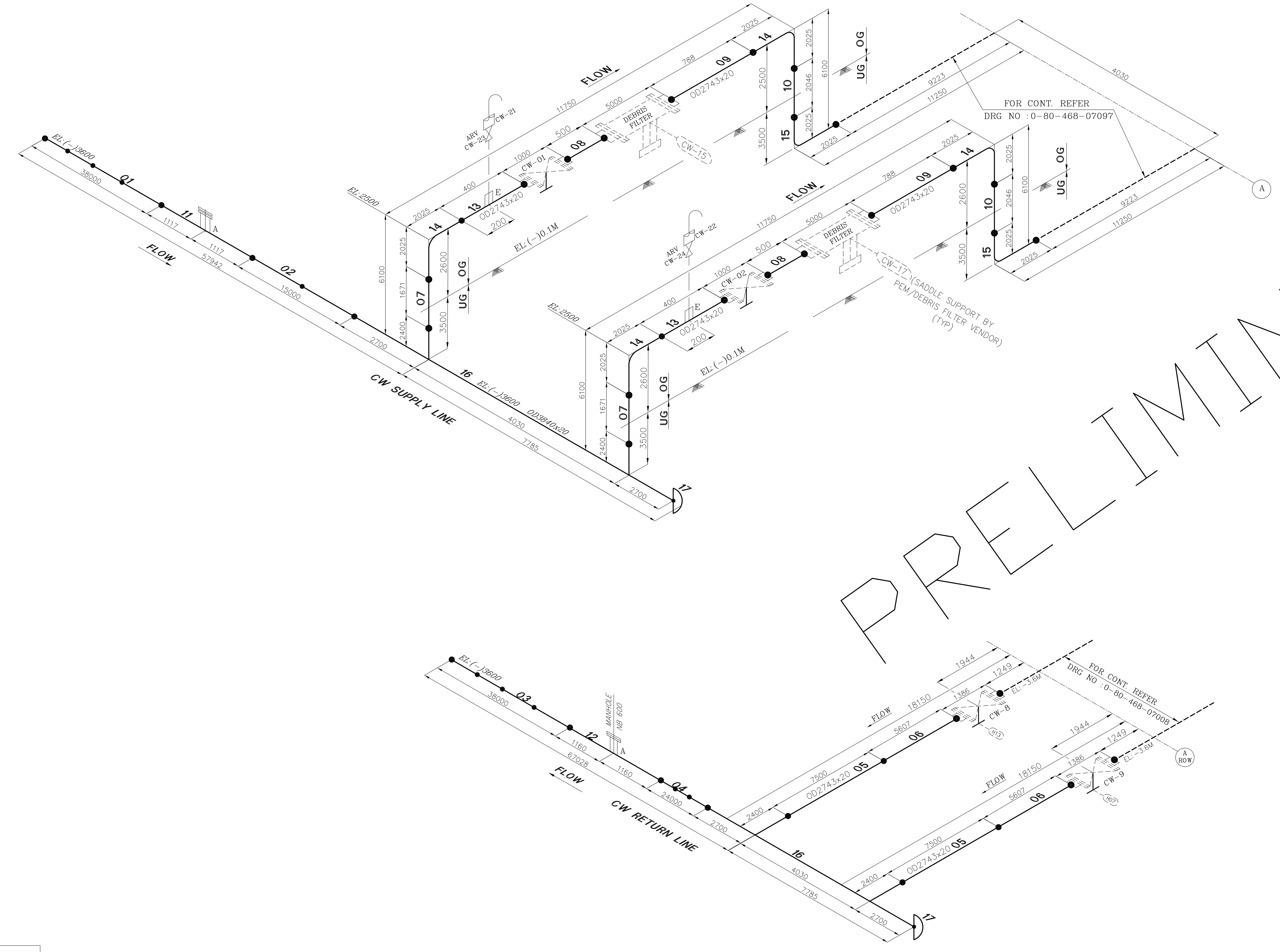
ALL DIMENSIONS ARE IN MILLIMETRES

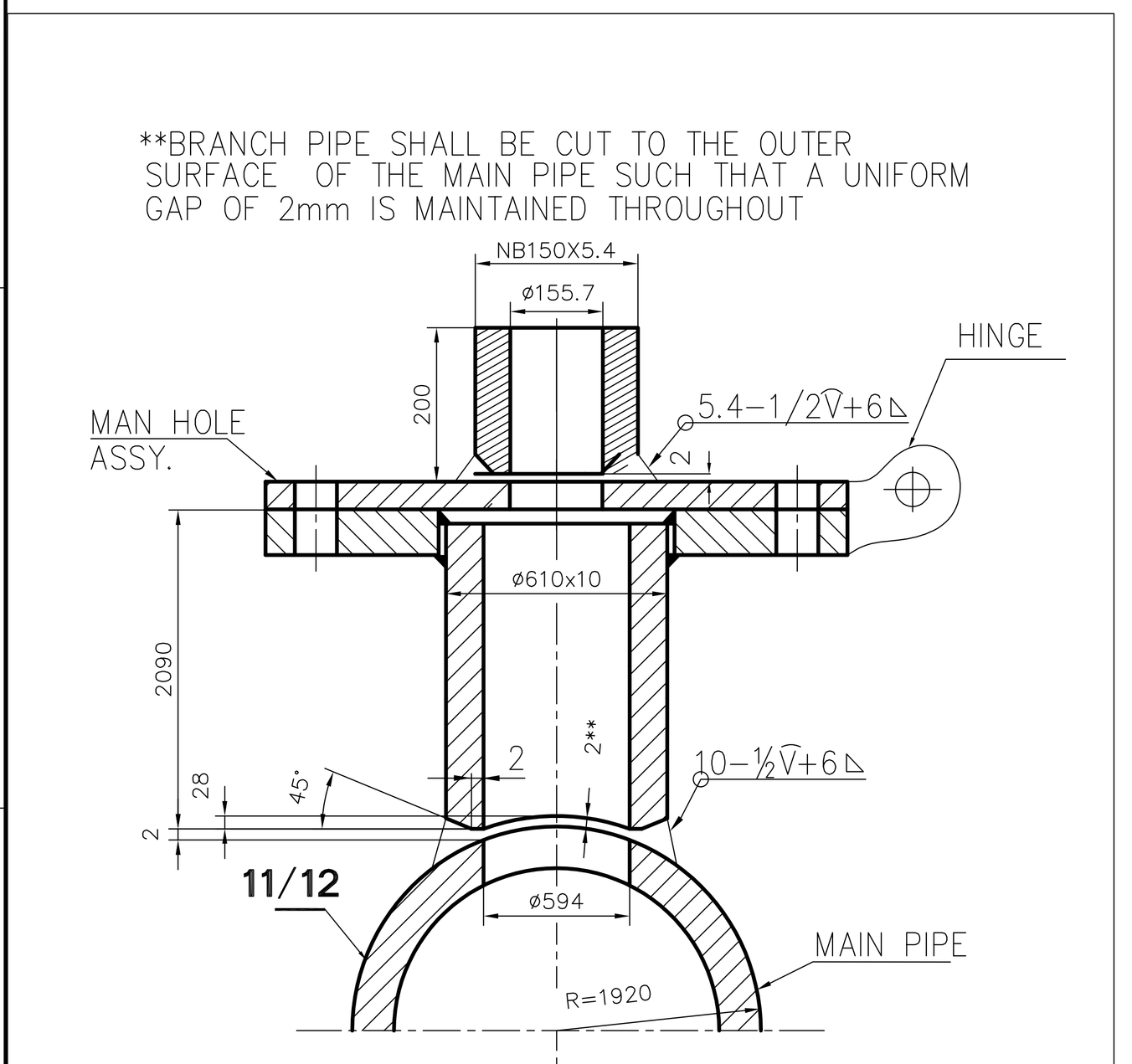
NOTES: –

01 DESIGN PRESSURE : 5.0 Kg/Cm^2 (g)
02 DESIGN TEMPARETURE : 60° C
03 WORKING MEDIUM : WATER
04 HYDRAULIC TEST PRESSURE AT SITE : 7.50 Kg/Cm^2 (g)
05 FOR STANDARD NOTES OF PRODUCTION & ERECTION OF PIPES AND TOLERANCE ON FITTINGS REFFER DRG.No.4-80-001-37654 & 4-80-301-26192 RESPECTIVELY
06 FOR ERECTION WELDING SCHEDULE REFER DRG No. 4-80-468-80716
07 FOLLOW APPLICABLE QP.
08 PIPE EDGE PREPARATION & ELECTRODE DETAILS ARE AS FOLLOWS UNLESS OTHERWISE INDICATED

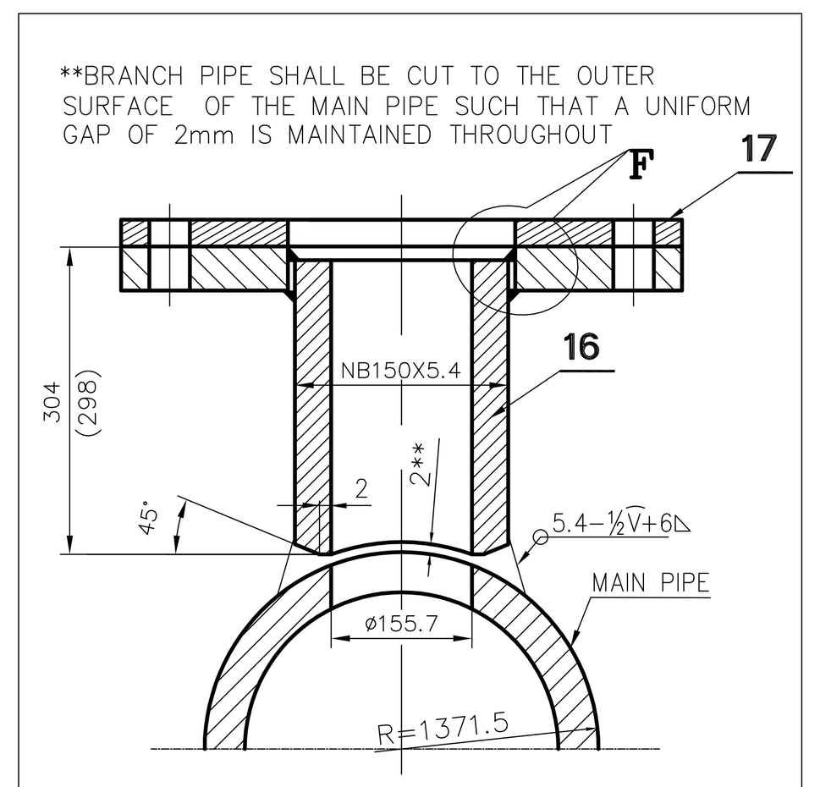
PIPE SIZE ODxT	MATERIAL SPECN.	WT. Kg/M	EP AS PER 4-80-999-93079 STY	d1	RADIUS OF BEND	WELD SPECN.	ELECTRODE SPECN. ROOT RUN	FURTHER RUN
OD2743x20	IS3589-410MPA	1343.00	FIG-A	2729.0	R=2025	6V 14	E 7018	E 7018
OD3840x20	IS3589-410MPA	1884.00	FIG-A	3826.0	R=2850	6V 14	E 7018	E 7018

09 ● INDICATES 2mm WELD GAP, WELD AT SITE.
10 VENTS & DRAINS OF SIZE NB150 TO BE PROVIDED BY SITE AS PER LAYOUT REQUIREMENT.
11 INTERNAL PU(POLYURETHANE) COATING SHALL BE AS PER AWWA C222, APPROVED QUALITY PLAN AND AS PER DRAWING 4-80-468-80717.
12 STUBS AND BRANCH WELDING TO BE DONE AT SITE SHALL BE PU COATED AFTER WELDING
13 VALVE TAG NOS CW-06,07,08 & 09 ARE SUPPLIED BY BHEL-BHOPAL & DEBRIS FILTRES ARE SUPPLIED BY BHEL-PEM.
14 FOR PLATE FORMED PIPES, USE OF IS3589/ SA515GR70/ SA515GR.60 MATERIAL ALSO ACCEPTABLE AS THE CASE MAY BE APPLICABLE.
15 SPIDER ARRANGEMENT HAS TO BE WELDED AT THE ENDS AFTER EDGE PREPARATION. REFER DWG.NO. 4-80-999-93078

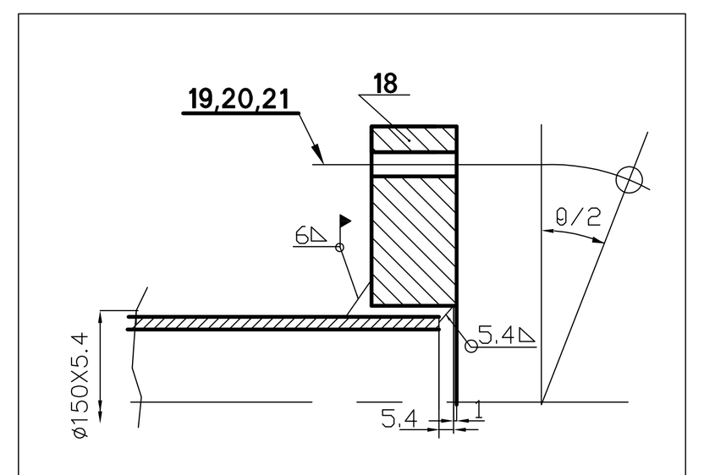




DETAIL–A



DETAIL–B



DETAIL–F

D.U. NO.	ITEM NO.	DESCRIPTION	STD	DRAWING NO.	ITEM NO. / VAR NO.	MATL CODE / MATL SPECN	A/C	UNIT / DI	UNIT WT. / QTY.	G.S.	ZONE
	17	TORISPHERICAL DISHED END OD3840X20 (UG)		4-80-468-80718		15 942 114 0000 / SA 515 GR70			3566 100 / 2		
	16	FABRICATED HEADER NB 3800/NB2700 (UG)		3-80-468-33462		– / WELDMENT			22813 000 / 2		
	15	90DEG MITRE BEND OD2743x20 R=2025 (UG)		3-80-468-33461		15 011 201 0200 / IS 2062 E250 GRB			4492 647 / 2		
	14	90DEG MITRE BEND OD2743x20 R=2025 (OG)		3-80-468-33461		15 011 201 0200 / IS 2062 E250 GRB			4492 647 / 4		
	13	P.F. PIPE OD 2743x20 WITH NB150 STUB		3-80-468-33460		WELD MENT / –			544 125 / 2		
	12	P.F. PIPE OD 3840x20 WITH NB600 MAN HOLE ASSEMBLY		2-80-468-14503		WELD MENT / –			xxx 000 / 1		
	11	P.F. PIPE OD 3840x20 WITH NB600 MAN HOLE ASSEMBLY		2-80-468-14502		WELD MENT / –			xxx 000 / 1		
	10	P.F. PIPE OD 2743x20 L=2046 (OG)		3-80-468-33458	06	15 011 201 0200 / IS 2062 E250 GRB			2747 778 / 2		
	09	P.F. PIPE OD 2743x20 L=788 (OG)		3-80-468-33458	05	15 011 201 0200 / IS 2062 E250 GRB			1058 284 / 2		
	08	P.F. PIPE OD 2743x20 L=500 (OG)		3-80-468-33458	04	15 011 201 0200 / IS 2062 E250 GRB			671 500 / 2		
	07	P.F. PIPE OD 2743x20 L=1671 (OG)		3-80-468-33458	03	15 011 201 0200 / IS 2062 E250 GRB			2244 153 / 2		
	06	P.F. PIPE OD 2743x20 L=5607 (UG)		3-80-468-33458	02	15 011 201 0200 / IS 2062 E250 GRB			7530 201 / 2		
	05	P.F. PIPE OD 2743x20 L=7500 (UG)		3-80-468-33458	01	15 011 201 0200 / IS 2062 E250 GRB			10072 500 / 2		
	04	PIPE OD 3840x20 L=24M (UG)		0-80-468-07096		15 938 740 0001 / IS3589-410MPA			45216 000 / 1		
	03	PIPE OD 3840x20 L=38M (UG)		0-80-468-07096		15 938 740 0001 / IS3589-410MPA			71592 000 / 1		
	02	PIPE OD 3840x20 L=15M (UG)		0-80-468-07096		15 938 740 0001 / IS3589-410MPA			28260 000 / 1		
	01	PIPE OD 3840x20 L=38M (UG)		0-80-468-07096		15 938 740 0001 / IS3589-410MPA			71592 000 / 1		

CUST NO. 7311

CUSTOMER: TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
5th Floor, Western Wing, NPKRR Maaligai,
144, Anna Salai, Chennai–600002

CONSULTANT: FICHTNER INDIA
Fichtner Consulting Engineers (India) Pvt Ltd.
Menon Eternity, 9th Floor, No.165, St. Mary's Road,
Alwarpet, Chennai–600018

PROJECT: 1X800 MW TANGEDCO NORTH CHENNAI TPP
STAGE III–BTG

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

	NAME	SIGN	DATE	NO. OF VAR.
DRN	P SURESH	-SD-	09.02.17	
CHD	R SESHAGIRI	-SD-	09.02.17	
APPD	R SESHAGIRI	-SD-	09.02.17	

DEPT ENGG. CODE | GRADE OF UNTOL. DIM C/M F/ | SCALE N.T.S | WEIGHT (KG) | REF TO PEM'S DRG NO PE-DG-423-165-M001/R1 | ITEM No.

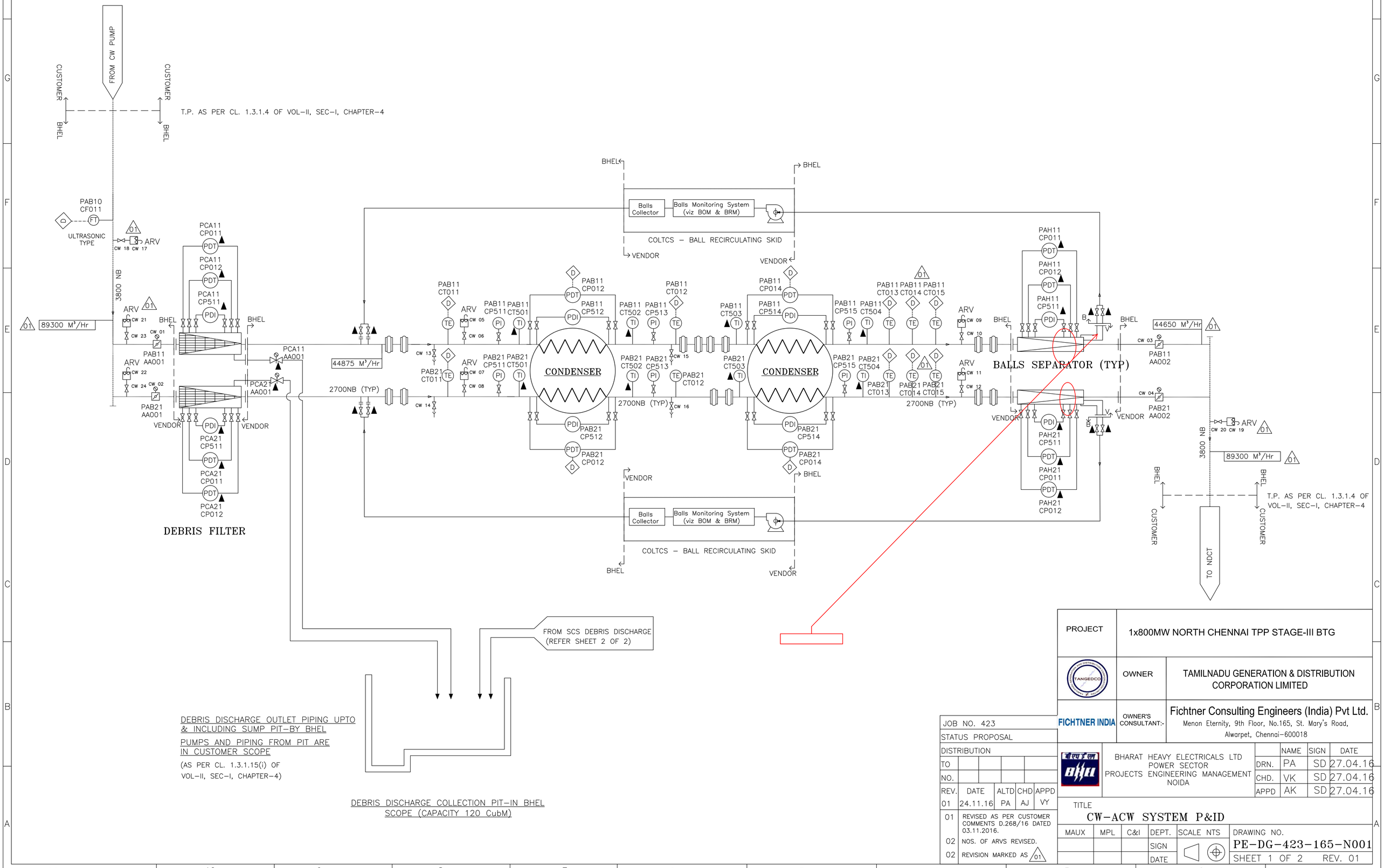
TITLE: MAIN CONDENSER COOLING WATER PIPING OUTSIDE TG HALL

CARD CODE U 01 | PC DRAWING NO. 0-80-468-XXXXX | REV XX

REV	DATE	ALTERED / APPROVED
01		

ZONE

Size A0



PROJECT	1x800MW NORTH CHENNAI TPP STAGE-III BTG
OWNER	TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
OWNER'S CONSULTANT:-	Fichtner Consulting Engineers (India) Pvt Ltd. Menon Eternity, 9th Floor, No.165, St. Mary's Road, Alwarpet, Chennai–600018

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

	NAME	SIGN	DATE
DRN.	PA	SD	27.04.16
CHD.	VK	SD	27.04.16
APPD	AK	SD	27.04.16

JOB NO. 423
STATUS PROPOSAL
DISTRIBUTION
TO
NO.

REV.	DATE	ALTD	CHD	APPD
01	24.11.16	PA	AJ	VY

01	REVISED AS PER CUSTOMER COMMENTS D.268/16 DATED 03.11.2016.
02	NOS. OF ARVS REVISED.
02	REVISION MARKED AS 01

TITLE
CW–ACW SYSTEM P&ID

MAUX	MPL	C&I	DEPT.	SCALE NTS	DRAWING NO.
			SIGN		PE–DG–423–165–N001
			DATE		SHEET 1 OF 2 REV. 01

WATER-REQUIREMENTS

S.NO.	EQUIPMENT	NOS. WORK. + STANDBY	CW REQD. PER COOLER CUB.M/Hr.	CW REQD. PER UNIT CUB.M/Hr	PRESS. DROP MWC	TEMP. RISE °C	REMARKS
1	CONDENSER	2+0	44650(For each Condenser half)	89300 △01	2*2.5	8.5	
2	VACUUM PUMPS	2 + 2	100	400*	3.5	2	*DURING START UP BOTH PUMPS ARE WORKING
3	TG–PHE's	2+1	1396 △01	2792 △01	7.0	8.5	
4	SG–PHE's	1+1	525 △01	525 △01	7.0	6.11 △01	

NOTES:

1. CW SYSTEM DESIGN PRESSURE : 5.0 Kg/sq.cm (g), ACW SYSTEM DESIGN PRESSURE : 10.0 Kg/sq.cm (g)
   DESIGN CW INLET TEMP. TO CONDENSER & VACUUM PUMP HEAT EXCH. = 32.5 °C
   DESIGN ACW INLET TEMP. TO PHE'S = 36 °C
   DESIGN MECHANICAL TEMPERATURE : 60 °C

2. MATERIALS OF CONSTRUCTION :
   A) PIPING UPTO 150Nb SHALL BE DUPLEX SS (AS PER SCH 40S FOR PIPE UPTO 50 NB & SCH 10S FOR PIPE SIZE ABOVE 50 NB).
   B) PIPING 200 NB AND ABOVE SHALL BE CARBON STEEL AS PER IS 3589 FABRICATED FROM IS 2062 PLATES INTERNALLY LINED WITH CORROCOAT OR POLYUREA COATING INSIDE OF 2000 MICRONS DFT.

3. DRAIN/VENT VALVES – △01
   – CW SYSTEM : 200 NB
   – ACW SYSTEM : 50NB FOR SIZES ABOVE 350 NB & 25 NB FOR LOWER PIPE SIZES
   DRAIN / VENT SHALL BE PROVIDED AS PER LAYOUT REQTS.

4. EXTERNAL PAINTING/PROTECTION FOR CARBON STEEL PIPE SHALL BE AS FOLLOWS:–
   4.1 OVERGROUND PIPING
   REFER PIPING CENTER DOC. NO. 7311:QPC:12 (PAINTING SCHEME FOR LP PIPING FABRICATION)

   4.2 BURIED PIPING:
   a) SURFACE CLEANIG BY SAND BLASTING.
   b) COAL TAR PRIMER COMPATIBLE WITH COAL TAR ENAMEL GRADE. THE NUMBER OF COATS SHALL BE TWO WITH A DFT OF 35 MICRONS EACH.
   c) COAL TAR ENAMEL SHALL BE APPLIED. A SINGLE SPIRAL INNER WRAP OF GLASS FIBRE TISSUES SHALL BE APPLIED OVERLAPPING AT LEAST 25 MM ENSURING IMPREGNATION OF GLASS FIBRE TISSUES IN THE FIRST COAT. THE SECOND COAT OF ENAMEL AND SECOND OUTER WRAP OF GLASS FIBRE FELT, TYPE – I TO IS: 7193–1974 WILL BE APPLIED IN THE SAME WAY CONFIRMING TO TABLE – 10 OF IS – 10221 – 1982.
   d) ALTERNATIVELY WRAPPING WITH COAL TAR BASED ANTICORROSION TAPE CONFORMING TO IS 15337:2003. THICKNESS SHALL BE 4.0 MM.

   TEST TO BE CARRIED OUT AFTER APPLICATION: BOND/ADHESION TEST, HOLIDAY TEST.

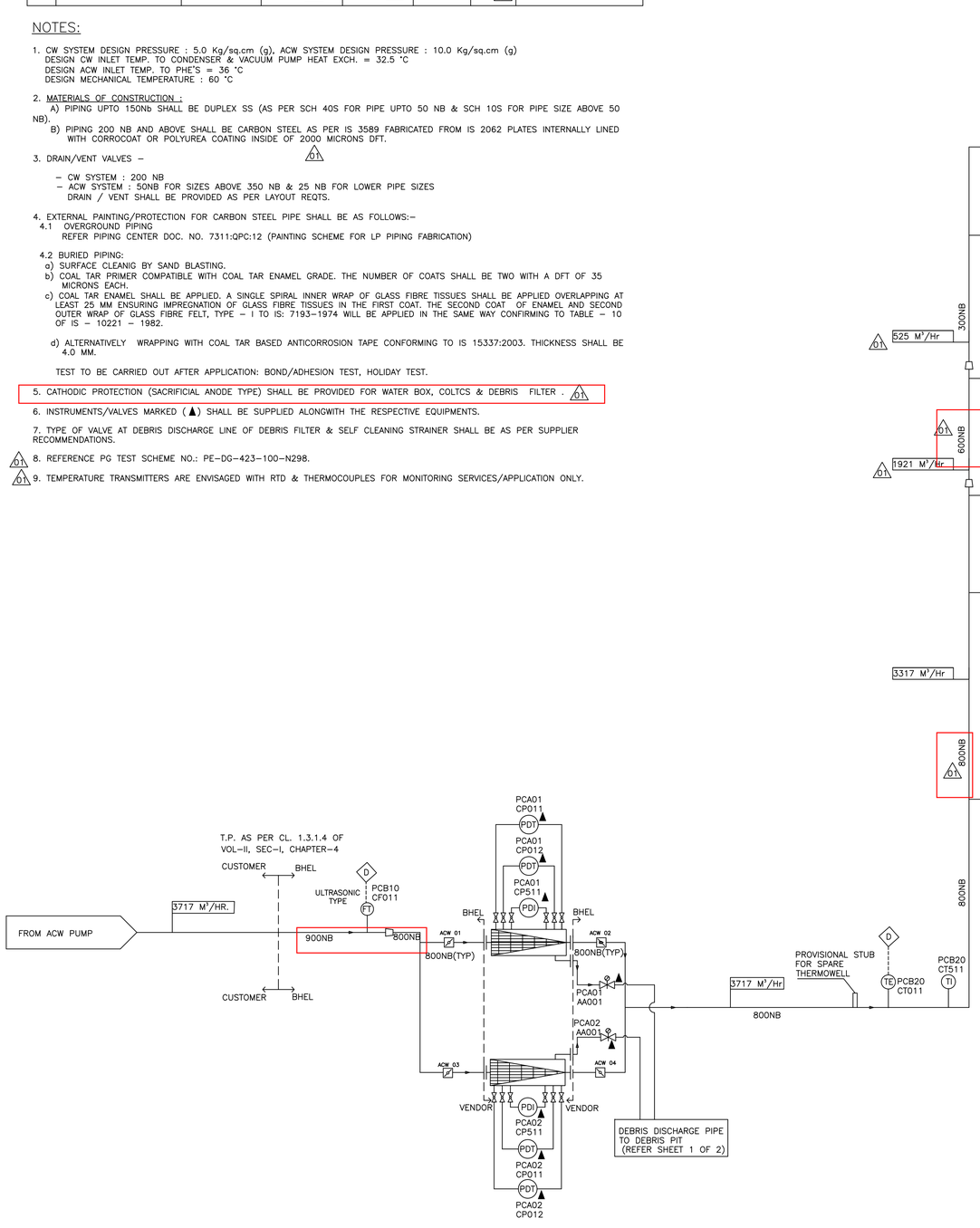
5. CATHODIC PROTECTION (SACRIFICIAL ANODE TYPE) SHALL BE PROVIDED FOR WATER BOX, COLTCS & DEBRIS FILTER . △01

6. INSTRUMENTS/VALVES MARKED (▲) SHALL BE SUPPLIED ALONGWITH THE RESPECTIVE EQUIPMENTS.

7. TYPE OF VALVE AT DEBRIS DISCHARGE LINE OF DEBRIS FILTER & SELF CLEANING STRAINER SHALL BE AS PER SUPPLIER RECOMMENDATIONS.

△01 8. REFERENCE PG TEST SCHEME NO.: PE–DG–423–100–N298.

△01 9. TEMPERATURE TRANSMITTERS ARE ENVISAGED WITH RTD & THERMOCOUPLES FOR MONITORING SERVICES/APPLICATION ONLY.



LEGEND

- MOTOR OPERATED GATE VALVE
- MOTOR OPERATED BUTTERFLY VALVE
- MANUAL BUTTERFLY VALVE
- GLOBE VALVE
- GATE VALVE
- PI — PRESSURE GAUGE
- TI — TEMPERATURE GAUGE
- PDT — DIFFERENTIAL PRESS. TRANSMITTER
- PDI — DIFFERENTIAL PRESS. GAUGE
- PT — PRESSURE TRANSMITTER
- FT — FLOW TRANSMITTER
- MVN — MEAN VALUE SELECTION
- FT/FE — ANNUBAR WITH FL TRANSMITTER
- D — SIGNAL TO DDCMIS
- A — ALARM
- REDUCER/EXPANDER
- TE — TEMPERATURE ELEMENT
- R.E. JOINT (TIED TYPE)
- AIR RELEASE VALVE

PIPE SIZES OF DUPLEX SS PIPING

NB	OD	THICK.
25	33.4	3.38
40	48.3	3.68
50	60.3	3.91
65	73.0	3.05
80	88.9	3.05
100	114.3	3.05
150	168.3	3.40

PIPE SIZES OF CS PIPING

NB	OD	THICK.
200	219.1	6.4
250	273.0	6.4
300	323.9	6.4
350	355.6	8.0
400	406.4	8.0
450	457.0	8.0
500	508.0	8.0
600	610.0	8.0
700	711.0	10.0
△01 800	813.0	10.0
△01 900	914.0	10.0
2700	2740	20.0
3800	3840	20.0

PROJECT	1x800MW NORTH CHENNAI TPP STAGE-III BTG
OWNER	TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
OWNER'S CONSULTANT:-	Fichtner Consulting Engineers (India) Pvt Ltd. Menon Eternity, 9th Floor, No.165, St. Mary's Road, Alwarpet, Chennai–600018

JOB NO. 423
STATUS: CONTRACT
DISTRIBUTION

TO					
NO.					

REV.	DATE	ALTD	CHD	APPD
01	24.11.16	PA	AJ	VY

01	REVISED AS PER CUSTOMER COMMENTS D.268/16 DATED 03.11.2016.
02	PIPESIZE REVISED TO 900NB FOR BURRIED ACW PIPING.
03	REVISION MARKED AS △01

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

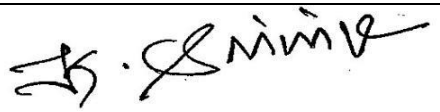
	NAME	SIGN	DATE
DRN.	PA	SD	27.04.16
CHD.	VK	SD	27.04.16
APPD	AK	SD	27.04.16

TITLE
CW–ACW SYSTEM P&ID

MAUX	MPL	C&I	DEPT.	SCALE NTS	DRAWING NO.
			SIGN		PE–DG–423–165–N001
			DATE		SHEET 2 OF 2 REV. 01

BHARAT HEAVY ELECTRICALS LIMITED
Tiruchirappalli - 620 014

TANGEDCO 1X800MW NORTH CHENNAI TPS STAGE-III, CHENNAI, CUSTOMER NO: U8/1818, UNIT - I
PAINTING SCHEDULE

Prepared by	**K. Srinivasan** **Senior Engineer/ Plant Lab**		**Document No: PL: C3 - PS / 1818**
Reviewed by	**Dr. V. Rajasekharan** **SM/ Plant lab**		**Revision No: 00 Dated: 28-10-2016**
	D. Vijayakumar **SM /PE/FB**		
Approved by	**Dr. V. Anbazhagan** **DGM / Plant Lab**		**Sheet No. 01 of 12.**

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RECORD OF REVISIONS

Rev. No	Date	Details of revision	Remarks
00	**28-10-2016**	New	**Prepared in line with bid resolutions between TANGEDCO/LAHMEYER & BHEL on BID spec No. SE/E/T&H(P)/OT No.02/2015-16, Ref: Annexure- 4, SG painting, 1x800MW North chennai TPP.**

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
1 PS1AC	**Collector & Separator Vessels (Except Internals), Supports** 04 – 147,321,323,547	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	1	--	--	Synthetic enamel paint (Long Oil Alkyd) to IS2932 (DFT = 20µm/ coat)	2	International orange shade No:592 of IS 5	70
2 PS5	**Collector & Separator Vessels internals and** Dd items (threaded and machined surfaces only) (Refer Note 25) 04-347;07-302,309,331,361,362,393; 08-911,912,913;12-314,317,324,327,328; 12-344,348,354,393;17-304,306,319; 19-306,307;21-602,605,700; 24-352,700,803,813,818,827,842; 28-700;32-700;35-190,700,701; 36-700,701;39-700;41-710;42-700,710; 43-710;45-710;47-710;48-019,700,913; 65-710;67-710; **Foundation materials**: 35-010;39-012;	SSPC-SP1/ or SSPC – SP3 Solvent / Power Tool Cleaning	Rust Preventive Fluid to PR: CHEM: 09 – 04 DFT=25µm per coat	1	--	--	--	--	--	25
3 PS19C3	**Buck stays** 08-001,003,006,007,111,380,382,501,503; 08-901,907,910; **Boiler supporting structures, Columns, Girders, Bracings** 34-100,200,300,390,400,500; 35-111,112,121,122,130,140,150,211,212; 35-213,214,221,222,231,232,311,312,321; 35-322,331,332,341,342,351,352,361,362; 35-371,372,374,375,381,382,383,384,385; 35-386,387,388,390,441,442,443,444,445; 35-446,447,448,451,452,453,454,455,456; 35-457,458,511,512,513,514,515,516,517; 35-518,521,522,523,524,525,526,527;	Blast cleaning to SA2 ½ (Near white metal)/ SSPC-SP10 with surface profile 3-50 µm	Inorganic Zinc Silicate Primer to IS14946 DFT = 75µm	1	Epoxy based MIO pigmented intermediate coat DFT/coat = 75µm	2	#Aliphatic acrylic Polyurethane paint to IS 13213 (latest) DFT = 35µ	#1	Dark Admiralty Grey Shade No: 632 of IS 5	260

 # To be applied at site.

S. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3 PS19C3 (Contd.)	35-531,532,533,534,535,536,537,538; **Galleries, Stair-ways & inter connecting Walkways** 36-110,150,311,312,313,314,315,316,321,322; 36-323,324,325,326,331,332,333,334,335,336; 36-337,341,342,343,344,345,346,347,351,352; 36-353,354,355,356,361,362,363,364,365,366; 36-371,372,373,374,375,376,391,392,393,394; 36-395,610,620,621,740;38-210,299,310,381; 38-410,510,610,611,710; **ID system structures.** 39-101,102,141,142,150,299,300,301; 39-304,305,306; **Duct supports** 48-015,115,145,205,225,235,265,385; 48-435,465,485,495,665;	Blast cleaning to SA2 ½ (Near white metal)/ SSPC-SP10 with surface profile 35-50 µm	Inorganic Zinc Silicate Primer to IS14946 DFT = 75µm	1	Epoxy based MIO pigmented intermediate coat DFT/coat = 75µm	2	#Aliphatic acrylic Polyurethane paint to IS 13213 (latest) DFT = 35µm	#1	Dark Admiralty Grey Shade No: 632 of IS 5	260
4 PS3	**Components >95° C Insulated other than components in Sl.No.7 & 9** Ring Headers, Down Comers, Hot air Headers outside the gas path etc. 05-155,227,231,251,327,330,350; 07-102,110,125,223,231,232,317; 10-135,174,178,191,195,235,274,278,283; 10-284,285,291,295,315,687;12-178,850,852; 12-900;15-136,178,236,278;17-476; 18-001,002,010,701;19-701,702,903; 21-600;24-811,824,828,836,837; 42-020,030,070,120,128,158;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	2	--	--	No paint	No paint	Red oxide	60
# To be applied at site.										

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
4 PS3 (Contd.)	**Hot Air:** 48-202,204,207,208,212,214,222,224,232,234; 48-262,264, 662,664,667; **Flue Gas:** 48-372,382,384,432,434,462,464,482,484,492,494;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm	2	--	--	No paint	No paint	Red oxide	60
5 PS9B1	**Components uninsulated other than components coming in gas path.** **Temp: >95°C & <400°C** 20-511; 24-807,820,860,865,867; 42-200,300; Instrument tappings, doors 48-200,915;	Blast cleaning to SA2 ½ (Near white metal)/ SSPC-SP10 with surface profile 35-50 µm	Inorganic ethyl Zinc Silicate Primer to IS14946 DFT = 75µm	1	--	--	--	--	Grey	75
6 PS10	**Components uninsulated other than components coming in gas path.** **Temp: >400°C & <600°C** 09-003,004,005; 28-220;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT= 20µm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183 Gr.I DFT= 20µm per coat	1	Aluminum	40
7 PS2	**Loose tubes, SH, RH & Eco. coils** 11-074,078,095,374,378,395,406,467,469,474; 11-487,491,494,606,608,684,694,716,717,718; 11-767,768,769,787,791,916,917,918,967,968; 11-969,987,991;12-179,181,184,187,368,395,403, 12-405,495,514,515,517,524,528,544,548,554 ; 12-568,619,800,803,805,903,914,917,924; 12-927,928,944,948,954,968; 16-079,201,202,203,270,379; 19-814,824,884,914,924,984;	SSPC – SP2 or SSPC – SP3 Hand tool / Power tool cleaning	Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03 DFT=35µm per coat	1*	--	--	No paint	No paint	Red Oxide	35

*-In lieu of dip painting, 2 coats of brush painting of Red oxide Zinc Phosphate primer to a coating thickness of 60µ is also permitted in line with Sr.No.8.

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate Coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
8 PS1A	**Components < 95° C –Other than components in Sl.No.3.** **Miscellaneous and casing sheets** 07-409,431,460,461,462,502,503,531,560,561; 12-906,907;17-519,919;21-601,604,606; 24-350,351,354,801,804,805,806,808,809; 24-810,815,817,825,826,835,840,841,855,950; 24-955,960;30-233,234;35-995 36-396,611,613;39-302 Fuel firing: 41-350,390,500; Steam blowing piping 42-001,002,005,010,046,065,152, 42-153,154,157; 43-004,104,200; 45-200,801,802,804,805,858; 47-261,263,858; Duct plates, expansion joints 48-911,912; Coal feeding 65-736;67-204,272,276,283,801,802,803 95-088,089,091,485;96-186,189; 97-585,591,592 **Handling equipments:** 99-100,300, 400, 502,600; Impulse lines: 24-800 Seal air ducting: 43-005, 105; Cold Air duct: 48-012,014, 112,114,141; Tempering Air: 48-142,144;	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	1	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20µm per coat	2	Smoke Grey Shade No: 692 of IS5	70

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
9 PS3	**Components >95° C coming in the gas path ,Headers, Commissioning Spares &erection Materials etc.,** 05-137,147;06-400,401,431,434,437,441,447; 06-451,453,455,500,501,731,732,734,735,737; 06-741,744,745,747,751,752,753,755,759; 07-315,316,318,423,993;10-182,183,184,185; 12-993; 17-174,474,504,506,900,903; 19-850,851,852,853;24-822,823,993; 30-103,215,219,223,224,235;31-010,104,993; 32-010,210,810;35-993;37-010;38-993;39-993; 42-858;48-916,993;65-200;67-200;97-282,590; 99-099;20-988,998;21-987,988;24-987,988,989; 41-988;42-988;95-988;99-501	SSPC-SP3/ Power Tool Cleaning	Red Oxide Zinc phosphate Primer (Alkyd Base) to IS 12744 DFT= 30µm per coat	2	--	--	No paint	No paint	Red oxide	60
10 1B3	**Hand rails and posts, ladders / rungs** 34-820,850; 35-821,822,823,851; 36-820,851,852,853; 38-820,850;39-820,850;	SSPC-SP3/ Power Tool Cleaning	HB chlorinated rubber based Zinc phosphate Primer DFT= 50µm per coat	1	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20µm per coat	2	Dark admiralty Grey Shade No: 632 of IS5	90
11 PS6	**Floor Grills, Step treads** 34-810;35-811,812; 36-811,812,813,814; 38-810;39-810;	Hot dip Galvanizing to a coating weight of 610 g/m^2 (minimum) and to a coating thickness of 85.0 microns (minimum). Refer Notes given below **								

Notes **: The Guard plates, Hood Ladders and Stringer channels shall be painted as per painting scheme prescribed in Sl. No: 03

PAINTING SCHEME FOR VALVES

Sl.No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
12 PS 10	Cast carbon steel valves (Conventional) Cast alloy steel valves (Conventional) All API valves, QCNRV, SV & SRV Silencers, 21-800,825, 24-885; 42-358; Safety valves & ERV 21-850; 24-880,881,883;	SSPC-SP3/ Power Tool Cleaning	Heat Resistant Aluminium Paint to IS 13183 Gr. I DFT= 20µm per coat	1	--	--	Heat Resistant Aluminium Paint to IS 13183Gr. I DFT= 20µm per coat	1	Aluminum	40
	Forged valves	Phosphating	To a coating weight of 1500 mg per Sq.ft.	--	--	--	--	--	--	--
13 1AS1	Soot Blower components 20-051,054,201,204,794,962;	SSPC-SP3/ Power Tool Cleaning	HB chlorinated rubber based Zinc phosphate Primer DFT= 50µm per coat	1	--	--	Syn. Enamel paint (Long Oil Alkyd) to IS 2932 DFT= 20µm per coat	2	Verdigris Green Shade No. 280 of IS5	90

Sl. No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat		Finish coat			Total DFT µm (min)
			Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
14 PS15	**For CLH & VLH*** PGs 07,08,12,17,19,21,24,47,48 &80 07-402,403,405; 17-904,906; 19-506,507,906,907; 24-353; 48-206,395;	Blast cleaning to SA2 ½ (Near white metal)/ SSPC-SP10 with surface profile 35-50 µm	Epoxy zinc rich primer To IS 14589 Gr. II %VS=35, (min) DFT=40 microns per coat	1	--	--	Aliphatic acrylic Poly-urethane paint %VS=40.0 (min) DFT= 30.0 microns per coat	1	Phirozi Blue Shade No. 176 of IS5	70
15 PS33A	**Components > 95°C & <200 °C, un-insulated Fuel pipes** 47-200,266,267,268,269;	Blast cleaning to SA2 ½ (Near white metal)/ SSPC-SP10 with surface profile 35-50 µm	Inorganic ethyl Zinc Silicate Primer to IS14946 DFT = 75µm	1	Heat Resistant Aluminium Paint to IS 13183 Gr.II DFT= 25µm per coat	2	Heat Resistant Aluminium Paint to IS 13183 Gr.II DFT= 20µm per coat	1	Aluminum	145

*- For components other than CLH & VLH, Painting scheme shall be as given in Sl. No. 8.

NOTES:

1. **Rust Preventive Coating should be given on HSFG Bolt and nut threads.**

2. Machined surfaces and all retainers are to be applied with a coating of Temporary Rust Preventive oil.

3. All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, Sleeves, Splice/cover plate/gusset plate/rest plate and metal contact area usually bolted at site to enhance the load transfer by friction grip shall be coated with Temporary Rust Preventive Fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents.

4. Ground shade/colour of Finish paints & identification tag/Band for equipments, pipings pipe service, boiler supporting structures and other boiler components shall be followed as per tender/ approved painting schedule.

5. PGMAs under Sub-Vendor items are not indicated. For all bought-out and sub-vendors items including PGMAs mentioned above falling under the scope of BHEL the same scheme as for main equipment as covered in this document shall be followed.

6. This painting Schemes is valid for only Customer No: U8/1818, TANGEDCO NORTH CHENNAI TPS - 1X800 MW.

7. No painting is required for Stainless Steel, non-ferrous & galvanized components.

08. Wherever inside surfaces of components under PGMA 48 – XXX & others, need protection till erection, two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns shall be applied, after power tool cleaning.

09. The Temporary Rust Preventive coating that already been applied on any components, tubes, pipes etc., shall be visually inspected for good adherence. If the coating is intact, direct coating of alkyd based red oxide paints over the coating is permitted. In case, the coating has peeled off over a large area, then the coating is to be removed by suitable solvents / heating to 350 –400 °C for an hour before primer paint application –but, in this case, it should be ensured that the minimum surface cleanliness required for primer paint application shall be SSPC – SP2 (equivalent – Hand Tool cleaning).

10. In components, wherever plates / sheets of thickness less than or equal to 5 mm and rods of <25mm/tubes/drain pipes are used, power tool / hand tool cleaning to SSPC – SP3 / SP2 shall be followed and the painting shall be done as described in Sl.No.8.

11. For all commissioning components-erection materials (xx-993) two coats of Red oxide Zinc Phosphate Primer shall be applied to meet the temporary protection till erection, after power tool cleaning.

12. Touch-up painting of damaged areas shall be carried out as per clause 4.3, Page 4 of 12, Vol. II, Section-I, Chapter-8, EPC Specification, – North Chennai TPP, Stage III (1x800MW).

13. All components covered under different PGMA's are to be painted. In case any component is left out, the same shall be deemed to be included under the relevant section based on paint logic approved.

14. For very small components like clamps etc. Sl.No.8 shall be followed.

15. For very small components with weldable primer at edges, the entire component shall be applied with weldable primer. Structural members having welded connections at site, relevant area can be painted with primer paint instead of Weldable primer.

16. Painting scheme for all temporary structures like 04-196, 35-391,392,393 shall be PS 1AE i.e. 1 coat of Red oxide Zinc Phosphate primer (Alkyd Base) to IS 12744-DFT-30µ and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20µ Shade Yellow –Shade No. 356 of IS 5- Total DFT 70µ. These are to be cut & removed at site after erection. (It excludes components covered under Sr. No. 3 & 9 of description table).

17. For internal protection of Pipes, tubes, headers and other pressure parts, Volatile Corrosion Inhibitor (VCI) pellets shall be put (after sponge testing/ draining/ or drying) and subsequently end capped. The dosage of VCI pellets shall be approximately 100 g/ Cu.m. For tubes typically 4 – 5 tablets per end are to be put. For C & I items the dosage of self-indicating Silica Gel (colourless) shall be 250 g/ cu.m. (About 2 to 3 bags weighing approximately 100 grams each). VCI pellets shall not be used for stainless steel components and its composite associates.

18. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.

19. Soot blower components i.e Valve head assembly having high surface temperature up to 425 deg. C shall be applied with two coats of HR aluminum paint conforms to IS13183 Gr.I and total DFT 40microns.

20. Corner plate, sheet channel and fixing pins of PGMA 32-210 shall be painted as per scheme PS3 to total DFT of 60 microns.

21. It is mandatory that for finish coat each layer shall have a permanent DFT and free from any paint defects like sags, wrinkles etc. Total DFT of a component correspond to respective painting scheme has to be ensured and recorded by inspection agency as per QP.

22. For chequered plates having thickness <=5mm, surface preparation can be power tool cleaning to St3 and painting shall be in line with Sl. No. 8.

23. Handrails of PGMA under Sl. No. 3 need to be painted in line with scheme for handrails (i.e. Sl .No. 10).

24. Inside surfaces of fabricated structure (e.g. Box type column) shall be painted with two coats of red oxide primer paint during fit up stage.

25. For DD items, DUs other than threaded/ machined surfaces shall be painted as per scheme of Sl. No. 8, PS1A.

Painting Scheme – Details for procurement & application purposes

Sl. No.	Generic nature of paint	Theoretical Covering Capacity Sq.m per Litre.	No. of pack	Volume solids, % (min)**	DFT in microns per coat (approx.)	Shade	Shade No. to IS5	Mode of appln.	Over coating interval, Hrs.
1	Epoxy Zinc rich primer to IS14589 Gr.II	8	2	35	50	Grey	--	Spray	24
2	Aliphatic acrylic polyurethane paint to IS 13213	13	2	40	30	Phirozi – Blue/ Dark admiralty grey	176/ 632	Spray	24
3	Heat resistant Aluminium paint to IS 13183 Grade I/II	10	1	-	20	--	--	Brush / Spray	24
4	Red oxide zinc phosphate primer paint to IS 12744	10	1	--	30	-	--	Brush / Spray	12
5	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	35	--	---	Dip	12
6	Long oil alkyd synthetic enamel finish paint to IS2932	17	1	--	20	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
7	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	--	25	--	--	--	12
8	General purpose Aluminium paint to IS 2339	10	2	--	20	Aluminum	--	Brush	12
9	HB Chlorinated Rubber Based Zinc Phosphate Primer-Colour Grey	8	1	40	50	Grey	--	Brush / Spray	12
10	Inorganic ethyl zinc silicate primer to IS14946	8	2	60	75	Grey	--	Spray only	16
11	Epoxy based polyamide cured MIO/ TiO_2 pigmented intermediate coat.	8	2	50	75	Brown/ grey	--	Spray	24
12	Epoxy based polyamide cured finish paint to IS14209.	13	2	40	30	Smoke grey	692	Spray	24

Brush painting is accepted, if recommended by the Paint suppliers. The covering capacity of paints specified is only approximate.
The paints and Rust Preventive fluid shall be procured from BHEL's approved suppliers. ** Values are indicative.