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VOLUME – IA BLOCK-1 TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
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1.0	**Project Information (RUPPL, HMD, Hazira)**			
	1	Purchaser	:	M/s Reliance Utilities and Power Pvt. Limited
	2	Project Title	:	4X93.1 MW STG Packages for CCPP Project
	3	Location	:	Village - Mora, Dist-Surat, State–Gujarat(India)
	4	Address Detail	:	4x93.1 MW STG Package Reliance Utilities and Power Pvt. Ltd Village – Mora, Dist.- Surat Pin Code- 394510, Gujarat State, India
	5	Nearest Railway Station	:	Surat, Gujarat
	6	Road Approach	:	SH 6
	7	Nearest Air Port	:	Surat
	8	Nearest Port	:	Adani Hazira Port Pvt. Ltd.
	9	Data of Seismic Design	:	As per IS 1893
	10	Average Annual Rainfall	:	1205 mm
	11	Ambient Air Temperature (Average)	:	a) Maximum : 36.50 C b) Minimum : 14.20 C:
	12	Soil Bearing Capacity	:	20 T / m2
	13	Average Relative Humidity	:	50 – 85 %
	14	Climatic Condition	:	Tropical Climate

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

2.0 SCOPE OF WORK

This section list major scope of work for Unit 1, 2, 3 & 4 of 4 X 93.1 MW STGs at HMD, Hazira to be carried out by contractor, but not limited to following for safe, speedy erection and commissioning of this package.

a) Design, manufacture, supply, erection (at a place to be specified by the BHEL engineer), final fitup , touchup, painting (and other associated works) of Removable/Re- Erectable Pre - Engineered, Pre-Fabricated Steel Closed Storage Shed of size 30m (Length)X 15 m (width) X 5.25 m(height), one number at HMD, Hazira site.

b) Site development, viz. leveling, grading, storm water drain, development of open storage yard with 200mm thick hard granular murum, base/foundation preparation for installation of Porta cabins, barbed wire fencing with gates of site and storage areas, laying of water distribution network, laying of sewerage lines, soak pit, installation of water storage tanks, etc. for the site office area allotted to BHEL. Illumination of the site office area and open storage yard, Electrical distribution & other light fittings. Provision of Pantry, toilet & meeting area in the extended portion of the Pre-fab shed referred in 2.0(a) above(approximate size 15m.(L) x 6.0m.(W) x 3.0m.(Ht.).

c) Supply of 2nos Portable cabins each of size 20ft. x 10ft. x 8ft. with furniture & other fittings on hiring basis for a period of 20 months.These porta cabins shall be used as BHEL site office & bidder shall take back the cabins after 20 months. Details of porta cabins are given in Part-II, chapter III of TCC.

d) Receipt of materials from Manufacturing Units of BHEL, BHEL Sub Vendor, Customer stores, Storage yard etc. Handling at stores/storage yard, site of work, transportation to site of work. Exclusive crane for material handling of around 50 T to be provided. Preservation of all materials / equipments under custody of the contractor during storage, pre-assembly and erection, commissioning etc. shall be carried out by Contractor.

e) Rotating Equipments (Steam turbine, Turbo generator, BFP, DMCW Pump, ACW Pump, CEP, CFP and auxiliary pumps including Bought out Items (BOI)): Inspection, preparation of foundation for erection, erection, leveling, centering, alignment, grouting & final alignment. Pre commissioning & commissioning.

   Generator Assembly erection (All Units) is planned with Strand Jack method only. The Contractor has to arrange for the strand jack system for handling & erection Generator Assembly as per the detailed specification provided in in Part-II, chapter VII of TCC.

f) Piping between various equipment & customer battery limit (Steam, Utility, Oil, CW) : Piping above 2" will be supplied as Pre-fabricated spool pieces. 2" and below sized pipes will be loose supply in commercial length.

   i. Fabrication, Preassembly, erection, alignment, welding, Insulation, NDT, Fabrication of supports, fixing hangers & supports, installation of valves, instruments installation, chemical cleaning / pickling, card board blasting, oil flushing, water flushing, hydro

testing, & supply of target plates for steam blowing. Pre commissioning & commissioning.

ii. Fabrication & erection of Temporary Piping alongwith supports & insulation, Installation of fixtures (blinds etc) not limited to Hydrotesting, steam blowing, chemical cleaning etc.

iii. Lifting, laying, erection, bolt tensioning, bolt torque tightening, supporting and installation, pre and post weld heat treatment, inspection, nondestructive testing including radiography and hydrostatic test, water / steam flushing, air drying, nitrogen purging and other testing of piping installations above ground

g) Vessels (HP Flash Tank, Overhead Oil tank, Atm. Flash tank, DMCW Expansion tank, Generator Adaptor Box): Pre assembly, preparation of foundation for erection, erection, welding, NDT. Pre commissioning & commissioning.

h) Heat Exchangers (Surface Condenser, Generator Air Cooler, LP Heaters, HP Heaters, Deaerator, SJAE, GSC, Drain Cooler, PHE for DMCW) : Pre assembly, preparation of foundation for erection, erection, welding, insulation, NDT. Pre commissioning & commissioning.

i) Static Equipment (Lube Oil Console, Jacking Oil Skid, HP Control Oil skid, Oil Centrifuge, Ammonia & NaOH Dosing Skids) : Inspection, preparation of foundation for erection, erection, leveling, centering, alignment, grouting & final alignment. Pre commissioning & commissioning.

j) Support for commissioning (IA / PA System, Condensate Forwarding tank): Contractor to provide support for interface activities for commissioning, under BHEL supervision.

k) Associated surface finish, supply & application of primer & finish paints / Anti corrosive / steamwash paints including labeling on equipments, Piping, platforms, structure etc.

l) Execute all mechanical jobs identified during check list, Technical audits, pre-commissioning and commissioning, including additional supports required to restrain pipe movement avoiding interference with nearby structural / piping.

m) Obtain clearances and approvals from all applicable statutory / Government agencies e.g. IBR, etc.

n) Installation of any necessary blind or additional valves to isolate lines to facilitate phased commissioning and start-up.

o) Dewatering inside building for equipment erection facilitating is contractor scope.

p) Provision of crane for erection activities as and when required.

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT TECHNICAL SPECIFICATIONS PROVIDED IN THE SUSEQUENT CHAPTERS IN THE TCC

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Fire fighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labour colony (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity For construction purposes** of Voltage 415/440 V			FREE
a	Single point source	Yes		At a distance of approx. 1000 M from site (Distance is only estimated, it may vary up to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.2	**Electricity for the office, stores, canteen etc of the bidder**			FREE
a	Single point source	Yes		At a distance of approx. 1000 M from site (Distance is only estimated, it may vary up to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc**		Yes	Bidder has to take care.
a	Single point source		Yes	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	**WATER SUPPLY**			
3.3.1	**For construction purposes**			FREE
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	**Water supply for bidder's office, stores, canteen etc**			FREE
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	**Water supply for Living Purpose**		**Yes**	Bidder has to take care.

S. No.	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Téléphone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

Sl. No	Description PART II 3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.9.1	**Engineering works for construction:**			
a	Providing the erection drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes		
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		**YES**	In consultation with BHEL
d	Shipping lists etc for reference and planning the activities	Yes		In consultation with BHEL
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on S. No. e. Hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
h	Daily erection / work plan based on S. No. g. Hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
i	Periodic visit of senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	
l	Arranging the materials required for preassembly		Yes	

Sl. No	Description PART II 3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
M	Coordination for inspection (IMIR etc) and getting clearance from Client / PMC		Yes	
N	Preparation of formats for completion of activities		Yes	

A. List of minimum major Tools & Plants to be deployed by the contractor:

4.1. All the tools & plants and Measuring Monitoring Equipment (MME) required for this scope of work, except the tools & plants provided by BHEL, are to be arranged by the contractor within the quoted rates.

4.2. Experienced Crane operator for EOT crane shall be arranged by the bidder within the quoted rate / price.

4.3. Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

4.4. For loading and transportation, all necessary T&P such as Trailers, Cranes, Winches, Chain pulley, welding generators, slings, de-shackle, jacks, sleepers, rails etc., are to be arranged by the contractor. All the tools & plants required for this scope of work, except the tools & plants provided by BHEL, are to be arranged by the contractor within the quoted rates /prices.

4.5. All the tools and plants including suitable Jacks / Hydraulics jacks / pressurizing pumps for Hydraulic test of all Piping, required for satisfactory completion of the work has to be arranged by the contractor.

4.6. Contractor has to arrange required pumps and suitable piping with sufficient capacity for filling water in the lines for conducting Hydro test. For testing Steam lines (High Pressure) necessary Hydraulic Test pumps / Hand pumps are to be arranged by the contractor.

4.7. Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work.

4.8. Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor‘s account.

4.9. For lifting, shifting and placement on foundation, Generator Assemblies the contractor will have to arrange Strand Jack system as per the time schedule informed by BHEL. The details of mobilization, demobilization & other details are provided in part-II, chapter VII of TCC.

4.10. Besides the T & P mentioned below, which is being made available to the contractor on free of hire charges, any additional crane and other T & P which may be required for successful and timely execution of the work covered within the scope of this tender shall be arranged and provided at site by the contractor at his cost. In case if the contractor fails to provide such equipment’s, BHEL will arrange for the same and the cost will be recovered from the contractor‘s bill with BHEL overheads, as applicable from time to time which may vary even during contract period.

4.11. All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.

4.12. In case of non-availability of power DG welding sets are to be deployed for faster execution of job.

B. **MEASURING AND MONITORING DEVISES (MMD):**

TO BE FINALIZED AT SITE IN CONSULTATION WITH SITE ENGINEER IN CHARGE/CM.

NOTE:

THIS ABOVE LIST IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. CONTRACTOR SHALL DEPLOY ALL NECESSARY T&P TO MEET THE SCHEDULES & AS PRESCRIBED BY BHEL ENGINEER AND REQUIRED FOR COMPLETION OF WORK.

SN	DESCRIPTION & CAPACITY OF T&P	QUANTITY	PURPOSE
01	EOT CRANE IN TG HALL	1 No. of 55 T Capacity (For four units)	FOR HANDLING AND ERECTION WITHIN TG HALL ON SHARING BASIS AS AVAILABLE AND SUBJECT TO THEIR ACCESSIBILITY AND APPROACHABILITY.

NOTE:

1. Customer will provide one no. EOT crane of 55 T capacity (for all units), however contractor will have to provide the EOT crane operator for his operations and will carry out the day today operational maintenance, general cleanliness, attending of gear box leakages etc., applying caladium Compound on slings and holding/supporting the supply cables etc. as part of scope of work.

2. EOT cranes will be used on sharing basis by other agencies working within the TG hall under the instruction of BHEL. Contractor has to plan his activities well in advance and inform BHEL engineer in charge/ Construction Manager the date of actual use.

6.1 **TIME SCHEDULE**

6.1.1
For all Units the entire work of erection testing and commissioning of the Steam Turbine, Generator & their auxiliaries and other BOI (Bought Out Items) as detailed elsewhere in the Tender Specification shall be completed within **20 (Twenty) months** from the date of commencement of work at site.

6.1.2
During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

6.1.3
The work of Design, manufacture, supply & erection of Pre-engineered & Prefabricated store shed cum office and site development works shall be completed in all respect within **3 (three) months** from the date of issue of LOI.

6.1.
The erection work shall be commenced on the mutually agreed date between the bidder and BHEL engineer and shall be deemed as completed in all respect only when the unit is in operation. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer will be final.

6.3 MOBILISATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIOING ETC.,

6.3.1
The activities for erection, testing etc. shall be started as per directions of Construction manager of BHEL.

6.3.2

The contractor has to augment his resources in such a manner that following major milestones of erection & commission are achieved on specified schedules:

TENTATIVE SCHEDULE

A. For HMD, Hazira (4 sets)

Activity	**Tentative Schedule for completion**			
	Unit 1	**Unit II**	**Unit III**	**Unit IV**
Erection of Pre-Engineered & Prefabricated steel structure store shed	May'14			
Site Development works	May'14			
Start of Work	June' 14	June'14	July'14	Jul'14
Completion of Oil Flushing	Mar'15	Apr'15	May'15	June'15
Barring Gear Operation	Apr'15	May'15	June'15	July'15
Steam Blowing Completion	**Apr'15**	May'15	June'15	July'15
Rolling & Synchronization	**May'15**	Jun'15	July'15	Aug'15
Trial Operation Completion	**May'15**	Jun'15	July'15	Aug'15
Support for operation & H/O				Dec'15

6.3.3

In order to meet above schedule in general, and any other intermediate targets set, to meet customer / project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.

6.4 CONTRACT PERIOD

For all units the contract period for completion of entire work under scope shall be **20 (Twenty) months** from the –COMMENCEMENT OF CONTRACT PERIOD as specified earlier for completion of the entire work under this package.

6.5 GUARANTEE PERIOD (For Each Unit)

The guarantee period of twelve months shall commence from the date of handing over of the Unit to Customer or six months from the date of first synchronization of the set, whichever is earlier (Provided all erection, testing, and commissioning works are completed in all respects)

The progressive payment for erection, testing and commissioning on accepted price of contract value per unit of STG Package rates will be released as per the break up given hereinafter:

7.1. Pre-Engineered & Prefabricated store shed cum office, site development work & hiring of Porta cabins

The following are the weightages assigned for various activities against prices for Part A of the Price bid specification.

Sl. No.		Item	Weightage
7.1.1	**Store shed, site development & Porta cabins**		
	1.	SUPPLY & ERECTION OF PREFABRICATED STORE CUM OFFICE SHED	40%
	2.	COMPLETION OF ENTIRE SITE DEVELOPMENT WORKS	40%
	3.	HIRING CHARGES OF TWO NOS. PORTA CABIN FOR FIRST TWELEVE MONTHS PAYABLE ON SUPPLY & FIXING OF PORTA CABINS ALONGWITH ALL FURNITURES, FIXTURES, ETC.	12%
	4.	HIRING CHARGES OF TWO NOS. PORTA CABIN FOR BALANCE PERIOD PAYABLE AFTER COMPLETION OF TWELEVE MONTHS FROM THE DATE FIXING OF CABINS AS DEFINED IN S. NO. 3 ABOVE	08%
	Total		**100.00%**

7.2. Erection,Testing, Insulation, Painting & Commissioning of Mechanical & Piping works

7.2.1 Summary : The following is weightage for each unit. The total price allotted as per Part B of Price Bid specification to be divided into four equal parts and Unit prices for billing purpose is to be arrived.

Sl	Item	Weightage
1	**Surface Condenser**	**15%**
2	**Steam Turbine**	**18%**
3	**Generator**	**15%**
4	**Pump and Auxiliary Equipment's**	**12%**
5	**Heat Exchanger & Deaerator**	**10%**
6	**Miscellaneous Item**	**10%**
7	**Piping**	**20%**
	Total	**100.00%**

7.2.2 Detailed activity / work description for pro-rata payment of 85%

Sl. No.		Item	Weightage
7.2.2.1	**Surface Condenser**		
	1.	PREPARATION OF FOUNDATION	2%
	2.	PLACEMENT, ALIGNMENT, ASSEMBLY AND WELDING OF, HOT WELL, NDT	10%
	3.	ASSEMBLY AND POSITIONING OF CONDENSOR SHELL, FOUNDATION BOLT FIXING AND GROUTING	12%
	4.	ASSEMBLY, ALIGNMENT AND WELDING & NDT OF TUBE SUPPORT PLATES AND INTERNALS LIKE BAFFLE PLATES, AIR EVACUATION PIPES ETC.	5%
	5.	ASSEMBLY, WELDING & NDT OF DOME WALLS AND DOME STIFFENERS, STAND PIPE, SURGE PIPE ETC.	10%
	6.	INSERTION, EXPANSION, CUTTING ETC. OF CONDENSER TUBES	20%
	7.	HYDRO TEST OF STEAM AND WATER SIDE	10%
	8.	WELDING OF CONDENSER NECK JOINT, BELLOW AND NDT& COMPLETION OF BALANCE WORKS	10%
	9.	VACCUM TEST, ERECTION, COMMISSIONING,	3%
	10.	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.2	**Steam Turbine**		
	1	PREPARATION OF FOUNDATION, PLACEMENT, ALIGNMENT AND GROUTING OF BASE PLATES AND BEARING PEDESTALS	9%
	2	PLACEMENT AND ALIGNMENT OF OUTER CASING BOTTOM PORTION AND CENTRE GUIDE KEYS	8%
	3	PLACEMENT OF ROTOR ON BEARINGS AND ALIGNMENT WITH INNER CASING AND CHECKING OF BLADE CLEARANCE	9%
	4	ASSEMBLY, ALIGNMENT & BOLTING OF OUTER CASING UPPER HALF	9%
	5	BOXING UP OF INNER-INNER & INNER-OUTER AND ROLL CHECK	7%
	6	ALIGNMENT OF ROTORS INCLUDING REAMING, HONING AND FIXING OF COUPLING BOLTS	9%
	7	ASSEMBLY OF GOVERNING SYSTEM/EQUIPMENT	5%
	8	INSTALLATION OF ESVS, VALVES, MS STRAINERS (INTERNALS)	9%
	9	ERECTION, ALIGNMENT AND WELDING OF CROSS AROUND PIPING	5%
	10	FINAL BOX UP OF TURBINE INCLUDING FIXING OF RUPTURE DISK ETC.	5%

	11	ASSEMBLY AND PREPARATION OF HYDRO-TEST, STEAMBLOWING DEVICES AND NORMALISATION ETC	5%
	12	FINAL BOXING UP OF PEDESTALS AFTER OIL FLUSHING COMPLETION	5%
	Total		85.00%
7.2.2.3	**Turbo Generator**		
	1	PREPARATION OF FOUNDATION, LEVELLING, MATCHING AND GROUTING OF FOUNDATION PLATES	5%
	2	LIFTING, LEVELLING AND ALIGNMNET OF GENERATOR USING STRAND JACK METHOD (INCLUDING ERECTION AND DISMANTLING OF STRAND JACK)	50%
	3	ALIGNMENT OF GENERATOR ROTOR WITH TURBINE ROTOR, RUN-OUT CHECKS AND REAMING, HONING OF COUPLING HOLES AND FIXING OF COUPLING BOLTS	10%
	4	ERECTION OF EXCITATION EQUIPMENTS & ALIGNMENT OF GEN-EXCITER ROTORS INCLUDING SWING CHECK AND COMPLETION OF BALANCE WORKS	10%
	5	INSTALLATION OF ENCLOSURES OF GENERATOR/EXCITER WITH ALL AUXILIARIES	5%
	6	GROUTING OF GEN BASE FRAME	5%
	Total		**85.00%**
7.2.2.4	**PUMPS AND AUXILIARIES**		
	1	ERECTION / TESTING AND COMMISSIONING OF MAIN OIL PUMP, JOP, EOP, AOP, MIST OIL EXTRACTION FAN, OIL MIST SEPERATOR, OIL ACCUMULATORS CENTRALISED LUBE OIL PURIFICATION SYSTEM, GOVERNING OIL, HP CONTROL OIL ALONG WITH ALL AUXILLIARIES	17%
	2	ERECTION / TESTING AND COMMISSIONING OF THREE MOTOR DRIVEN BFP, ALONG WITH ALL AUXILLIARIES	16%
	3	ERECTION, TESTING, GROUTING ETC. OF CCW (COMMON FOR ALL UNITS) PUMPS AND TANKS ALONG WITH ALL AUXILLIARIES	17%
	4	ERECTION, TESTING, GROUTING ETC. & COMMISSIONING OF CONDENSATE EXTRACTION PUMPS ALONG WITH ALL AUXILLIARIES	17%
	5	ERECTION, TESTING, GROUTING ETC. & COMMISSIONING OF ACW, CONDENSATE FORWARDING PUMPS, RELATED ITEMS	15%
	6	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.5	**HEATERS AND DEAERATORS**		
	1	ERECTION, TESTING & COMMISSIONING OF HP, LP HEATERS	15%

	2	ERECTION, TESTING & COMMISSIONING OF SJAE, GLAND STEAM CONDENSER, DRAIN COOLERS	15%
	3	ERECTION, TESTING & COMMISSIONING OF DE-AERATOR, FEED STORAGE TANK AND ASSOCIATED APPROACH PLATFORM WITH LADDERS ETC.	22%
	4	ERECTION, TESTING & COMMISSIONING OF PHE'S FOR CCW SYSTEM (COMMON FOR ALL UNIT)	10%
	5	ERECTION, TESTING & COMMISSIONING OF TWIN OIL COOLERS OF LOC, DUPLEX LUBE OIL COOLERS & DUPLEX WORKING OIL COOLERS OF BFP, HP GOVERNING OIL COOLERS	15%
	6	ERECTION, TESTING & COMMISSIONING OF STG AIR COOLERS	5%
	7	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.6	**MISCELLANEOUS ITEMS**		
	1.	ERECTION, TESTING & COMMISSIONING OF CCW EXPANSION TANK, CARBON DIOXIDE BREATHERS, HYDROSTATIC SEAL ETC	7%
	2.	ERECTION, TESTING & COMMISSIONING OF HP FLASH TANK, ATM FLASH TANKS IN STG AREA AND COMMON AREA	8%
	3.	ERECTION, TESTING & COMMISSIONING OF BOILER STARTUP PRDS AND DESUPERHEATERS.	7%
	4.	ERECTION, TESTING & COMMISSIONING OF AUXILARY PRDS AND DESUPERHEATERS.	8%
	5.	ERECTION, TESTING & COMMISSIONING OF DEAERATOR PEGGING STEAM PRDS AND DESUPERHEATERS.	7%
	6.	ERECTION, TESTING & COMMISSIONING OF STRAINERS	5%
	7.	ERECTION, TESTING & COMMISSIONING OF OVERHEAD OIL TANK	6%
	8.	ERECTION, TESTING & COMMISSIONING OF VENT SILENCERS	5%
	9.	COMMISSIONING SUPPORT FOR IA / PA COMPRESSOR (COMMON FOR ALL UNIT)	6%
	10.	COMMISSIONING SUPPORT FOR CONDENSATE FORWARDING TANK.	5%
	11.	ERECTION, TESTING AND COMMISSIONING OF BELLOWS, BUTTERFLY VALVE FOR SURFACE CONDENSOR	5%
	12.	ERECTION, TESTING & COMMISSIONING OF LP DOSING SKIDS (NaOH, HYDRAZINE, AMMONIA)	8%
	13.	ERECTION TESTING AND COMMISSIONING OF SWAS ROOM INTERCONNECTING LINES	5%
	14.	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.7	**PIPING**		
	1	FABRICATION OF PRE-FABRICATED (UPTO 2") NON – IBR PIPING, IBR PIPING, PRE-ASSEMBLY WHEREVER APPLICABLE	15%
	2	PLACEMENT IN POSITION	17%
	3	ALIGNMENT	15%

	4	WELDING / BOLTING / FIXING OF VALVES, INSTRUMENTS	10%
	5	INSULATION / CLADDING	10%
	6	NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT	5%
	7	FABRICATION OF SUPPORTS, HANGERS & SUPPORTS ETC WHEREVER NECESSARY AS PER DRG	5%
	8	STEAM BLOWING ,HYDRAULIC TEST/PNEUMATIC TEST WHERE EVER APPLICABLE ALONGWITH TEMPORARY PIPING	5%
	9	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**

7.2.3 Detailed activity / work description for stage/milestone payments (15%)

Sl. No.		Item	Weightage
7.2.2.8		**STAGE/MILESTONE PAYMENTS (15%)**	
	1	STEAM BLOWING / CHEMICAL CLEANING	1%
	2	OIL FLUSHING (TG)	1%
	3	BARRING GEAR (TG)	1%
	4	ROLLING AND SYNCHRONISATION	2%
	5	FULL LOAD	2%
	6	TRIAL OPERATION OF UNIT	2%
	7	PAINTING (INCLUDING ARROW MARKING, NOMENCLATURE, ETC)	2%
	8	AREA CLEANING, TEMPORARY STRUCTURES CUTTING/REMOVAL AND RETURN OF SCRAP	1%
	9	PUNCH LIST POINTS/PENDING POINTS LIQUIDATION	1%
	10	MATERIAL RECONCILIATION	1%
	11	COMPLETION OF CONTRACTUAL OBLIGATIONS	1%
	Total for Milestone/Stage payments (15%)		15.00%

7.3 Material Handling Works

The following are the weightages assigned for various activities against prices for Part C of the Price bid specification.

Sl. No.		Item	Weightage
7.3.1	**MATERIAL HANDLING FOR STORE, SITE (COMMON)**		
	1	Deployment of Crane, Hydra & Other material Handling T & P	20%
	2	Receipt and Unloading of Consignments	50%
	3	Storage and Preservation	20%
	4	Manpower Support (as per cl. 8.8, Part-II, Chapter-VIII)	10%
			100.00%

7.4 Mode of Payment and measurement of work completed

Refer General Conditions of Contract

Note:

1. Wherever application of INSULATION is applicable, same shall be covered under the respective item/equipment for 'Terms of Payment'.
2. BHEL at discretion may further split up the above percentage and effect payment to suit the site conditions, cash flow requirements, according to the progress of work.
3. Payments against the above Billing break up will be subject to the other statutory deductions, viz. retention amount, TDS towards income tax, security deposits, etc. as per the provisions contained in GCC,SCC, NIT & other contract documents.

8.0 TAXES, DUTIES, LEVIES

8.1. For All types of works
8.1.1
The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.
However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

8.1.2 Service Tax & Cess on Service Tax

Contractor's price/rates shall be exclusive of Service Tax and Cess on Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and pay the same to the concerned tax authorities, such applicable amount will be paid by BHEL at the prevailing Service Tax Rate (presently 12.36 %) on the admitted bill value.

Contractor shall submit to BHEL documentary evidence of Service Tax registration certificate specifying name of services covered under this contract. Contractor shall submit serially numbered Service Tax and Cess Invoice, signed by him or a person authorized by him in respect of taxable service provided, and shall contain the following, namely,

1. **The name, address and the registration number of the contractor,**
2. **The name and address of the party receiving taxable service,**
3. **Description, classification and value of taxable service provided and,**
4. **The service tax payable thereon.**

All the Four conditions shall be fulfilled in the invoice before release of service tax payment.

Wherever, more than one route/option are available for discharge of service tax liability under a particular service, (e.g. "works contract Service"), contractor shall obtain prior written consent from BHEL site before billing the amount towards Service Tax.

8.1.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT)/CST on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be inclusive of the same and in no case input or output VAT/CST will be reimbursed extra.

In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. Contractor will submit all the details of VAT/CST paid for the contract in the prescribed format of the respective state VAT laws. Also, the contractor will issue the tax Invoices to BHEL as per the Tax laws of respective state on monthly basis. Contractor shall also be required to furnish to BHEL necessary proof of VAT remittance on monthly basis.

Deduction of tax at source shall be made as per the provisions of law and is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made.

Further, if BHEL, at the instance of customer or otherwise adopts the specific route for discharging output VAT liability itself, benefit of the reduction in liability of the contractor will be passed on to BHEL.

In case, BHEL is forced to pay any VAT liability on behalf of contractor, the same will be recovered from contractor's bill or otherwise as deemed fit

8.2 New Taxes/Levies

In case the Government imposes any new levy/tax etc.(that are not existing as on date of Technical Bid opening only) on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual against documentary proof.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of Price Bid. Claim for any such impact after opening the Price Bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

No reimbursement/recovery on account of increase/reduction in the rate of taxes, levies, duties etc. on input goods/services/work shall be made. Such impact shall be taken care of by the Price Variation/Adjustment Clause (PVC) if any. In case PVC is not applicable for the contract, Bidder has to make his own assessment of the impact of future variation if any, in rates of taxes/duties/ levies etc. in his price bid.

8.3 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998.

In case any portion of work involves execution through building or construction workers, then compliance to the above titled Acts shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under:-

i. It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.

ii. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these act and rules including that of payment / deposit of 1% cess on the extant of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.

iii. It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building workers) engaged by the sub-contractor during the preceding month.

iv. It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

9. WEIGHT SCHEDULE - SUMMARY

Sl.No.	Equipment/Package	Approximate Weight in MT/Unit	Total weight for HMD, Hazira in MT (4 Units)
A	Surface Condenser	122.226	488.904
B	Steam Turbine	213.014	852.056
C	Generator	187	748
D	Pump and Auxiliary Equipment's (Common Eqp - 40 MT)	207.084	748.336
E	Heat Exchanger (Common Eqpt - 10.578 MT)	258.698	992.48
F	Miscellaneous Item (Common Eqp – 20 MT)	61.775	87.1
	Common Equipment	70.578	70.578
G	**Piping**		
	Common :		544.977
	Per Unit :	314.36	1257.44
	Integral Piping :	20.8	83.2
	Support (10%) :	88.014	352.056
	Total Weight (MT)	2017.948	6225.127

Hazira : Piping Weights (Common and 4 Units)

SL NO	LINE DESCRIPTION	IBR	PIPE MATERIAL	WEIGHT (Kg)	TOTAL WEIGHT (Kg)
A	COMMON				
1	MAIN STEAM FROM TP TO HEADER	IBR	A335GRP91	7896	7896
2	MAIN STEAM HEADER	IBR	A335GRP91	152975	152975
3	BOILER STARTUP STEAM FROM TP UPTO PCV	IBR	A335GRP91	38303	38303
4	BOILER STARTUP STEAM FROM FROM PCV UPTO DS	IBR	A335GRP11	9516	9516

5	BOILER STARTUP STEAM HEADER	IBR	A106GRB	33246	33246
6	FEED WATER HEADER	IBR	A106GRB	95687	95687
7	FEED WATER FROM HEADER TO TP	IBR	A106GRB	18416	18416
8	DEAERATOR OVERFLOW & DRAIN HEADER	IBR	A106GRB	5894	5894
9	CCCW PIPING		IS3589GRFE330	136827	136827
10	DRAIN PIPING (P91)	IBR	A335GRP91	7839	7839
11	DRAIN PIPING (P11)	IBR	A335GRP11	1176	1176
12	DRAIN PIPING (CS)	IBR	A106GRB	5828	5828
13	SWAS PIPING (IBR)	IBR	A335GRP91	1037	1037
14	SWAS PIPING (CS)		A106GRB	3578	3578
15	SWAS PIPING (SS)		A312GRTP304	894	894
16	SERVICE AIR DISTRIBUTION PIPING		IS1239	11269	11269
17	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	11269	11269
18	LP DOSING PIPING		A312GRTP304	3327	3327
	COMMON PIPING			**544977**	**544977**
B	**PER UNIT**				
1	MAIN STEAM PIPING FROM HEADER TO TURBINE	IBR	A335GRP91	27426	109704
2	TURBINE WARM UP VENT PIPING	IBR	A335GRP91	494	1976
3	BOILER STARTUP STEAM PIPING FROM HEADER TO CONDENSER	IBR	A106GRB	7475	29900
4	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-6	IBR	A106GRB	1792	7168
5	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-5	IBR	A106GRB	3659	14636

6	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	8063	32252
7	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	11014	44056
8	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-2	IBR	A106GRB	8766	35064
9	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-1	IBR	A106GRB	16469	65876
10	BALANCE PISTON LEAK-OFF PIPING	IBR	A106GRB	708	2832
11	BFP DISCHARGE PIPING	IBR	A106GRB	20584	82336
12	BFP RECIRCULATION PIPING TO DEAERATOR	IBR	A106GRB	5548	22192
13	BFP DISCHARGE HEADER	IBR	A106GRB	3236	12944
14	FEED WATER PIPING FROM BFP DISCH HEADER TO HPH-5 (INCL HPH-5 BYPASS)	IBR	A106GRB	27636	110544
15	FEED WATER PIPING FROM HPH-5 TO HPH-6 (INCL HPH-6 BYPASS)	IBR	A106GRB	27764	111056
16	FEED WATER PIPING FROM HPH-6 TO FEED WATER HEADER	IBR	A106GRB	16190	64760
17	OVERFLOW & DRAIN PIPING FROM DEAERATOR	IBR	A106GRB	2603	10412

	TO HEADER				
18	CCCW PIPING		IS3589GRFE330	18164	72656
19	CW/ACW PIPING		IS3589GRFE330	25096	100384
20	CONDENSATE PIPING (CS)		A106GRB	14890	59560
21	CONDENSATE PIPING (SS)		A312GRTP304	34581	138324
22	BFP SUCTION PIPING		A106GRB	9720	38880
23	HP HEATERS DRAIN PIPING		A106GRB	10263	41052
24	LP HEATERS DRAIN PIPING		A106GRB	10361	41444
25	VENT PIPING		A106GRB	1858	7432
	PER UNIT PIPING			**314360**	**1257440**
	TOTAL PIPING				**1802417**

Dahej : Piping Weights (Common and 3 Units)

SL NO	LINE DESCRIPTION	IBR	PIPE MATERIAL	WEIGHT (Kg)	TOTAL WEIGHT (Kg)
A	**COMMON**				
1	MAIN STEAM FROM TP TO HEADER	IBR	A335GRP91	5922	5922
2	MAIN STEAM HEADER	IBR	A335GRP91	114732	114732
3	BOILER STARTUP STEAM FROM TP UPTO PCV	IBR	A335GRP91	28728	28728
4	BOILER STARTUP STEAM FROM FROM PCV UPTO DS	IBR	A335GRP11	7137	7137
5	BOILER STARTUP STEAM HEADER	IBR	A106GRB	24935	24935
6	FEED WATER HEADER	IBR	A106GRB	71766	71766

7	FEED WATER FROM HEADER TO TP	IBR	A106GRB	13812	13812
8	DEAERATOR OVERFLOW & DRAIN HEADER	IBR	A106GRB	4421	4421
9	CCCW PIPING		IS3589GRFE330	102621	102621
10	DRAIN PIPING (P91)	IBR	A335GRP91	5880	5880
11	DRAIN PIPING (P11)	IBR	A335GRP11	882	882
12	DRAIN PIPING (CS)	IBR	A106GRB	4371	4371
13	SWAS PIPING (IBR)	IBR	A335GRP91	778	778
14	SWAS PIPING (CS)		A106GRB	2684	2684
15	SWAS PIPING (SS)		A312GRTP304	671	671
16	SERVICE AIR DISTRIBUTION PIPING		IS1239	8452	8452
17	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	8452	8452
18	LP DOSING PIPING		A312GRTP304	2496	2496
	COMMON PIPING			**408740**	**408740**
B	**PER UNIT**				
1	MAIN STEAM PIPING FROM HEADER TO TURBINE	IBR	A335GRP91	27426	82278
2	TURBINE WARMUP VENT PIPING	IBR	A335GRP91	494	1482
3	BOILER STARTUP STEAM PIPING FROM HEADER TO CONDENSER	IBR	A106GRB	7475	22425
4	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-6	IBR	A106GRB	1792	5376
5	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-5	IBR	A106GRB	3659	10977
6	TURBINE EXTRACTION	IBR	A106GRB	8063	24189

	STEAM PIPING TO DEAERATOR				
7	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	11014	33042
8	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-2	IBR	A106GRB	8766	26298
9	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-1	IBR	A106GRB	16469	49407
10	BALANCE PISTON LEAK-OFF PIPING	IBR	A106GRB	708	2124
11	BFP DISCHARGE PIPING	IBR	A106GRB	20584	61752
12	BFP RECIRCULATION PIPING TO DEAERATOR	IBR	A106GRB	5548	16644
13	BFP DISCHARGE HEADER	IBR	A106GRB	3236	9708
14	FEED WATER PIPING FROM BFP DISCH HEADER TO HPH-5 (INCL HPH-5 BYPASS)	IBR	A106GRB	27636	82908
15	FEED WATER PIPING FROM HPH-5 TO HPH-6 (INCL HPH-6 BYPASS)	IBR	A106GRB	27764	83292
16	FEED WATER PIPING FROM HPH-6 TO FEED WATER HEADER	IBR	A106GRB	16190	48570
17	OVERFLOW & DRAIN PIPING FROM DEAERATOR TO HEADER	IBR	A106GRB	2603	7809
18	CCCW PIPING		IS3589GRFE330	18164	54492

19	CW/ACW PIPING		IS3589GRFE330	25096	75288
20	CONDENSATE PIPING (CS)		A106GRB	14890	44670
21	CONDENSATE PIPING (SS)		A312GRTP304	34581	103743
22	BFP SUCTION PIPING		A106GRB	9720	29160
23	HP HEATERS DRAIN PIPING		A106GRB	10263	30789
24	LP HEATERS DRAIN PIPING		A106GRB	10361	31083
25	VENT PIPING		A106GRB	1858	5574
	PER UNIT PIPING			**314360**	**943080**
	TOTAL PIPING				**1351820**

Turbine Integral Piping

Sl. No.	Item	Material	Weight (kg)/ Unit	Hazira (4 Units)	Dahej (3 Units)
1.	Carbon Steel Flanges	A105	800	3200	2400
2.	Carbon Steel Piping	A106B	14400	57600	43200
3.	Carbon Steel Fittings	A234WPB	1900	7600	5700
4.	Alloy Steel Piping	A335P22	1000	4000	3000
	SS Piping	A321	2700	10800	8100
		Total	**20800**	**83200**	**62400**

Insulation for Equipment & Piping : 114 MT,
Painting Area: Approximately 21798 M^2
Misc. Equipment / Items : 468 MT

Note:

1. A Lump sum price is to be quoted in the price bid for Erection & Commissioning of STG system consisting of all equipment's detailed under Clause no. 9 (Weight schedule-summary) of this chapter that shall also cover works like integral piping, and final painting, as applicable. The Lump sum quoted value for Erection works shall include the variation of +/-15% (Fifteen percent) in total indicated weight. In case of variation in weight beyond +/- 15%, compensation will be as per clause 2.14.2 of GCC.

2. The list is tentative and is given to enable the contractor to study the nature of the work. The approximate weight and dimensions of the various sub-assemblies of turbine, generator and its auxiliaries and other brought out item and Piping system etc.is indicated above. The weights & Dimensions given are only approximate and for general guidance and they are subject to variation as per design consideration.

3. The information furnished is only a description regarding the items to be erected by the contractor. BHEL reserves the right to add or exclude any components / items/ system according to the site requirements / customer requirements to complete various systems in all respects.

4. Any other systems/ components supplied by BHEL manufacturing units which are integral to Steam turbine & Generator and its auxiliaries and other bought out items are also to be erected and commissioned by the contractor within the quoted / accepted tonnage rate /lump sum value.

5. Details regarding components, sub-assemblies, and auxiliaries etc., to be erected, tested and commissioned under the scope of this tender are given in this tender. The schedule of weights given are only approximate and meant for giving a general idea to the tenderer, about the magnitude of the work involved. This should not be taken for billing or any other claims. All weights for such purposes will have to be taken from design documents only (shipping list).

1.1
The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for fabrication, engineering and construction management. The Bidder should ensure timely completion of work. The Bidder must have adequate quantity of tools, construction aids, equipment's etc., in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel.

1.2
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Bidder and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

1.3
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

1.4
The Bidder shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work.

1.5
Contractor shall erect all the equipment as per sequence prescribed by BHEL at site. The sequence of erection, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the Contractor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets or for any reasons whatsoever.

1.6
All the necessary certificates and licenses required to carry out this work are to be arranged by the Contractor expeditiously at his cost.

1.7
The work to be carried out under the scope of these specifications covers the complete work of collection from stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, leveling, cold pulling, adjusting, Non-destructive testing, Post weld heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries covered under these specifications, commissioning and all other activities till handing over of the unit. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. That will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL at the cost and risk of the contractor.

1.8
The terminal points as decided by BHEL shall be final and binding on the Contractor.

1.9
During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feedback from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/rectification/fabrication/repairs etc., promptly and expeditiously. Claims of contractor, if any, for such works will be dealt as per relevant clauses of General Conditions of Contract.

1.10
Daily log sheets indicating the details of work carried out, man-hours, consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day.

1.11
All tools and tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

1.12
The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

1.13
All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.

1.14
Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

1.15
Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

1.16
Contractor shall mobilize sufficient quantity of sleepers for stacking of materials in his custody.

1.17.1
Utility Points : Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N_2) etc., shall be indicated in the P & I diagram. Contractor to locate the utility points as advised by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with Bill of Material (BOM) to BHEL for approval.

1.17.2
The utility points shall be located at convenient point to handle and to be terminated with brass / bronze valve with suitable connection for hose pipe.

1.18
As Built Drawings : Contractor shall be supplied with two extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copy with Red ink all the changes / deviations / alterations etc carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

1.18
Site Inspection : The owner / employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

1.19
Field Quality Assurance Formats: It is the responsibility of the contractor to collect and fill up the relevant FQA Log sheets / Welding logs & Heat treatment charts and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL / Customer in token of their acceptance. Monthly Running Bill Payment to the contractor will be linked with the submission of these Log sheets.

1.20
For other agencies, such as cabling, instrumentation etc., to commence their work from / on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

1.21
For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

1.22
Contractor should obtain the formal statutory clearance from Chief Inspector of Boilers to carry out erection & Welding of piping / tanks under IBR purview. All IBR piping layout drawings received from BHEL for pipeline erection to be submitted to Boiler Inspector for approval. Arrangement for the visit of Boiler inspector for field inspection, hydraulic test etc., is in the scope of contractor, and necessary drawing / details only will be given by BHEL. Inspection fee, if any shall be paid by BHEL. After approval of the drawings, Erection of pipe lines / tanks to be started.

2.0 PRE ENGINEERED & PREFABRICATED STEEL STRUCTURE STORE SHED, SITE MESS/CONFERENCE HALL/TOILET & OPEN STORAGE AREA

The contractor's scope of services for Pre Engineered & Prefabricated steel structures, site mess/conference Hall/Toilet & development of open storage areas are detailed in this chapter.

2.1 SCOPE

This Specification covers Design, Manufacturing, supply, Receipt at site, Erection, site Painting etc. of closed shed removable/Re-erectable type Pre-Engineered, Pre-fabricated Steel Storage sheds, construction of site mess/conference Hall/Toilet & development of open storage areas. After completion of the entire project, i.e. erection & commissioning & handing over to the client, the contractor will be required to dismantle/remove the entire temporary structures referred in this chapter and make good the area in the original condition, as it was received from the customer. The contractor can take back all the serviceable materials received after the dismantling of these temporary structures. All unserviceable materials will have to be disposed at a specified location within the premises of the customer or outside as per the direction & instructions of BHEL engineer. A detailed instruction for dismantling/removal will be provided by BHEL engineer in this regard at appropriate time during the currency of the contract.

2.2 PRE ENGINEERED & PREFABRICATED STEEL STRUCTURE STORE SHED

2.2.1 DESIGN AND CONSIDERATIONS

- Size of closed sheds – 15 M c/cX30M c/cX5.25 M (approximately)
- Clear height of the closed shed (between FFL & Bottom of truss/Structural member)-5.25M
- Columns shall spanning – 6.0M c/c long span & 5.0M c/c short span.
- All design work of sheds shall be of pressed steel sections. The bidder will submit structural stability certificate for the same.
- All Side cladding/roof sheets shall be fitted in such a way that they can be removed at any point of time.
- Sliding doors (4.00 M Width x 4.5 M Height) shall be provided at front entrance shed at center location. Suitable arrangement shall be made for easy operation of gates (gear operated).
- One man entry gate to be provided on at one side of each shed (front entrance by the side of sliding door).
- For Local site conditions, bidder to refer to enclosed write up (refer SCC).
- The bidder should submit a guarantee for 3 years of operations for the materials supplied and erected by him.

2.2.2 STRUCTURAL STEEL WORK

All materials for structural steel works have to be supplied by the contractor and necessary test certificates of the materials procured for this work has to be submitted for scrutiny. All fabrication and erection of structures must be executed according to the specification and drawings. Erection

of trusses is true to line and level and aligned properly, as per drawing and instruction of Engineer-In-charge.

- Structural/steel members will have 1 coat of Zinc Chromate primer (surface preparation of the section as per the standards to suit the climatic conditions) followed by 2 coats of synthetic enamel paint, if not pre coated. The roof truss should have bolted joints at crown and at both ends.
- All accessories like G.I. bolts, washers and nuts complete from reputed manufacturer shall be included in the scope. All bolts, nuts (IS 4759) shall be galvanized (hot dip) min. 270 gm/m^2. Galvanized spring/plain washer shall be as per IS 1573.
- Since these are detachable sheds & to be in repetitive use at other locations, proper marking (permanent) shall be so designed that it can be dismantled at any time and may be transported to be re-erected at other location.
- Roof and side cladding with Galvalume Sheet confirming to ASTM A 792 of thickness 0.47 mm with zinc coating not less than 150gm/Sq.m (both side mass) of 550Mpa (min) of approved make. Translucent (Poly Carbonate) sheet of approved make shall be provided for alternative bays (10% of the sheeting area). Both roof and side cladding are to be made "Water Tight".
- Purlins for walls & roof Cladding shall be made up-up with pressed steel.
- Providing ventilators 900 mm (W)x 600mm (H) – 16 nos should be at a height of 4.5m from FFL, made of suitable Aluminum section with wired glass open-able type.
- Store In-charge room shall be of 50 mm Thick PUF insulated sand witch panels. These panels are to be made out of 0.47 thick colour coated G.I. Sheet as exterior on both sides with PU Foam of density 38 Kg/Cu.Mtr. and tensile strength of 4 kg/Sq.Cm inside. Compressive strength (10% deformation) 2.1 Kg/Sq. Cm. Thermal Conductivity at 10 Deg 0.02 W/M Deg K Temparatue Range – 80 Deg C to + 100 Deg C The PU Foam thickness is 60 mm.
- False Ceiling shall be provided with sandwich panels of thickness 30mm thick.
- 1nos. table of 1200mm width X 600 mm depth X 750mm height consisting 3 drawer unit left side, should also have CPU & keyboard provision (table in beech/black colour0, 1nos executive chair (Width -70.0 Cm, Depth-70 Cm, Height-84.0 Cm-96.5Cm Seat Hight-46.5-59.0CM)&3nos visitor chairs of approved make shall be provided.
- 1nos. file cabinet consisting 4 drawers of size 470mm width X 1320 mm height X 620mm depth and 1nos. single side steel file/book rake consisting of 3 rakes of size 900mm width X 1850 mm heightX316mm depth shall be provided.
- Suitable long span shelve system shall be provided throughout the length of both opposite longitudinal spans of closed sheds. It should have two shelves with on shorter top & one wider middle rack at height of 600 mm from floor adding to a total height of 1200mm. The shelves shall be design to with stand SKU loading (125Kg/Sq.m) with suitable angle section. The width of top shelf shall be of 600mm & intermediate/middle shelf is 750mm.

2.3 SITE MESS,CONFERENCE HALL/TOILET & OPEN STORAGE AREA

- The entire site development works, viz. leveling, grading, access way(two layers of WBM), development of open storage yard with 200mm thick compacted murrum, concrete base/foundation preparation for installation of Porta cabins, barbed wire fencing(1.8m. high, angle iron posts & minimum 5 layers of barbed wires) with gates of site and storage areas, laying of water distribution network, soak pit, installation of water storage tanks, etc. for the site office area allotted to BHEL are in the scope of the contractor.

- A meeting cum mess room of approximate size 15.0m.(L) x 6.0m.(W)x 3.0 m.(Ht.) is to be constructed in the extended portion of the closed store shed for BHEL's office for meeting, pantry, toilet, etc. A toilet block having WC & urinal facilities with wash basin and another Kicthen & dining hall is to be constructed in one portion of the store building.. These areas will have separate access and will cater to the daily need of the BHEL site staffs.

Indicative drawing with Bill of quantities for various miscellaneous items to be provided/ executed by the contractor are attached as Annexure 44 & Annexure 45 respectively.

NOTE:

THIS ABOVE REFERRED DRAWING & BILL OF QUANTITIES FOR SITE DEVELOPMENT IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. THE DRAWING & BILL OF QUANTITIES ARE SUBJECT TO CHANGE DEPENDING UPON THE EXACT LAND PROVIDED BY THE CUSTOMER. THE CONTRACTOR WILL BE REQUIRED TO CARRY OUT THE WORK AS PER THE REVISED LAYOUT & BILL OF QUANTITIES IN SUCH CASE WITHOUT ANY EXTRA PAYMENT.

3.0 PORTABLE CABIN

3.1 Supply of 2 No's of brand new Portable Cabins (Size: 20 ft X 10 ft X 8.0 ft) on hiring basis for 20 months for BHEL's site office use. If Project schedule is extended, BHEL reserves the right to extend the hiring period for another 6 months at the same rates, terms and conditions.
Amenities to be included in each Cabin are given below
Furniture and Fixtures suitable for 6 members

- Executive Table with Side Table - 01 no.
- Executive Revolving Chair - 01 no.
- Visitor Revolving chair - 03 nos.
- Office Table - 05 nos.
- Office Revolving Chair - 05 nos.
- Wall mounted cabinet - 05 nos.
- Window Air Conditioner 1.5 ton - 02 no.
- White board of size 750x1000mm - 01 no.
- Perforated Board of size 750x1000mm - 01 no.

Interior cum Insulation

- Insulated walls with Pre-Laminated Sheet
- Ceiling : Glass Wool Covered with Pre-Laminated Sheet
- Flooring : Cement fiber sheet with PVC vinyl carpet

Other accessories:

- Tube Lights-4, Wall mounted Fans-5,LAN Points-6, TELE Point-1, External Light-1 Aluminum sliding windows, 15 Amp Switch-2, 5 Amp Switch-4,Electrical switch board-1
- Insulated paneling Doors, Safety Grills for all windows, Vertical Blinds For all Windows
- Weather sheds for all door and windows, Partition(laminated sheet both sides) with internal Door facility, Corrosion free and fire proof paints

Maintenance:

- During hiring period, maintenance of the Porta cabin and accessories shall be in the scope of bidder.

Note:

- Supply, transportation & installation of Porta cabins to the worksite shall be in the scope of bidder.
- Removal of Porta cabins from the work site & transportation after completion of all the activities of E&C related to this project shall be in the scope of bidder. Porta Cabins shall remain the property of the supplier after the completion of the hiring period.
- Power Cable (approx. 50m of length) shall be in the scope of bidder.

4.0 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

4.1
Contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc from the storage yard/stores/sheds of BHEL/ client. The Contractor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the Contractor, in appropriate manner as per BHEL's instructions.

4.2
The contractor shall return all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost of parts/materials used in excess or misused, with departmental charges.

4.3
Transportation of lube oil, Chemicals, Gas cylinders etc. from stores, is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores.

TEST TAPPING POINTS

Installation and welding of Tapping Points for taking performance test measurements shall be carried out by the contractor as part of this work for the equipments covered under this tender specification under the guidance of BHEL engineer. The scope will be limited to all the tapping points for which materials are available and their locations identified within the regular contract period and extensions thereof.

4.4
All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.

4.5
All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established up to National Physical Laboratory.

4.6
Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis.

5.0 PREPARATION OF FOUNDATION

5.1

Buildings, foundations and other necessary civil works for supporting structures, equipments etc, will be provided by the customer. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits and also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations up to 25mm for achieving proper levels will be within the scope of work/specification.

5.2

All minor foundations and anchor points required for installing erection equipments like winches, anchors etc. are to be cast by the contractor.

5.3

Grouting of equipments is included in the scope of contractor. All the materials required for grouting including special cements like PAGEL, CONBEXTRA- GP2, SHRINKOMB or its equivalent grade free flow cement as approved by BHEL and other materials like Portland cement, sand, gravel etc., are to be arranged by the contractor within the quoted rate. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.

5.3.1

Contractor shall arrange the required nos. of mixing machines and vibrators at their cost for carrying out the grouting operation. All the materials like cement and cleaning consumables shall also be arranged by the contractor at his cost.

12.3.2

The certificates of the grout is to be submitted BHEL. If necessary test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.

The approximate Quantity of grouting cement required for each unit is 10T

5.3.3

Cleaning of the foundation surfaces, pocket holes, anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods will be within the scope of this work.

5.4

BHEL will provide only shims and packer plates (either machined or plain), which are received from BHEL's manufacturing plants and go as permanent part of the equipment. Additional packer plates and shims if required will have to be prepared by the contractor out of steel plates, steel sheets to meet site requirements. Necessary steel plates for this purpose will be provided by BHEL free of cost.

5.5
The contractor shall carry out scrapping and matching of embedded plates, permanent spacers and all the matching parts of turbine, generator, pumps and other equipments under scope wherever required. The support and sole plates matching and concrete surface bedding is also covered in the scope of work. The fine dressing of concrete shall be with Prussian blue-match checks.

5.6
Packer plates shall not only be blue matched with foundations but also inter-packer contact surfaces, contact surfaces between packer and pedestals, contact surface between packer and foundation frame etc. shall also be blue matched and required percentage contact shall be achieved by chipping and scrapping as per engineer's instructions.

6 : Erection

The scope of the erection works will comprise of but not limited to the following:
(All the works mentioned hereunder and covered under the scope of work shall be carried out within the accepted rate unless otherwise specified.)

6.1
The work to be carried out at quoted / accepted rates by the contractor under the scope of these specification covers the complete work of handling, loading at stores, transporting to site of erection, inspection, preparation of foundation, erection, leveling, centering, alignment, grouting& final alignment of Steam turbine, Turbo Generator and auxiliaries, preassembly, erection, alignment welding, NDT, fixing hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing, &steam blowing of Piping, Water cooling system, Preassembly, erection welding, NDT of water cooled Condensers, feed water storage tank, de-aerator, LP / HP heaters, GSC & other coolers, flash tanks etc., erection and commissioning of Turbine driven and Motor Driven Boiler feed pumps, Motor driven Condensate Extraction Pumps, surface finish, Supply & application of primer & finish paints inclusive of Anti corrosive epoxy resin based, steam wash paints including labeling, on equipment,& piping, pre-commissioning, commissioning, trial operation & handing over.

6.2
Brief list of equipment / sub-assemblies to be erected by the contractor &approximate weight and size of individual heavy components are given under the Part-I, Chapter-IX, Annexure-I (Bill of quantity) and is meant for giving general idea to the tender only about magnitude of the work involved. The components are sent in parts for convenient transportation. They are to be cleaned, assembled in stage by stage, fastened / welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers**. The bidders may note that lifting, shifting & placing/erection of Generator Assemblies have to be done only by Strand Jack method for which the detailed specifications are provided in in Part-II, chapter VII of TCC**

6.3
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.

6.4
All the works such as cleaning, leveling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer‘s instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rate.

6.5
Contractor shall erect all the equipments as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineers 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 STG set in other places.

6.6
All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include Scaffolding and rigging operations Flame / electric cutting, grinding, welding, radiography and stress relieving. Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, cleaning, checking, leveling, blue matching, aligning and assembly. Surface grinding, drilling, doweling, shaping Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication

6.7
Bolt stretching fixtures for TG anchor bolts are to be arranged by the contractor.

6.8
Auxiliary Oil Pump / Jacking Oil Pump / Emergency Oil Pump etc., and their motors will be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.

6.9
Sand / Grit / shot blasting of condenser / turbine components / piping is to be carried out by the contractor wherever necessary as instructed by BHEL Engineer. Contractor has to arrange Sand / Grit / shot blasting machine, compressor required consumables, etc. at his cost.

6.10
The contractor shall also carry out erection, testing, and commissioning of the oil centrifuge within their quoted rate.

6.11
Generator Assembly will be transported from Hyderabad works to site on special wagon / Trailer. This will be received at site nearer to the lifting point of Portal Gantry Crane (near 'A' row). Unloading of Generator Assembly from wagon / trailer, assembling the terminal box & cooler housing and placing in position is in the scope of this specification. The Generator Assembly placement on TG Deck is planned by Strand Jack.

6.12
Contractor to provide suitable Crane for lifting and placement of De-aerator and FST from area / place near to TG Building to place them at suitable location / elevation of equipment foundation depending upon accessibility and approachability of crane. Individual sections of Deaerator / FST are to be lifted to de-aerator floor and to be assembled and / erected / welded at de-aerator floor. Deaerator including all loose items, valves, stand pipes, root valves, fittings are included in the scope of contract. Drawing-GA of spray cum tray deaerator is enclosed. Contractor shall also arrange other T&P as required for installation of De-aerator and Feed water Storage Tank (FST). Contractor shall plan his activities so as to carry out the work in a minimum possible time period. In case of any accessibility and approachability limitations of crane to place the FST and Deaerator on required foundation, the contractor shall make necessary arrangement temporary platform / approach including providing the materials as per requirement as part of scope of work. The erection, alignment & welded in position and Welding, NDT & heat treatment shall be carried out by the contractor with in quoted rate.

6.13
The feed water storage tank will be supplied in different sections with feed pipe, heating steam header, spray nozzles, supports etc., in loose components. These are to be erected, aligned & welded in position. Welding, NDT & heat treatment if required shall be carried out by the contractor within quoted rate.

6.14
Erection of platform and supporting structures around feed water storage tank / De-aerator / equipments / valves / filters etc. is covered in the scope of contract and shall be erected by the contractor within the quoted rate.

6.15
Erection, testing & commissioning of BFP & BP along with mechanical seal, end chambers cooling lines, lube oil & working oil lines are also included in the scope of contractor.

6.16
BFP, BP & its auxiliaries will be supplied in parts consists of lube oil console, oil pumps, gear box, couplings, coolers etc., which are to be assembled at site and erected.

6.17
The condenser will be supplied in components / parts and contractor shall have to carry out assembly and erect on the condenser foundation. This includes complete fabrication of shell out of steel plates, welding of hot well with bottom plates, assembly of water chambers and welding with side walls, bottom plates and dome wall, assembly of water chambers, assembly of support plates, baffles and stiffening structures etc.. While carrying out the assembly stitch welding shall be done only after the due approval for alignment from BHEL Engineer. Final welding shall have to be carried out by step back seam method to ensure minimum deformation within acceptable limits of the welding parts.

6.18
The condenser main tube plates will be dispatched to site from works with surface protection only for water box side. The same shall be removed suitably by sand/ grit / shot blasting or with steam mixed with caustic soda as per the instructions of the BHEL Engineer before erecting the same.

6.19
The contractor shall have to carry out the condenser tubes insertion and expansion at site after the installation of condenser on their foundation. Before insertion of tubes the contractor shall check for absence of any dents mechanical damages or any other defects of tubes caused during storage or transportation. Tube should be thoroughly internally cleaned of all extraneous matter. Only fine emery paper shall be used for cleaning the tubes at the ends where expansion has to be carried out.

6.20
Before insertion of tubes the contractor shall clean the surface of the holes in the tube plates and tube support plates for paint / corrosion spots, oxide scales etc., using chemical cleaning agent like carbon tetra chloride.

6.21

Condenser tube expansion to be carried out by contractor's experienced operators, as per the erection procedure / BHEL engineer's instruction.

6.22
The tube shall be inserted such that it shall project 2 to 3 mm beyond the tube plate outer surface. The tube shall be expanded using an automatic electronic torque control tube expanding unit or pneumatic tube expander so as to get the % thinning of the tube walls and elongation of tube ends as recommended by the supplier / Drawing / Tube expansion procedure. The length of expansion in no case shall exceed a length of 70 to 80% of the tube plate thickness. Finally, proper trimming of the excess length of the tube shall be carried out and flare-up / bell mouthing has to be done by the contractor at his cost.

6.23
The contractor shall carry out the condenser neck welding with Turbine casing. It shall be ensured that all spring supports are evenly loaded and the gap between the condenser and the different spring supports is within 1.0 mm. The clearance between the condenser neck and the exhaust hood should be within 3 mm by suitably lifting the condenser. Machined packers of suitable thickness are to be used under the spring supports and condenser load is to be gradually transferred on these packers. The neck welding shall be subjected to non-destructive testing.

6.24
The hydrostatic testing of steam space with the condenser vacuum system and hydraulic testing of water space with the circulating water (CW) lines after assembly of water boxes are also included in the scope of the contractor. Dummies are to be provided by the contractor at inlet and outlet for Hydraulic Test. Required MS plates shall be supplied by BHEL free of cost. Fabrication of dummies shall be done by the contractor at his cost.

6.25
Water boxes inside Carbon steel surfaces are to be Sand / Grit / shot blasted before hydraulic testing. After hydraulic testing water boxes and the water chambers of Circulating water side, they are to be thoroughly cleaned for removal of all traces of dirt, grease, oil, rust etc., it shall be dry and free from burns and shall have a metallic surface. The (Sand / Grit / shot) Blasting machine and accessories and also the required consumables shall be arranged by the contractor within the quoted rate.

6.26
Handling equipment & Structures for Condenser and associated equipments and auxiliaries shall be erected by the contractor within the quoted rate.

6.27
One no LP Heater is to be erected inside the condenser in rear side, for which contractor has to cut open the condenser dome plate already erected. After erection, condenser plates have to be strengthened / stiffened as per the instruction of BHEL Engineer.

6.28
The foundation of all equipment shall be checked, before placing the respective equipment on the foundation.

6.29

The contractor shall carryout the erection of Rubber /Steel expansion bellows, stretching bolt assembly and connected joints within the quoted rate.

6.30
All the weld seams shall be properly ground and subjected to examination. If any paint or rust (other than steam washable paints) noted in the steam side of the condenser parts, these are to be removed either by sand / shot / Grit blasting or buffing method.

6.31
All the weld seams shall be properly ground and subjected to radiographic examination as per manufacturer's recommendation. If any paint or rust (other than steam washable paints) noted in the steam side of the condenser parts, are to be removed either by Sand Grit / shot blasting or buffing method.

6.32
The Contractor shall carry out the reaming and honing of coupling holes with his own reamers, honing machine and honing accessories etc. at his own cost.

6.33
Erection of all the piping systems supplied along with turbine, generator, pumps and other auxiliaries covered in this contract, is to be erected by the contractor within the quoted rate.

6.34
Wherever pipes / bends / equipments are supplied in pre-fabricated / assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.

6.35
All the oil, steam piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.

6.36
All the lubricant oil for flushing and during trial run of the equipment including first fill up, chemicals for detergent flushing, acid pickling/cleaning/trail run etc., will be arranged by BHEL at free of cost. Required manpower shall be provided by the contractor for handling, filling, emptying and re-filling etc., as part of the work without any extra cost, till the unit is handed over. Transportation of all the above shall be arranged by the contractor from BHEL store / yard to work site and returning of the empty barrels / drums to stores at their cost. Care should be taken to avoid any spillage / wastage.

6.37
Normally weld neck valves will have prepared edges for welding. But, if it becomes necessary, the contractor shall prepare new edges, re-prepare the edges by grinding or chamfering to suit site conditions, which shall be done by the contractor at no extra cost.

6.38
All fittings like elbows, tees, reducers, weld neck flanges, inserts etc., shall be matched with pipes for welding which may require re-edge preparation, grinding etc., No extra cost shall be paid for this.

6.39

The valves will have to be cleaned, checked, lapped or overhauled in full or in parts before erection, after chemical cleaning, during commissioning. Any special tools required for lapping only will be arranged by BHEL.

6.40
All piping items including pipes, bends, tees, elbow, mitre bends, reducers, flanges, fittings, thruster blocks etc. shall be supplied as Pre-fabricated spool pieces for sizes above 2" (except for GI piping). However around 5% of piping items to be considered as non- prefab, minor length adjustments in the spool pieces for sizes 2" and above, etc. shall be included in the contractor's scope within the quoted rate.

6.41
For pipes nominal size 2" and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above size if the routing is shown in layout sit is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site engineer's advice.

6.42
Contractor should fabricate bends of ≤ 2" diameter size from running meters of pipe.

6.43
Wherever elbows of 45° deg or any other angle are required, the same shall be cut from 90° deg. Elbow supplied and used. No extra cost shall be paid.

6.44
All the drain lines should have sufficient slope towards drain. Slope of 1 : 500 shall be maintained towards drain point unless otherwise specified. Expansion loops shall be provided in all the vents and drains as per the drawings.

6.45
All the integral lube and control oil pipelines required TIG welding operations. Purging is required in case integral lube and control oil pipelines are of stainless steel material. The tubes / pipes are to be purged with Nitrogen Gas / Argon Gas for the purpose of creating inert atmosphere in the pipelines during the process of TIG welding. Nitrogen, Argon gas required for this purpose shall have to be arranged by the contractor at his cost.

6.46
Carrying out erection of 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, welding, 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.

6.47
Adjustment 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 NDT, heat treatment procedure shall be carried out by the contractor within the quoted rate.

6.48
Certain adjustments in length may be necessary while erecting pipelines / steel members. Removing / adding extra lengths to suit the final layout, preparing edges afresh and adopting specified NDT, heat treatment procedure are in the scope of work.

6.49
All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. Pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.

6.50
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 subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., by gouging/ grinding and not by hammering. 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 sub surface cracks in these ground areas.

6.51
All the weld joints on equipments and piping shall be ground or filed on completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,

6.52
Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.

6.53
Flame cutting of piping or any other equipments shall be strictly done as per BHEL Engineer‘s instructions and clearance only.

6.54
The work on piping systems (air, water, oil, steam, gas etc.,) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc., welded on the lines, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and / or as per approved drawings / documents.

6.55
Flow nozzles, orifice, spray nozzles etc., forming part of the system (under this scope of work) irrespective of the supplier shall be mounted / erected after chemical cleaning and / or steam blowing and / oil flushing at site at no extra cost.

6.56
The instrumentations other than an assembled part of the equipments / items are not included in the scope of this works and shall be carried out by other contractors. The fixing and assembly of the thermocouples for IP Turbine including assembly of junction box as per drawing is also in the scope within the quoted rate.

6.57
Certain instruments like pressure switches, gauges, air filters, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismantle such instruments and re erect whenever required prior to commissioning. Sometime this may have to be handed over to store or instrumentation contractor.

6.58
The dampers, actuators etc. will have to be cleaned, checked and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as maybe necessary.

6.59
Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting from BHEL / Customer stores, transport to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.

6.60
Erection of all the piping systems supplied along with equipments, pumps and other auxiliaries covered in this contract is to be erected by the contractor within the quoted rate.

6.61
All piping 2" and above will be supplied as pre-fabricated spools, contractor has to cut and edge prepare as per the standards / drawings and as per the instruction of BHEL Engineer within the quoted rate.

6.62
Contractor shall also weld small length of piping with root valve to the pressure, temperature, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

6.63
All drains / vents / relief / escape / safety valve piping to various tanks / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.

6.64
Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc., shall be carried out at site by contractor within the quoted rate.

6.65
Tubes or pipes wherever deemed to be convenient will be sent in standard length and will be cut to suit the site conditions and the layouts. Bends less than or equal to NB 65 mm will have to be fabricated at site adopting specified NDT, heat treatment procedures, wherever required at no extra cost.

6.66
All site-fabricated pipes will be issued in running meters as straight. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing.

6.67
For all the site routed piping, as built drawings are to be submitted by the contractor immediately after erection.

6.68
Fine fittings, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. In case any minor modifications are required in these pipelines after completion to meet the system requirements, the same shall be carried out by the contractor within the quoted rate.

6.69
The contractor shall fabricate piping, install lube oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system; carry out the hydraulic test of oil coolers. etc.,

6.70
All the attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing. Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.

6.71
In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.

6.72
For any mismatch while matching the joints in tubes, the cutting, preparing edges afresh, re-welding, addition of spool pieces, adopting specified NDT, heat treatment procedure should be done by the contractor to match site conditions without any extra payment.

6.73
The surface of the pipes to be joined shall be suitably prepared as per instructions of BHEL Engineers. Edge preparation shall be done by chamfering machine, whenever required and all welding surfaces must be cleaned thoroughly.

6.74

Instrumentation drains, stubs which are sent in loose from manufacturing units are to be welded at site as per BHEL Engineer's instructions.

6.75
Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.

6.76
Contractor has to fabricate and erect temporary spool pieces wherever required due to non-receipt of valves in time and after receipt of valves the spool pieces are to be replaced with regular valves at no extra charges to BHEL. For spool pieces materials will be supplied free of cost by BHEL.

6.77
All the valve packing with asbestos base to be lubricated once in 6 months till handing over. Tightening of Stuffing box prior to pre – commissioning is in scope of Contractor. Contractor to check every valves for proper tightness of stuffing box and ensure no leakage from this area as well.

6.78
Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive within the quoted / accepted rate / price.

6.79
In the case of structural members / pipes, plates etc, in certain cases, or in small bore piping for integral cooling water or lubrication system, etc., the raw material will be supplied in random lengths and the contractor will have to make up the length/prepare the edges to suit the matching profiles, weld/bolt connect the joints at no extra cost.

6.80
Permanent Operating / Approach platforms, cross over, canopies, ladders etc., shall have to be fabricated from raw materials supplied by BHEL at free of cost and are to be erected as per instruction of BHEL, by the contractor within the quoted rate / price.

6.81
Additional platforms for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be assembled and erected by contractor. The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement within the quoted rate / price.

6.82
Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., to be provided on the components/ equipments/ pipelines erected by the contractor shall be carried out by the contractor, as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, the items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package.

6.83

All the dampers, valves, lifting equipments, actuators / power cylinders, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during precommissioning.

6.84
All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection by the contractor. If in the opinion of BHEL Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor within the quoted rate.

6.85
All the shafts of rotating equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment.

6.86
All the equipments / material to be taken inside the plant building shall be cleaned thoroughly before taking them inside for erection.

6.87
The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints assembly and other components as per instruction of BHEL Engineer during erection.

6.88
All the bearings, Gearboxes etc., of the equipment and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing / gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing / lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.

6.89
All the motors / pumps shall be stripped opened, thoroughly serviced with proper care and re-assembled properly before erection by the contractor. During servicing, pre-commissioning & commissioning, if any deficiency is observed the same should be taken up with BHEL Engineer at site and rectified at site without any delay.

6.90
For skid mounted equipment, dismantling if any, for the convenience of erection / commissioning, checking and re-alignment required at site is in the scope of work.

6.91
Assistance for calibrating / testing the power cylinders/ actuators / valves, gauges, instruments, etc. and setting to actuators / gauges/ instruments shall be provided by contractor within the quoted rates. 1.13.93 Fixing / fitting / welding of thermo wells, stubs, hoses, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification.

6.92
The contractor shall also weld all thermo wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermo wells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermo wells and flow elements with branch pipes be installed and welded.

6.93
Wherever hanger and support materials of piping are not received from manufacturing unit in time, to suit the erection schedule contractor shall erect the piping system on temporary supports to ensure the progress of work. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports. The above work is within the scope of this contract.

6.94
Suspension for pressure parts, piping etc., will be supplied in running lengths and shall be cut to suitable sizes and adjusted as required. Hangers'components which are being supplied in loose shall be assembled at site and erected as part of the work.

6.95
Spring suspensions / constant load hangers have to be preassembled and adjusted for the required loading and erected as per instructions, of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers, etc., have to be carried out as and when required.

6.96
All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain are reliable and complete installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).

6.97
For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold / hot values and locking etc.

6.98
Normally, the machine profile will be cut for the structural members but the contractor will have to carry out suitable alterations / adjustments at site, without any extra payment, in case it becomes necessary. Also, it may sometimes be necessary to remove some of the erected members to facilitate erection of bigger pre assembled equipments. In such case, the removal and re-erection of such members which are essential and if so agreed by the BHEL Engineer will have to be done by the contractor without any extra payment.

13.99
All attachment welding including those for insulation and refractory work coming on the pressure parts shall be done by the contractor. The hooks are suitable for stud welding machines. Contractor's quoted rate shall include all these contingencies. Attachment welding on pressure parts shall be done by qualified and certified welders only.

6.100
Certain extra lengths of portions / parts of various site fabricated components / parts / bellows / piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout. Certain small length of portions / components / bellows / piping casing etc., may have to be added to suit conditions and layouts. Preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work. No extra payment will be admitted for such works.

6.101
All instrumentation impulse lines from equipment / component / pipings upto root valves shall also be erected and welded by TIG welding only by the contractor within their quoted value. The required piping and root valves will be supplied by BHEL free of cost.

6.102
The HT motor bearings shall be blue matched at site and checked for bearing clearance. Scrapping of bearing housing, if required to any extent shall be carried out by the contractor. No extra claim for blue matching of any two surfaces will be entertained. The HT motors will also be checked for air gap and adjustment stator / rotor to magnetic center shall be carried out as part of erection.

6.103
The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.

13.104
HSFG (High Strength Friction Grip) Bolts are to be tightened by turn of nut method / Torque Wrench, as per the instruction of BHEL Engineer. The bolted joints shall be jointly checked by BHEL / Customer personnel for the required tightness and retightened wherever necessary. The tightened bolts shall be identified by color paints. Facility for random checking with calibrated Torque Wrench shall also be provided by contractor.

6.105
The temporary structures / items welded to permanent members / pipes, temporary lugs / structures meant for transportation are to be cut and removed without any damage. In case of any damage, the same has to be made good by the contractor at his cost.

6.106
Contractor has to arrange required fire retardant covering material at their cost to protect the machined components / assembled parts drawn from BHEL before and after erection.

6.107
The contractor shall provide any fixtures, concrete blocks / wooden sleepers, steel structures etc., which are required for temporary supporting for checking / welding / lifting / handling / preassembly of the components at site.

6.108
Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be attended as per directions of BHEL engineer.

13.109
Before lifting the heavy components, soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the winch.

6.110
The end caps provided at shop for various stubs are to be removed during final fit up only.

6.111
For other agencies, such as cabling, instrumentation, insulation, civil works etc., to commence their work from / on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

6.112
The contractor shall conduct non-destructive tests like Radiography, Ultrasonic, Dye penetrant, Magnetic particle tests, etc. on welds, castings, valve bodies & other equipments etc. and Ultrasonic test for finding thickness of materials as per BHEL Engineer's instructions.

6.113
The contractor has to fabricate stainless steel orifice plate within the quoted rate. No extra payment will be made for fabrication of above orifice plates. The required stainless steel plate will be supplied by BHEL.

6.114
All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.

6.115
It is the responsibility of the contractor to do the alignment, checking, etc. if necessary, repeatedly to satisfy BHEL Engineer / Customer Engineers with all the necessary tools and tackles, manpower etc. without any extra cost. The alignment will be completed only when jointly certified so, by the BHEL Engineer & Customer. Also the contractor should ensure that the alignment is not disturbed afterwards.

6.116
Some of the packages may be sent in parts to suit the site condition / transportation, the same is to be assembled at site without any extra cost. Likewise, the package may be assembled together and sent as a single assembly. Contractor may have to dismantle and erect (or) erect as single assembly as per the instruction of BHEL Engineers within the quoted rates / prices.

6.117
The Contractor shall also submit to the Owner for approval a list of construction equipment, erection tools, tackle, etc., prior to commencement of site activities. These tools and tackle shall not be removed from site without written permission of the Owner.

6.118

The works under execution shall be open to inspection and supervision by the Owner at all times. The Contractor shall give reasonable notice to the Owner before covering up or otherwise placing beyond the reach of inspection any work in order that same may be verified, if so desired by the Owner.

6.119
It is responsibility of the Contractor to do the alignment, etc., if necessary, repeatedly to satisfy Owner, with all the necessary tools and tackles, manpower, etc. The alignment will be complete only when jointly certified by the Contractor's Owner and Owner. The Contractor should also ensure that the alignment is not disturbed afterward.

6.120
All combustible waste and rubbish shall be collected and removed from the worksite at least once each day. Use of undercoated canvas paper, corrugated paper, fabricated carton, and plastic or other flammable materials shall be restricted to the minimum and promptly removed.

6.121
The Contractor shall provide adequate number of fire protection equipment of the required types for its stores, office, temporary structures, labor colony, etc. Personnel trained for fire-fighting shall be made available by the Contractor on site during the entire period of the Contract.

6.122
All workers of the Contractor working in construction site shall wear safety helmets, safety boots, and safety belts. The Contractor shall take appropriate insurance cover against accidents for its workers as well as third parties.

7.0 LIFTING, SHIFTING & PLACEMENT OF GENERATOR ASSEMBLY ON FOUNDATION BY BY STRAND JACK METHOD

7.1 SCOPE OF WORK

The intent of this specification is to provide on turn-key basis complete design, development of scheme, works & services of fabrication at shop and site as may be required, erection/ installation/ rigging of all temporary structures along with all lifting & shifting equipments (e.g. hydraulic & telescopic lifting & shifting system, strand jacks, power packs with centralised control system, modular structural towers , lifting beams, high capacity wire rope slings, steel plates rolled section for on-site fabrication etc. as may be necessary), all Tools & Plants (e.g. cranes for site handling/ erection /dismantling, welding machines, gas cutting sets, slings, D-shackles, wire ropes, etc), and all manpower requirement i.e. technical and supervisory, skilled, semiskilled, & unskilled manpower for handling, lifting, shifting, lowering and placement of Generator Stator on its specified foundations included but not limited to following:

- Design of the Jacking System
- Supply of Jacking System and its accessories
- All necessary consumables, excluding fuel and or LT Power for the equipments.
- Fuel for the Power Packs
- Provision of all necessary supervision to oversee lifting, operating & dismantling the bidder's equipments.
- Communication system for the jacking operations.
- Manufacturers test certificates for each coil of strand
- Procedure & Write Up for lifting of Generator Stator from start to Finish.

7.2 Details of Equipment to be lifted:-

Sl No.	Description	Approx. Weight	Aprrox. Dimensions	Approx. CL Elevation of Stator	Likely Lifting Schedule at site
7.2.1 RIL HMD Hazira (4x 93.1 MW)					
1	Generator Assembly Unit# 1	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Nov'14
2	Generator Assembly Unit# 2	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Dec'14
3	Generator Assembly Unit# 3	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Jan'15
4	Generator Assembly Unit# 4	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Feb'14

Chapter-VII Lifting, Shifting & Placement Of Generator Assembly On Foundation By By Strand Jack Method

7.3 Preparatory Civil works

(a) The civil foundations for installation of lifting and shifting arrangements of Strand & Jack system shall be provided by BHEL. Foundation details for Strand Jack tower footings along with load details of Strand jack system on foundations & co-ordinates of the lifting and shifting arrangement will be provided by the contractor well in advance as per requirement of BHEL. (The location of foundation for Strand Jack shall be provided by the bidder). Design of the foundation will be done by BHEL. Inserts for Strand Jack arrangement on TG Deck will be provided by BHEL. Supply of foundation bolts shall be in the scope of contractor.

(b) All other requirement of foundation and other civil works are to be arranged by the contractor on his own within the quoted rates.

(c) GA and Layout drawings of various equipments of the Power Plant are provided as part of tender document for information of bidders.

7.4. LIFTING, SHIFTING & PLACEMENT OF GENERATOR ASSEMBLY ON ITS FOUNDATION:

(a) The Generator Assembly has to be lifted directly from the transport carrier or from the trailor or from stools /supports & placed on specified foundation. In case packer/ distance piece are required to be provided between the Generator Assembly and the foundation, these will be made available by BHEL to the contractor.

(b) Alignment, Leveling, Bolting & grouting of the Gen. Assembly on their foundations is not included in Contractor scope. However while placing the Generator Assembly on its foundation, this has to be suitably maneuvered to ensure placement in rough alignment with axes and elevation in line with tender conditions.

(c) The Generator Assembly is to be lifted by using lugs/ lifting facility provided specifically for the purpose of lifting /handling on the equipments. No other mode of tying/jacking over the body of Generator Stator is possible/ allowed for lifting/ shifting/lowering purposes.

(d) In any case dragging of Generator Assembly will not be allowed.

(e) Generator Assembly lifting will be done from the service bay.
Generator Assembly has to be lifted directly from the transport carrier and placed on designated foundation. In case if generator assembly arrives before arrival / readiness of Strand jack system by contractor, BHEL will unload the assembly at the specified position. Contractor shall depute their representative at site at the time of unloading to finalize the suitable position of unloading.

(f) Contractor shall provide swivel arrangement for rotation of Generator Assembly where ever rotation is required.

7.5 Providing temporary structures, access platforms, ladders etc. as required including necessary steels, others materials, consumables, fabrication and erection there of and dismantling after completion of work is part of contractor's scope.

7.6 Contractor should arrange for adequate stock of spares for the entire system so as to ensure continuation of work with least disruption in case of any failures/ faults encountered during operation. Such disruptions/ hold ups should not pose any danger to the safety of equipments being handled. However for erection purpose, power source will be provided by BHEL.

7.7 Before deployment on the job, contractor has to furnish the load test certificates, including overload test certificates as applicable, of all the lifting equipment, wire rope (strand), and material test certificate for the steel being used in the system. Contractor should also submit certificate towards Design adequacy and other safety clearances as applicable.

7.8 After completion of work, contractor shall dismantle the total installation (excluding foundations made for this purpose as specified in foregoing para) and clear the premises of all debris scrap etc and take back all the equipments.

7.9 Contractor shall be solely responsible for watch and ward of his equipment, including while in storage as the case may be.

7.10 Way bills / Entry Permits for movement of Strand Jack Equipment are to be discussed later.

7.11 DRAWINGS AND DOCUMENTS

7.11.1
The technical details and drawing of the Generator Assembly given in this tender specification are only for guidance and only indicative of the requirement. The contractor shall take note of all the aspects of technical details furnished while arranging the required equipments/ materials/services as the case may be.

7.11.2
The detailed drawings, specifications available with BHEL engineers will also form part of this tender specification. Revision of drawings/documents may take place due to various considerations as is normal in such large project. Work will have to be carried out as per revised drawings/ documents. These documents will be made available to the contractor during execution of work at site.

7.11.3
One set of necessary drawings/documents to carry out the erection work will be furnished to the contractor by BHEL.

7.11.4
If any error or ambiguity is discovered in the specification/information contained in the documents/drawings and tender, the contractor shall forthwith bring the same to the notice of BHEL before submission of offer.

7.11.5
In case an ambiguity is detected after award of work, the same must be brought to the notice of BHEL before commencement of the work/activity. BHEL's interpretation in such cases will be final and binding on the contractor.

7.11.6

In case of discrepancy between quoted item rate and corresponding amount in the rate schedule, the quoted item rates shall be reckoned as correct and amount recalculated. Quoted item rates shall also prevail for arriving at the total price quoted for offer evaluation. Offers will evaluated on the total amount for the entire Rate Schedule and the work will be awarded without splitting the scope.

7.11.7

Bank Guarantees to be furnished by the contractor towards Security Deposit shall have a claim period of six months over and above the validity period required for the respective cases.

LIST OF DRAWINGS ATTACHED

- TG Equipment Layout Plan at 0.0M (Refer Ann. – 1)
- TG Hall Equipment Layout Plan at 13.0 M Level (Refer Ann. – 1)
- Plan showing tentative tower foundation arrangement for Generator Assembly lifting (Refer Ann.-1)
- Interface /Route plan for trailer movement at Hazira location(Refer Ann.-43)

8.0 **MATERIAL HANDLING & SITE STORAGE**

8.1
Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.

8.2
Contractor shall plan and transport equipments, components from storage yard to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.

8.3
The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

8.4
Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

8.5
Materials shall be stacked neatly, preserved and stored in the contractor‘s shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

8.6
Open ends of piping valves, pipes and tubes shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

8.7
The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting of the components at site.

8.8
The contractor shall deploy minimum two (2) persons continuously on daily basis for organizing, receiving the consignment, checking the complete list of material received with each consignment, entering into the receipt records, organizing for storage at the proper place, maintain the store records. These persons will provide all logistic support to the BHEL material management personnel. Besides these two persons, the contractor will be required to deploy continuously minimum three (3) more workers on daily basis for material handling functions. However, based on the instructions of the BHEL Engineer more manpower shall be deployed by the contractor as per the requirement for material handling functions.

9.0 HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS

9.1
Contractor shall carry out the following tests required to complete the erection and commissioning of the TG Set:

(1) Hydraulic testing of individual equipments like coolers, heaters, other auxiliaries, equipment's and piping. Required capacity Hydraulic test pump/Fill pump and other necessary arrangement shall be provided by contractor to carry out hydraulic testing. Chemical cleaning of the equipments and piping as part of scope of work under this tender specification.
(2) Ultrasonic test
(3) Dye Penetrant test
(4) Magnetic Particle Test.

All above facilities (men, materials, equipments, consumables etc) with operating engineer/experienced person and proper approach wherever required shall be provided by the contractor for satisfactory completion of the above tests.

9.2
Contractor shall lay all necessary temporary piping, welding, supports, install pumps, valves, pressure gauges, electric cables and switches etc, required for the Hydro test, Air leak test, Chemical cleaning, Steam blowing etc.. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting above tests will be done by the contractor. No separate payment shall be made for this purpose.

9.3
All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.

9.4
Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by contractor. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

9.5
Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

9.6
While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions. Blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some–times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same

as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor.

The contractor shall carry out any other tests as desired by BHEL engineers on erected equipment covered in the scope of this contract during testing and commissioning to demonstrate the satisfactory completion of any part or whole of work performed by the contractor.

10.0 PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING

10.1
Commissioning of the TG equipments with associated Aux. and other Equipments with auxiliaries shall involve the following tests and activities of the equipments erected:

(a) Trial run of Boiler Feed Pumps, CEP, Booster Pump, etc and other pumps/equipments like Misc. pumps etc. and other various rotating machineries / pumps as per tender specification.

(b) Trial run of motors/ drives for various auxiliaries.

(c) Hydraulic Test, Chemical Cleaning, Oil flushing of lube oil system, Jacking oil/Lifting oil, HP oil supply system, Governing oil system/Control oil system, Air cleaning/blowing of pipelines, closed systems, Tanks and Vessels.

(d) Flushing of all pipelines by air/oil/water/Chemicals/steam as the case may be.

(e) Servicing of all valves, Hydraulic Power cylinders, HP Valves (ESV), HP Control valves, QCNRV etc. and fittings.

(f) Manual/mechanical cleaning of Oil tanks, Suction Strainers / Filter elements of BFP, Booster Pump, Misc. Pumps, and other various equipments & tanks /vessels erected by the contractor. This may have to be repeated several times during the commissioning process.

(g) Chemical cleaning of piping systems, as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components gauges, instruments etc. as instructed by BHEL during this process.

(h) Putting turbine on barring gear.

(i) Rolling and synchronization.

(j) Full load operation.

(k) Trial operation

The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements.

10.2
Contractor shall lay temporary pipelines with fittings and accessories etc. as instructed by BHEL engineer for the purpose of pre-commissioning and commissioning activities like Hydraulic testing, chemical cleaning, oil flushing, steam blowing etc. of piping and other equipments as part of the scope of work. Temporary installations shall be dismantled by contractor and returned to BHEL stores as specified elsewhere in this T.S.

10.3
The contractor shall provide necessary assistance to facilitate/enable electrical and instrumentation testing and commissioning of equipments under this scope of work, to BHEL and their Testing & Commissioning agency.

10.4
The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor.

10.5
In case any malfunctioning and / or defect is found during tests / trial runs such as loose components, undue noise or vibrations, strain on connected equipments etc. The contractor shall immediately attend to these defects/ malfunctioning and take necessary corrective measures. If any readjustment and realignments are necessary, the same shall be done as per BHEL engineer's instructions, free of cost.

10.6
The cleaning of Lube oil tank etc. is in general by wire brush / abrasive paper etc. In case of tenacious rusting spots found if any, the same shall be cleaned thoroughly mechanically by buffing wheel etc. If manual / mechanical cleaning is not proper, the cleaning by sand blasting as per instructions of BHEL engineer before and after oil flushing is responsibility of contractor.

10.7
The contractor shall associate for initial and subsequent fillings of gas in generator gas system as and when required till unit is handed over to Customer.

10.8
The contractor shall carry out leak test of generator air cooling system to the satisfaction of BHEL engineer.

10.9
Replacing/changing mechanical/other seals of equipment, pumps etc. during commissioning stage is within the scope of work.

10.10
During the stages of commissioning, and till Unit is handed over, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to the contractor will be governed by relevant clauses of 'General Conditions of Contract'. The parts to be replaced shall however, be provided by BHEL free of cost.

10.11
During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned units are taken over by the customer.

10.12
In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, strain on connected equipment etc., The contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment or realignment is necessary, same shall be done as per BHEL engineer's instruction.

10.13
The pre-commissioning activities will start prior to Lube oil, HP Oil supply System, Governing/ Control oil flushing etc. of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need specialized gangs including electricians, Instrument Technicians, Fitters, in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required.

10.14
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, without any extra payment.

10.15
After the start of commercial operation of machine, commissioning activities will continue. It shall be the responsibility of contractor to provide following manpower along with supervisor as part of commissioning assistance for a period of three months per Unit.

1) Supervisor	2 Nos.
2) Pipe fitter/Millwright fitter	2 Nos.
3) Welder	2 Nos.
4) Rigger	2 Nos.
5) Electrician/instrument technician	1 No. each
6) Unskilled worker	6 Nos.

10.16
The above figures shows only minimum required over and above labour required for completing pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand.

10.17
It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL commissioning engineers.

10.18
During commissioning, opening of valves, changing of gaskets, checking, realigning of rotating and other equipment, attending to leakages in piping, tanks etc. and adjustments of erected equipment may arise. Valves shall be serviced and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions.

10.19
It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specifications, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

The scope of the work will comprise of but not limited to the following: (All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

11.1
The equipments and piping shall be erected in conformity with the standard / Indian Boiler Regulations / and as may be directed as per any other standard / specification in practice in BHEL. The method of welding (viz) MMAW, Gas, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions.

11.2
The technical particulars, specifications and other general details of work
shall be in accordance with ASME / IBR / BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.

11.3
The contractor shall conduct nondestructive tests like radiography ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc., on weld joints, castings, valve bodies and other equipments etc., as per BHEL Engineer's instructions.

11.4
Welding of pressure parts, piping & fittings (under IBR code) shall be done by certified high pressure welders who possess valid certificate of CIB of the State in which the equipment is erected as per provision of IBR. The H.P. welder who possesses necessary certificate shall ensure re-validation as per relevant provisions of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired shall not be utilized for high pressure works.

11.5
Welding of high tensile structural steel shall be done by “certified high pressure welders” who possess valid certificate and who are approved by BHEL Engineer.

11.6
All welders including tack welders, structural and high pressure welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification AND performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.

11.7
All charges towards testing of welders for destructive and non-destructive testing and approval of welders for engaging in the erection work shall be borne by the contractor.

11.8
All expenses for testing of contractor's welders (pre-production test) including destructive and Non-destructive tests conducted by BHEL or by the inspecting authority at site or at laboratory shall have to be borne by the contractor only. Limited quantity of tube and pipe material required for making test pieces will be supplied by BHEL free of cost and all testing facility shall be made available by the contractor.

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

11.9
BHEL Engineer is entitled to stop any welder from the work if his performance is unsatisfactory for any technical reason or if there is a high percentage of rejection in the joints welded by him. The welders having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.

11.10
The contractor shall carry out the root run welding of all Piping, valves by TIG welding method as specified in the Drawing / EWS. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall carry out purging the pipes with inert gas before and during welding.

11.11
All welded joints for temporary piping required for chemical cleaning and steam blowing should be got done by HP welders only. The root run should be done by TIG welding. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.

11.12
The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.

11.13
The thermostat and thermometer of electrode drying oven shall be also calibrated. All welders shall have electrodes drying portable oven at the work spot.

11.14
Pre -heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary are part of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer and as specified in Erection Welding Schedule, Welding, Heat Treatment & NDT manuals and Field Quality Plan. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

11.15
Preheating, post weld heating and stress relieving after welding are part of erectors work and shall be performed by the contractor in accordance with the instructions of BHEL Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the contractor shall have to arrange for labour, all heating elements thermocouples etc. insulating materials like mineral wool, asbestos, clothes, ceramic beads, asbestos ropes etc., required for heat treatment and stress relieving works.

11.16
Preheating, post weld heating and stress relieving after welding are part of erectors work and shall be performed by the contractor in accordance with the instructions of BHEL Engineer.

11.17
Oxy-acetylene flame heating or exo-thermic chemical heating for stress relieving is not permitted. Heating shall be by means of Electric Induction coil or Electric resistance coil. Potentiometric type recorders shall only be used for temperature recording purposes.

11.18
Contractor shall arrange all necessary heating and stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, compensating cables, thermo-chalks, temperature recorders, thermocouple attachment units, graph sheets, insulating materials like wools, asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress-relieving operations. The contractor should take a note of the following, Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL. All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost. The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of Stress Relieving operations.

11.19
The contractor shall also be equipped for carrying out other NDT like LPI / MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required also has to be arranged by the contractor.

11.20
All arrangements for carrying out radiography work including radiography source & equipments and consumables, dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies shall be submitted to BHEL Engineer and approval obtained before the actual deployment of agency for radiography work.

11.21
Contractor shall note that 100% radiography will be done at the initial stages on the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radiographed shall not be less than the requirement of BHEL welding schedule / specifications / drawings / Customer‘s requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. For LP Piping, as per site engineer‘s instructions, NDT method and other tests to be carried out.

11.22
Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including safety, labour, supervisors/ Engineer required for the work as per directions of BHEL.

11.23
The Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR, enclosed. However percentage radiography shown in the respective drawings shall be final and binding on the contractors.

11.24

Low speed high contrast fine grain films (D7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5. to 2.00 1.15.25 Penetrameter as per ASME / ISO shall be used for all exposures.

11.26
All radiographs shall be free from mechanical / chemical process marks to the extent that they shall not confuse the radiographic image and defect finding penetrameter as per ASME / SI shall be used for all exposures.

11.27
Lead numbers and letters (generally of 6mm size) are to be used for identification of radiographs. Contract No., joints identification, sources used, welders identification, SFD used are to be noted down in the paper cover of radiography. Lead intensifying screens for front and back of the film shall be used as per the instructions of BHEL Engineer.

11.28
The weld joint is to be marked with permanent mark A, B, C, etc. to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the downstream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.

11.29
The contractor shall be fully equipped with radiography equipments, films, chemicals and other dark room facilities. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor‘s radiographers shall also be registered with BARC for film badge service.

11.30
Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work.

11.31
If the contractor does not carry out radiography work in time due to nonavailability of film, chemicals etc. BHEL shall get the work done through some other agency at the risk and cost of the contractor.

11.32
All the radiographic films of joints radiographed at site in connection with work of this tender shall be properly preserved in air-conditioned rooms and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL/customer.

11.33
Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced immediately.

11.34
The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radiographed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.

11.35
Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radiographed and new film submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and reradiographed at contractor‘s cost.

11.36
Radiography work of the welds connected with this contract shall be arranged by the contractor including provisions of services of technicians and necessary equipment and consumables like Isotope camera, X-Ray films, chemicals and other dark room facilities etc. Also contractor has to provide necessary labour required such as Riggers, Helpers etc. to assist the technicians for carrying the above radiography work and making other arrangements. Such as providing scaffolding, approaches, platform lighting arrangements at his cost as per the instructions of BHEL. It may please be noted that invariably the radiography will be carried out after the normal working hours only.

11.37
Radiography inspection of welds shall be performed in accordance with the requirements and recommendation of BHEL Engineer. The Minimum extent of radiographic inspection shall be as per BHEL Drawings / provision of IBR Regulations. They may however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer / Boiler inspection authority.

11.38
Contractor has to make his own arrangements for air conditioned dark room to process the radiographs.

11.39
BHEL Engineer reserves the right to alter the quantum of radiography of joints. The decision of the BHEL Engineer in this regard is fixed and final and binding on the contractor. Any defects as pointed out by BHEL Engineer shall have to be rectified by the contractor at his cost.

11.40
It may also become necessary to adopt inter layer Radiography / MPT/ UT depending upon the site / technical / requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The tenderers shall take all this into account and quote the price inclusive of all such work and radiography.

11.41
All field joints shall be subjected to dye penetrant examination as specified in the respective drawings and shall have to be accepted by BHEL Engineer. Any rectifications required shall have to be done by the contractor at his cost.

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11.42
For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.

11.43
The welded surface irrespective of place of welding shall be cleaned of slag and painted with primer paint to prevent corrosion at no extra cost.

11.44
The contractor shall have to do root run by TIG process, wherever required as per the instruction of BHEL Engineer.

11.45
All welds shall be painted with primer as specified in the painting schedule, once radiography and stress relieving works are over.

11.46
Erection of equipment involves good quality of Welding, Heat treatment and Non Destructive Testing. Wherever required, 100% dye penetration tests have to be carried out as per instructions of BHEL Engineer. Contractor's Engineers, Supervisors, Technicians and workers engaged should have adequate knowledge on the above works.

11.47
The contractor shall maintain a record in the format as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or otherwise of the welds shall be final.

11.48
Approval Given by Customer / BHEL for welding, results tests etc. shall also be recorded in the log book.

11.49
All site welded joints shall be subjected to acceptance by BHEL / Customer Engineer.

11.50
All the data such as heating temperatures, heating rate, soaking time, maximum temperature reached during heat treatment shall be properly recorded and documented which will be property of BHEL.

17.51
Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. Prior to any repair approval shall be obtain from BHEL Engineer for the procedure for the repair of defective welds. After the repair has been carried out, the compliance document shall be submitted to the quality engineer.

11.52

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The contractor shall carry out the edge preparation of weld joints at site in accordance with details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting will be allowed only for edge preparation.

11.53
All the prepared / patched edges will have to be suitably protected to prevent rusting or foreign material ingression.

11.54
All necessary preheating, post heating of welds and stress relieving operation of welds are part of the erection work and shall be performed by the contractor in accordance with the relevant regulations and standards of BHEL practice and to the satisfaction of BHEL Engineer and in accordance with the drawings and specifications.

11.55
Welding of Hangers, supports, stubs and impulse piping to be carried out by the contractor as per drawing specification and as per BHEL Engineer's instructions. According to drawing specifications and as per BHEL Engineer's instructions preheating post-heating stress relieving etc. have to be carried out by the contractor wherever necessary.

11.56
All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination, magnuflux, and ultrasonic testing shall be employed wherever necessary / recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed.

11.57
Statutory payments in respect of IBR approvals including inspection for design and manufacturer of equipment shall be made by the Contractor. All payment for erection and testing at site shall also be made by the Contractor. In such case, Contractor's scope shall also be extended to preparation of all necessary documents, coordination, and followup with IBR authorities for above approval.

11.58
All safety precautions shall be taken for welding and cutting operations as per IS-818.

11.59
Welding shall be done in accordance with IS-813, IS-816, IS-9595, and other relevant IS/international standards and as per instructions of Contractor. Only those welders who are qualified as per IS-817 for ordinary welds and as per IBR/ASME Section-IX for high pressure welds shall be employed on the job.

11.60
All welders shall be tested and approved by Owner before they are actually engaged on the work even though they may possess the requisite certificates. The Owner reserves the right to reject any welder without assigning any reason. The welder identification code as approved by the Owner shall be stamped by

the welder on each joint done by him or her. The Contractor will be responsible for the periodic renewal and re-testing of the welders as demanded by Owner.

11.61
All electrodes shall be baked and dried in the electric/electrode drying oven to the required temperature and for the period specified by the Owner before they are used in erection work. The electrodes used shall be as per IS-814, IS-815, IS-1442, IS-7280, and other codes as applicable, and shall be of approved reputed manufacture. The electrodes shall meet the requirement of the pipe material. No electrode manufactured more than 12 months ago and the type covered under certificate issued after conducting tests more than 6 months ago shall be used. All electrodes shall be preserved at works and at site as per manufacturer's recommendations.

11.62
Following will be stages of inspection during welding:
a) Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensionally and to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage will depend upon on criticality as specified by Owner.
b) Joint fit-up will be a stage of inspection. Misalignment after fit-up may vary from 0.3 mm to 1.6 mm depending on outside diameter and thickness.
c) All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

11.63
All welded joints shall be painted with anti-corrosive paint immediately on completion of radiography and stress-relieving.

11.64
All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other international equivalent standard acceptable to the Owner.
All brazers, welders, etc., employed on any part of the contract at the Contractor's / subcontractors' works or at the site shall be qualified as per ASME Section IX or BS-4871 or equivalent international standard approved by the Owner. Such qualification tests shall be conducted in the presence of the Owner/Authorized Representative.

11.65

Welding Electrodes for P91, Filler wires for IBR piping will be provided free of cost, Bidder to take utmost care for preservation and provide utilization report. Procurement of balance electrodes, filler wires are in bidder's scope.

11.66
Contractor to adopt following "Field Welding Schedule" for Piping Field Joints

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

FIELD WELDING SCHEDULE

PROJECT: FWS NO.:

CONTRACTOR: REV NO.:

PACKAGE: FIELD WELDING CODE:

SYSTEM: PAGE NO.:

Sl No.	Drawing No. for Weld Locations & Identification Mark	Description of Parts to be Welded	Material Specification	Dimensions	Process of Welding	Type of Weld	Electrode Filler Specification	WPS No.	Minimum Pre-heat Temperature	Heat Treatment Temperature [Holding Time in secs]	NDT Method Quantum	NDT Specifi-cation Number	Accep-tance Norm Ref.	Remarks

The Field Welding Schedule should be submitted for:

- Pressure Parts
- Tanks/Vessels
- Piping
- Heavy/Important Structural Steel
- Heat Exchangers
- Bus Ducts

Chapter-XII ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

12.1
Contractor shall lay and erect temporary pipelines with fittings and accessories and also erect/commission the chemical cleaning/circulating pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing of piping and shall provide all other arrangements as per requirement as part of scope of work. Contractor has to be arranged the chemical cleaning pumps. The required DM water and Steam will be provided by BHEL free of cost.

It shall be specifically noted by the contractor that all pipes for above works shall be supplied in random length and in loose condition. Contractor has to assemble and erect them as per schemes / drawings provided by BHEL. Further, flanges bend etc. for completing the scheme shall be machined/ fabricated by the contractor at his own cost. However, plates / steel etc. for the same will be provided by BHEL free of charges.

12.2
After the chemical cleaning/Flushing have been successfully completed, dismantling of all temporary installations as instructed by BHEL is within the scope of work under this specification. The dismantled materials shall be dressed and returned to BHEL as stated elsewhere in this tender spec.

12.3
Preservation of the cleaned surfaces will be the responsibility of contractor under the guidance of BHEL engineer.

12.4
Hydraulic test of temporary piping is to be carried out as per the instructions of BHEL Engineer. Carrying out repairs, if any, is in the scope of work/specification.

12.5
For chemical cleaning of the piping system, contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected is in the scope of contractor or not. Decision of BHEL Engineer in this regard will be final and binding on the contractor.

12.6
During the initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging and emptying. Necessary low point drains and temporary piping for this will have to be provided by contractor from materials provided by BHEL.

12.7
Laying effluent discharge line from mixing tank (for acid cleaning or any other chemical cleaning process) as per the instructions of BHEL engineer and dismantling, servicing for preservation and handing over the same to BHEL stores after completion of the job is within the scope of work/specification.

12.8
Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge should be carried out.

Chapter-XII ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

12.9

Contractor shall also carry out the repairs or attend leaks etc., in the temporary piping and equipments for the above operations / activities while carrying out the above activities / operations.

12.10

For chemical cleaning of system which consist of equipment/piping erected by the contractor and also equipment/piping erected by other contractors of BHEL/customer's contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilized by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decisions on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on the contractor.

12.11

Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL. No separate payment on this account shall be entertained.

12.12

After acid cleaning/pickling of lubricating system (including oil piping of lube oil system, HP Oil supply system, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems etc. as per instructions of BHEL Engineer is carried out, Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc. is the responsibility of the contractor.

12.13

For full welding of structures, tanks and piping etc., only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.

12.14

Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load shall be the responsibility of contractor as part of scope of work.

12.15

The guidelines stipulated in the Technical specification for Main steam system chemical cleaning (10090/91-SS-M31-BEF-0003) and air steam blowing (10090/91-SS-M31-BEF-0001) shall be followed.

The same is enclosed in Annexure

13.0 FINAL PAINTING

13.1

All exposed metal parts of the equipment including piping, structures, railings etc wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by BHEL engineer for painting. Afterwards, the above parts shall be finished with two coats as per painting specification.

13.2 Touch-up painting on damaged areas –

a)For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.
Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush/spray within maximum seven (7) days of application of touch up primer.
Painting scheme is enclosed for information at relevant annexure. However, for execution only the latest document shall be applicable and no claim whatsoever shall be entertained in case of any variance between such documents. Similarly, documents as provided progressively during the execution of work for all other products/ equipments etc shall be applicable.

13.3

Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.

(a.) Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.
(b.) Painting procedure to be followed as mentioned above for touch-up painting on damaged areas.

13.4

The scope of work includes painting of colour bands, lettering, marking and signs for direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/customer engineer at site for the equipments/ components covered in these specifications.

13.5

All exposed metal parts of the equipment including piping, structures, hand railing, grating etc shall be thoroughly cleaned off dust, rust, scales and other foreign materials by manual or mechanised wire brushing, scrapping, sand blasting etc and the same being inspected and approved by BHEL/customer engineer before application of primer. Afterwards, the above parts shall be finish painted with specified number of coats as per specification.

13.6

In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

13.7 Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated

further as prescribed in use of such cleaning agents. The contractor at his own cost shall provide all the consumables and application implements.

13.8

During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, contractor shall repair the same free of cost to BHEL.

13.9

Specified drying time shall be permitted from one to another coat.

13.10

This work requires working at higher altitudes from ground level to as high as 30 m and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

13.11

Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by contractor, BHEL shall have the right to recover the cost of such damages from the contractor.

13.12

Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the contractor without any extra charges.

13.13

In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush/spray painting. However, areas/equipment inaccessible for manual painting has to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the contractor. For the purpose of spray painting, air at one point will be made available by BHEL free. Laying of air hose pipe and any other line required shall be done by contractor at his cost. The contractor shall provide spray equipment set.

13.14

The contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during execution of the work.

13.15

Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions

14.1
Application of thermal insulation (Pyrogel-Mineral Wool), finishing, cladding and outer casing etc of the following:

1 TG Piping
2. Other equipments including BOI's, though not listed above but required for completion
3. ST-TG auxiliaries including, but not limited, to heat exchangers, pumps, tanks and vessels and other equipments
4. Application of spray insulation on turbine is by others

14.2
The work shall conform to dimension and tolerances specified in the various drawing and documents that will be provided during the execution. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost. Failing which the work will be got done by engaging other agencies or departmentally and recoveries will be dedicated from contractor's bills towards expenditure incurred including 30% departmental charges.

14.3
The terminal points as decided by BHEL shall be final and binding on the contractor.

14.4
All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc required will be supplied by BHEL and the same have to be erected/ applied as per the drawings and specifications of BHEL by the contractor.

14.5
The contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.

14.6
Contractor shall observe all precaution for laying, curing etc of pourable insulation. The contractor at his own cost shall redo any defective works found.

14.7
Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipments. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipments/ systems covered under the scope of work.

14.8
Cutting & dressing of insulation bricks to suit the site area of application is incidental to work.

14.9
Removable type of insulation has to be provided for valves fittings, expansion joints etc as per drawing or as directed by BHEL engineer.

14.10
The cladding and outer casing are aluminum sheets. All relevant specifications and procedures with regards to beading, sealing etc for aluminum sheets have to be adhered to.

14.11
Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather.

14.12
The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by BHEL free of cost.

14.13
To take care of bimetal corrosion due to variety of metals in contact of each other viz retainer to support, support to outer casing/cladding, cladding-to-cladding etc., suitable paints specified by BHEL, to be applied and/or neoprene rubber packing/strips or any other insert may have to be fixed as required.

14.14
The contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL engineer to facilitate inspection or during commissioning to fix gauges, fittings, instruments etc. These gaps will have to be finished as per drawings at later date by the contractor at his cost.

Contractor shall cut open works in needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.

14.15
A log book shall be maintained by the contractor for the clearance of the area for application of refractory and insulation where the contractor does the work on his own accord without prior permission. The work should be re-done, at his own cost, where necessitated.

14.16
Wastage allowances for the material issued are envisaged as follows:

A	Pourable & castable insulation	-	2%
B	Insulation bricks and motor	-	2%
C	Wool mattresses	-	2%
D	Cladding sheets	-	2%

The wastage allowance will be applicable on the net issued quantity i.e. Total quantity issued reduced by the quantity returned to stores as unused/fresh item. Contractor shall reconcile the material issues periodically as prescribed by BHEL site. Payment for the done will be regulated as per relevant section.

14.17
The following works are also included in the scope of this contract:

- Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint shall be arranged by contractor.

- Cutting of the wool mattresses to the required shape and application of finishing cement of required thickness wherever required.

14.18
Insulation work of temporary piping for alkali boil out, steam blowing and chemical cleaning has to be carried out at site. The same have to be removed and returned to the BHEL stores after the completion of activity. Rates quoted for application of wool for boiler and auxiliaries will be applicable for this work also. No separate payment will be made for removal of temporary insulation and return of the same to BHEL stores/yard.

14.19
In certain instances, co-ordinated/ phased application of castable refractory/ insulation on pressure parts etc may be necessitated in consideration of sequence of activities of other erection agencies. Contractor shall do such phased work as may be directed by BHEL.

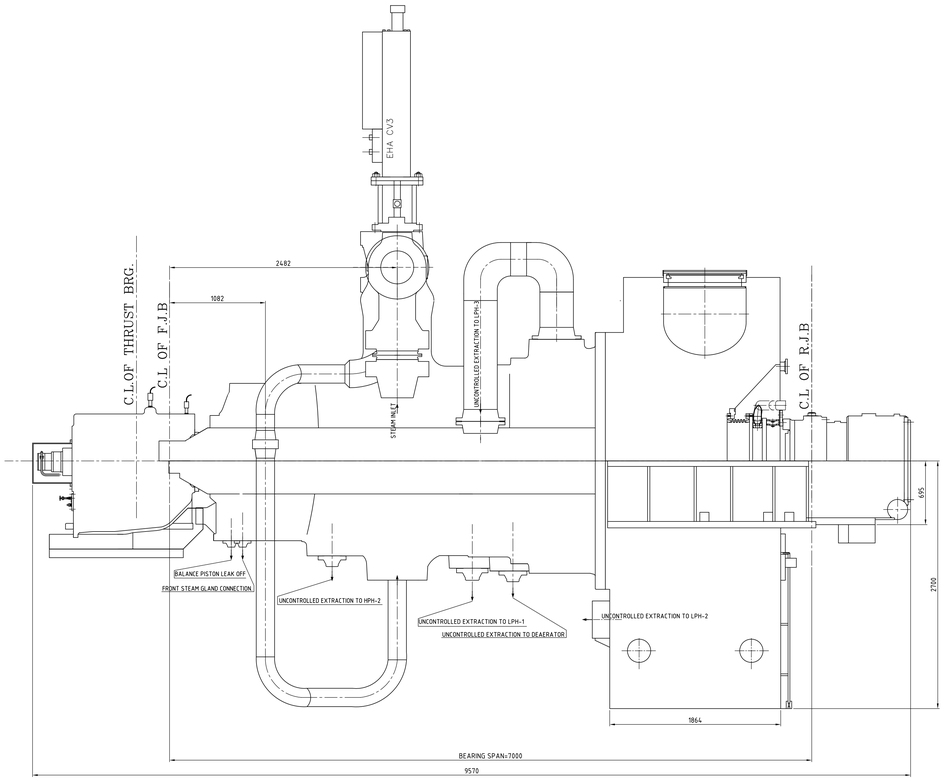
14.20
Prior to application of refractory bituminous painting on the pressure parts and other area is under contractor scope. The bituminous paint shall be arranged by contractor. No separate payment will be made for application of paint

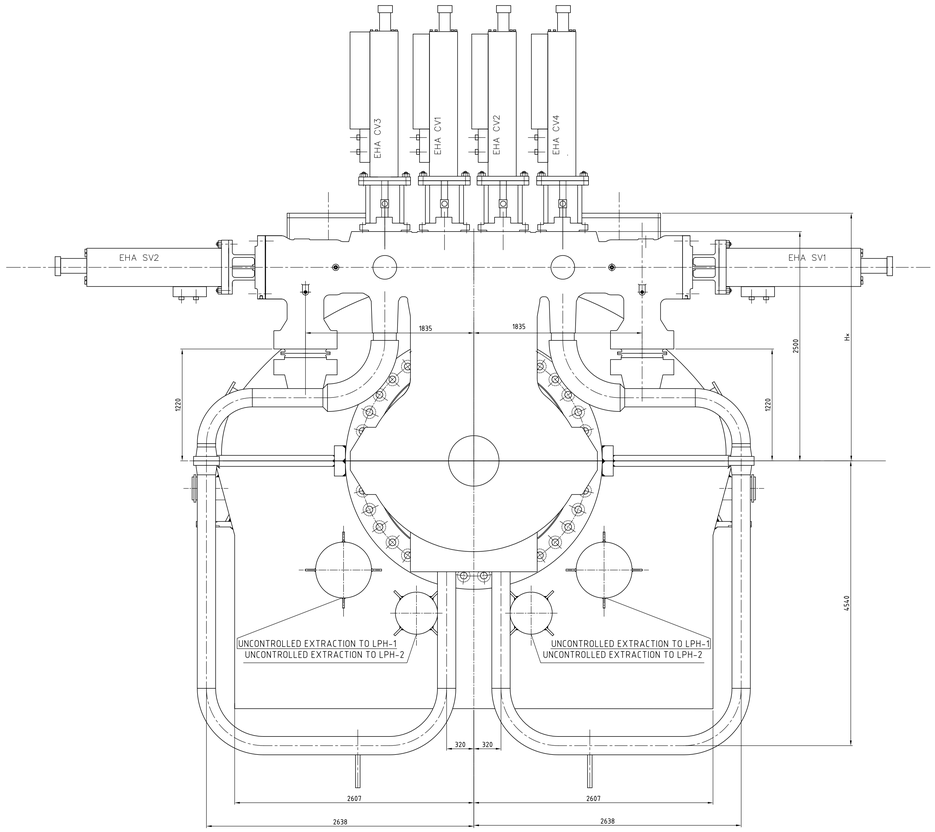
FIRST ANGLE PROJECTION

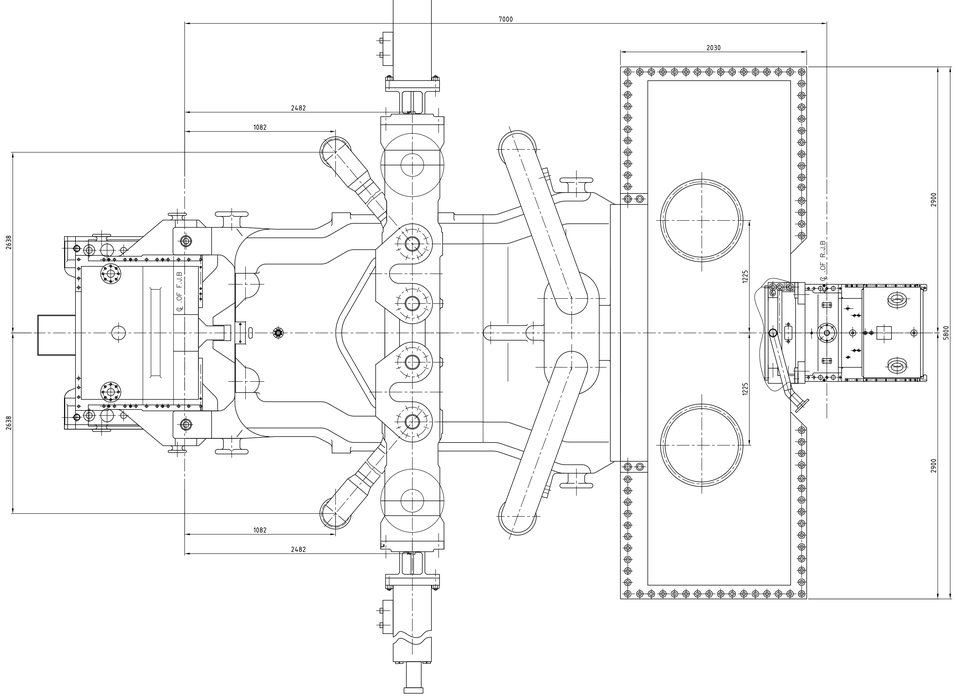
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-30771-00109

SHT. x OF x







WEIGHT OF TURBINE	180000 Kg.
WEIGHT OF ROTOR	34000 Kg.
WEIGHT OF THE SINGLE HEAVIEST PART (OUTER CASING U.P + EXH. HOOD U.P)	55000Kg.
DIRECTION OF ROTATION (WHEN VIEWED FROM TURBINE FRONT TO REAR)	COUNTER CLOCK WISE
TURBINE SPEED	3000RPM.
BEARING SPAN	7000mm.

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME XXXXXXXXXXX-SXX-RXX

REVISION REASON: IF1/ IFA/ IFD/ IFC/ CANC	REV.	DATE	ALTERED CHD/APPD	ZONE

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)

CUSTOMER: RELIANCE INDUSTRIES LIMITED, COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER DAHEJ: 10091-M53-CSAC03-BHL-T001-000

RIL DRG. NUMBER HAZIRA: 10090-M53-CSAC03-BHL-T001-000

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE	NO.OF VAR.
DRN.	PATIL	08.11.13	
CHD.	ASHOK	08.11.13	N.A.
APPD.	MRB	08.11.13	

RESTRICTED USE

DEPT.	UNTOL. DIMS. OR	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
LTD		N.T.S	N.A.	N.A.	N.A.	N.A.
CODE 475						

TITLE: GENERAL ARRANGEMENT OF STEAM TURBINE.

CARD CODE N.A.

BHEL DRAWING NO. 0-30771-00-00109 REV. 00

SHT. No X NO. OF SHT. X

Nov Wed 20 16:14 2013

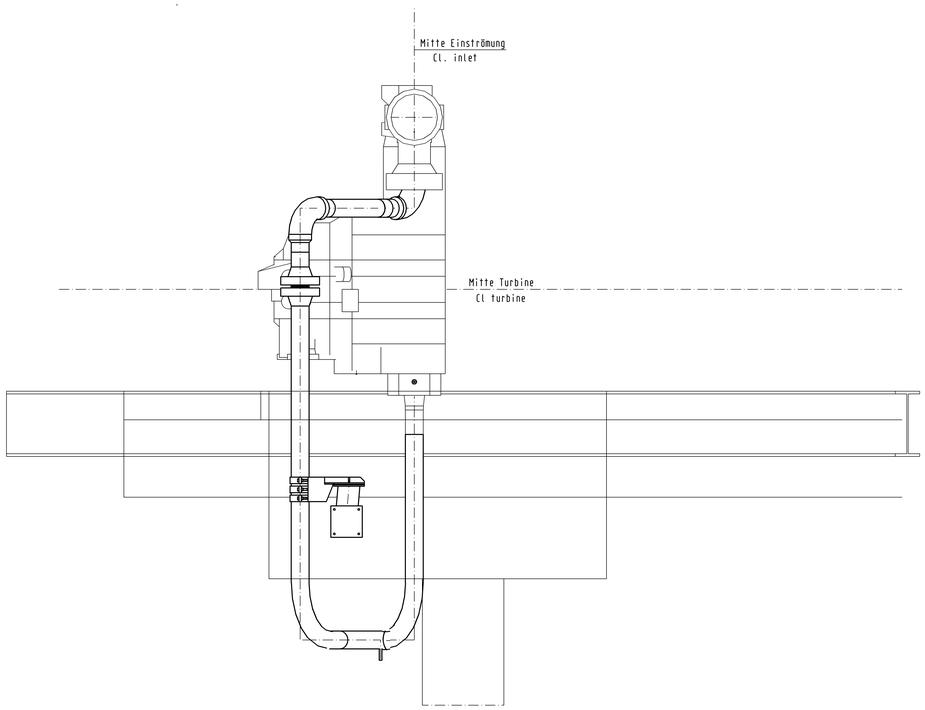
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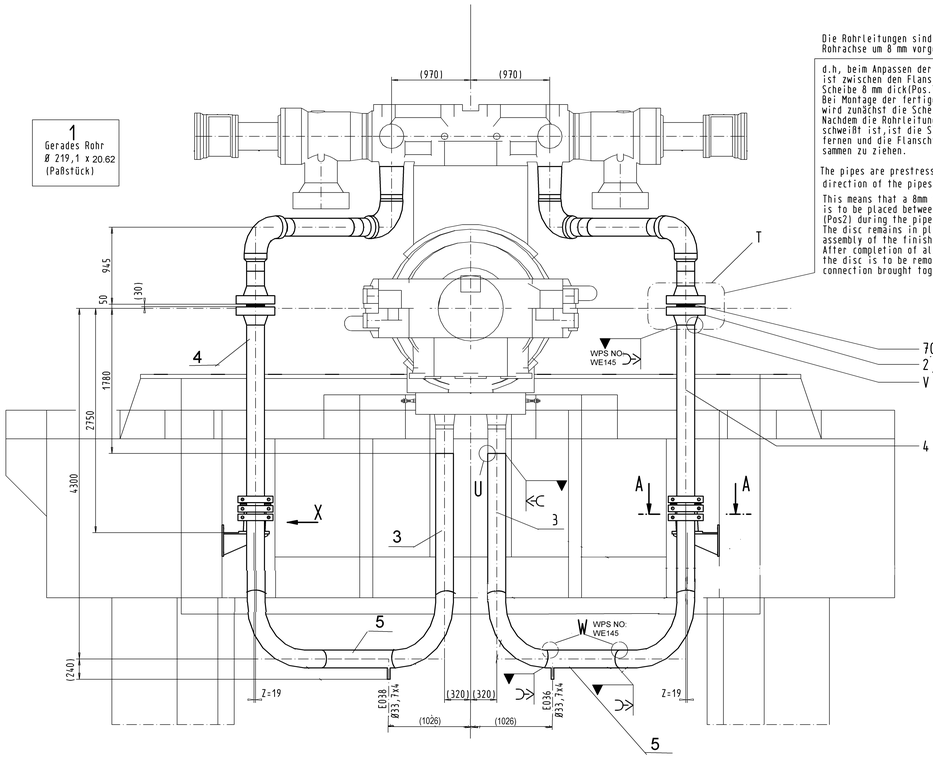
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FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SH. 01 OF 01 DRG. NO. 0-308-59-00003



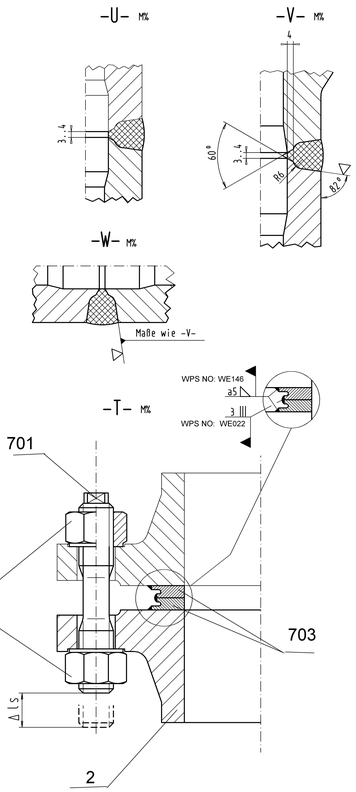


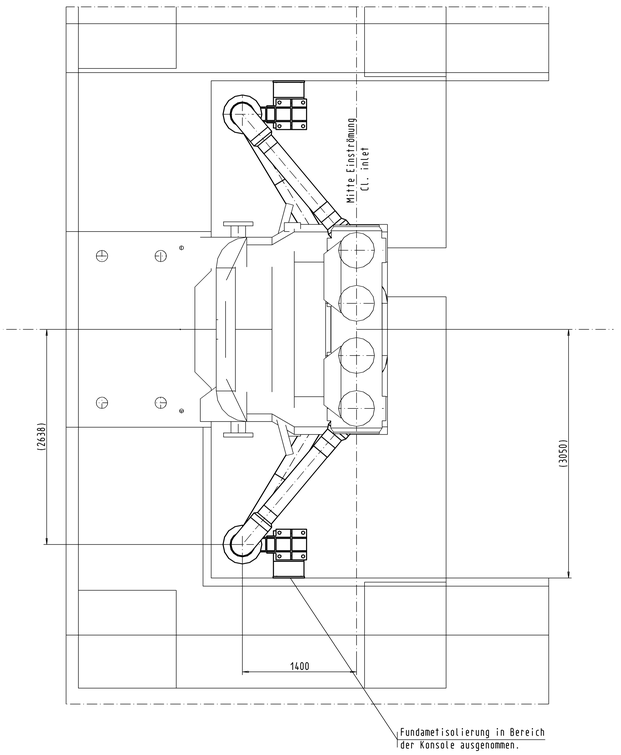
Die Rohrleitungen sind in Richtung der Rohrachse um 8 mm vorgespannt;

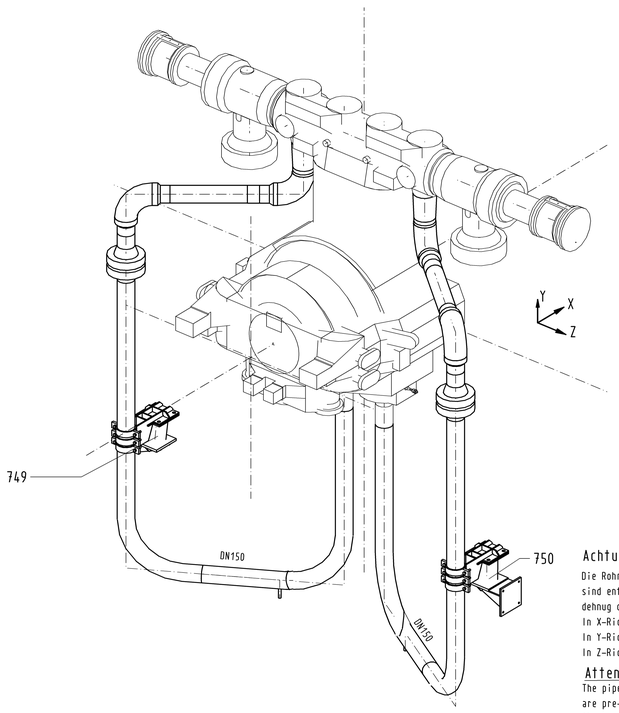
d.h, beim Anpassen der Rohrleitungen ist zwischen den Flanschen (Pos.2) eine Scheibe 8 mm dick(Pos.710)einzubauen. Bei Montage der fertigen Rohrleitung wird zunächst die Scheibe mit eingebaut. Nachdem die Rohrleitung kompl.verschweißt ist,ist die Scheibe zu entfernen und die Flanschverbindung zusammen zu ziehen.

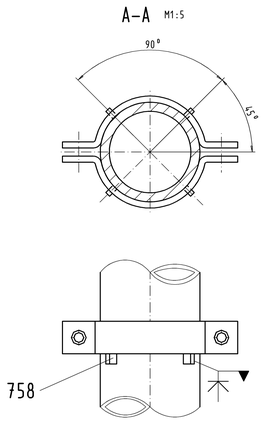
The pipes are prestressed by 8mm in the direction of the pipes axis.

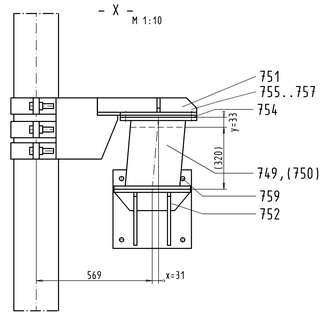
This means that a 8mm disc (Temporarily) is to be placed between the flanges (Pos2) during the pipe fitting work. The disc remains in place during the assembly of the finished pipe. After completion of all welding work the disc is to be removed and the flange connection brought together.











APPLICABLE WPS:

1) FOR POS. 703 TO 703 WPS NO: WE022
2) FOR POS. 2 TO 703 WPS NO: WE0146
3) FOR POS. 3 TO POS. 5 WPS NO: WE0145
4) FOR POS. 4 TO POS. 5 WPS NO: WE0145

NOTES:-

1. CLASSIFICATION OF WELDS ,THEIR INSPECTION,TESTING,AND ACCEPTENCE AS PER AA0622101 GRADE - I
2. TO BE PRESSURE TESTED TO 210 ata
3. INTER CONNECTING PIPING TO BE MATCHED WITH MAIN STEAM TOP & BOTTOM CONNECTING POINTS AND THEN ONLY FINAL WELDING IS TO BE CARRIED OUT.
4. ALL BUTT WELDS TO BE 100% RADIOGRAPHED AND FILLET WELDS TO BE 100% D.P TESTED.
5. FOR FUSION FACES REFER PLANT STANDARD:HY0620599
6. PIPING MATERIAL SPECIFICATION HY10634 ASTM SA335-P91
7. CLEANING & PAINTING OF PIPES AS PER PLANT STD: HY 0674162
8. GENERAL QUALITY REQUIREMENTS FOR PIPING AS PER PS: TC 76001
9. POST WELD HEAT TREATMENT AS APPLICABLE SHOULD BE AS PER PARA 132 OF ASME B31.1
10. HYDRAULIC PRESSURE TESTING SHALL BE CARRIED OUT AS PER PARA. 137 OF ASME B31.1

Achtung

Die Rohrleitungsdämpfer (Pos.749/750) sind entspr.der zu erwartenden Wärmedehnug der Einströmleitung voreingestellt.
In X-Richtung 31
In Y-Richtung 33
In Z-Richtung 19 / -19

Attention

The pipe dampers (Pos.749/750) are pre-adjusted to accept the expected head expansion.
X-direction 31mm
Y-direction 33mm
Z-direction 19mm / -19mm

Schraubenbolzen (Pos.701) sind wie folgt vorzuspannen: Bolts (Pos 701) are to be prestressed as follows.	
Schraubenlängung Δls Boltelongation	Anzugsmoment MA (relevanter Wert) tightening torgne (relevant value)
0,42 mm +0,06 −0,02	1217 Nm (Hilfswert) (provisional value)

Anmerkung: Die Kontrolle der Vorspannung erfolgt ausschließlich über die Feststellung der Längenänderung △ ls der Schraube nach dem Anziehen!
Note: The check of the prestress is to be carried out by establishing the elongation change △ ls of the bolt after tightening.

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME

WT. DRG. NO. 2-3885-1703-00

SIGN AND DATE

INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD
		GMM	DSR

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LIMITED
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	GMM		08.11.05	NA
CHD.	DSR		08.11.05	
APPD.	DSR		08.11.05	

DEPT. ITD | CODE 415 | UNTOL. DIMS. CR. ± 1/64" | SCALE NTS | WEIGHT (KG) 2903.00 | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

POS. 6 REMOVED WPS WE146, WE022,WE145 ADDED

TITLE
INTER CONNECTING PIPING

CARD CODE N.A.

DRAWING NO. 0-308-59-00003 | REV. 01

SHT. No 01 | NO. OF SHT. 01

RELEASED FOR EDAS

14-Jul-2016 14:29:53

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME: 0381010152901-R03.DWG

REF. DRG. NO.

SIGN. AND DATE

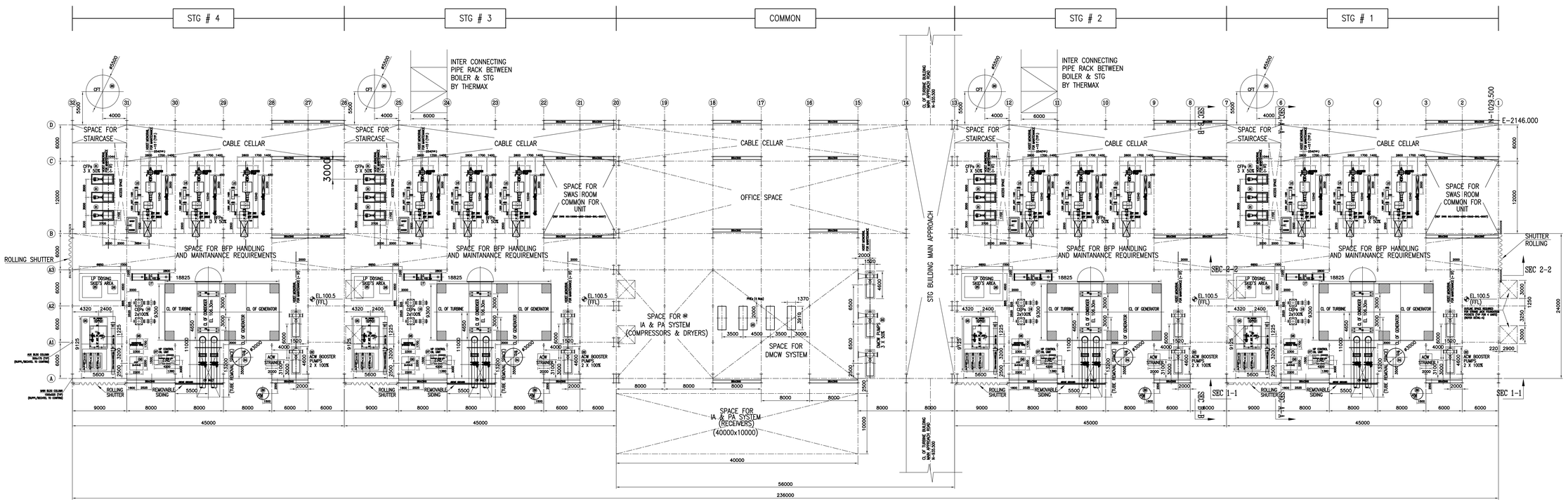
INVENTORY NO

PLANT NORTH

15°

TRUE NORTH

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

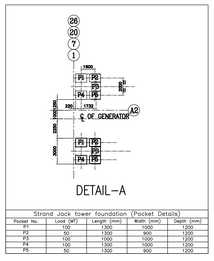
PLAN AT GROUND FLOOR EL.100.5m (FFL)

NOTES:

1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2) EQUIPMENT DIMENSIONS ARE TENTATIVE, WHICH SHALL BE CONFIRMED AFTER DETAIL ENGINEERING.
3) PIPING INTERFACE AREAS BETWEEN BHEL AND RUPPL/BECHTEL/THERMAX SHALL BE AS GIVEN BELOW. (TO BE FINALISED)

PIPING TERMINAL POINT AREA	TERMINAL POINTS	GRID REFERENCE
PTPA–01	1) MAIN STEAM–1 FROM BOILER HEADER (TP–77) 2) FEED WATER–1 TO BOILER HEADER (TP–148) 3) BOILER FLASH TANK VENT–1 FROM BOILER (TP–199) 4) BOILER STARTUP STEAM BYPASS FROM BOILER (TP–79) 5) FEED WATER SUPPLY FOR LIMESTONE DRYING (BY BECHTEL) 6) CONDENSATE RETURN FROM LIMESTONE DRYING (BY BECHTEL) 7) CLOSED CIRCUIT COOLING WATER SUPPLY TO BOILER AUXILIARIES (TP–80) 8) CLOSED CIRCUIT COOLING WATER RETURN FROM BOILER AUXILIARIES (TP–81) 9) POTABLE WATER (TP–9) 10) SERVICE AIR (TP–4) 11) INSTRUMENT AIR (TP–5) 12) SERVICE WATER (TP–201) 13) BOILER FILL (TP–6)	BETWEEN GRID 11 & 12 1M INSIDE STG BUILDING ALONG ROW–D ABOVE GROUND
PTPA–02	1) MAIN STEAM–2 FROM BOILER HEADER (TP–78) 2) FEED WATER–2 TO BOILER HEADER (TP–149) 3) BOILER FLASH TANK VENT–2 FROM BOILER (TP–200)	BETWEEN GRID 24 & 25 1M INSIDE STG BUILDING ALONG ROW–D ABOVE GROUND
PTPA–03	1) CIRCULATING WATER SUPPLY TO UNIT–1/2/3/4 CONDENSER (TP–119 & 120/TP–123 & 124/TP–127 & 128/TP–131 & 132) 2) CIRCULATING WATER RETURN FROM UNIT–1/2/3/4 CONDENSER (TP–121 & 122/TP–125 & 126/TP–129 & 130/TP–133 & 134)	BETWEEN GRID 3&5/9&11/22&24/28&30 ALONG ROW–A ABOVE GROUND
PTPA–04	1) CONDENSATE RETURN FROM PROCESS TO UNIT–1/2/3/4 CFT (TP–168/TP–169/TP–170/TP–171)	AT CFT NOZZLE OF EACH UNIT
PTPA–05	1) CONDENSATE FILL TO UNIT–1/2/3/4 CONDENSER (TP–172/TP–173/TP–174/TP–175) 2) CONDENSATE RETURN FROM LIMESTONE DRYER TO UNIT–1/2/3/4 CONDENSER (TP–160/TP–161/TP–162/TP–163)	AT CONDENSER NOZZLE OF EACH UNIT

4) MINIMUM CRANE HOOK ELEVATION SHALL BE 122.25 M.
5) WEIGHT OF SINGLE HEAVIEST PIECE FOR MAINTENANCE IS 55 TONN.
6) ELEVATION 0.00 CORRESPONDS TO FINISHED GROUND FLOOR LEVEL OF STG BUILDING WHICH CORRESPONDS TO SITE RL EL.+100.5M
7) DEAERATOR FLOOR ELEVATION IS 118.5 m.(BECHTEL TO CONFIRM THE SAME)
8) LAYDOWN & MAINTENANCE SPACE IS INDICATED ON THE OPERATING FLOOR COMMON AREA WITH THE ASSUMPTION THAT 2 UNITS ARE TAKEN FOR MAINTENANCE AT THE SAME TIME.
9) REVISED EQUIPMENT LOADS INDICATED BECHTEL TO CONSIDER THE SAME.



HOLD:

1) MONORAIL LOCATIONS, ELEVATION AND CAPACITY.
2) IA & PA SYSTEM.

EQUIPMENT LIST (PER UNIT) 03

SL NO.	EQUIPMENT	QTY (Nos.)	EMPTY WT(Kg)	FLOODED WT(Kg)	STATUS NOT TO EXCEED(NTE) FINAL (F)
1	STEAM TURBINE	1	COVERED IN "MACHINERY ARRANGEMENT AND FOUNDATION" DRG.NO.1–313–01–08634		
2	GENERATOR	1			
3	SURFACE CONDENSER	1			
4	GENERATOR AIR COOLER ASSEMBLY	1			
5	LUBE OIL CONSOLE (LUBE OIL TANK, MOP, AOP, EOP, TWN LUBE OIL COOLERS)	1	13100	30450	F
6	JACKING OIL SKID	1	1800	2400	F
7	HP CONTROL OIL SKID	1	4150	5000	F
8	OIL CENTRIFUGE(TROLLEY TYPE)	1	1900	2200	F
9	LP HEATER – 1	1	31100	62000	F
10	LP HEATER – 2	1	34000	64000	F
11	LP HEATER – 3	1	32000	59500	F
12	DEAERATOR	1	80420	401090	F
13	HP HEATER – 5	1	53500	73100	F
14	HP HEATER – 6	1	63100	84600	F
15	STEAM JET AIR EJECTOR ASSEMBLY	1	7500	11500	F
16	GLAND STEAM CONDENSER WITH EJECTOR	1	2000	2700	F
17	DRAIN COOLER	1	5800	8400	F
18	BOILER FEED PUMP ASSEMBLY WITH MOTOR	3	–	38182	NTE
19	CONDENSATE EXTRACTION PUMP WITH MOTOR	2	–	10000	NTE
20	CONDENSATE FORWARDING TANK	1	15000	240000	NTE
21	CONDENSATE FORWARDING PUMP WITH MOTOR	3	–	4010	NTE
22	ACW BOOSTER PUMP WITH MOTOR	2	–	6894	NTE
23	PHE FOR CLOSED CIRCUIT CW SYSTEM	1	10578	14166	NTE
24	HP FLASH TANK FOR STG	1	**	**	**
25	AMMONIA DOSING SKID	1	1250	1650	NTE
26	HYDRAZINE DOSING SKID	1	1250	1650	NTE
27	NAOH DOSING SKID	1	800	1000	NTE
28	OVER HEAD TANK (OIL)	1	2100	10450	F
29	ATMOSPHERIC FLASH TANK	1	900	1000	NTE
30	GENERATOR ADAPTER BOX	1	–	8000	NTE

EQUIPMENT LIST (COMMON)

SL NO.	EQUIPMENT	QTY (Nos.)	EMPTY WT(Kg)	FLOODED WT(Kg)	STATUS NOT TO EXCEED(NTE) FINAL (F)
51	CLOSED CIRCUIT CW SYSTEM PUMP	3	–	10000	NTE
52	IA & PA SYSTEM	1	–	20000	NTE
53	DMCW EXPANSION TANK	1	10000	90000	NTE
54	SWAS PANEL (TOTAL PER SWAS UNIT)	2	–	6000	NTE
55	LOCAL GAUGE BOARD	2	–	800	F

LOAD DETAILS SHALL BE CONFIRMED AFTER DETAIL ENGINEERING

NOTE: WEIGHTS FURNISHED ARE UNIT WEIGHTS

REV.	DATE	ALTERED	CHD/APPD	DESCRIPTION
03	21/12/13	VUK	GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
02	29/10/13	VUK	GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	VUK	GS/WSS	DRAWING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE INDUSTRIES LIMITED

COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER HAZIRA: 10090–P50–HAT100–BHL–B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN	DATE
DRN.	V.U.K	–SD–	09.09.13
CHD.	G.S	–SD–	09.09.13
APPD.	V.V.S.S	–SD–	09.09.13

DEPT. PESD–ENGG | CODE APP. | UNTOL. DIMS. CR. 9'0"/F | SCALE 1:250 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT GROUND FLOOR (100.5m)

CARD CODE

BHEL DRAWING NO: 0–381–01–01529 REV. 03

SHT. No 01 NO. OF SHT. 04

RELEASED FOR CONSTRUCTION EDAS

This Drawing is printed from Engineering Digital Archive System (EDAS). Therefore signatures are not essentially required.

FIRST ANGLE PROJECTION

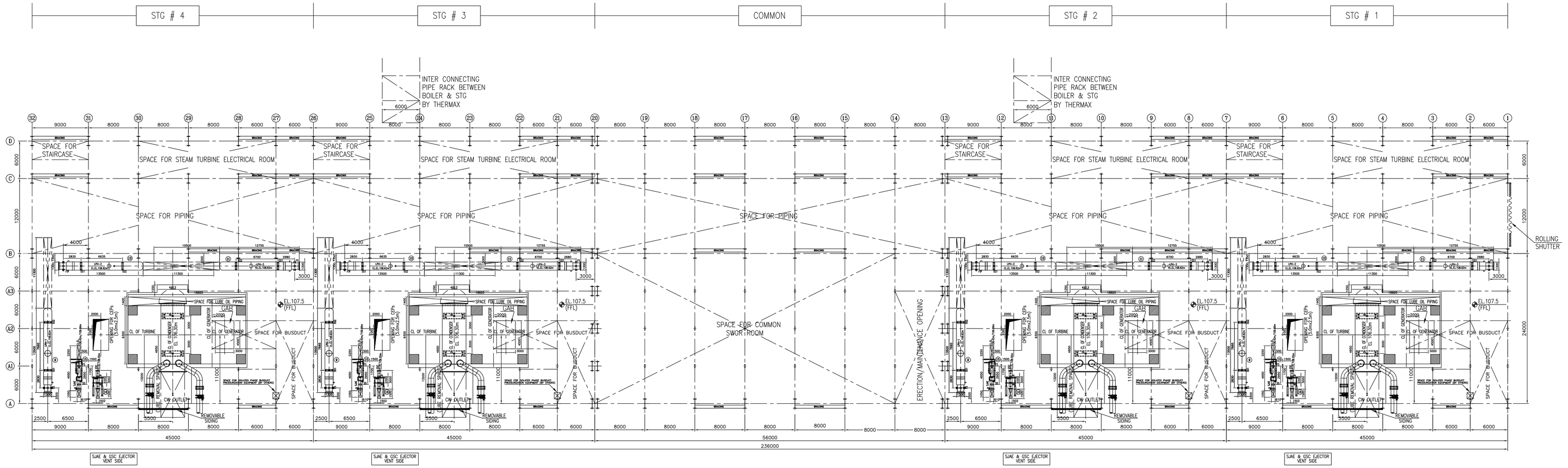
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-381-01-01529 SHT. 02 OF 04

PLANT NORTH

TRUE NORTH

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT MEZZANINE FLOOR EL.107.5m (FFL)

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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME (0381010529-S02-R01.DWG) | INVENTORY NO.

REV.	DATE	ALTERED	CHD/APPD	ZONE
03	21/12/13	ALTERED VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
02	29/10/13	ALTERED VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	ALTERED VUK	CHD/APPD GS/WSS	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NUMBER HAZIRA:	10090-P50-HAT100-BHL-B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	
CHD.	G.S	-SD-	09.09.13	NA
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 450	g/M/f	1:250	NA	NA	NA	NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT MEZZANINE FLOOR (107.5M)

CARD CODE

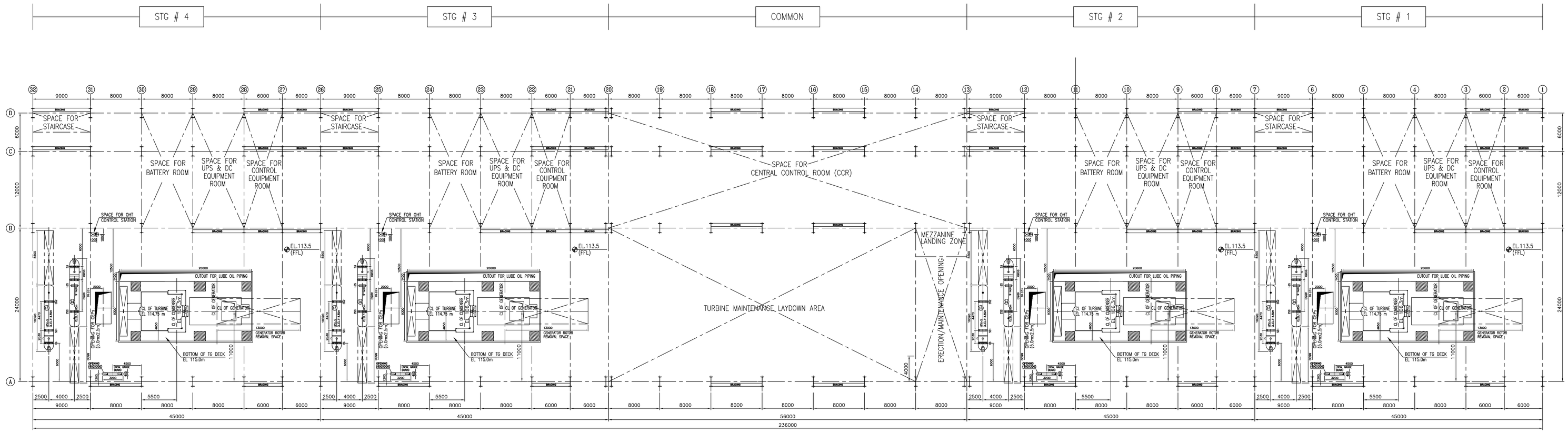
BHEL DRAWING NO: 0-381-01-01529 REV. 03

SHT. No 02 NO. OF SHT. 04

PLANT NORTH

TRUE NORTH

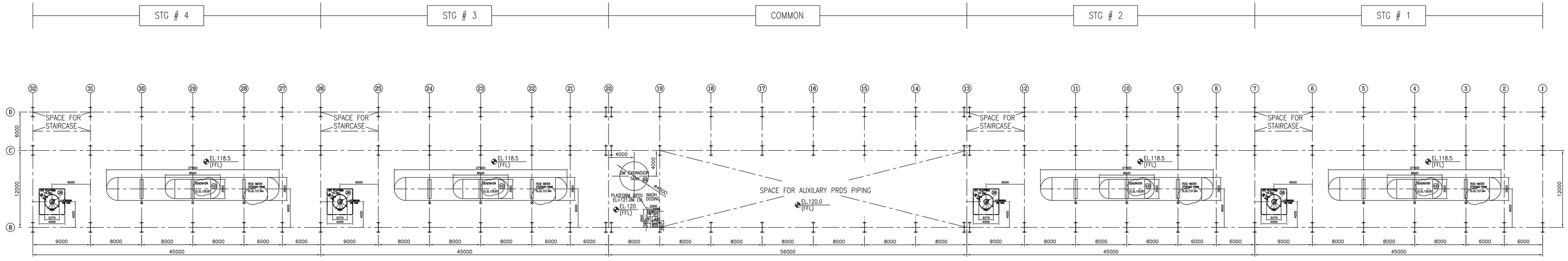
BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT OPERATING FLOOR EL.113.5m (FFL)

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT DEAERATOR FLOOR EL.118.5m (FFL)

PLAN AT COMMON BUILDING FLOOR EL.120m (FFL)

AND AT OHT PLATFORM EL.121.5m (TOS)

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME (0381010152 9-S03-R03.DWG)

SIGN. AND DATE | REF. DRG. NO. | INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD	ZONE
03	21/12/13	VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
02	29/10/13	VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	VUK	CHD/APPD GS/WSS	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NUMBER HAZIRA:	10090-P50-HAT100-BHL-B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	
CHD.	G.S	-SD-	09.09.13	NA
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 450	DN. 9/W/F	1:250	NA	NA	NA	NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT OPERATING FLOOR (103.5M), DEAERATOR FLOOR (118.5M) & OHT PLATFORM (121.5M)

CARD CODE

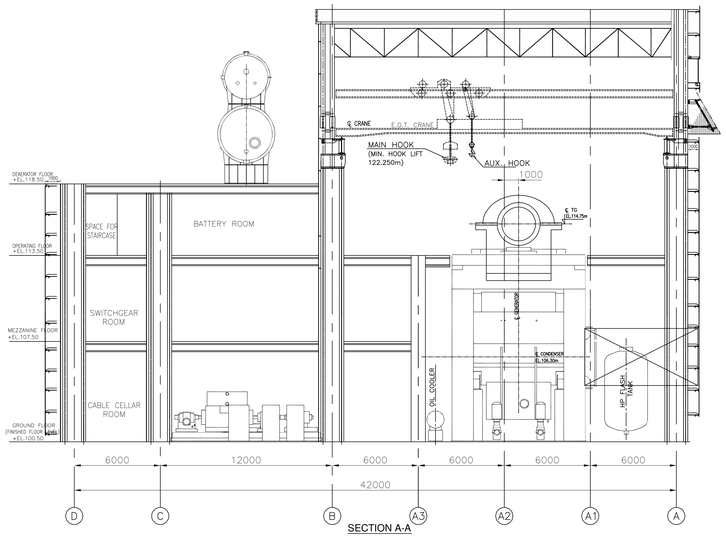
BHEL DRAWING NO: 0-381-01-01529 REV. 03

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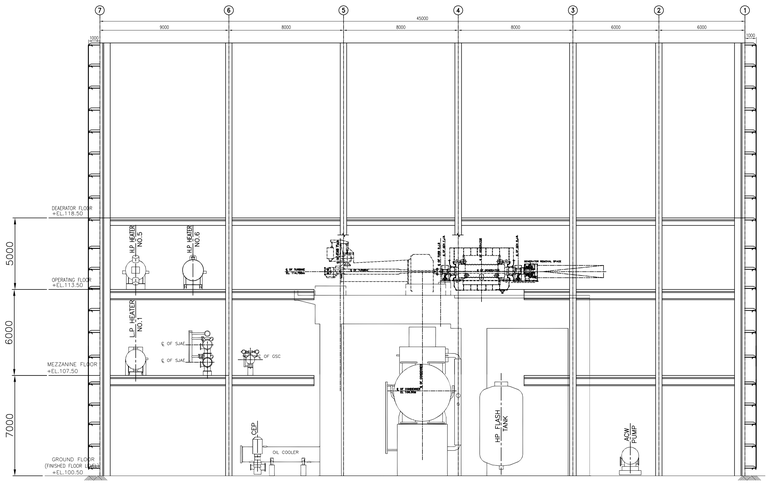
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

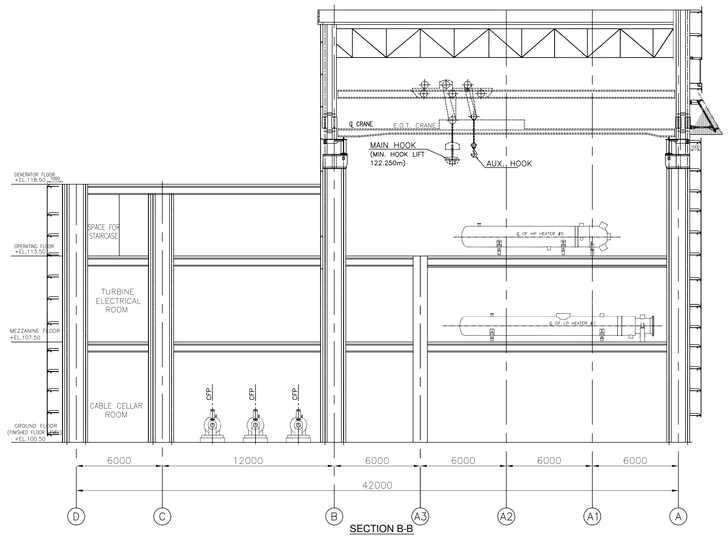
DRG. NO. 0-381-01-01529 SHT. 04 OF 04



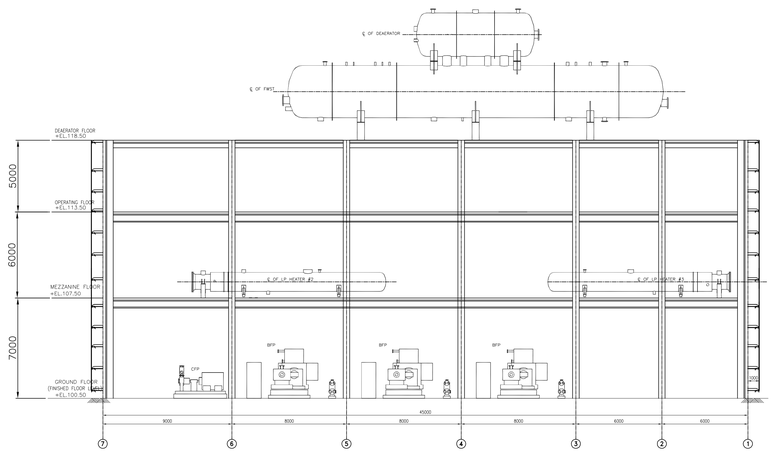
SECTION A-A



SECTION 1-1
(FOR STG # 1)
(TYPICAL)



SECTION B-B



SECTION 2-2
(FOR STG # 1)
(TYPICAL)

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY02302261

SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME

INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD
03	21/12/13	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.	CHD/APPD GS/WSS
02	29/10/13	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.	CHD/APPD GS/WSS
01	14/09/13	DRAWING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.	CHD/APPD GS/WSS

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE INDUSTRIES LIMITED, COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER HAZIRA: 10090-P50-HAT100-BHL-B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION, HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	NA
CHD.	G.S	-SD-	09.09.13	
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG | CODE 450 | UNTOL. DIMS. CR. 9/M/F | SCALE 1:100 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

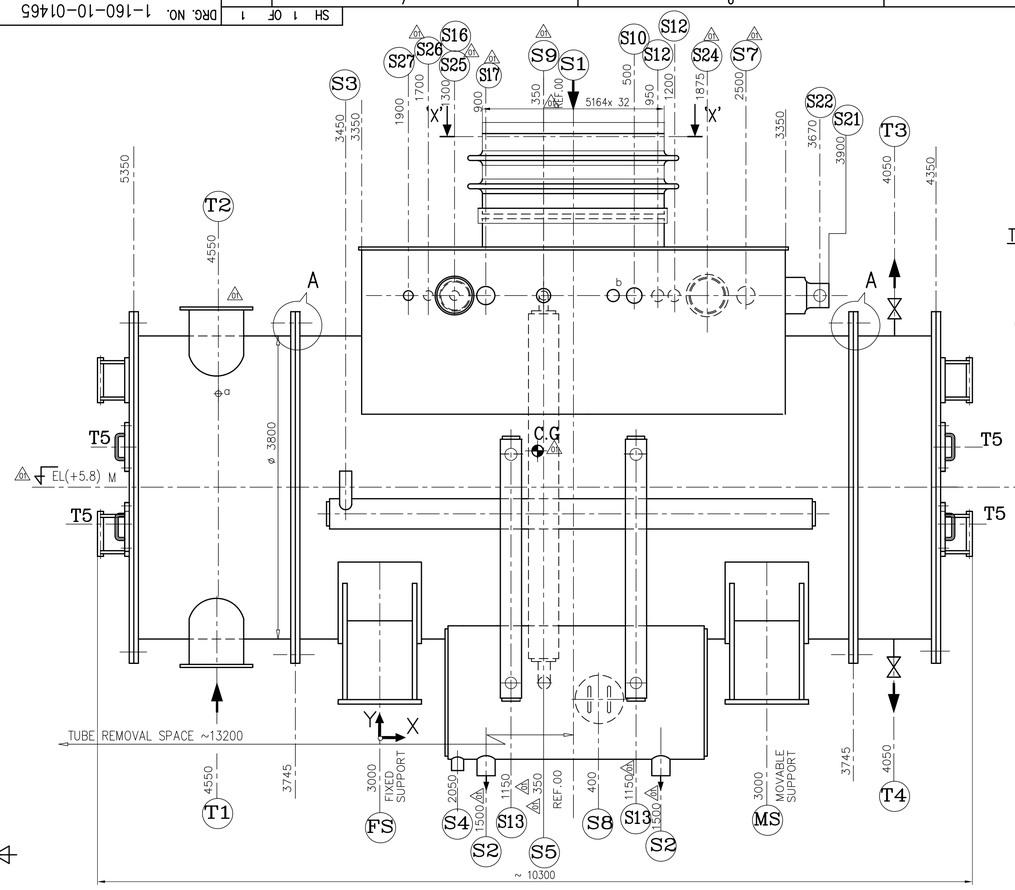
TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT, SECTIONAL VIEWS

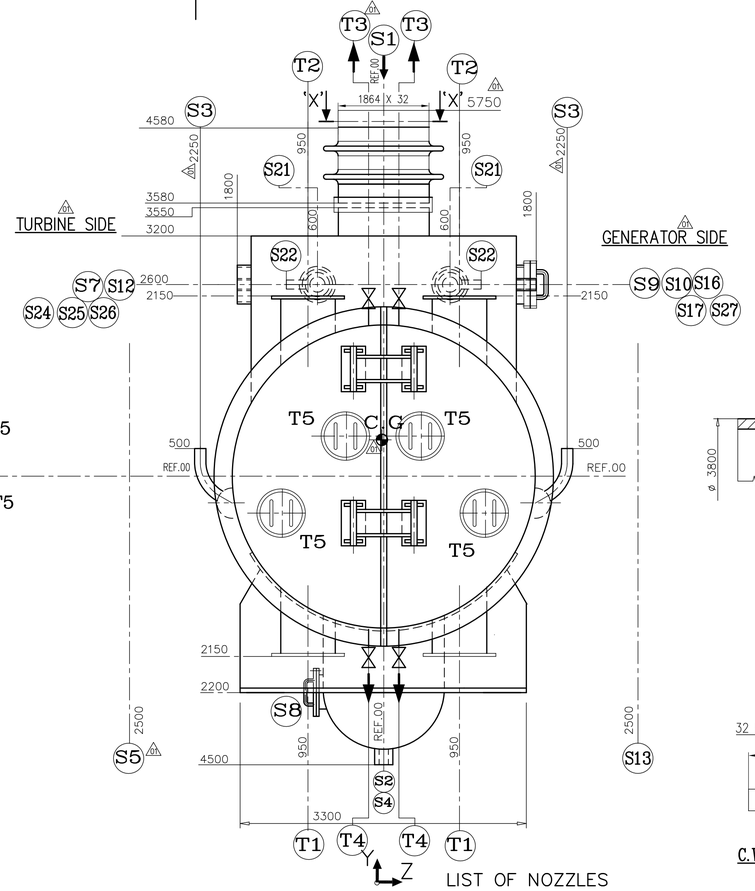
CARD CODE | BHEL DRAWING NO: 0-381-01-01529 | REV. 03 | SHT. No 04 | NO. OF SHT. 04

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

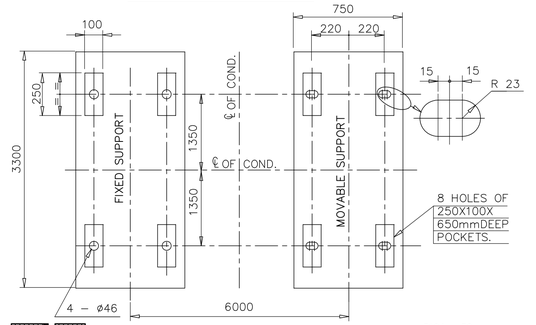
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

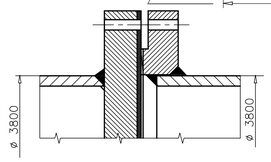
SH 1 OF 1 DRG. NO. 1-160-10-01465



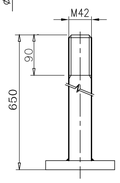


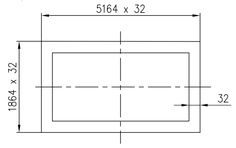
FOUNDATION DETAIL





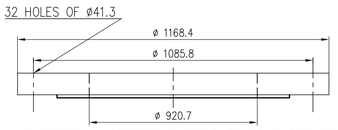
DETAIL – A





EXHAUST DETAIL (S1)
SECTION 'X X'

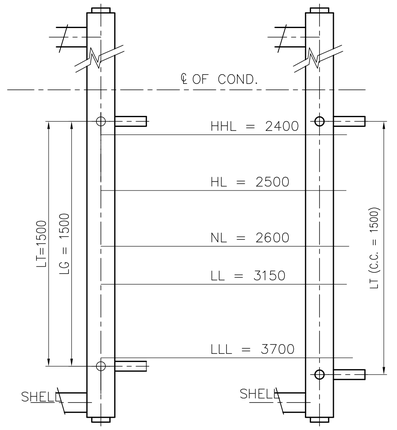
FOUNDATION BOLT DETAIL

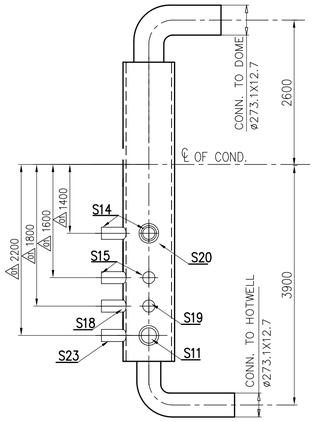


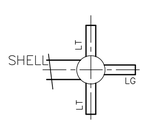
C.W. INLET & OUTLET NOZZLE FLANGE DETAIL

NOZZLE FORCES, MOMENTS AND THERMAL MOVEMENTS

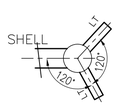
NOZZLE REF	MOMENTS Kg-M	FORCES Kgs	THERMAL MOVEMENTS X mm	Y mm	Z mm
T1	7730	2900	−1.6	+0.1	±1.0
T2	7730	2900	−1.6	+4.4	±1.0
S2	2600	970	+3.0	−2.3	±0.3
S3	900	350	−0.5	+2.7	±2.2
S7	1350	500	+5.5	+2.6	−1.8
S9	700	260	+2.7	+2.6	+1.8
S10	700	260	+3.5	+2.6	+1.8
S17	700	260	+2.1	+2.6	+1.8
S21	2600	970	+10.0	+4.0	±1.0



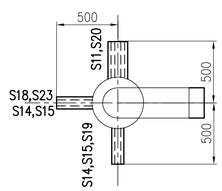




STAND PIPE–I



STAND PIPE–II



SURGE PIPE

DESIGN DATA

DESIGN CODE: H E I / B H E L			
DESCRIPTION		SHELL SIDE	TUBE SIDE
TYPE			2 PASS DIVIDED
DESIGN PRESSURE	Kg/sq.CM (g)	1.1 & FULL VC.	3.0
DESIGN TEMPERATURE	°C	100	65
TEST PRESSURE	Kg/sq.CM (g)	HY.FILL	3.9
TEST TEMPERATURE	°C	AMBIENT	AMBIENT
TOTAL SURFACE AREA	sq.M	4232	
TUBE SIZE (OD X THICK)		ø 22x22 BWG (AVG) / ø22x20 BWG	
NO. OF TUBES		8300	
PRESSURE DROP ON C.W. SIDE	M.W.C.	7.0	
HOTWELL CAPACITY (NL TO LLL)	MINUTES	5 MINUTE	
EMPTY WIEGHT		120000 Kgs.	
WORKING WIEGHT		180000 Kgs	
FLOODED WIEGHT		230000 Kgs	
INSPECTION		BHEL/CUSTOMER (AS PER APPD.QAP)	

LIST OF INSTRUMENTS CONNECTIONS

REF.	DESCRIPTION	SIZE	QTY	LOCATION
a	TEMPERATURE GAUGE CONN.	M 33X2	9	HOTWELL, STEAM INLET, C.W.INLET & OUTLET.
b	COMPOUND PRESSURE GAUGE CONN.	1/2"(SW)VALVE	9	ON SHELL
c	LEVEL GAUGE L = 1500	1"ANSI300 RF	2	ON STAND PIPE
d	LEVEL SWITCH CONNECTION	–	–	–
e	LEVEL CONTROLLER/TRANSMETER CONN.	2"ANSI 300 RF	8	ON STAND PIPE
f	WATER EXPANSION RELIEF VALVE	3/4" / 1" S.W	2	ON C.W. INLET

MATERIALS

TUBES – CONDENSING ZONE	SA249 TP316
TUBES – AIR COOLING ZONE	SA249 TP316
TUBE PLATE	SA516 Gr70 WITH SS CLADDING
SUPPORT PLATE	CS:IS 2062 OR EQUVT.
SHELL & OTHER PARTS	CS: SA516 Gr70 OR EQUVT.
INTERNAL BOLTS & NUTS	SA 193 B7, SA194 2H

C.G CENTER OF GRAVITY

	EMPTY	OPERATING	FLOODED
XC	−370	−665	−440
YC	395	−230	−465
ZC	−25	−15	−10

LIST OF NOZZLES

REF.	DESCRIPTION	SIZE	QTY	REMARKS
	TUBE SIDE NOZZLES			
T1	COOLING WATER INLET	36" – 150 SORF	2	FLANGED
T2	COOLING WATER OUTLET	36" – 150 SORF	2	FLANGED
T3	WATER BOX VENT	ø60.3 X 5.54	2	S.W.
T4	WATER BOX DRAIN	ø60.3 X 5.54	4	S.W.
T5	WATER BOX INSPECTION HOLE	18" ANSI 150 FLRF	8	FLANGED
	SHELL SIDE NOZZLES			
S1	EXHAUST STEAM INLET	AS PER SEC.X–X	1	FLANGED
S2	CONDENSATE OUTLET (WITH VORTEX PLATE)	ø323.9X12.7	2	B.W.
S3	AIR SUCTION	ø168.3X7.11	2	B.W.
S4	HOT WELL DRAIN	ø60.3 X 5.54	1	B.W.
S5	EXPANSION SURGE.	ø508 X 12.7	1	–
S6	–	–	–	–
S7	GLAND STEAM LEAKAGE CONN.	ø323.9X 12.7	1	B.W.
S8	HOTWELL INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S9	CONDENSATE RECIRCULATION	ø88.9 X 5.49	1	B.W.
S10	CONN. FOR MAKE UP WATER.	ø88.9 X 5.49	1	B.W.
S11	DRAIN FROM STEAM INLET (PIPING TO TURBINE)	ø219.1 X 12.7	2	B.W.
S12	CONDENSATE PUMP DEAERATION	ø33.4 X 4.55	2	B.W.
S13	STAND PIPE	ø114.3 X 6.02	2	--
S14	INTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S15	AFTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S16	DOME INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S17	VACCUM BREAKER CONNECTION	ø114.3 X8.56	1	B.W.
S18	G S C DRAINS	ø60.3 X 5.54	1	B.W. *
S19	DRAIN FROM EJECTOR AIR HEADER	ø33.4 X 4.55	1	B.W. *
S20	DRAIN FROM DRAIN COOLER	ø273.1 X 12.7	1	B.W. *
S21	HP STEAM DUMP NOZZLE	ø323.9 x 6.35	2	B.W.
S22	WATER CONN. TO DUMP NOZZLE	ø88.9 X 5.49	2	B.W.
S23	HPFLASH TANK DRAIN	ø273.1 X 12.7	1	B.W. *
S24	HPFLASH TANK VENT	ø910 X 9.53	1	B.W.
S25	LP HEATER–1 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S26	LP HEATER–2 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S27	LP HEATER–3 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.

NOTES:–

1. ALL COUNTER FLANGES, FASTNERS AND PACKINGS ARE UNDER B.H.E.L. SCOPE OF SUPPLY.
2. TUBES ARE PROVIDED WITH SELF DRAINING.
3. * CONNS. MOUNTED ON EXPANSION SURGE PIPE–S5.
4. PAINTING: –
   a). STEAM SPACE: 2 COATS OF STEAM WASHABLE PAINT
   b). EXTERNAL SURFACES: 2 COATS OF REDOXIDE ZINC PHOSPHATE PRIMER
   c). WATER SPACE: 2 COATS OF COAL TAR EPOXY.
5. TUBES,DOME ASSLY,HOTWELL,TOPCONNECTING PIECE, BELLOW,STAND PIPES & SURGE PIPES WILL BE SUPPLIED LOOSE TO SITE, FOR ERECTION & ASSLY. BY ERECTION AGENCY.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

REV.	DATE	ALTERED	CHECKED	APPD
01	17.10.13	VSN	MV	MV

ZONE: DRAWING REVISED AS PER T&C ENGG.& PE&SD COMMENTS AND CUSTOMER COMMENTS AND SHOWN AS REV.01

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091–6239977–T000–M–M61–BHL–B02–H001
RIL DRG. NO. (HAZIRA):	10090–6239976–T000–M–M61–BHL–B02–H001

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN	DATE	NO.OF VAR.
DRN.	SUDHAKAR	SUDHAKAR	04.09.13	N.A
CHD.	M VENKAT		04.09.13	
APPD.	M VENKAT		04.09.13	

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE	g/m/f	NTS	NA	NA	N.A	N.A
CODE 405						

TITLE: SURFACE CONDENSER

CARD CODE

DRAWING NO. 1–160–10–01465 REV. 01

SHEET No. 1 NO OF SHEETS 1

INVENTORY NO TSGR. AND DATE REF. DRG. NO. COMPUTER FILE NAME

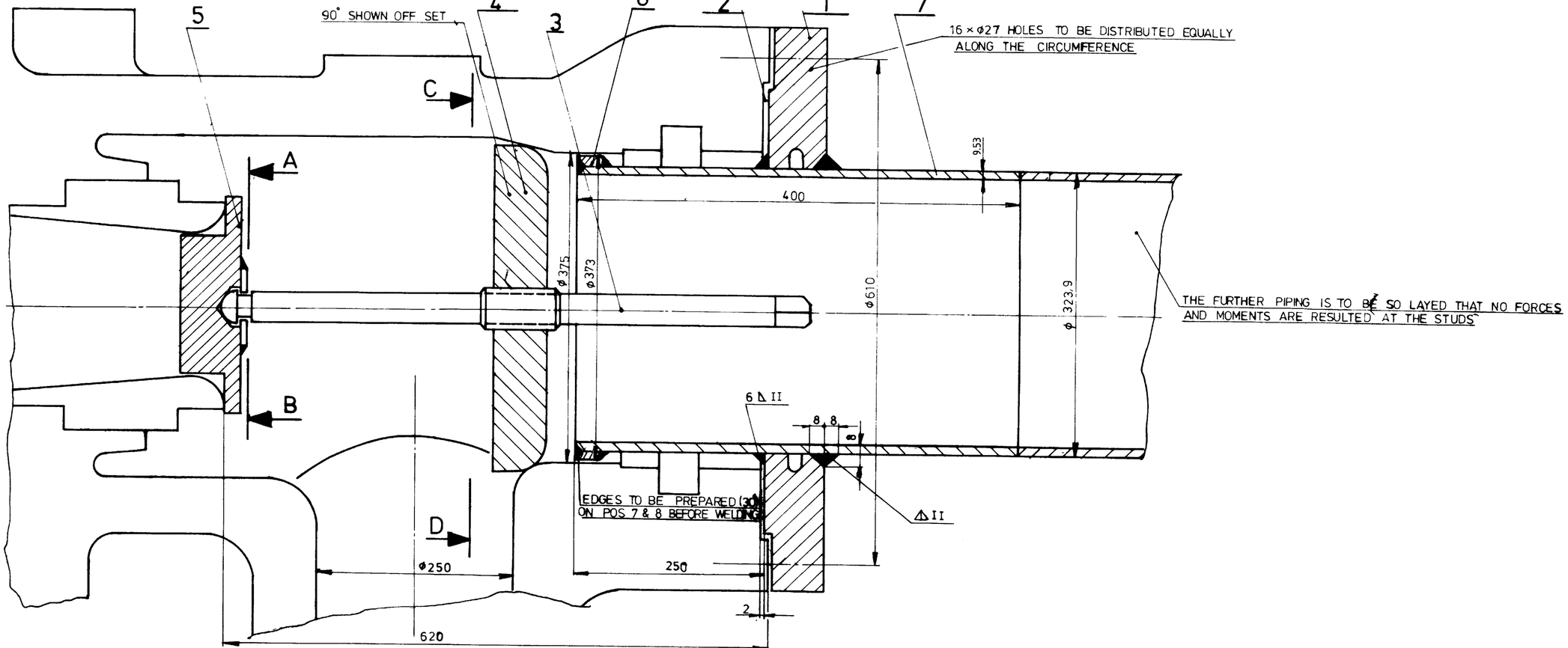
Nov Wed 27 14:10 2013
Printed by : V.SUDHAKAR-HME3166 / 6192726 on 27-11-13 14:28:23
This Drawing is printed from Engineering Digital Archive System (EDAS).
Therefore signatures are not essentially required.

DRG NO. 2-308-42-00015

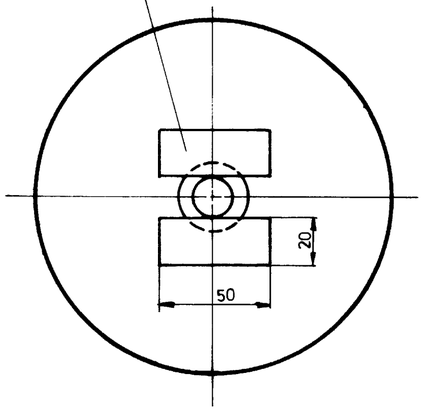
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

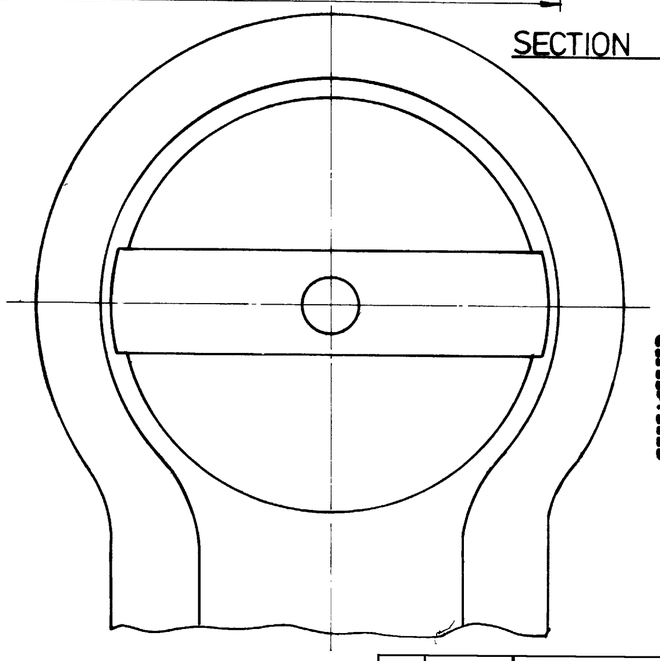
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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.



6 SECTION A-B



SECTION C-D



SSV H250

MAX TEMP	MAX PRESSURE	VAR XX
500°	25 Kg/Cm²	00

VAR OO	REMARKS	VAR. NO	ITEM NO	DESCRIPTION	STD.	DRAWING NO	IT.NO.	MATL CODE	UNIT	UNIT WT	ZONE
							VAR	MATL. SPECN.		QTY.	

CARD TYPE -3 — CARD TYPE -2 — CARD TYPE -1

ADDITIONAL INFORMATION

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

TYPE OF PRODUCT
OR
NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE
DRN.	G.S RANI	G S Rani	12-4-85
CHD.	G.B RAO		12-4-85
APPD.	G B RAO		12-4-85

REV	DATE	ALTERED	PATIL
02	27.11.13	CHECKED	ASHOK

PIPE THICKNESS 9.53 WAS 7.1.
(POS. NO. 07)

REV	DATE	ALTERED	G Rao
01	17/7/85	CHECKED	

ZONE: 16 X φ 27 holes was 16 x φ28. (at F4)

DEPT.	GRADE OF MATL.	SCALE	WEIGHT (KG)
1:TD	SA 105 GR II	/	194.0
CODE 415			

REF TO ASSY. DRG.

TITLE
BLOWING DOWN EQUIPMENT
(H 250)

CARD CODE

DRAWING NO.
2-308-42-00015-XX 02

SHEET NO. 1 NO. OF SHEETS 1

INVENTORY NO. | SIGN AND DATE | REF. DRG NO. 2-8535-0507-00

TD-100-REV. NO. 1

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

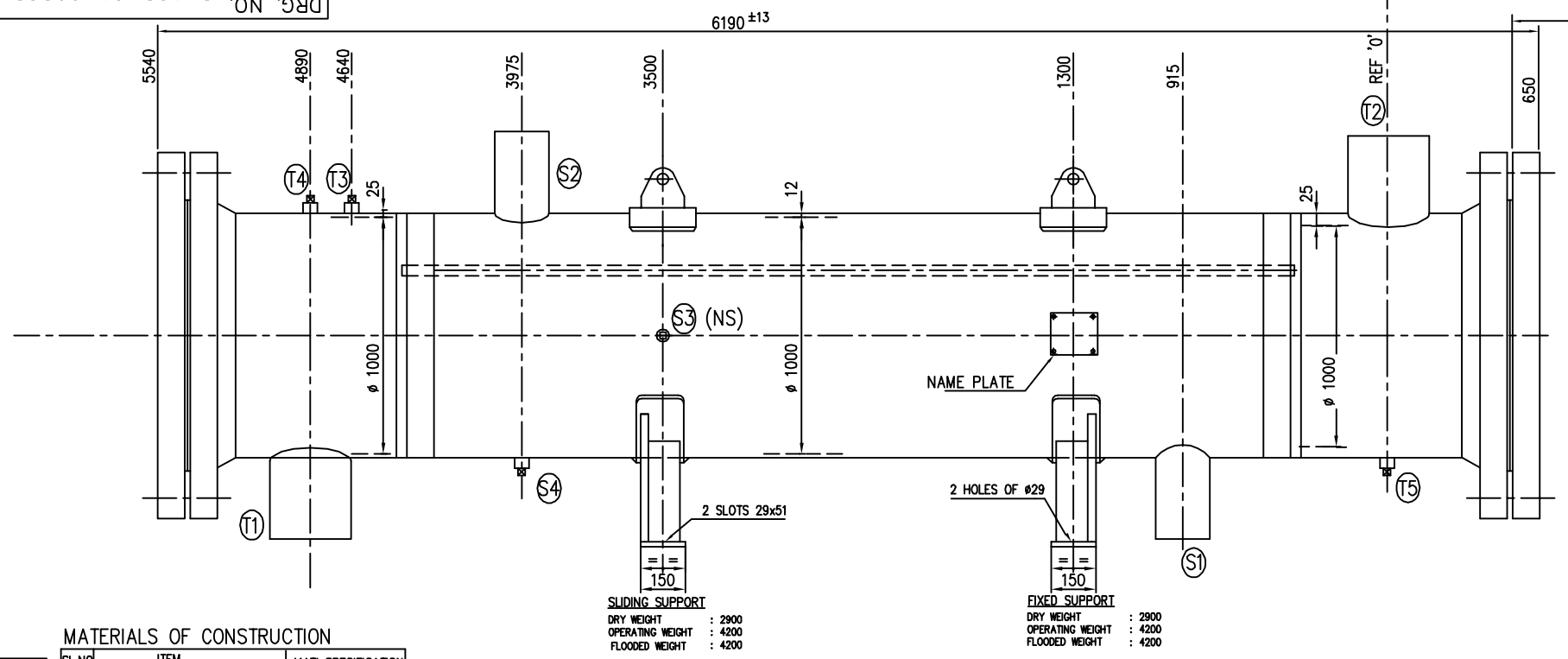
SHT. 1 OF 1

DRG. NO. 2-162-01-00363

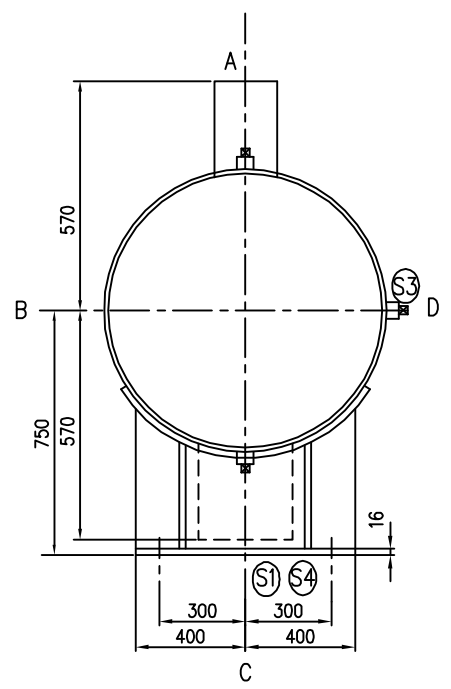
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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

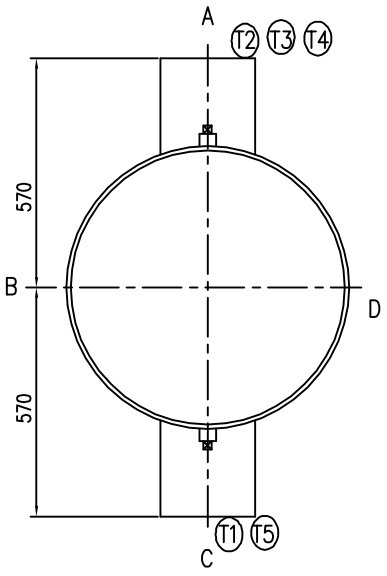
COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO



FS	FAR SIDE
NS	NEAR SIDE



SHELL SIDE NOZZLES



CHANNEL SIDE NOZZLES

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL.SPECIFICATION
1	SHELL	CS SA516 Gr.70
2	CHANNEL	SS SA240 TP304
3	TUBE SHEET	SS SA182 F304
4	CHANNEL FLANGE	SS SA182 F304
5	CHANNEL COVER	SS SA182 F304
6	BAFFLE PLATES	IS 2062
7	TUBES	SA249 TP304
8	NOZZLE PIPES SHELL SIDE	CS, SA106 Gr.B
9	NOZZLE PIPES TUBE SIDE	SS 304

WEIGHTS in Kgs.

DRY	5800
OPERATING	8400
FLOODED	8400

LIST OF NOZZLES

REF	QTY	DESCRIPTION	SIZE	CONNECTING PIPE THK.	TYPE
S1	1	DRAIN INLET	ø273.1X12.7	9.27	BW
S2	1	DRAIN OUTLET	ø 273.1X12.7	9.27	BW
S3	1	PRESSURE GAUGE CONNECTION	1/2" ANSI 6000# COUPLING	–	SW
S4	1	SHELL DRAIN	1" ANSI 6000# COUPLING	–	SW
T1	1	CONDENSATE INLET	ø 323.9X12.7	12.7	BW
T2	1	CONDENSATE OUTLET	ø 323.9X12.7	12.7	BW
T3	1	CHANNEL SAFETY RELIEF VALVE CONN.	3/4" ANSI 6000# COUPLING	–	SW
T4	1	CHANNEL START UP VENT	1" ANSI 6000# COUPLING	–	SW
T5	1	CHANNEL DRAIN	1" ANSI 6000# COUPLING	–	SW

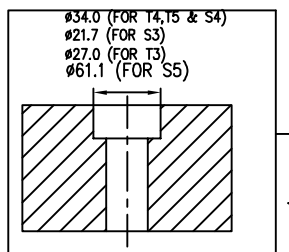
THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

NOZZLE	THERMAL MOVEMENT IN mm			FORCE IN KGF.			MOMENT IN KGM		
	Δx	Δy	Δz	fx	fy	fz	Mx	My	Mz
T1	−4.70	−0.27	0.0	±1200	±1200	±1200	±2400	±2400	±2400
T2	1.70	1.28	0.0	±1200	±1200	±1200	±2400	±2400	±2400
S1	0.50	−0.28	0.0	±700	±700	±700	±1400	±1400	±1400
S2	−3.50	1.29	0.0	±700	±700	±700	±1400	±1400	±1400

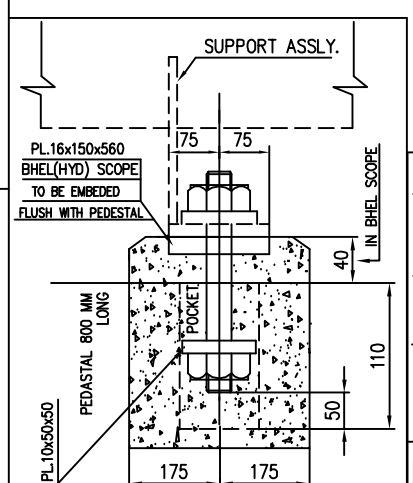
DESIGN DATA

CODE : ASME SEC.VIII DIV-1 2007 UPTO & INCL. ADD. NIL & HEI 6th EDN.

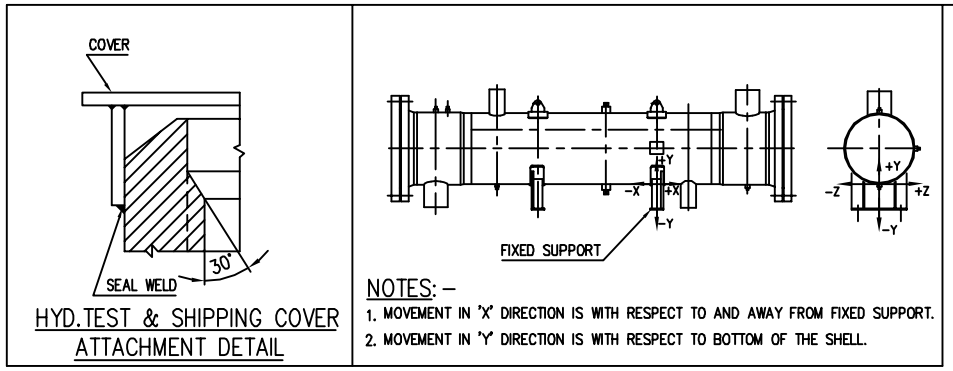
DESCRIPTION		SHELL SIDE	TUBE SIDE
DESIGN PRESSURE	Kg/sq.cm(g)	3.5 & FULL VACUUM	25 & FULL VACUUM
TEST PRESSURE	Kg/sq.cm(g)	4.55	32.5
DESIGN TEMP *	℃	140	140
NO OF PASSES or ZONES		ONE ZONE	ONE PASS
CORROSION ALLOWANCE	mm	3.2	3.2
TUBE SIZE	mm	ODXTHKXL	OD 19.05X0.889X4000L
POST WELD HEAT TREATMENT		NO	NO
RADIOGRAPHY		SPOT	FULL
No. OF TUBES REQUIRED		917	



SOCKET WELD CONNECTION

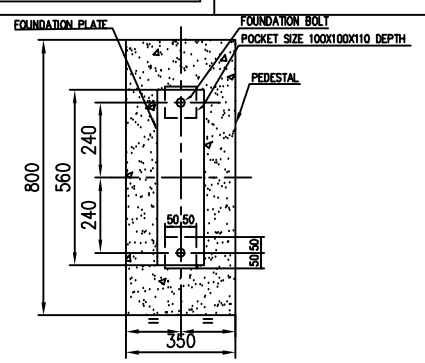


FOUNDATION DETAIL
(POCKET SIZE: 100x100x110)



HYD.TEST & SHIPPING COVER ATTACHMENT DETAIL

NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS WITH RESPECT TO AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.



FOUNDATION PLAN

NOTES: –

1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES.
3. ALL COUPLINGS ARE 6000 LBS AND PLUGGED.
4. START UP VENTS SHOULD NOT BE USED DURING NORMAL OPERATION.
5. TUBES ARE WELDED AND ROLLED INTO TUBE SHEET HOLES.
6. INSULATION CLIPS WELDED ON 240mm CENTRES AT SITE.
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. TWO LIFTING LUGS WITH 30mm DIA HOLES PROVIDED.
9. (a) 7 EXCESS TUBES PROVIDED FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISSIONING FOR PLUGGING PURPOSE.
10. FOUNDATION BOLTS STUD WITH TWO NUTS M24x150 – 4 Nos.
11. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.
12. TEMP.GAUGE CONNS.& PRESSURE GAUGE CONNS. FOT T1,T2,S1,S2 NOZZLES SHELL BE PROVIDED ON PIPING NEAREST TO THE NOZZLES.

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FICILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FICILITIES

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAMESH G		06.09.13	
CHD.	K.K.K		06.09.13	N.A
APPD.	B.SRINIVAS		06.09.13	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR.		N.T.S	4800	N.A	N.A	N.A
CODE 405	℄/M/F						

TITLE: GENERAL ARRANGEMENT OF DRAIN COOLER

CARD CODE

DRAWING NO. 2-162-01-00363 REV. 00

SHT. No 1 NO. OF SHT. 1

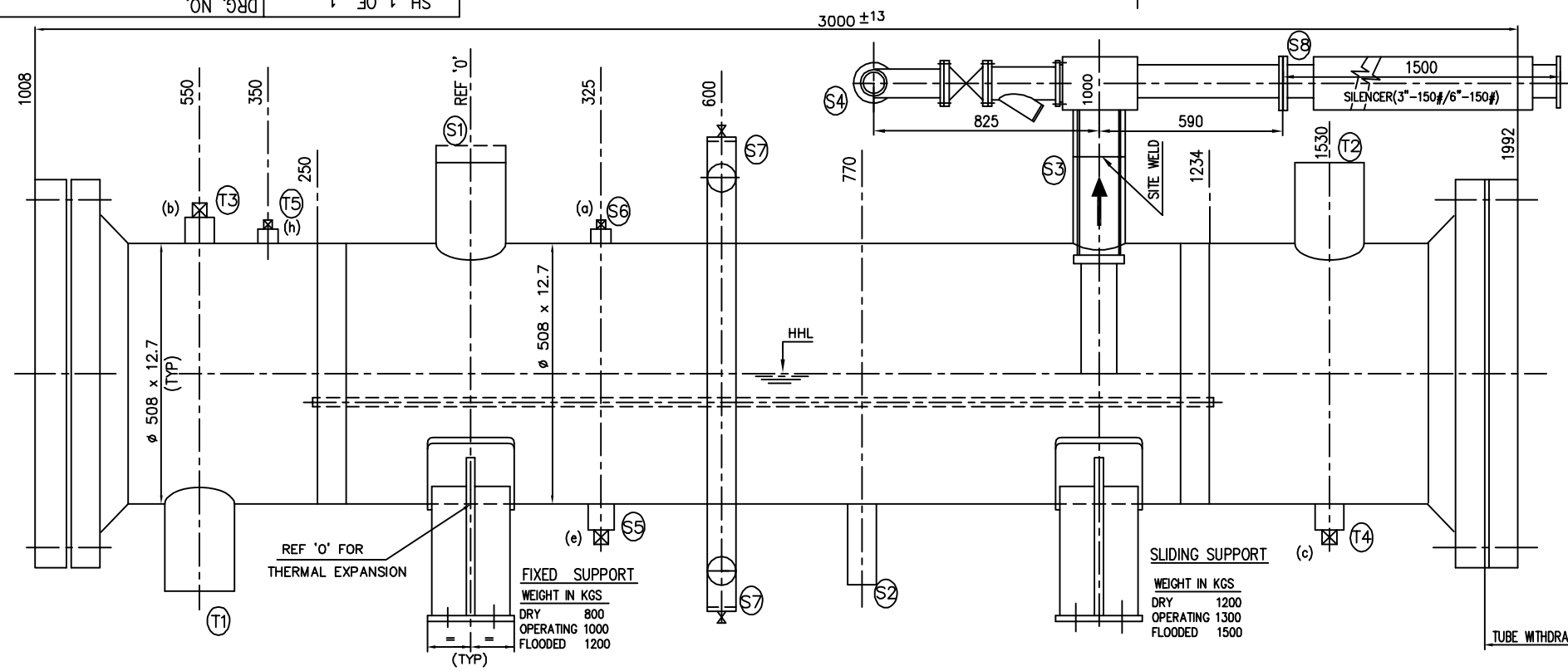
REV.	DATE	ALTERED	CHD/APPD	ZONE

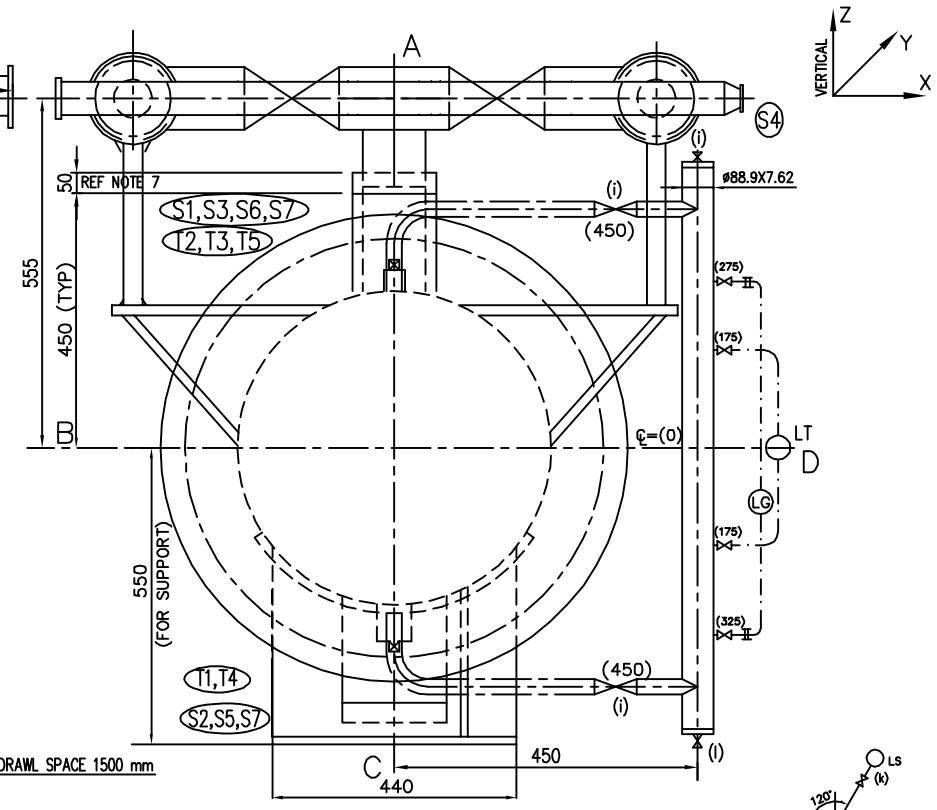
FIRST ANGLE PROJECTION

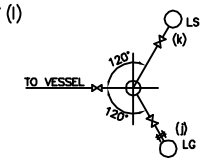
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-14-00573

SH. 1 OF 1







WEIGHTS IN KGS

EMPTY	2000
OPERATING	2300
FLOODED	2700

BILL OF MATERIAL

SL.NO	MATERIAL	SPECIFICATION
1	SHELL AND CHANNEL	CS SA106 Gr B/EQVT.
2	TUBE PLATE, CHANNEL COVER	CS SA516 GR70
3	BAFFLE PLATES	IS 2062 / EQVT.
4	CHANNEL FLANGE	CS SA 105
5	TUBES	SA 249 TP 304
6	IMPINGEMENT PLATE	SS SA240 TP304/EQVT.
7	NOZZLES (PIPES)	CS SA106 GRB EQVT.

EJECTOR DATA

MOTIVE STEAM		
PRESSURE	ATA	16
TEMPERATURE	°C	230
CONSUMPTION	Kg/Hr	200
SUCTION STEAM + AIR		
LEAKAGE STEAM & AIR MIXTURE QTY. (MAX.)	Kg/Hr	450
SUCTION PRESSURE	ATA	0.9

LIST OF NOZZLES

REF	DESCRIPTION	SIZE	QTY	END CONN.
T1	CONDENSATE INLET	ø273.1X12.7/6.35	1	BW
T2	CONDENSATE OUTLET	ø273.1X12.7/6.35	1	BW
T3	FRONT WATER BOX VENT	1" ANSI 6000# CPLG	1	SW
T4	REAR WATER BOX DRAIN	1" ANSI 6000# CPLG	1	SW
T5	WATER EXPANSION REL VALVE CONN.	3/4" SW	1	SW
S1	STEAM INLET	ø168.3x12.7 / 6.35	1	SW
S2	DRAIN OUTLET	ø60.3X8.74/5.54	1	BW
S3	AIR OUTLET	ø114.3X11.13	1	BW
S4	MOTIVE STEAM TO EJECTOR	ø48.3X5.08	1	BW
S5	SHELL DRAIN	1" ANSI 6000# CPLG	1	SW
S6	PRESSURE GAUGE CONNECTION	1/2" ANSI 6000# CPLG	1	SW
S7	STAND PIPE CONNECTION	ø60.3X8.74/5.54	2	BW
S8	EJECTOR OUTLET (SILENCER INLET 3"–150# / OUTLET 6"–150#)		2	FLANGED

VALVE SCHEDULE

REF	DESCRIPTION	CONN SIZE	QTY	LOCATION
a	PR. GAUGE ISOLATING VALVE	1/2" SW	7	ON SHELL,COND IN/OUT AIR & STEAM TO EJECTOR
b	WATER BOX VENT VALVE	1" SW	1	ON FRONT WATER BOX
c	WATER BOX DRAIN VALVE	1" SW	1	ON REAR WATER BOX
d	—	—		—
e	SHELL DRAIN VALVE	1" SW	1	ON SHELL
f	—	—		—
g	AIR OUTLET VALVE	3" BW	2	ON S3 PIPE LINE
h	WATER EXPANSION RELIEF VALVE	INLET 3/4" SW OUTLET 1" SW	1	ON FRONT WATER BOX
i	STAND PIPE ISOLATING VALVES	2" SW	2	—
j	STAND PIPE VENT&DRAIN VALVES	1/2" SW	2	ON STAND PIPE
k	L G ISOLATION VALVES	1" SW	2	ON STAND PIPE

DESIGN DATA

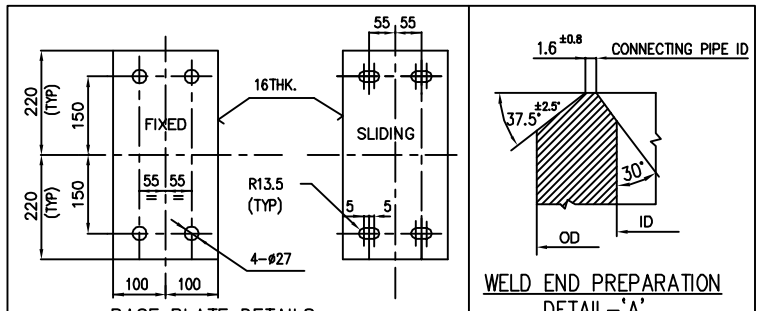
DESCRIPTION		SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/sq.cm(g)		25 & FULL VACUUM	25
TEST PRESSURE Kg/sq.cm(g)		32.5	32.5
DESIGN TEMP	°C	210	100
TEST TEMP	°C	AMBIENT	AMBIENT
CORROSION ALLOWANCE	MM	3.2	3.2
STRESS RELIEVING		—	—
JOINT EFFICIENCY		N.A	N.A
NO. OF PASSES		ONE	ONE
MEDIUM		STEAM & AIR	CONDENSATE
RADIO GRAPHY		N.A	N.A
TUBE SIZE	ODxTHKXL	ø19.05X0.889X1500	
No. OF TUBES REQUIRED		200	

ALLOWABLE FORCES, MOMENTS & MOVEMENTS

NOZZLE	FORCE IN KGF.			MOMENT IN KGM			THERMAL MOVEMENT INmm		
	fx	fy	fz	Mx	My	Mz	Δx	Δy	Δz
T1	±400	±400	±400	±800	±800	±800	−0.27	0.00	−0.1
T2	±400	±400	±400	±800	±800	±800	+1.8	0.00	+0.34
S1	±250	±250	±250	±500	±500	±500	0.00	0.00	+1.21
S3	±250	±250	±250	±500	±500	±500	+6.0	0.00	+1.21

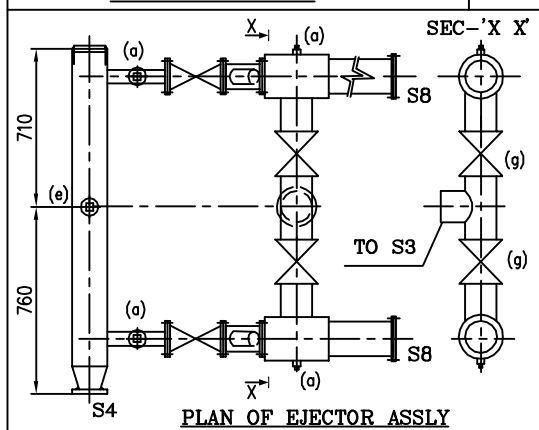
LIST OF INSTRUMENT CONNECTIONS(DATA AWAITED)

SL.No	DESCRIPTION	CONNECTION	LOCATION	QTY
1	PRESSURE GAUGE	1/2"SW	ON SHELL,T1,T2 PIPELINES AIR & STEAM TO EJECTOR	7
2	LEVEL GAUGE (C–C 600)	1" 300# RF	ON STAND PIPE	2
3	TEMPERATURE GAUGE	M33 x 2	ON S1,T1,T2 PIPELINES & STEAM TO EJECTOR	4
4	LEVEL SWITCH (C–C 350)	1" SW	ON STAND PIPE	2



BASE PLATE DETAILS

WELD END PREPARATION DETAIL–'A'



PLAN OF EJECTOR ASSLY

NOTES:–

1. DESIGN CODE : (a) THERMAL ----- HEI 8th EDN
   (b) MECHANICAL -- HEI/ASME SEC. VIII DIV.1 2010 INCLUDING ADD 2011.
2. INSPECTION : BHEL / CUSTOMER
3. PAINTING :
   (a) INSIDE ---- NIL
   (b) OUTSIDE --- 2 COATS OF HEAT RESISTANT ALUMINIUM PAINT.
4. FOUNDATION BOLTS (STUD+2NUTS M24x300) –8Nos.+ WASHERS BY BHEL (HYD.)
5. S3 NOZZLE IS TO BE CONNECTED WITH 2x100% EJECTOR ASSEMBLY AT SITE.
6. ALL BOLT HOLES TO STRADDLE CENTER LINES.
7. NOZZLES T1,T2,S1,S2,S3,S7 ARE PROVIDED WITH 50 MM EXTRA LENGTHS. FOR REMOVAL OF HYDRO–TEST BLANKS AT SITE & EDGE PREPARATION AS PER DETAIL–A.
8. 6 Nos. OF TUBES ARE PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
9. SILENCER SHALL BE SUITABLLY SUPPORTED ALONG WITH PIPING AT SITE

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FICILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FICILITIES

BHEL BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAMESH G		02.09.13	
CHD.	K.K.K.		02.09.13	NA
APPD.	B.SRINIVAS		02.09.13	

DEPT.	GRADE OF TOL.DIM. C/M/F		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE			NA	–	NA	NA	NA
CODE 405							

TITLE: G.A OF GLAND STEAM CONDENSER

CARD CODE

DRAWING NO. 2-162-14-00573 REV. 00

SHEET No. 1 NO OF SHEETS 1

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN any DETRIMENTAL TO THE INTEREST OF THE COMPANY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

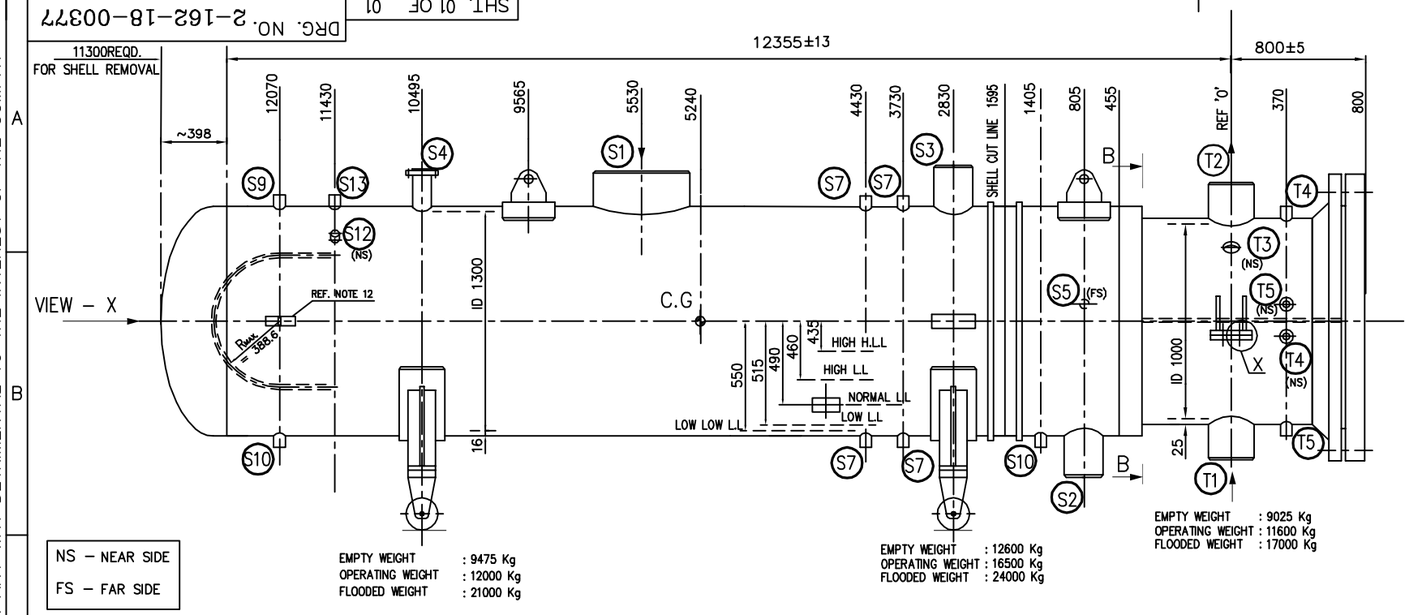
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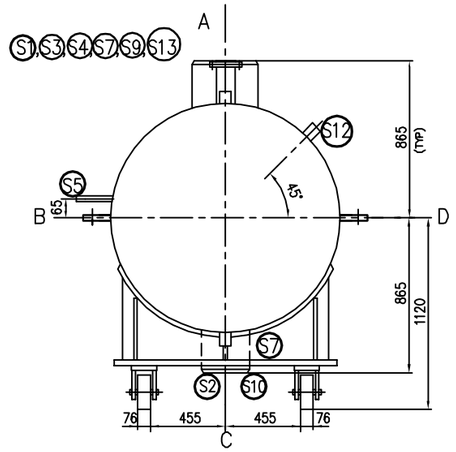
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FIRST ANGLE PROJECTION

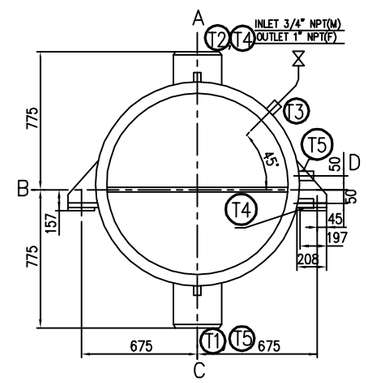
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-18-00377 SHT. 01 OF 01





VIEW – X



SECTION B.B

LIST OF NOZZLES

REF.	QTY.	DESCRIPTION	SIZE & RATING	CONNECTING PIPE THICKNESS	TYPE
S1	1	STEAM INLET	ø 965 x 12	9.53	BW
S2	1	DRAINS OUTLET	ø273.1 x 12.7	9.27	BW
S3	1	DRAINS INLET	ø273.1 x 12.7	9.27	BW
S4	1	SHELL SAFETY RELIEF VALVE CONN.	4" ANSI 150#	SRV OULET SIZE 6" ANSI 150#	RF
S5	1	OPERATING AIR OUTLET	ø 114.3 x 11.13	6.02	BW
–	–	–	–	——	–
S7	4	LIQUID LEVEL STAND PIPE CONN.	2" ANSI 6000# CPLG	——	SW
–	–	–	–	——	
S9	1	SHELL START UP VENT	1" ANSI 6000# CPLG	——	SW
S10	2	SHELL DRAIN	1" ANSI 6000# CPLG	——	SW
–	–	–	–	——	–
S12	1	PRESSURE GAUGE CONN.	1/2" ANSI 6000# CPLG	——	SW
S13	1	PRESSURE GAUGE CONN. FOR TESTING	1/2" ANSI 6000# CPLG	——	SW
T1	1	CONDENSATE INLET	ø 323.9 x 12.7	9.5	BW
T2	1	CONDENSATE OUTLET	ø 323.9 x 12.7	9.5	BW
T3	1	CHANNEL SAFETY RELEIF VALVE CONN.	3/4" ANSI 6000# CPLG	——	SW
T4	2	CHANNEL START UP VENT	1" ANSI 6000# CPLG	——	SW
T5	2	CHANNEL DRAIN	1" ANSI 6000# CPLG	——	SW

DESIGN DATA

CODE : ASME SEC.VIII DIV–1 2010 UPTO & INCL. ADD. 2011 & HEI 8th EDN.

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq cm (g)	3 & FULL VACUUM	25
TEST PRESSURE Kg/Sq cm (g)	3.9	32.5
DESIGN TEMPERATURE °C *	143	143
No. OF PASSES OR ZONES	ONE ZONE	TWO PASS
CORROSION ALLOWANCE	3.2 mm	3.2 mm
POST WELD HEAT TREATMENT	NO	NO
RADIOGRAPHY	SPOT	FULL
U–TUBE SIZE	OD 19.05 X LEG LENGTH 11800	
NO OF TUBES PROVIDED	439 'U'	

* MINIMUM DESIGN METAL TEMP. 5°C
MINIMUM HYDRO–TEST TEMP. 22°C

LIST OF FITTINGS & VALVES

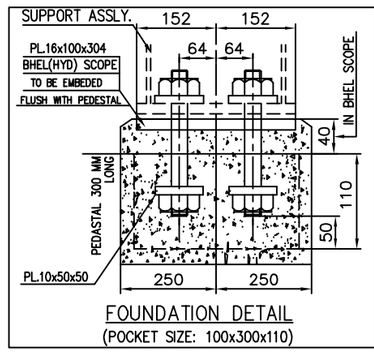
SL.NO	DESCRIPTION	CONN.	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE	1/2"SW ANSI 800#	ON SHELL	1
b	ROOT VALVE FOR DRAIN & VENT OF STAND PIPES	1/2"SW ANSI 800#	ON STAND PIPE	4
c	ROOT VALVE FOR STAND PIPES	2" SW ANSI 800#	ON SHELL	4
d	ROOT VALVE FOR SHELL VENT & DRAIN	1" SW ANSI 800#	ON SHELL	3
e	ROOT VALVE FOR CHANNEL VENT & DRAIN	1"SW ANSI 1500#	ON CHANNEL	4
i	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g)	INLET 4"ANSI150#	ON SHELL	1
		OUTLET 6"ANSI150#		
j	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g)	INLET 3/4" SW	ON CHANNEL	1
		OUTLET 1" SW		

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL. SPECIFICATION
1	SHELL	CS, SA516 Gr.70
2	SHELL DISHED END	CS, SA516 Gr.70
3	TUBE SHEET& CHANNEL END COVER	SS, SA182 F304
4	CHANNEL	SS, SA240 TP304
5	SUPPORT PLATES	CS, IS 2062
6	TUBES	SS, SA 688 TP 304
7	NOZZLES (SHELL SIDE)	CS, SA106 Gr.B
8	T1 & T2 NOZZLES	SS 304
9	IMPINGEMENT PLATE	SS, SA240 TP304

NOTES :–

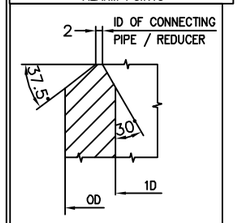
1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLET DURING OPERATION. CRITICAL ORIFICE FLOW PLATE HAS NOT BEEN PROVIDED IN CONN. S5. ORIFICE PLATE ASSLY. WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
6. CRITICAL ORIFICE FLOW PLATE HOLE DIA. 43 MM (FOR S5)
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES ARE ROLLED INTO TUBE SHEET HOLES WITH GROOVES.
10. INSULATION CLIPS WELDED ON 240 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 48 MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH 40 MM DIA. HOLE.
13. 7 No. OF TUBES PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
14. FOUNDATION BOLTS M24x150 STUD WITH TWO NUTS – 4 NOS.
15. FOR STAND PIPE DETAILS REFER DRG. No. 3–162–18–00961.
16. COUNTER FLANGE, FASTNERS & GASKET FOR SHELL SAFETY RELIEF VALVE – BY BHEL(HYD).
17. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.



FOUNDATION DETAIL
(POCKET SIZE: 100x300x110)

NORMAL OPERATING RANGE

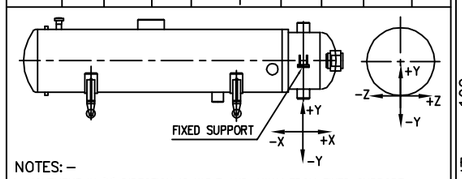
10	NORMAL LIQUID LEVEL
10	DO NOT USE FOR ALARM POINTS



DETAIL OF BUTT WELD CONN.
DETAIL–A

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

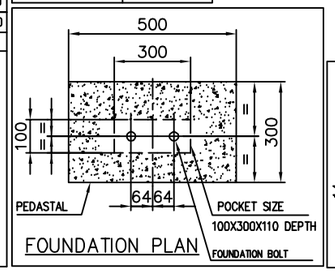
NOZZLE	NOZZLE THERMAL MOVEMENTS mm			MAX. ALLOWABLE FORCE Kgf			MAX. ALLOWABLE MOMENT KgM		
	Δx	Δy	Δz	Fx	Fy	Fz	Mx	My	Mz
T1	0.0	–1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
T2	0.0	+1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
S1	–9.9	+1.6	0.0	±3000	±3000	±3000	±6000	±6000	±6000
S2	–1.6	–1.6	0.0	±650	±650	±650	±1300	±1300	±1300
S3	–5.1	+1.6	0.0	±800	±800	±800	±1600	±1600	±1600



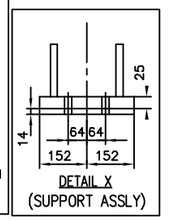
NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS W.R.T AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.

WEIGHTS IN Kgs

EMPTY	18500
OPERATING	23600
FLOODED	38000



FOUNDATION PLAN



DETAIL X
(SUPPORT ASSLY)

REV.	DATE	ALTERED	CHD/APPD
ZONE			

REV.	DATE	ALTERED	CHD/APPD
ZONE			

REV.	DATE	ALTERED	CHD/APPD
ZONE			

REV.	DATE	ALTERED	CHD/APPD
ZONE			

REV.	DATE	ALTERED	CHD/APPD
ZONE			

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.BHANU	BHANU	04.09.13	NA
CHD.	K KIRAN KUMAR		04.09.13	
APPD.	B.SRINIVAS		04.09.13	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR.		NTS	---	NA	NA	NA
CODE 405	℄/M/F						

TITLE
GENERAL ARRANGEMENT OF LP HEATER No. 1

CARD CODE

DRAWING NO. 2–162–18–00377 REV. 00

SHT. No 01 NO. OF SHT. 01

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

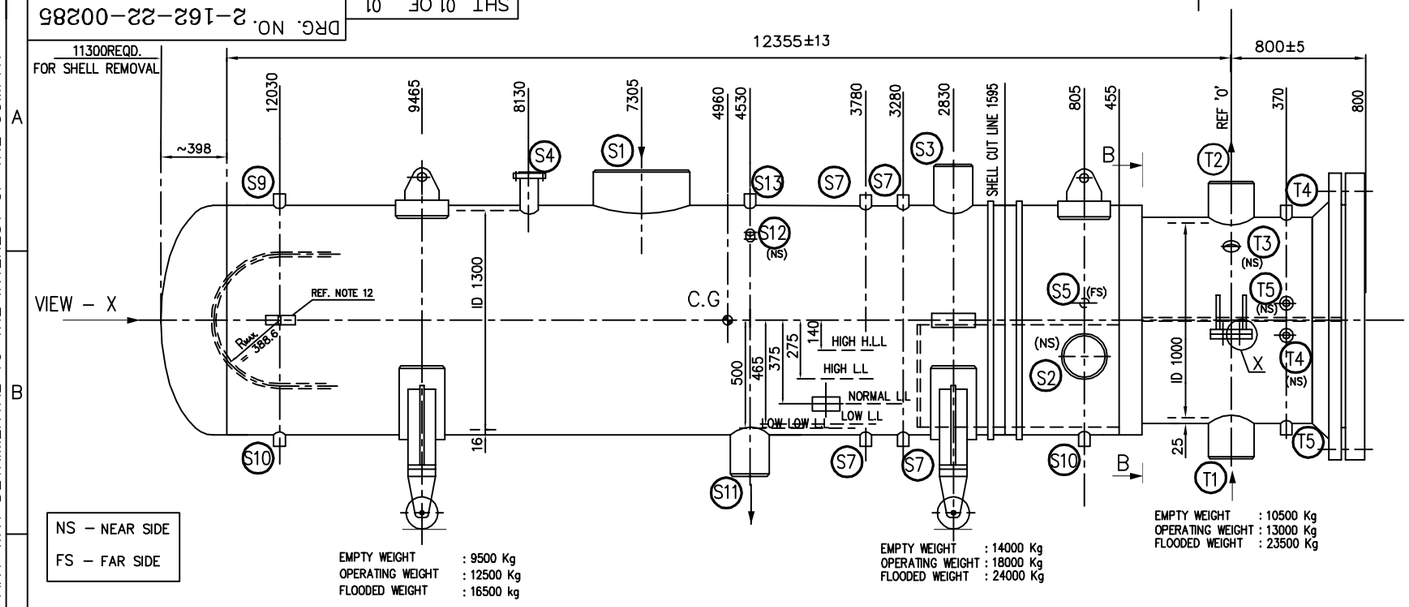
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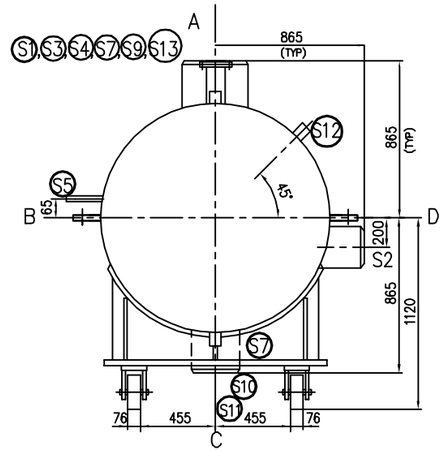
INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

FIRST ANGLE PROJECTION

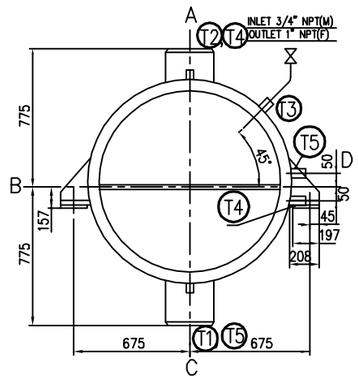
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-22-00285 SHT. 01 OF 01





VIEW – X



SECTION B.B

LIST OF NOZZLES

REF.	QTY.	DESCRIPTION	SIZE & RATING	CONNECTING PIPE THICKNESS	TYPE
S1	1	STEAM INLET	ø 610 x 9.53	6.35	BW
S2	1	DRAINS OUTLET	ø219.1 x 12.7	8.18	BW
S3	1	DRAINS INLET	ø273.1 x 9.27	7.8	BW
S4	1	SHELL SAFETY RELIEF VALVE CONN.	4" ANSI 150#	SRV OULET SIZE 6" ANSI 150#	RF
S5	1	OPERATING AIR OUTLET	ø 114.3 x 11.13	6.02	BW
–	–	–	–	——	–
S7	4	LIQUID LEVEL STAND PIPE CONN.	2" ANSI 6000# CPLG	——	SW
–	–	–	–	——	
S9	1	SHELL START UP VENT	1" ANSI 6000# CPLG	——	SW
S10	2	SHELL DRAIN	1" ANSI 6000# CPLG	——	SW
S11	1	DC ZONE BYPASS(LP DRAIN FT)	ø219.1 x 12.7	8.18	BW
S12	1	PRESSURE GAUGE CONN.	1/2" ANSI 6000# CPLG	——	SW
S13	1	PRESSURE GAUGE CONN. FOR TESTING	1/2" ANSI 6000# CPLG	——	SW
T1	1	CONDENSATE INLET	ø 323.9 x 12.7	9.5	BW
T2	1	CONDENSATE OUTLET	ø 323.9 x 12.7	9.5	BW
T3	1	CHANNEL SAFETY RELEIF VALVE CONN.	3/4" ANSI 6000# CPLG	——	SW
T4	2	CHANNEL START UP VENT	1" ANSI 6000# CPLG	——	SW
T5	2	CHANNEL DRAIN	1" ANSI 6000# CPLG	——	SW

DESIGN DATA

CODE : ASME SEC.VIII DIV–1 2010 UPTO & INCL. ADD. 2011 & HEI 8th EDN.

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq cm (g)	3 & FULL VACUUM	25
TEST PRESSURE Kg/Sq cm (g)	3.9	32.5
DESIGN TEMPERATURE °C *	143	143
No. OF PASSES OR ZONES	TWO ZONES	TWO PASS
CORROSION ALLOWANCE	3.2 mm	3.2 mm
POST WELD HEAT TREATMENT	NO	NO
RADIOGRAPHY	SPOT	FULL
U–TUBE SIZE	OD 19.05 X LEG LENGTH 11800	
NO OF TUBES PROVIDED	439 'U'	

* MINIMUM DESIGN METAL TEMP. 5°C
MINIMUM HYDRO–TEST TEMP. 22°C

LIST OF FITTINGS & VALVES

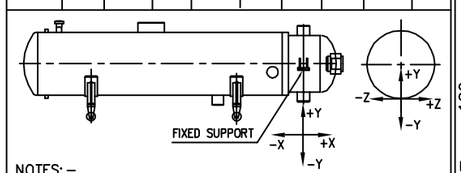
SL.NO	DESCRIPTION		CONN.	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE		1/2"SW ANSI 800#	ON SHELL	1
b	ROOT VALVE FOR DRAIN & VENT OF STAND PIPES		1/2"SW ANSI 800#	ON STAND PIPE	4
c	ROOT VALVE FOR STAND PIPES		2" SW ANSI 800#	ON SHELL	4
d	ROOT VALVE FOR SHELL VENT & DRAIN		1" SW ANSI 800#	ON SHELL	3
e	ROOT VALVE FOR CHANNEL VENT & DRAIN		1"SW ANSI 1500#	ON CHANNEL	4
i	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g)	INLET	4"ANSI150#	ON SHELL	1
		OUTLET	6"ANSI150#		
j	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g)	INLET	3/4" SW	ON CHANNEL	1
		OUTLET	1" SW		

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL. SPECIFICATION
1	SHELL	CS, SA516 Gr.70
2	SHELL DISHED END	CS, SA516 Gr.70
3	TUBE SHEET& CHANNEL END COVER	SS, SA182 F304
4	CHANNEL	SS, SA240 TP304
5	SUPPORT PLATES	CS, IS 2062
6	TUBES	SS, SA 688 TP 304
7	NOZZLES (SHELL SIDE)	CS, SA106 Gr.B
8	T1 & T2 NOZZLES	SS 304
9	IMPINGEMENT PLATE	SS, SA240 TP304

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

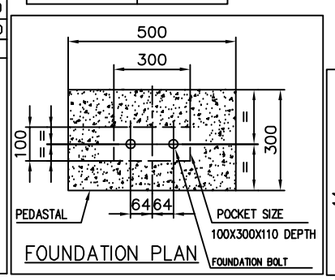
NOZZLE	NOZZLE THERMAL MOVEMENTS mm			MAX. ALLOWABLE FORCE Kgf			MAX. ALLOWABLE MOMENT KgM		
	△x	△y	△z	Fx	Fy	Fz	Mx	My	Mz
T1	0.0	–1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
T2	0.0	+1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
S1	–14.6	+2.1	0.0	±1800	±1800	±1800	±3600	±3600	±3600
S2	–2.1	–0.5	+2.1	±500	±500	±500	±1000	±1000	±1000
S3	–6.7	+2.1	0.0	±800	±800	±800	±1600	±1600	±1600
S11	–8.5	–1.6	0.0	±500	±500	±500	±1000	±1000	±1000



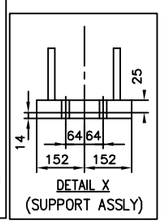
NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS W.R.T AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.

WEIGHTS IN Kgs

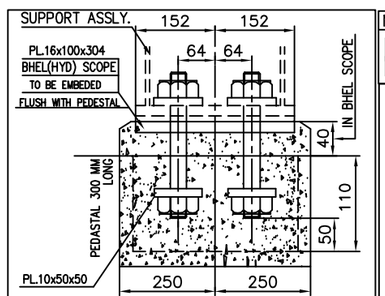
EMPTY	20000
OPERATING	25500
FLOODED	40000



FOUNDATION PLAN



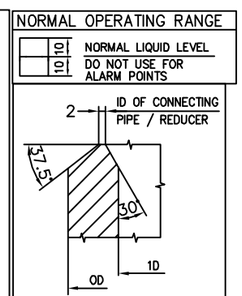
DETAIL X
(SUPPORT ASSLY)



FOUNDATION DETAIL
(POCKET SIZE: 100x300x110)

NORMAL OPERATING RANGE

10 10	NORMAL LIQUID LEVEL
10	DO NOT USE FOR ALARM POINTS



DETAIL OF BUTT WELD CONN.
DETAIL–A

NOTES :–

1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLET DURING OPERATION. CRITICAL ORIFICE FLOW PLATE HAS NOT BEEN PROVIDED IN CONN. S5. ORIFICE PLATE ASSLY. WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
6. CRITICAL ORIFICE FLOW PLATE HOLE DIA. 21 MM (FOR S5)
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES ARE ROLLED INTO TUBE SHEET HOLES WITH GROOVES.
10. INSULATION CLIPS WELDED ON 240 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 48 MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH 40 MM DIA. HOLE.
13. 7 No. OF TUBES PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
14. FOUNDATION BOLTS M24x150 STUD WITH TWO NUTS – 4 NOS.
15. FOR STAND PIPE DETAILS REFER DRG. No. 3–162–22–00469.
16. COUNTER FLANGE, FASTNERS & GASKET FOR SHELL SAFETY RELIEF VALVE – BY BHEL(HYD).
17. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPAY

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD
ZONE			

RIL DRG. NO.:

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.BHANU	BHANU	04.09.13	NA
CHD.	K KIRAN KUMAR		04.09.13	
APPD.	B.SRINIVAS		04.09.13	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR.		NTS	---	NA	NA	NA
CODE 405	₵/M/F						

TITLE: GENERAL ARRANGEMENT OF LP HEATER No. 2

CARD CODE

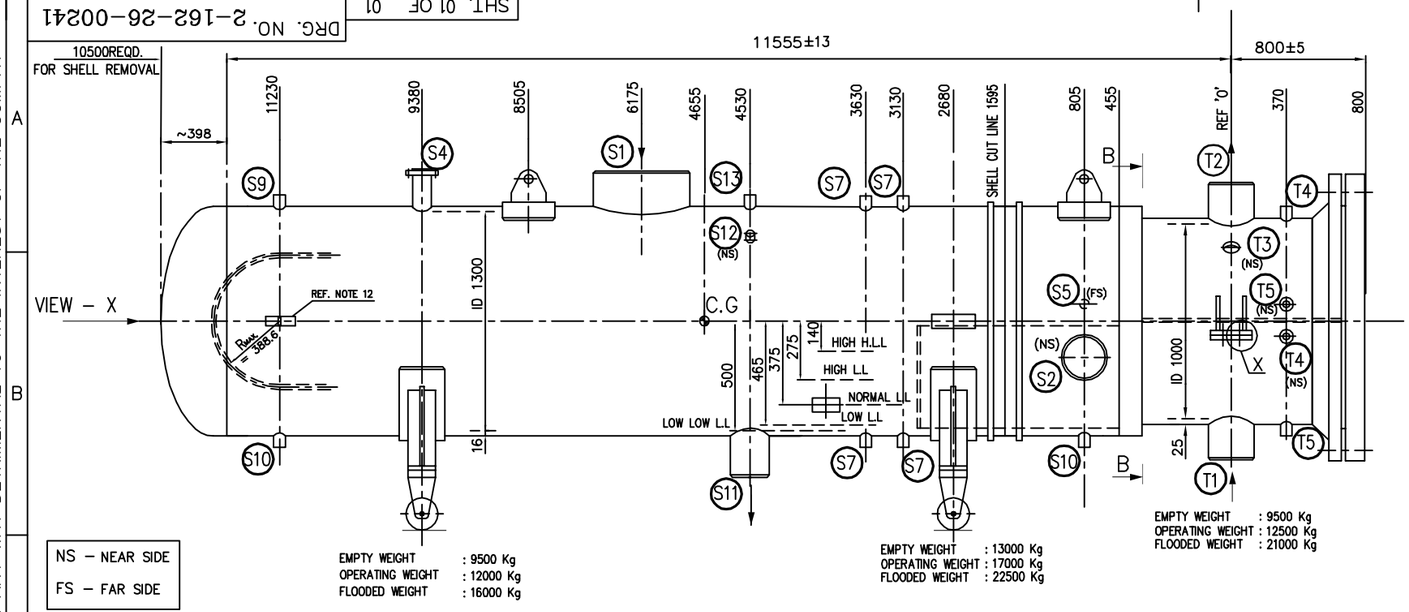
DRAWING NO. 2–162–22–00285 REV. 00

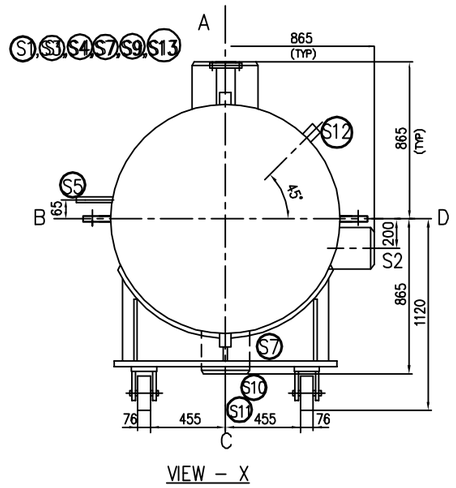
SHT. No 01 NO. OF SHT. 01

FIRST ANGLE PROJECTION

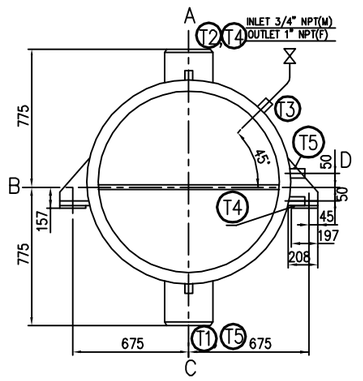
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-26-00241 SHT. 01 OF 01





VIEW – X



SECTION B.B

LIST OF NOZZLES

REF.	QTY.	DESCRIPTION	SIZE & RATING	CONNECTING PIPE THICKNESS	TYPE
S1	1	STEAM INLET	ø 406.4 x 9.52	6.35	BW
S2	1	DRAINS OUTLET	ø168.3 x 10.97	7.11	BW
–	–	–	–	—	–
S4	1	SHELL SAFETY RELIEF VALVE CONN.	4" ANSI 150#	SRV OULET SIZE 6" ANSI 150#	RF
S5	1	OPERATING AIR OUTLET	ø 114.3 x 11.13	6.02	BW
–	–	–	–	—	–
S7	4	LIQUID LEVEL STAND PIPE CONN.	2" ANSI 6000# CPLG	—	SW
–	–	–	–	—	
S9	1	SHELL START UP VENT	1" ANSI 6000# CPLG	—	SW
S10	2	SHELL DRAIN	1" ANSI 6000# CPLG	—	SW
S11	1	DC ZONE BYPASS(LP DRAIN FT)	ø168.3 x 10.97	7.11	BW
S12	1	PRESSURE GAUGE CONN.	1/2" ANSI 6000# CPLG	—	SW
S13	1	PRESSURE GAUGE CONN. FOR TESTING	1/2" ANSI 6000# CPLG	—	SW
T1	1	CONDENSATE INLET	ø 323.9 x 12.7	9.5	BW
T2	1	CONDENSATE OUTLET	ø 323.9 x 12.7	9.5	BW
T3	1	CHANNEL SAFETY RELEIF VALVE CONN.	3/4" ANSI 6000# CPLG	—	SW
T4	2	CHANNEL START UP VENT	1" ANSI 6000# CPLG	—	SW
T5	2	CHANNEL DRAIN	1" ANSI 6000# CPLG	—	SW

DESIGN DATA

CODE : ASME SEC.VIII DIV–1 2010 UPTO & INCL. ADD. 2011 & HEI 8th EDN.

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq cm (g)	4 & FULL VACUUM	25
TEST PRESSURE Kg/Sq cm (g)	5.2	32.5
DESIGN TEMPERATURE °C *	152	152
No. OF PASSES OR ZONES	TWO ZONES	TWO PASS
CORROSION ALLOWANCE	3.2 mm	3.2 mm
POST WELD HEAT TREATMENT	NO	NO
RADIOGRAPHY	SPOT	FULL
U–TUBE SIZE	OD 19.05 X LEG LENGTH 11000	
NO OF TUBES PROVIDED	439 'U'	

* MINIMUM DESIGN METAL TEMP. 5°C
MINIMUM HYDRO–TEST TEMP. 22°C

LIST OF FITTINGS & VALVES

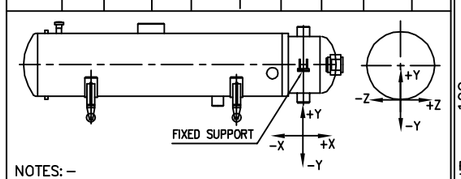
SL.NO	DESCRIPTION		CONN.	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE		1/2"SW ANSI 800#	ON SHELL	1
b	ROOT VALVE FOR DRAIN & VENT OF STAND PIPES		1/2"SW ANSI 800#	ON STAND PIPE	4
c	ROOT VALVE FOR STAND PIPES		2" SW ANSI 800#	ON SHELL	4
d	ROOT VALVE FOR SHELL VENT & DRAIN		1" SW ANSI 800#	ON SHELL	3
e	ROOT VALVE FOR CHANNEL VENT & DRAIN		1"SW ANSI 1500#	ON CHANNEL	4
i	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g)	INLET	4"ANSI150#	ON SHELL	1
		OUTLET	6"ANSI150#		
j	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g)	INLET	3/4" SW	ON CHANNEL	1
		OUTLET	1" SW		

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL. SPECIFICATION
1	SHELL	CS, SA516 Gr.70
2	SHELL DISHED END	CS, SA516 Gr.70
3	TUBE SHEET& CHANNEL END COVER	SS, SA182 F304
4	CHANNEL	SS, SA240 TP304
5	SUPPORT PLATES	CS, IS 2062
6	TUBES	SS, SA 688 TP 304
7	NOZZLES (SHELL SIDE)	CS, SA106 Gr.B
8	T1 & T2 NOZZLES	SS 304
9	IMPINGEMENT PLATE	SS, SA240 TP304

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

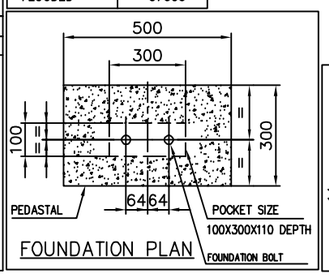
NOZZLE	NOZZLE THERMAL MOVEMENTS mm			MAX. ALLOWABLE FORCE Kgf			MAX. ALLOWABLE MOMENT KgM		
	Δx	Δy	Δz	Fx	Fy	Fz	Mx	My	Mz
T1	0.0	–1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
T2	0.0	+1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
S1	–14.6	+2.1	0.0	±1200	±1800	±1800	±2400	±3600	±3600
S2	–2.1	–0.5	+2.1	±500	±500	±500	±1000	±1000	±1000
S11	–8.5	–1.6	0.0	±500	±500	±500	±1000	±1000	±1000



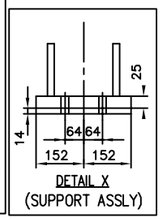
NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS W.R.T AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.

WEIGHTS IN Kgs

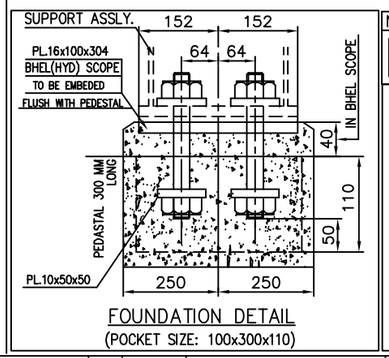
EMPTY	19000
OPERATING	24500
FLOODED	37000



FOUNDATION PLAN



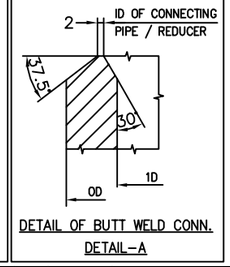
DETAIL X
(SUPPORT ASSLY)



FOUNDATION DETAIL
(POCKET SIZE: 100x300x110)

NORMAL OPERATING RANGE

10	NORMAL LIQUID LEVEL
10	DO NOT USE FOR ALARM POINTS



DETAIL OF BUTT WELD CONN.
DETAIL–A

NOTES :–

1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLET DURING OPERATION. CRITICAL ORIFICE FLOW PLATE HAS NOT BEEN PROVIDED IN CONN. S5. ORIFICE PLATE ASSLY. WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
6. CRITICAL ORIFICE FLOW PLATE HOLE DIA. 12.4 MM (FOR S5)
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES ARE ROLLED INTO TUBE SHEET HOLES WITH GROOVES.
10. INSULATION CLIPS WELDED ON 240 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 48 MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH 40 MM DIA. HOLE.
13. 7 No. OF TUBES PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
14. FOUNDATION BOLTS M24x150 STUD WITH TWO NUTS – 4 NOS.
15. FOR STAND PIPE DETAILS REFER DRG. No. 3–162–22–00469.
16. COUNTER FLANGE, FASTNERS & GASKET FOR SHELL SAFETY RELIEF VALVE – BY BHEL(HYD).
17. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

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INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

REV.	DATE	ALTERED	CHD/APPD
ZONE			

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.BHANU	BHANU	04.09.13	NA
CHD.	K KIRAN KUMAR		04.09.13	
APPD.	B.SRINIVAS		04.09.13	

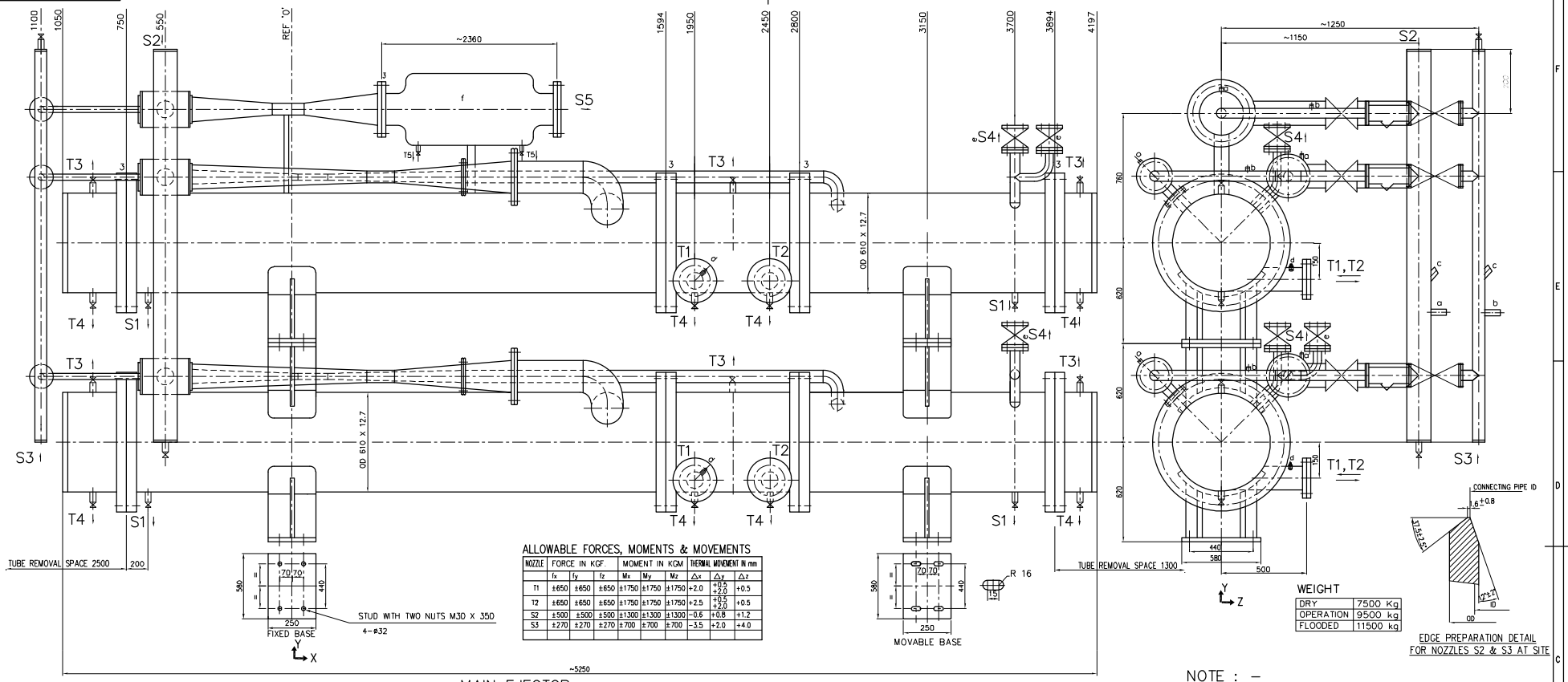
DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR.	NTS	---	NA	NA	NA
CODE 405	₵/M/F					

TITLE: GENERAL ARRANGEMENT OF LP HEATER No. 3

CARD CODE

DRAWING NO. 2–162–26–00241 REV. 00

SHT. No 01 | NO. OF SHT. 01



ALLOWABLE FORCES, MOMENTS & MOVEMENTS

NOZZLE	FORCE IN KGF			MOMENT IN KGM			THERMAL MOVEMENT IN mm		
	fx	fy	fz	Mx	My	Mz	Δx	Δy	Δz
T1	±650	±650	±650	±1750	±1750	±1750	+2.0	+0.5 +2.0	+0.5
T2	±650	±650	±650	±1750	±1750	±1750	+2.5	+0.5 +2.0	+0.5
S2	±500	±500	±500	±1300	±1300	±1300	−0.6	+0.8	+1.2
S3	±270	±270	±270	±700	±700	±700	−3.5	+2.0	+4.0

WEIGHT

DRY	7500 Kg
OPERATION	9500 kg
FLOODED	11500 kg

LIST OF NOZZLE CONNECTIONS

REF	DESCRIPTION	SIZE	QTY	END CONN
T1	CONDENSATE WATER INLET	10" ANSI 300 RF	2	FLG
T2	CONDENSATE WATER OUTLET	10" ANSI 300 RF	2	FLG
T3	WATER BOX VENT (WITH VALVE)	ø33.4 X 4.55	6	SW
T4	WATER BOX DRAIN (WITH VALVE)	ø33.4 X 4.55	8	SW
T5	SILENCER DRAIN (WITH VALVE)	ø33.4 X 4.55	2	SW
S1	INTER & AFTER COND. DRAIN (WITH VALVE)	ø60.3 X 5.54	4	BW
S2	AIR INLET	ø168.3 X 7.11	1	BW
S3	STEAM INLET	ø88.9x 7.62 / 5.49	1	BW
S4	AIR OUTLET	1 1/2" ANSI 300 # RF.	2	FLG
S5	SILENCER OUTLET	10" ANSI 150 SORF	1	FLG

LIST OF INSTRUMENTS

REF	DESCRIPTION	CONN. SIZE	LOCATION	
a	PR. GAUGE (-1 TO 1.5 Kg/Cm^2)	1/2" SW	ON 1 & 2 STG. ST. EJEC. AND S2	6
b	PR. GAUGE (0 TO 20 Kg/Cm^2)	1/2" SW	ON STEAM INLET PIPE (S3)	4
c	TEMP. GAUGE	M 33 X 2	ON T1&12 PIPING AND S2, S3	6
d	WATER EXPANSION RELIEF VALVE	3/4" X 1" SW	ON T1	2
e	ROTAMETER	1 1/2" ANSI 300 RF	ON S4	2
f	SILENCER	6" X 10" ANSI 150 RF	ON ST. EJECTOR OUTLET	1

MAIN EJECTOR:–

1. NO OF EJECTORS PROVIDED ---------- TWO
2. NO OF STAGES FOR EACH EJECTOR -------- TWO
3. CAPACITY OF EACH EJECTOR ---------- 100%
4. MOTIVE STEAM PRESSURE --------15 kg/cm^2 (g)
5. MOTIVE STEAM TEMPERATURE ----------260°C
6. DESIGN SUCTION PRESSURE---------- 0.035 kg/cm2 (a)
7. SUCTION QTY. :–
   - DRY AIR ----------20.4 Kg / hr
   - WATER VAPOUR ---------- 44.92 Kg / hr
   - TOTAL MIXTURE ---------- 65.4 Kg / hr
8. CONDENSATE FLOW :–
   - QTY. ---------- 378605 kg/hr (MAX.)
     292328 kg/hr (NRML.)
     189302 kg/hr (MIN.)
   - INLET TEMP.---------- 47.5°C
9. MOTIVE STEAM CONSUMPTION --------- 750 kg / hr

BILL OF MATERIALS:–

1. TUBES-----SS: SA 249 TP 304
2. TUBE PLATES-----CS: SA 516 Gr 70 OR EQUT
3. SHELL, WATER CHAMBERS....CS :SA 106 Gr.B/
   SA 516 Gr.70 OR EQVT
4. SUPPORT PLATES, MIXING CHAMBERS, DIFFUSERS
   STEAM STRAINERS & VALVES---CARBON STEEL OR EQUT
5. NOZZLES---A 276, TP 304 OR EQUT.
6. EJEC. AIR & STEAM PIPING---CS: SA 106 Gr 'B' OR EQUT.

STARTING EJECTOR :–

1. NO OF EJECTORS PROVIDED --------- ONE
2. NO OF STAGES FOR EACH EJECTOR --- ONE
3. CAPACITY OF EACH EJECTOR-------100%
4. MOTIVE STEAM PRESSURE----15 kg / cm^2 (g)
5. MOTIVE STEAM TEMPERATURE------ 260°C
6. TIME TAKEN TO ATTAIN SUCTION PRESSURE
   OF 0.35 Kg / sq cm (a) FROM ATMOSPHERIC
   PRESSURE (AS PER HEI) --------- 30 MINUTES.
7. MOTIVE STEAM CONSUMPTION ------ 950 Kg / hr

DESIGN DATA :–

DESCRIPTION	INTER COND. (TUBE SIDE)	AFTER COND. (TUBE SIDE)	SHELL SIDE
DESIGN PRESSURE Kg/Cm^2(g)	25	25	3.5 & FULL VAC.
TEST PRESSURE Kg/Cm^2(g)	32.5	32.5	4.55
DESIGN TEMP. °C	100	100	250
TEST TEMP. °C	AMBIENT	AMBIENT	AMBIENT
SURFACE AREA M^2	50	22	–
NO. OF PASSES	2	2	–
NO. OF TUBES	378	378	–
TUBE SIZE	ø3/4"X20 BWG(AVG.)	ø3/4"X20 BWG(AVG.)	–
			–

NOTE : –

1. PAINTING:–
   INSIDE : NO PAINTING
   OUTSIDE : 2 COATS OF FERROTOL HEAT RESISTING ALUMINIUM PAINT
2. EACH WORKING EJEC. WILL BE FUNCTIONALLY TESTED AT WORKS
3. STARTING EJEC. WILL NOT BE FUNCTIONALLY TESTED AT WORKS
4. DESIGN CODE: HEI / BHEL
5. THE EJEC. WILL BE HYDROSTATIC TESTED AT WORK AS PER THE DETAIL GIVEN UNDER DESIGN DATA BEFORE DESPATCH.
6. INSPECTION BY BHEL / CUSTOMER
7. COUNTER FLANGES,FASTENERS & PACKINGS ARE IN BHEL(HYD) SCOPE OF SUPPLY.
8. 3NO'S OF MOTOR OPERATED VALVES ON STEAM SIDE AND 1NO ON AIR SIDE IS INCLUDED IN BHEL (HYD) SCOPE OF SUPPLY.

DRAWING CATEGORY: FOR INFORMATION ONLY

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: RIL 4x90MW HMD HAZIRA, GUJARAT
RIL 3x90MW DMD DAHEJ, GUJARAT

CUSTOMER: Reliance Industries Limited

CONSULTANT: BECHTEL

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	K VASAVI		07.09.13	
CHD.	M.VENKAT		07.09.13	NA
APPD.	M.VENKAT		07.09.13	

DEPT. HED | CODE 405 | GRADE OF TOL.DIM. C/M/F | SCALE N.T.S | WEIGHT (KG) 7500.0 | REF. TO ASSY DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE: G.A. OF STEAM JET AIR EJECTOR

CARD CODE

DRAWING NO. 1-161-01-00780 | REV. 00

SHEET No. 1 | NO OF SHEETS 1

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HYD230261

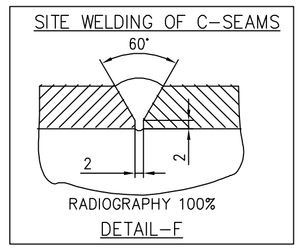
REF. DRG. NO. — SIGN. AND DATE — INVENTORY NO

Sep Mon 16 08:51 2013

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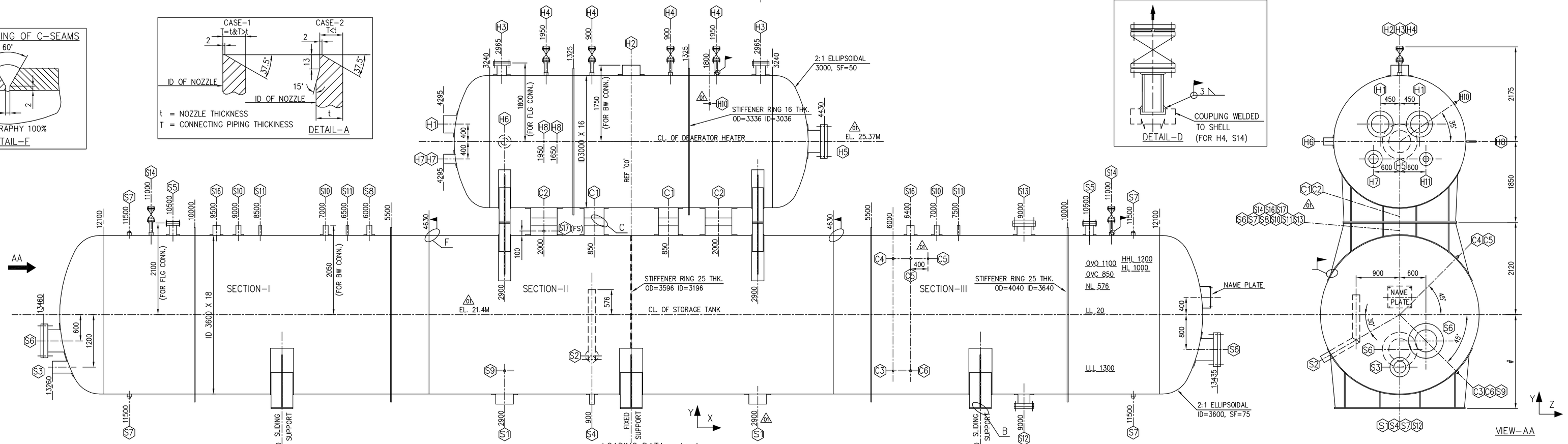
SITE WELDING OF C-SEAMS



DETAIL-F

DETAIL-A

DETAIL-D



2150 FOR FIXED SUPPORT & 2135 FOR SLIDING SUPPORT 15mm DIFFERENCE IN HEIGHT IS COMPENSATED BY TEFLON SHEET ASSLY. (REFER DET-B)

LOADING DATA (Kgs)
EMPTY – 24126
OPERATING – 78870
FLOODED – 120327
HORIZONTAL LOAD – 4813 (IN -X DIRECTION)

LOADING DATA (Kgs)
EMPTY – 32168
OPERATING – 105160
FLOODED – 160436
HORIZONTAL FORCE – 0

LOADING DATA (Kgs)
EMPTY – 24126
OPERATING – 78870
FLOODED – 120327
△6 HORIZONTAL LOAD – 4813 (IN X DIECTION)

RESULTANT FORCES, MOMENTS AND THERMAL MOVEMENTS AT DESIGN CONDITION

REF.	F(Kg)	M(Kg-M)	△X	△Y	△Z	
H1	57266	7274	-14.23	22.12	±1.53	△6
H2	13084	5396	0	25.85	0	
H6	7809	1765	-9.84	20.77	-5.09	△6
H7	31696	2767	-14.23	19.41	-2.04	
H11	26747	1934	-14.23	19.41	2.04	
S1	16870	7220	±7.77	0.80	0	△6
S2	9891	2361	-2.41	3.35	-4.18	
S3	44927	4783	-34.43	2.55	0	
S4	8800	1604	-2.41	0.80	0	
S8	8800	1604	-16.08	10.59	0	
S10	8800	1604	####	10.59	0	

△6 #### = -24.12, -18.76, 18.77

DESIGN DATA

DESCRIPTION			
DESIGN PRESSURE		(atg)	9 & FULL VACUUM
HYDROTEST PRESSURE		(atg)	11.7
STORAGE TANK DESIGN TEMPERATURE (MAX/MIN)		°C	210/ 0
HEATER DESIGN TEMPERATURE (MAX/MIN)		°C	260/ 0
HYDROTEST TEMPERATURE (MAX/MIN)		°C	AMBIENT/ 17
RADIOGRAPHY			FULL
CORROSION ALLOWANCE	SHELLS/ HEADS	mm	3.2
	RF PADS/ NOZZLES/ FLANGES	mm	1.6
OXYGEN CONTENT AT OUTLET		(cc/lit)	0.005 (7 PPB)
STORAGE TANK CAPACITY (BETWEEN NL & LLL FOR 10 min. CAPACITY)		(cu.m)	150
NO OF TRAYS			350 △6
NO OF SPRAY NOZZLES			60
WEIGHTS	DRY	(kgs)	80420
	OPERATING	(kgs)	262900
	FLOODED	(kgs)	401090
INSPECTION			AS PER APPROVED QP
PWHT			REQUIRED

△6 CG (ON REF. 00 AXIS) FROM ST.TANK CENTERLINE

EMPTY	954mm ABOVE
OPERATING	72mm BELOW
FLOODED	731mm ABOVE

CG IS LOCATED EXACTLY ON Z AXIS.

OPERATING PARAMETERS

OPERATING PRESSURE (HMD)	(ata)	8.1384
OPERATING TEMPERATURE (HMD)	°C	170.3
OPERATING PRESSURE (DMD)	(ata)	7.2675
OPERATING TEMPERATURE (DMD)	°C	165.7

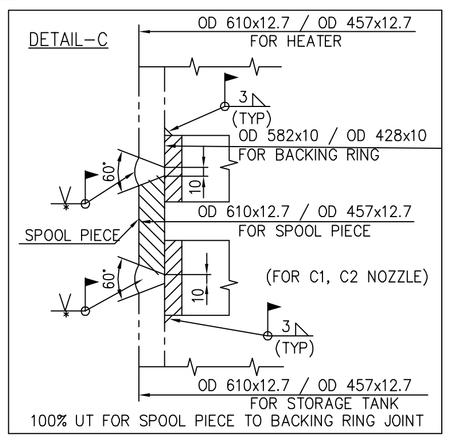
MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL
SHELL (ST.TANK & HEATER)	SA516 Gr.70
DISHED ENDS	SA516 Gr.70
PIPE FOR NOZZLE	SA106 GR.B****
TRAYS	SA240 TP430
COVERS FOR MAN HOLES	SA105
TRAY REMOVAL OPENING	SA106 Gr.B
SPRAY VALVE	SS TP316
VENT ORIFICE PLATE	SA240 TP304L
INTERNAL BOLTING	SS304
BOLTS & NUTS	SA193 B7/ SA194 2H
GASKETS	NON ASBESTOS MSW WITH GRAPHITE FILLER

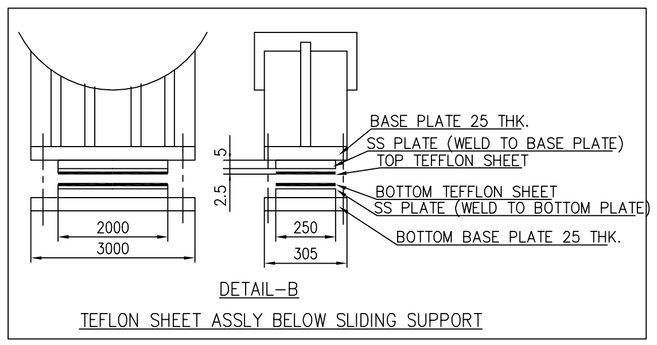
△6 **** SA240 TP304L FOR H2 NOZZLE (ROLLED PIPE)

LIST OF NOZZLE CONNECTIONS

REF.	DESCRIPTION	NPS	OD x THK/ CONN. PIPE THK.	QTY	END CONN.	REMARKS	REF.	
H1	STEAM INLET	16	406.4 x 12.7/	2	BW		H1	△6
H2	CONDENSATE INLET	16	406.4 x 12.0/	1	BW		H2	△6
H3	SAFETY RELIEF VALVE CONN.	8	219.1 x 12.7	2	FLG CL.300 RF		H3	
H4	VENT CONN.	2	COUPLING CL.6000	4	SW	REFER NOTE-12	H4	
H5	TRAY REMOVAL OPENING	20	508.0 x 12.7	1	FLG CL.300 RF		H5	
H6	FLASH TANK VENT CONN.	6	168.3 x 10.97/	1	BW		H6	△6
H7	HPH-5 DRAIN CONN.	8	219.1 x 12.7/	1	BW	WITH DISPERSER	H7	△6
H8	HPH VENT CONN.	1	33.4 x 6.35/	2	BW		H8	
								△6
H10	SPARE CONN.	1	COUPLING CL.6000	1	SW		H10	
H11	HPH-6 DRAIN CONN.	6	168.3 x 10.97/	1	BW	WITH DISPERSER	H11	
S1	FEED WATER OUTLET CONN.	16	406.4 x 12.7/	2	BW	WITH VORTEX BREAKER	S1	△6
S2	OVER FLOW CONN	6	168.3 x 10.97/	1	BW		S2	
S3	INITIAL HEATING STEAM CONN.	10	273.1 x 12.7/	1	BW		S3	
S4	DRAIN	4	114.3 x 11.13/	1	BW		S4	
S5	VENTILATOR	6	168.3 x 10.97	2	FLG CL.300 RF	REFER NOTE-10	S5	
S6	MAN HOLE	20	508.0 x 12.7	2	FLG CL.300 RF		S6	
S7	STAND PIPE CONN.	2	COUPLING CL.6000	4	SW		S7	
S8	INITIAL FILLING CONN.	4	114.3 x 11.13/	1	BW		S8	
S9	SAMPLING CONN.	1	COUPLING CL.6000	1	SW		S9	
S10	BFP RECIRCULATION CONN.	4	114.3 x 11.13/	3	BW	WITH DISPERSER	S10	
S11	BFP LEAK-OFF CONN.	2	60.3 x 8.74/	3	BW	WITH DISPERSER	S11	
S12	SPARE CONN.	10	273.1 x 12.7	1	FLG CL.300 RF		S12	
S13	SPARE CONN.	12	323.9 x 12.7	1	FLG CL.300 RF		S13	
S14	VENT CONN.	2	COUPLING CL.6000	2	SW	REFER NOTE-12	S14	
S16	SPARE CONN.	6	168.3 x 10.97	2	BW		S16	
S17	SPARE CONN.	1	COUPLING CL.6000	1	SW		S17	
C1	EQUALISER	18	457.0 x 12.7	2	BW		C1	
C2	DOWN COMMER	24	610.0 x 12.7	2	BW		C2	
C3	PRESSURE GAUGE CONN.	3/4	COUPLING CL.6000	1	SW		C3	△6
C4	THERMOMETER CONN.	M33X2	COUPLING	1	SCREWED		C4	△6
C5	PRESSURE TRANSMITTER CONN.	3/4	COUPLING CL.6000	2	SW		C5	△6
C6	TEMPERATURE ELEMENT CONN.	M33X2	COUPLING	1	SCREWED		C6	△6



100% UT FOR SPOOL PIECE TO BACKING RING JOINT



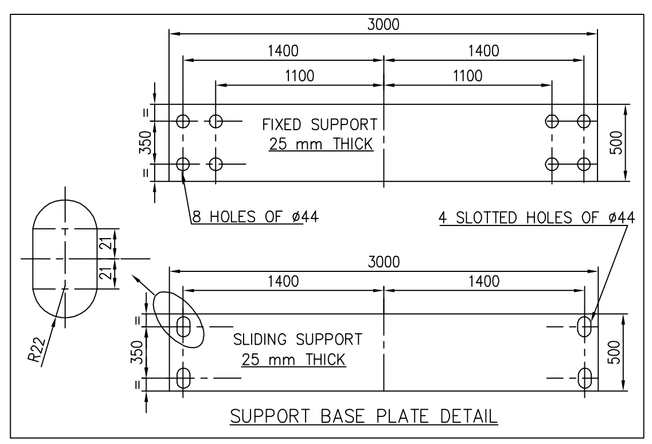
DETAIL-B

TEFLON SHEET ASSLY BELOW SLIDING SUPPORT

LIST OF FITTINGS & VALVES

REF.	DESCRIPTION	QTY	REMARKS
F1	MERCURY IN STEEL DIAL THERMOMETER	1	200° C
F2	PRESSURE GAUGE Kg/sq.cm (g)	1	-1 TO +10
F3	VENT ORIFICE PLATE	4	
F4	THERMOWELL	2	
V1	STAND PIPE ISOLATION VALVE	4	NPS 2 CL.800 SW
V2	SAMPLING VALVE	1	NPS 1 CL.800 SW
V3	SAFETY RELIEF VALVE (SET PR 8.5 atg REL CAP. 60 T/hr)	2	***
			△6
V5	VENT & DRAIN VALVES FOR STAND PIPE	4	NPS 1/2 CL.800 NPT
V6	VENT VALVE	6	NPS 2 CL.300 RF △6
V7	PRESSURE GAUGE & TRANSMITTER ISOLATION VALVES	3	NPS 3/4 CL.800 SW △6

*** NPS 8 CL.300/ NPS 10 CL.150 RF



SUPPORT BASE PLATE DETAIL

NOTES:-

1, HYDRO TEST BLANKING PLATE OF NOZZLES SHALL BE CUT AT SITE AND EDGE PREPARED AS PER DET-A FOR CONNECTING PIPING AT SITE.

2, SPOOL PIECES CONSTRUCTED OF SA516/70 WILL BE SUPPLIED TO AID IN PROPER FIT UP OF DOWN COMMERS AND EQUALIZERS. TWO BACKING RINGS WILL BE SUPPLIED WITH EACH SPOOL PIECE (REFER DET-C).

△6 3, PAINTING
EXTERNAL: AS PER BECHTEL SPEC. 10090/10091-PS-GP-BEF-0001.
INTERNAL: HEATER- NIL
STORAGE TANK - STEAM WASHABLE PAINT

4, SHIPPING
HEATER: DESPATCHED IN ONE ASSEMBLY.
STORAGE TANK: DESPATCHED IN THREE SECTIONS.

5, FOUNDATION BOLTS
M42X300 FOUNDATION BOLTS 16 NO'S WITH FASTENERS WILL BE SUPPLIED.

6, DESIGN CODE ASME SEC VIII DIV 1, 2010, ADD. 2011, HEI 9TH EDN. 2011 & PART 4.4 OF NACE RP0590-96 (FOR MANUFACTURING)

7, COUNTER FLANGES ALONG WITH BOLTS NUTS AND GASKETS WILL BE SUPPLIED FOR FLANGED CONNECTIONS.

8, MOVEMENT OF SLIDING SUPPORT FROM COLD TO OPERATING CONDITION IS= ±21.44 (MAX).

9, ⚑ INDICATES SITE WELDING.

10, VENTILATOR CONN. (NOZZLE S5) IS A SPARE CONN. PROVIDED WITH BLIND FLANGE, WHICH CAN BE OPENED FOR VENTILATION INSIDE THE STORAGE TANK DURING MAINTAINANCE OPERATION.

11, HEATER SUPPORTS ON STORAGE TANKE ARE DESPATCHED LOOSE FOR FINAL WELDING AT SITE.

12, ORIFICE ASSLY. AS PER DET-D SHALL BE WELDED TO COUPLING (H4, S14) AT SITE.

13, FOR DETAILS OF STANDPIPE REFER DRG. 2-163-19-11655.

14, NOZZLE S1 (FEED WATER OUTLET CONN.) PROVIDED WITH VORTEX BREAKER. NOZZLE PROJECTION INSIDE STORAGE TANK IS 150mm.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

REV.	DATE	ALTERED	CHECKED	APPD
01	29.12.13			

ZONE: REVISED IN-LINE FROM COMMENTS FROM CONSULTANT & PE&SD.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, USA
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091-6239977-T000-M-M61-BHL-B02-H009
RIL DRG. NO. (HAZIRA):	10090-6239976-T000-M-M61-BHL-B02-H009

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A RATH		05.09.13	
CHD.	UMESH MENON		05.09.13	N.A
APPD.	TSN BHARGAV		05.09.13	

DEPT: HEE	GRADE OF TOL.DIM. C/M/F	SCALE NTS	WEIGHT (KG) NA	REF. TO ASSY DRG. NA	ITEM NO. N.A	NO.OF ITEMS N.A
CODE 405						

TITLE: GA OF SPRAY CUM TRAY DEAERATOR

CARD CODE

BHEL DRAWING NO. 1-163-10-11431 REV. 01

SHEET No. 1 NO OF SHEETS 1

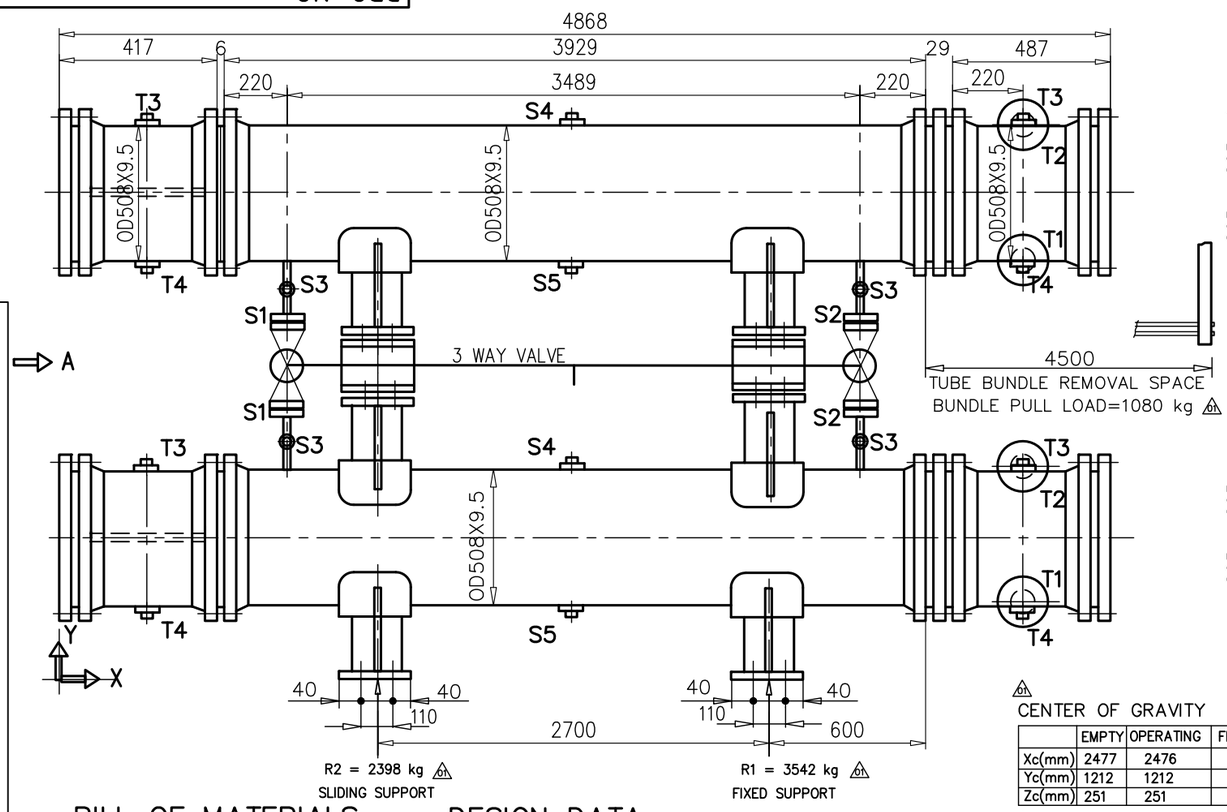
FIRST ANGLE PROJECTION

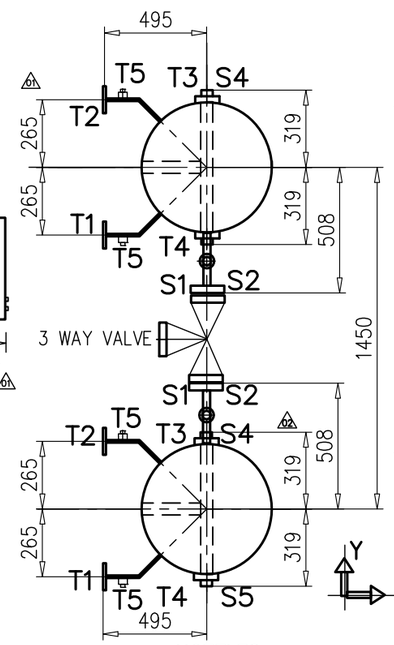
(ALL DIMENSIONS ARE IN mm)

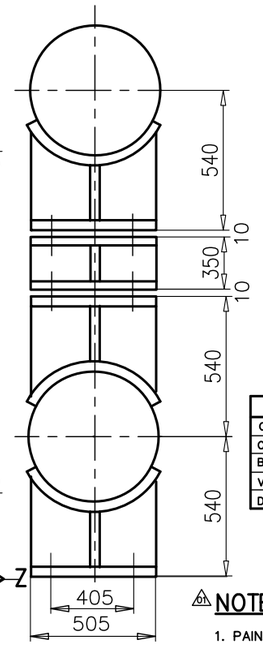
DRG. NO. 3-165-01-20579

SH. 1 OF 1

DESIGN CODE: ASME SEC VIII DIV I 2010 EDITION ADDENDA-2011 & TEMA'C'2007







DESIGN DATA

DESCRIPTION	
HEAT DUTY kW	336.72
OIL QTY. m^3/hr	46
WATER QTY. m^3/hr	90
OIL SIDE TEMP.(INLET/OUTLET) °C	62/47
WATER SIDE TEMP.(IN/OUTLET) °C	38/41

TUBE SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES
WATER INLET	T1	4"	ASME Cl.300 WNRF 01
WATER OUTLET	T2	4"	ASME Cl.300 WNRF 01
VENT	T3	3/4"	ASME 6000 NPT COUPLING
DRAIN	T4	3/4"	ASME 6000 NPT COUPLING
SPARE CONN.	T5	3/4"	ASME 6000 NPT COUPLING

SHELL SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES	
OIL INLET	S1	4"	ASME Cl.150 SORF	WITH 3-WAY CHANGE OVER VALVE
OIL OUTLET	S2	4"	ASME Cl.150 SORF	
BY PASS	S3	3/4"	ASME 6000 NPT COUPLING	
VENT	S4	3/4"	ASME 6000 NPT COUPLING	
DRAIN	S5	3/4"	ASME 6000 NPT COUPLING	

01 NOTE:-

1. PAINTING (OUTSIDE): a) PRIMER: 4-6 MILS OF EPOXY ZINC RICH.
   b) FINISH PAINT: 3-5 MILS OF POLYURETHANE.

01 CENTER OF GRAVITY

	EMPTY	OPERATING	FLOODED
Xc(mm)	2477	2476	2473
Yc(mm)	1212	1212	1212
Zc(mm)	251	251	251

02 SUPPORT REACTIONS

AT FIXED SUPPORT	R1	3542 kg
AT MOVABLE SUPPORT	R2	2398 kg

02 NOZZLE FORCES AND MOMENTS

		S1,S2	T1,T2	UNIT
RESULTANT RADIAL FORCE	F_{RRF}	9074	10007	kgf
RESULTANT CIRCUMFERENTIAL MOMENT	M_{RCM}	579	579	kgf-m

DRAWING CATEGORY: FOR INFORMATION ONLY

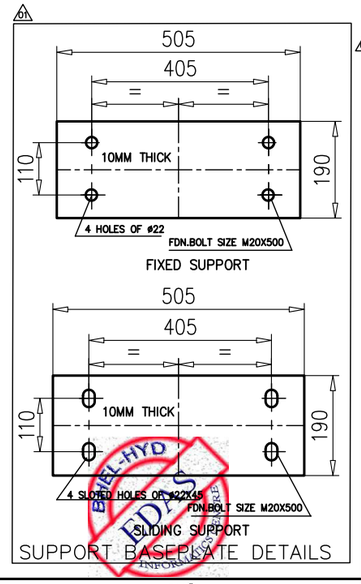
BILL OF MATERIALS

SHELL SIDE	SHELL		SA672GR.B60 CL22
	GIRTH FLANGES		SA266 Gr.2
	NOZZLE PIPES		SA 106/B
	NOZZLE FLANGES		SA 105
	SADDLES		SA516/70
TUBE SIDE	TUBES		SA249 TP 304
	TUBE SHEETS		SA516/70
	BAFFLES		IS2062 Gr.B
	TIE RODS		IS 1570/15C8
CHANNEL SIDE	SHELL		SA672GR.B60 CL22
	END COVER		SA 516/70
	GIRTH FLANGES		SA266 Gr.2
	NOZZLE PIPES		SA 106/B
	NOZZLE FLANGES		SA 105
GASKETS	FIX SIDE	SHELL	NON CAF 9
		CHANNEL	NON CAF 9
	FLT SIDE	SHELL	BUNA N
		CHANNEL	BUNA N
	STUDS & NUTS		SA 193-B7/194-2H
	SERVICE		LUBE OIL

DESIGN DATA

DESCRIPTION	SHELLSIDE	TUBE SIDE
DESIGN PRESSURE Kg/sq.cm (g)	13.5	10
MAWP Kg/sq.cm (g)	13.5	10 01
TEST PRESSURE Kg/sq.cm (g)	17.55	13
DESIGN TEMP. °C	100	100
CORROSION ALLOW. mm	1.6	1.6
STRESS RELIEVING	NO	NO
RADIOGRAPHY	SPOT	SPOT
NO. OF PASSES	1	4
MEDIUM	OIL	WATER
INSPECTION	AS PER QA PLAN	
SURFACE AREA / COOLER sq.m	85	
NO. OF TUBES PER COOLER	436	
TUBE LENGTH mm	4000	
TUBE SIZE ODxThk	5/8"x1.24THK.	
PITCH/TYPE mm	19.05 /△	
NO. OF BAFFLES PER COOLER	23	
BAFFLE PITCH mm	151	
EMPTY WEIGHT Kg (BOTH COOLERS)	5170	
WORKING WEIGHT Kg ,,	5940	
FLOODED WEIGHT Kg ,,	6050	
TUBE BUNDLE WEIGHT kg ,,	2160 02	

01



01 P&ID REF.NO.1-317-01-08662, TAG NO.: TGOC-01 02

CONSULTANT: BECHTEL
BECHTEL
FREDERICK, MARYLAND, USA

PROJECT:
STG PACKAGE (4X93.1 MW STGS), CCPP
HAZIRA MANUFACTURING DIVISION (HMD)
STG PACKAGE (3X90.3 MW STGS), CCPP
DAHEJ MANUFACTURING DIVISION (DMD)

CUSTOMER: Reliance Industries Limited
RELIANCE INDUSTRIES LIMITED
COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NO. (DAHEJ): 10091-6239977-T000-M-M59-BHL-B02-H001

RIL DRG. NO. (HAZIRA): 10090-6239976-T000-M-M59-BHL-B02-H001

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	S.S.R		07.09.13	NA
CHD.	A.C.S		08.09.13	
APPD.	A.C.S		08.09.13	

FOR REFERENCE USE

REV.	DATE	ALTERED	CHD/APPD
02	23.01.14	1. ALL NOZZLE PROJECTION DIM. ADDED 2. P&ID REF.NO. AND TAG NO. ADDED 3. NOZZLE FORCES AND MOMENTS ADDED	
01	21.10.13	1. TITLE BLOCK CHANGED 2. SUPPORT BASEPLATE DETAILS & SUPPORT REACTIONS ADDED 3. MAWP ADDED 4. C.G & BUNDLE PULL LOAD ADDED. 5. FOUNDATION BOLD SIZES ADDED. 6. NOZZLE ORIENTATION CHANGED. 7. T1,T2 NOZZLE FLANGES RATING CHANGED FROM Cl.150 TO Cl.300 AND SORF TO WNRF.	

DEPT.	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	C/M/F	N.T.S	5170	-	-	-
CODE 405						

TITLE
TWIN OIL COOLER
(TYPE-AEW)

CARD CODE

DRAWING NO. 3-165-01-20579 REV. 02

SHT. No 1 NO. OF SHT. 1

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

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Jan Fri 31 15:48 2014

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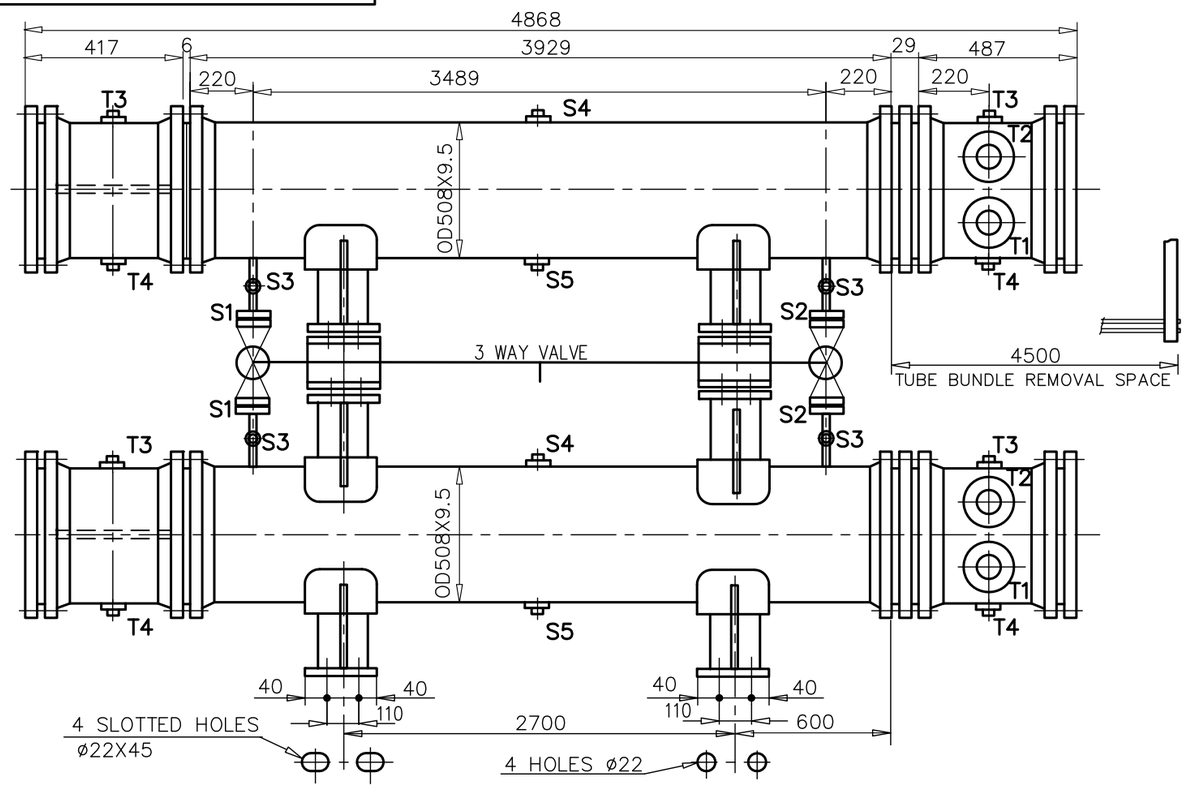
FIRST ANGLE PROJECTION

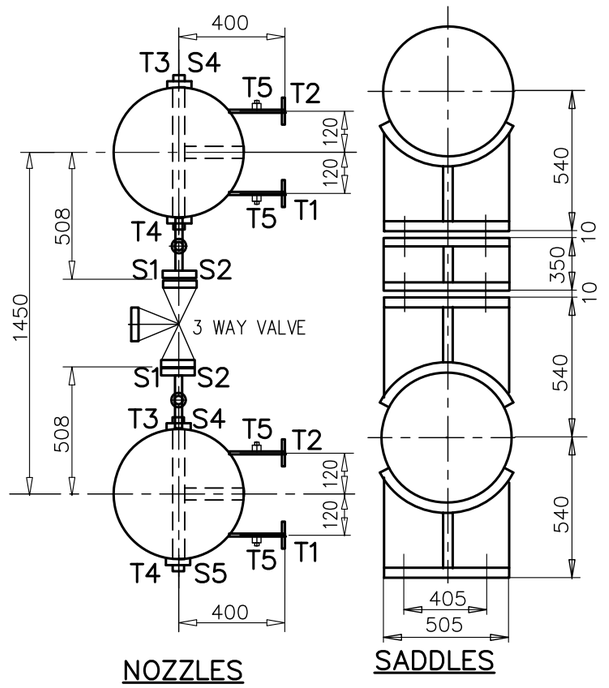
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3-165-01-20579

SH. 1 OF 1

DESIGN CODE: ASME SEC VIII DIV I 2010 EDITION ADDENDA–2011 & TEMA'C'2007





NOZZLES

SADDLES

DESIGN DATA

DESCRIPTION	
HEAT DUTY kW	336.72
OIL QTY. m^3/hr	46
WATER QTY. m^3/hr	90
OIL SIDE TEMP.(INLET/OUTLET) °C	62/47
WATER SIDE TEMP.(IN/OUTLET) °C	38/41

TUBE SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES
WATER INLET	T1	4"	ASME Cl.150 SORF
WATER OUTLET	T2	4"	ASME Cl.150 SORF
VENT	T3	3/4"	ASME 6000 NPT COUPLING
DRAIN	T4	3/4"	ASME 6000 NPT COUPLING
SPARE CONN.	T5	3/4"	ASME 6000 NPT COUPLING

SHELL SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES	
OIL INLET	S1	4"	ASME Cl.150 SORF	WITH 3-WAY CHANGE OVER VALVE
OIL OUTLET	S2	4"	ASME Cl.150 SORF	
BY PASS	S3	3/4"	ASME 6000 NPT COUPLING	
VENT	S4	3/4"	ASME 6000 NPT COUPLING	
DRAIN	S5	3/4"	ASME 6000 NPT COUPLING	

BILL OF MATERIALS

DESCRIPTION			MATERIALS
SHELL SIDE	SHELL		SA672GR.B60 CL22
	GIRTH FLANGES		SA266 Gr.2
	NOZZLE PIPES		SA 106/B
	NOZZLE FLANGES		SA 105
	SADDLES		SA516/70
TUBE SIDE	TUBES		SA249 TP 304
	TUBE SHEETS		SA516/70
	BAFFLES		IS2062 Gr.B
	TIE RODS		IS 1570/15C8
CHANNEL SIDE	SHELL		SA672GR.B60 CL22
	END COVER		SA 516/70
	GIRTH FLANGES		SA266 Gr.2
	NOZZLE PIPES		SA 106/B
	NOZZLE FLANGES		SA 105
GASKETS	FIX SIDE	SHELL	NON CAF 9
		CHANNEL	NON CAF 9
	FLT SIDE	SHELL	BUNA N
		CHANNEL	BUNA N
	STUDS & NUTS		SA 193-B7/194-2H

DESIGN DATA

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/sq.cm (g)	13.5	10
TEST PRESSURE Kg/sq.cm (g)	17.55	13
DESIGN TEMP. °C	100	100
CORROSION ALLOW. mm	1.6	1.6
STRESS RELIEVING	NO	NO
RADIOGRAPHY	SPOT	SPOT
NO. OF PASSES	1	4
MEDIUM	OIL	WATER
INSPECTION	AS PER QA PLAN	
SURFACE AREA / COOLER sq.m	85	
NO. OF TUBES PER COOLER	436	
TUBE LENGTH mm	4000	
TUBE SIZE ODxThk	5/8"x1.24THK.	
PITCH/TYPE mm	19.05 /	
NO. OF BAFFLES PER COOLER	23 △	
BAFFLE PITCH mm	151	
EMPTY WEIGHT Kg (BOTH COOLERS)	5150	
WORKING WEIGHT Kg ,,	5920	
FLOODED WEIGHT Kg ,,	6030	
SERVICE	LUBE OIL	

NOTE:–

1. PAINTING (OUTSIDE): PRIMER–2 COATS OF EPOXY BASED ZINC CHROMATE PRIMER.

: FINISH PAINT–1 COAT OF EPOXY BASED FINISH PAINT (GREY COLOUR).

DRAWING CATEGORY: FOR INFORMATION ONLY

CONSULTANT: BECHTEL

CUSTOMER: Reliance Industries Limited

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 7X90MW RIL–HAZIRA, DAHEZ RELIANCE UTILITIES AND POWER PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	S.S.R		07.09.13	NA
CHD.	A.C.S		08.09.13	
APPD.	A.C.S		08.09.13	

RESTRICTED USE

DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR. C/M/F	N.T.S	5150	–	–	–
CODE 405						

TITLE: TWIN OIL COOLER (TYPE–AEW)

CARD CODE

DRAWING NO. 3–165–01–20579 REV. 00

SHT. No 1 NO. OF SHT. 1

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

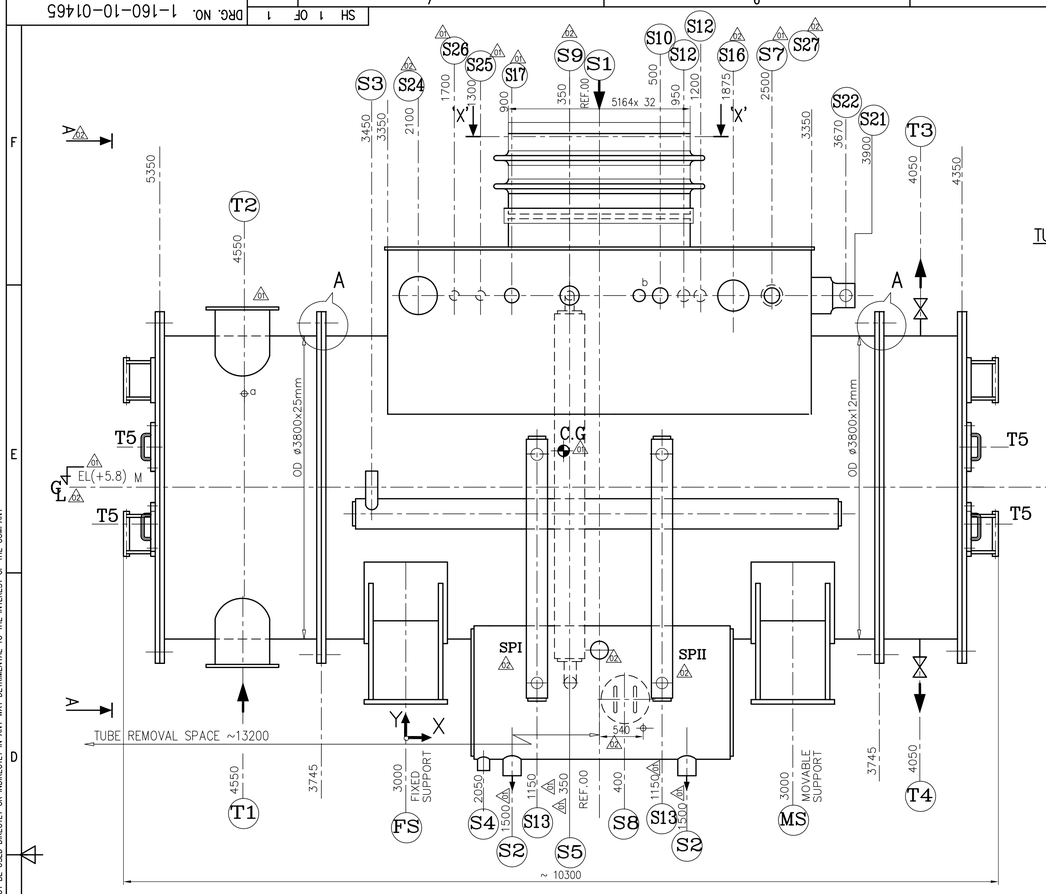
INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME | NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY | THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST

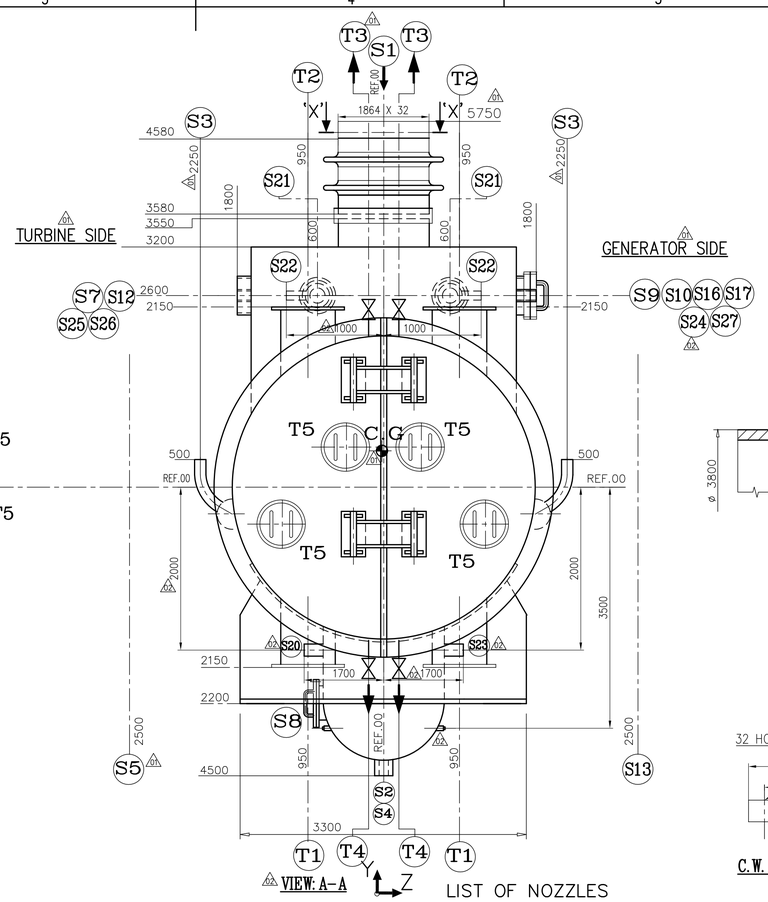
Sep Tue 24 12:03 2013

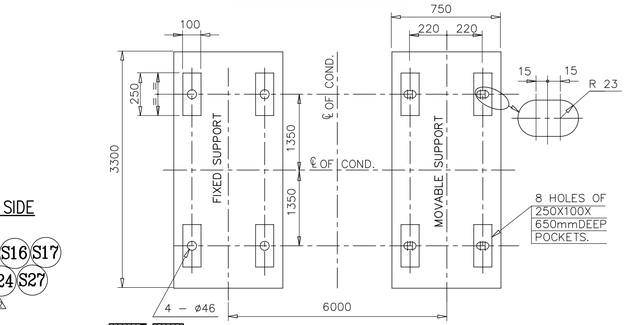
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Printed by : S. SUBBA RAO-HM2502 / 6016766 on 24-09-13 13:12:46

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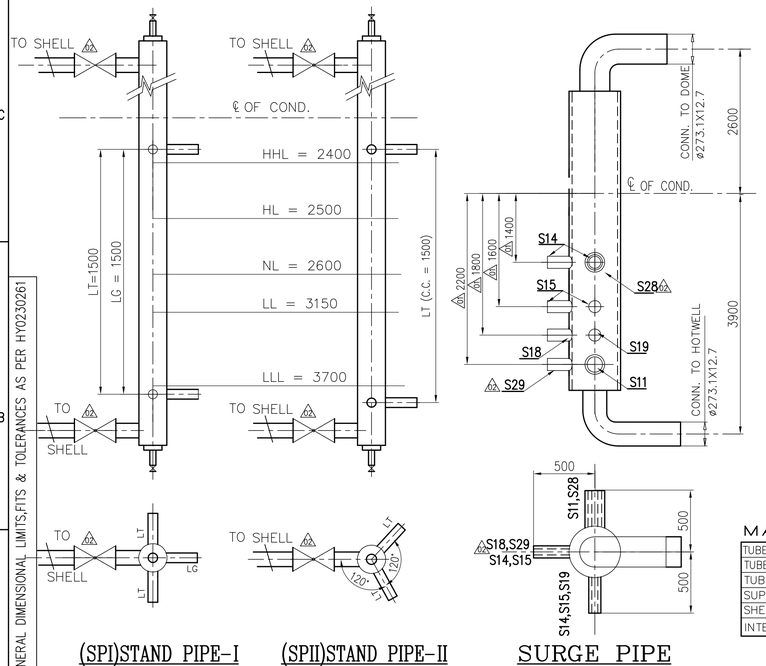






NOZZLE FORCES, MOMENTS AND THERMAL MOVEMENTS

NOZZLE REF	MOMENTS Kg–M	FORCES Kgs	THERMAL MOVEMENTS X mm	Y mm	Z mm
T1	7730	2900	–1.6	+0.1	±1.0
T2	7730	2900	–1.6	+4.4	±1.0
S2	2600	970	+3.0	–2.3	±0.3
S3	900	350	–0.5	+2.7	±2.2
S7	1350	500	+5.5	+2.6	–1.8
S9	700	260	+2.7	+2.6	+1.8
S10	700	260	+3.5	+2.6	+1.8
S17	700	260	+2.1	+2.6	+1.8
S21	2600	970	+10.0	+4.0	±1.0



DESIGN DATA

DESIGN CODE: H E I / B H E L			
DESCRIPTION		SHELL SIDE	TUBE SIDE
TYPE			2 PASS DIVIDED
DESIGN PRESSURE	Kg/sq.CM (g)	1.1 & FULL VC.	5.0
DESIGN TEMPERATURE	°C	100	65
TEST PRESSURE	Kg/sq.CM (g)	HY.FILL	6.9
TEST TEMPERATURE	°C	AMBIENT	AMBIENT
TOTAL SURFACE AREA	sq.M	4232	
TUBE SIZE (OD X THICK)		ø 22x22 BWG (AVG) / ø22x20 BWG	
NO. OF TUBES		8300	
PRESSURE DROP ON C.W. SIDE	M.W.C.	7.0	
HOTWELL CAPACITY (NL TO LLL)	MINUTES	5 MINUTE	
EMPTY WIEGHT		120000 Kgs.	
WORKING WIEGHT		180000 Kgs	
FLOODED WIEGHT		230000 Kgs	
INSPECTION		BHEL/CUSTOMER (AS PER APPD.QAP)	

LIST OF INSTRUMENTS CONNECTIONS

REF.	DESCRIPTION	SIZE	QTY	LOCATION
a	TEMPERATURE GAUGE CONN.	M 33X2	9	HOTWELL, STEAM INLET, C.W.INLET & OUTLET.
b	COMPOUND PRESSURE GAUGE CONN.	1/2"(SW)VALVE	9	ON SHELL
c	LEVEL GAUGE L = 1500	1"ANSI300 RF	2	ON STAND PIPE
d	LEVEL SWITCH CONNECTION	–	–	–
e	LEVEL CONTROLLER/TRANSMETER CONN.	2"ANSI 300 RF	8	ON STAND PIPE
f	WATER EXPANSION RELIEF VALVE	3/4" / 1" S.W	2	ON C.W. INLET

MATERIALS

TUBES – CONDENSING ZONE	SA249 TP316
TUBES – AIR COOLING ZONE	SA249 TP316
TUBE PLATE	SA516 Gr70 WITH SS CLADDING
SUPPORT PLATE	CS:IS 2062 OR EQUVT.
SHELL & OTHER PARTS	CS:SA516 Gr70 OR EQUVT.
INTERNAL BOLTS & NUTS	SA 193 B7, SA194 2H

C.G CENTER OF GRAVITY

	EMPTY	OPERATING	FLOODED
XC	–370	–665	–440
YC	395	–230	–465
ZC	–25	–15	–10

LIST OF NOZZLES

REF.	DESCRIPTION	SIZE	QTY	REMARKS
	TUBE SIDE NOZZLES			
T1	COOLING WATER INLET	36" – 150 SORF	2	FLANGED
T2	COOLING WATER OUTLET	36" – 150 SORF	2	FLANGED
T3	WATER BOX VENT	ø60.3 X 5.54	2	S.W.
T4	WATER BOX DRAIN	ø60.3 X 5.54	4	S.W.
T5	WATER BOX INSPECTION HOLE	18" ANSI 150 FLRF	8	FLANGED
	SHELL SIDE NOZZLES			
S1	EXHAUST STEAM INLET	AS PER SEC.X–X	1	FLANGED
S2	CONDENSATE OUTLET (WITH VORTEX PLATE)	ø323.9X12.7	2	B.W.
S3	AIR SUCTION	ø168.3X7.11	2	B.W.
S4	HOT WELL DRAIN	ø60.3 X 5.54	1	B.W.
S5	EXPANSION SURGE.	ø508 X 12.7	1	–
S6	–	–	–	–
S7	GLAND STEAM LEAKAGE CONN.	ø323.9X 12.7	1	B.W.
S8	HOTWELL INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S9	CONDENSATE RECIRCULATION	ø168.3 X 7.11	1	B.W.
S10	CONN. FOR MAKE UP WATER.	ø88.9 X 5.49	1	B.W.
S11	DRAIN FROM STEAM INLET (PIPING TO TURBINE)	ø219.1 X 12.7	2	B.W.
S12	CONDENSATE PUMP DEAERATION	ø33.4 X 4.55	2	B.W.
S13	STAND PIPE	ø114.3 X 6.02	2	--
S14	INTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S15	AFTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S16	DOME INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S17	VACCUM BREAKER CONNECTION	ø114.3 X8.56	1	B.W.
S18	G S C DRAINS	ø60.3 X 5.54	1	B.W. *
S19	DRAIN FROM EJECTOR AIR HEADER	ø33.4 X 4.55	1	B.W. *
S20	DRAIN FROM DRAIN COOLER	ø273.1 X 12.7	1	B.W.
S21	HP STEAM DUMP NOZZLE	ø323.9 x 6.35	2	B.W.
S22	WATER CONN. TO DUMP NOZZLE	ø88.9 X 5.49	2	B.W.
S23	HPFLASH TANK DRAIN	ø273.1 X 12.7	1	B.W.
S24	HPFLASH TANK VENT	ø910 X 9.53	1	B.W.
S25	LP HEATER–1 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S26	LP HEATER–2 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S27	LP HEATER–3 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.

NOTES:–

1. ALL COUNTER FLANGES, FASTNERS AND PACKINGS ARE UNDER B.H.E.L. SCOPE OF SUPPLY.
2. TUBES ARE PROVIDED WITH SELF DRAINING.
3. * CONNS. MOUNTED ON EXPANSION SURGE PIPE–S5.
4. PAINTING:–
   a). STEAM SPACE: 2 COATS OF STEAM WASHABLE PAINT
   b). EXTERNAL SURFACES: 2 COATS OF REDOXIDE ZINC PHOSPHATE PRIMER
   c). WATER SPACE: 2 COATS OF COAL TAR EPOXY.
5. TUBES,DOME ASSLY,HOTWELL,TOPCONNECTING PIECE, BELLOW,STAND PIPES & SURGE PIPES WILL BE SUPPLIED LOOSE TO SITE, FOR ERECTION & ASSLY. BY ERECTION AGENCY.

– Ref.P&ID and Equipment tag No: TGC–01(CONDENSER)

S28	LP HEATER–2 ALTERNATE DRAIN	ø273.1 X 12.7	1	B.W.	*
S29	LP HEATER–3 ALTERNATE DRAIN	ø219.1 X 12.7	1	B.W.	*

CONSULTANT: BECHTEL	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER: Reliance Industries Limited	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091–6239977–T000–M–M61–BHL–B02–H001
RIL DRG. NO. (HAZIRA):	10090–6239976–T000–M–M61–BHL–B02–H001

BHEL HYD EDAS RELEASED

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN	DATE	NO.OF VAR.
DRN.	SUDHAKAR	SUDHAKAR	04.09.13	N.A
CHD.	M VENKAT		04.09.13	
APPD.	M VENKAT		04.09.13	

REV.	DATE	ALTERED	CHECKED	APPD
02	25.01.14	VSN	MV	MV
01	17.10.13	VSN	MV	MV

ZONE 02: DRAWING REVISED AS PER T&C ENGG.& PE&SD COMMENTS AND CUSTOMER COMMENTS AND SHOWN AS REV.△2

ZONE 01: DRAWING REVISED AS PER T&C ENGG.& PE&SD COMMENTS AND CUSTOMER COMMENTS AND SHOWN AS REV.△1

DEPT. CODE	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE 405	g/m/f	NTS	NA	NA	N.A	N.A

TITLE: SURFACE CONDENSER

CARD CODE

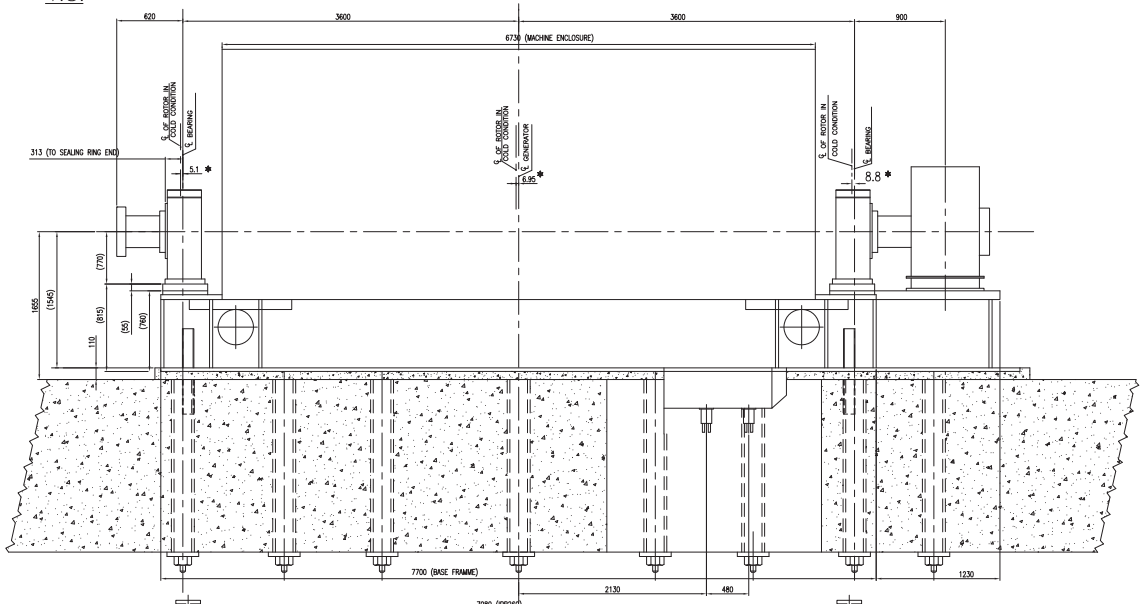
DRAWING NO. 1–160–10–01465 REV. 02

SHEET No. 1 NO OF SHEETS 1

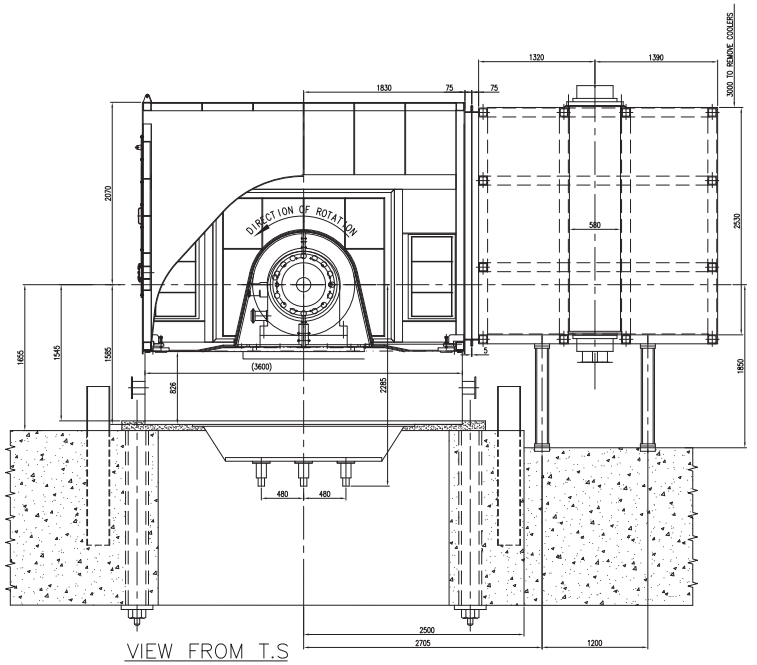
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FIRST ANGLE PROJECTION
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SHT. X OF X
DRG. NO. 0-139-12-31420
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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY02302261
SIGN AND DATE
MFG. DWG. NO.
DRAWING NO.

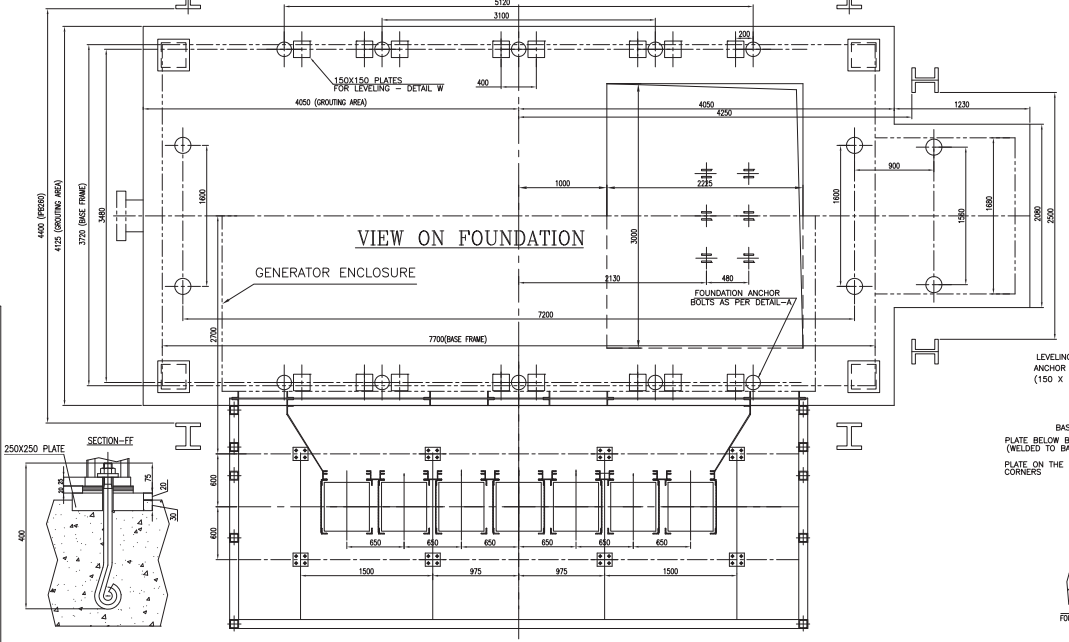
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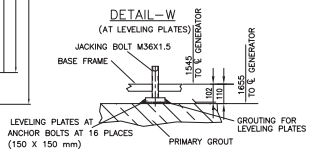


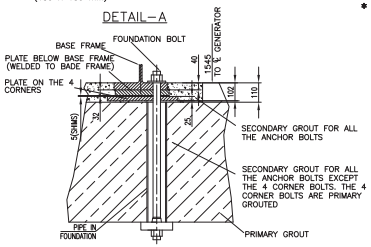
E.S.



VIEW FROM T.S







WEIGHT IN TONNES

1. GENERATOR STATOR	:	167.0
2. GENERATOR ROTOR	:	35.6
3. BEARINGS	:	5.0
4. ACCESSORIES	:	8.0
5. EXCITER	:	3.0
6. MAX. TRANSPORT WEIGHT	:	218.6
7. MAX. ERECTION WEIGHT	:	218.6
8. TOTAL WEIGHT	:	225.0

TECHNICAL DATA

01. TYPE	:	TARI 930–36P
02. RATING	:	125 MVA
03. VOLTAGE	:	11 KV
04. FREQUENCY	:	50 Hz
05. RATED POWER FACTOR	:	0.8 LAG
06. CURRENT	:	6561 A
07. OPERATING SPEED	:	3000 RPM
08. MASS MOMENT OF INERTIA OF ROTOR ($GD^2/4$)	:	3265 $Kg.m^2$
09. CRITICAL SPEED	:	1170 , 3650 RPM
10. QTY. OF LUBRICATING OIL PER GEN. BEARING.	:	110 LT/MIN.
11. PRESSURE OF LUBE OIL	:	1.8 BAR
12. QTY. OF JACKING OIL PER BRG.	:	10 LT/MIN
13. PRESSURE OF JACKING OIL	:	123 BAR
14. DIRECTION OF ROTATION	:	ANTI–CLOCKWISE WHEN VIEWED FROM TURBINE END

* IN THE GENERATOR PACKAGE, THE GEN.FRONT BEARING,GENERATOR STATOR AND GEN. REAR BEARING ARE TO BE SHIFTED TOWARDS E.S. BY 5.1, 6.95 AND 8.8 mm RESPECTIVELY WITH REFERENCE TO ROTOR CENTRE LINES TO TAKE CARE OF TURBINE AND GENERATOR ROTOR THERMAL EXPANSIONS.

REVISION REASON: IF1/ IF4/ IFD/ IFC/ CANC	REV.	DATE	ALTERED CHD/APPD	ZONE

CONSULTANT:	BHEL, FREDERICK, MARYLAND, U.S.A			
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)			
	STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)			
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)			
RIL DRG. NUMBER DAHEJ:	XXXXXXXXXXXXX			
RIL DRG. NUMBER HAZIRA:	XXXXXXXXXXXXX			
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD	DRN. SHAUKAT	24.10.13	NO.OF VAR.	
	CHD. K.C.PANDA	24.10.13	N.A.	
	APPD. U.SRIDHAR	24.10.13		
DEPT. DWG. CODE:	UNTOL. DIMS. ON:	SCALE: N.T.S	WEIGHT (KG): N.A.	REF. TO ASSY. DRG.: N.A.
				ITEM NO.: N.A.
				NO.OF ITEMS: N.A.
TITLE: LAYOUT OF GENERATOR	CARD CODE: N.A.	BHEL DRAWING NO.: 0-139-12-31420	REV.: 00	SHT. No: 1 NO. OF SHT.: 1

Oct Thu 24 15:19 2013
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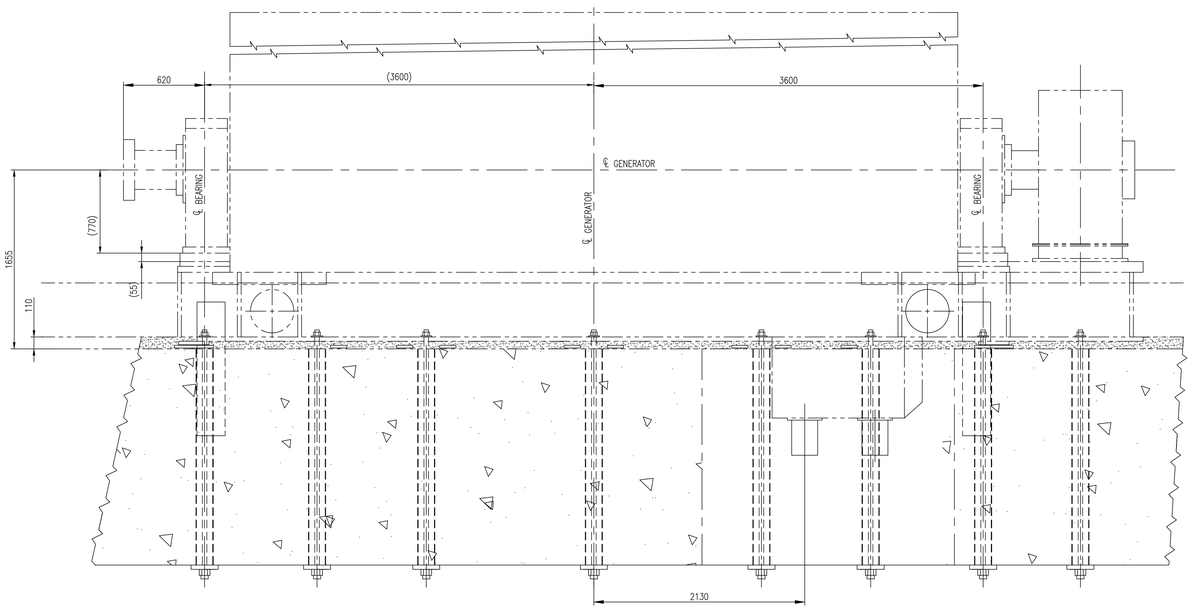
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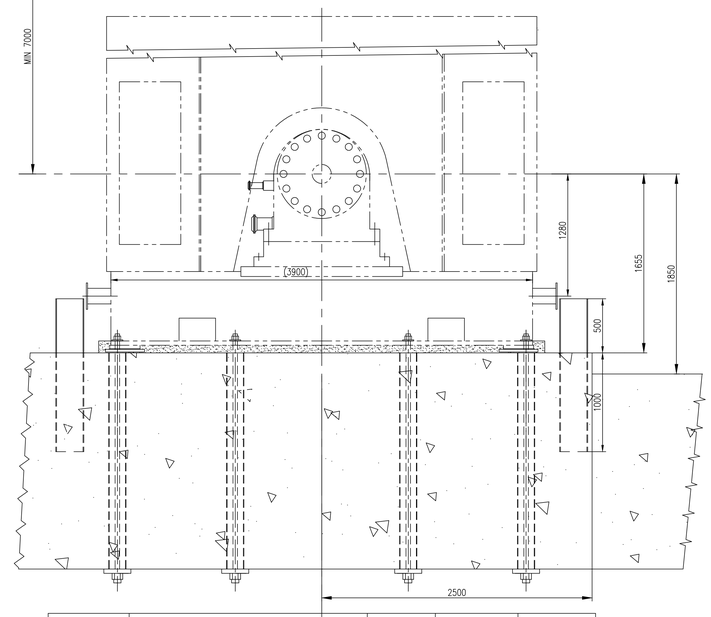
SECTION–KK

MIN 13000 FOR ROTOR REMOVAL

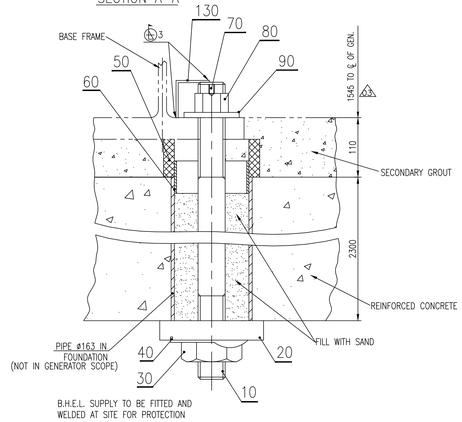
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VIEW FROM T.S

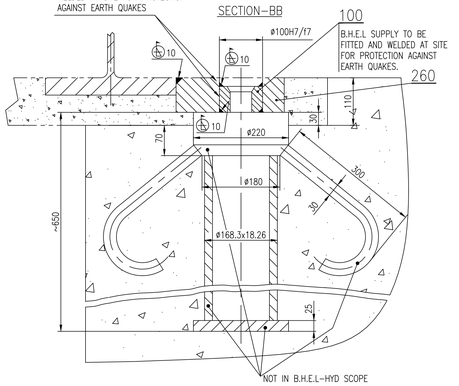


SECTION A–A

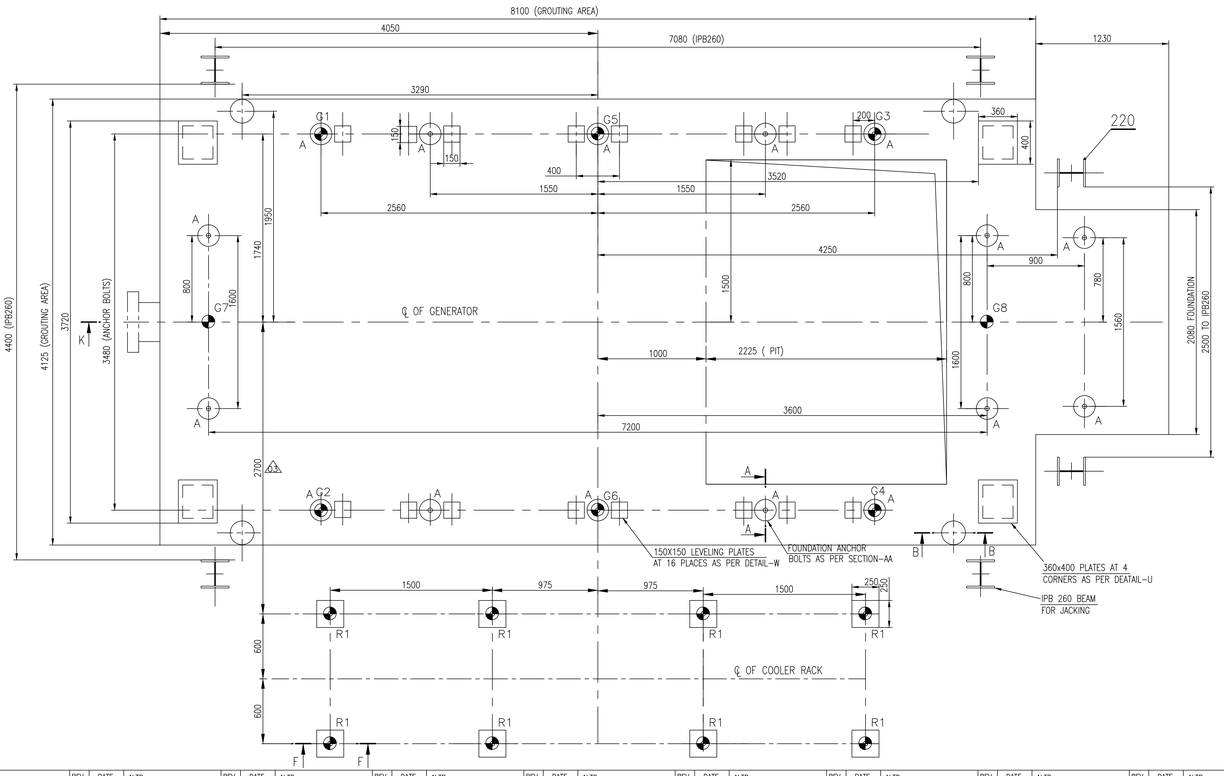


B.H.E.L. SUPPLY TO BE FITTED AND WELDED AT SITE FOR PROTECTION AGAINST EARTH QUAKES

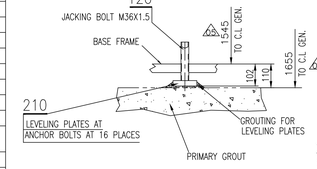
SECTION–BB



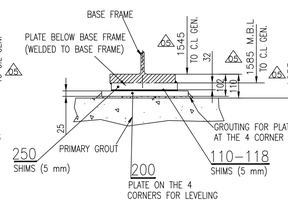
DETAIL ON FOUNDATION



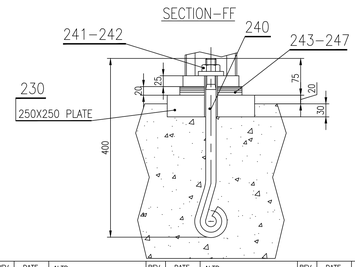
DETAIL–W
(LEVELING PLATES)



DETAIL–U
(4 CORNER ANCHOR BOLTS)



SECTION–FF



POS. NO	DESCRIPTION	QTY	EMBEDMENT	REMARKS
10	FOUNDATION BOLT–M42X3..2875 (01)	16	NO	BHEL–HYD
20	SUPPORT PLATE––STRL ST(WLDG QL	16	NO	BHEL–HYD
30	HEX.NUT–M42X3	16	NO	BHEL–HYD
40	TAB WASHER––CRCSSHT:1.6MM. Dia.=50	16	NO	BHEL–HYD
50	FOAM RUBBER RING: ID=152; OD=220	16	NO	BHEL–HYD
60	COVER–CRCSSHT:1.0mm	16	NO	BHEL–HYD
70	BOLT–M12X320	1	NO	BHEL–HYD
80	HEX. NUT; M42X3	16	NO	BHEL–HYD
90	WASHER Dia=50	16	NO	BHEL–HYD
100	SIESMIC ARRESTOR PIN	4	NO	BHEL–HYD
110–118	SHIMS AT CORNERS	4 SETS	NO	BHEL–HYD
120	JACKING BOLTS M36X1.5	10	NO	BHEL–HYD
130	LOCKING STRIP	16	NO	BHEL–HYD
200	BOTTOM CORNER PLATES	4	NO	BHEL–HYD
210	LEVELING PLATES	16	NO	BHEL–HYD
220	I–BEAM FOR JACKING/MOVEMENT	6	YES	CIVIL CONTRACOR
230	PLATES FOR COOELR 250X250	8	YES	BHEL–HYD
240	BOLTS FOR COOLERS M24	8	YES	BHEL–HYD
241	NUT M24	8	NO	BHEL–HYD
242	WASHER FOR M24	8	NO	BHEL–HYD
243–247	SHIMS	8 SETS	NO	BHEL–HYD
250	TOP CORNER PLATES	4	NO	BHEL–HYD
260	SIESMIC ARRESTOR BLOCK	4	NO	BHEL–HYD

⚠3 VERTICAL LOCATION OF G1 TO G8 IS 1545 MM BELOW THE GENERATOR AXIS.

FOUNDATION LOAD DATA IN KN

LOAD POINT	STATIC LOAD ⚠6A	ROTATING LOAD ⚠6B	SHORT CIRCUIT LOAD	OPERATING TORQUE	FORCE DUE TO UNABALCE (HORIZ. & VERTICAL) ⚠7	DYNAMIC LOADS IN FAILURE (HORIZONTAL & VERTICAL) ⚠8	SYSMIC LOAD (FY) ⚠9	SYSMIC LOAD (FX) ⚠9	SYSMIC LOAD (FZ) ⚠9
G1	–210		±405	–46			±13	±26	±26
G2	–210		±405	46			±13	±26	±26
G3	–210		±405	–46			±13	±26	±26
G4	–210		±405	46			±13	±26	±26
G5	–210		±202.5	–23			±13	±26	±26
G6	–210		±202.5	23			±13	±26	±26
G7	–230	–155			±32	±192	±24	±47	±47
G8	–240	–155			±32	±192	±24	±47	±47
R1	–20						±1.2	±2.4	±2.4 ⚠3
	⚠6A	⚠6B			⚠7		⚠9	⚠9	⚠9

REMARKS:

01. FOUNDATION PRE LOADING: 150 kN.
OR
BOLT STRETCHING: $1.2^{+0.3}_{-0.0}$mm.
OR
TIGHTENING TORQUE FOR M42 ANCHOR BOLTS IS 1800 N–m

02. W.P.S No. WE006.

03. POS. NO. 250 BE PLACED ON POS. NO. 200 AFTER COLOUR MATCHING WITH SURFACE PLATE ON BOTH SIDES. GENERATOR STATOR/PACKAGE IS PLACED ON THESE 4 CORNER PLATES. SHIMS SHALL BE PLACED AS PER ALIGNMENT REQUIREMENT. THE PLATES (POS.NO. 250) ARE WELDED TO BASE FRAME I–BEAM AFTER COMPLETING SPRING BACK CHECK

** ALL THE FOUNDATION DETAILS OF GENERATOR SHALL BE KEPT BY THIS AMOUNT W.R.T. TURBINE FLANGE TO TAKE CARE OF THE THERMAL EAPANSION. INITALLY WHEN GENERATOR IS PLACED ON FOUNDATION AT SITE, THERE EXISTS A GAP OF 8.5MM BETWEEN COUPLNG FLANGES. THE GENERATOR STATOR IS FIXED AT THIS POSIITON AND THE GENERATOR ROTOR IS PULLED TOWARDS TURBINE AND COUPLING BOLTS ARE FIXED. WHILE RUNNING CONDITION DUE TO TURBINE SHAFT EXPANSION ON TO GENERATOR ROTOR THE GENERATOR ROTOR IS PUSHED BACK TO ITS ORIGINAL POSIITON.

WEIGHT IN TON

01. GENERATOR STATOR : 145 ⚠4
02. GENERATOR ROTOR : 31.5 ⚠4
03. GENERATOR BEARING : 7.5 ⚠4
04. ACCESSORIES : 8
05. EXCITER : 3.0
06. MAX TRANSPORT WEIGHT: 187 (TRANSPORT FRAME NOT INCLUDED.)
07. MAX ERECTION WEIGHT : 187 ⚠4

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: TARI 930–36P, RIL, HAZIRA

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	ARUN KUMAR		05.09.13
CHD.	SHAUKAT		05.09.13
APPD.	K C PANDA		05.09.13

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
EME			NA	NA	NA
CODE 425	N.A	NA			

TITLE: FOUNDATION DETAILS

DRAWING NO. 0–137–01–31037 REV. 06

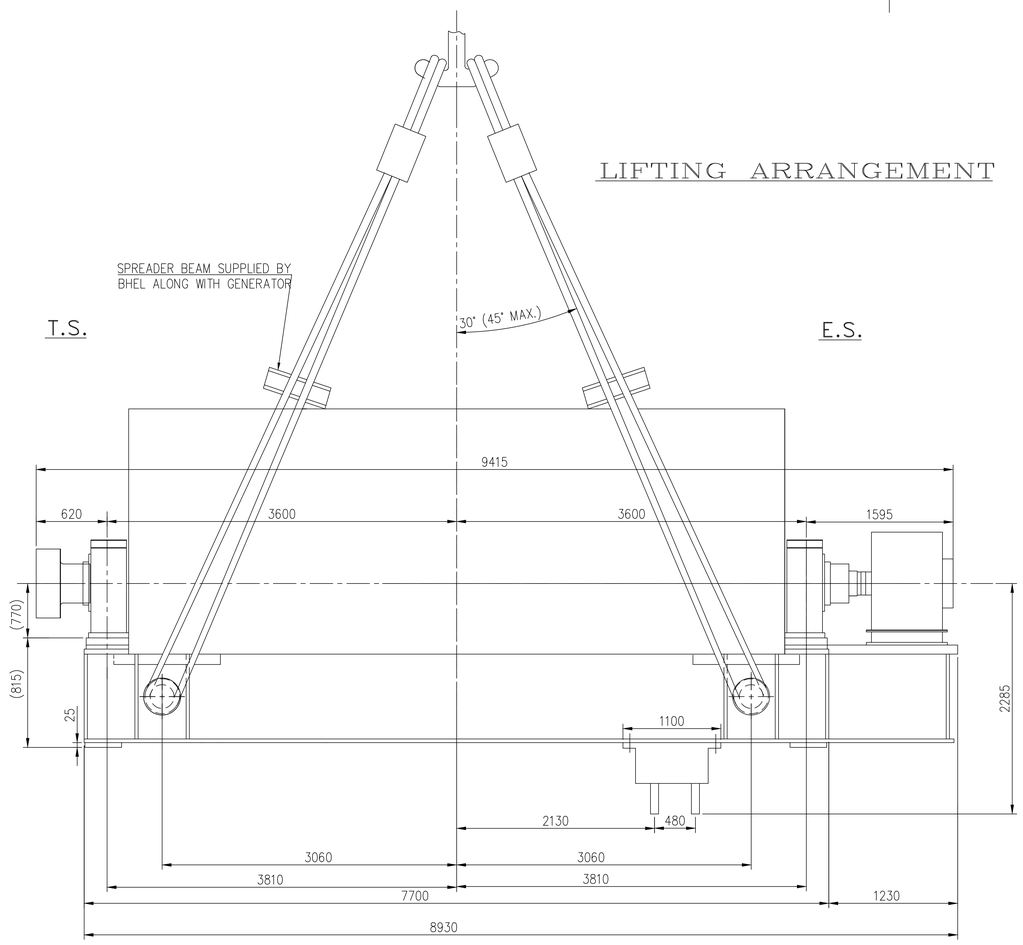
SHEET NO. 01 NO OF SHEETS 01

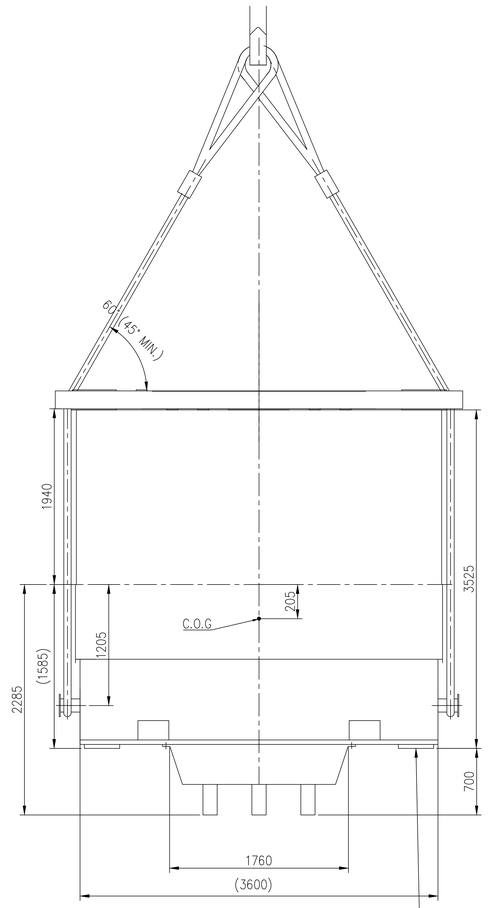
REV.	DATE	ALTD	CHD	APPD.	ZONE
06	28.11.13	FOUNDATION LOAD AND TOTAL LOAD MODIFIED.			
05	27.11.13	COOLER SYSMIC LOAD ADDED. DETAIL U & W MODIFIED.			
04	19.10.13	SYSMIC LOAD ADDED.			
03	15.10.13	SECTION AA REVISED AND COOLER DUCT SUPPORTING STRUCTURE LOCATION SHOWN.			
02	07.09.13	FOUNDATION LOAD MODIFIED.			
01	06.09.13	FOUNDATION LOAD TABLE ADDED.			J17

SOIL AND DATE | REF. DRG. NO. | COMPUTER FILE NAME : | INVENTORY NO

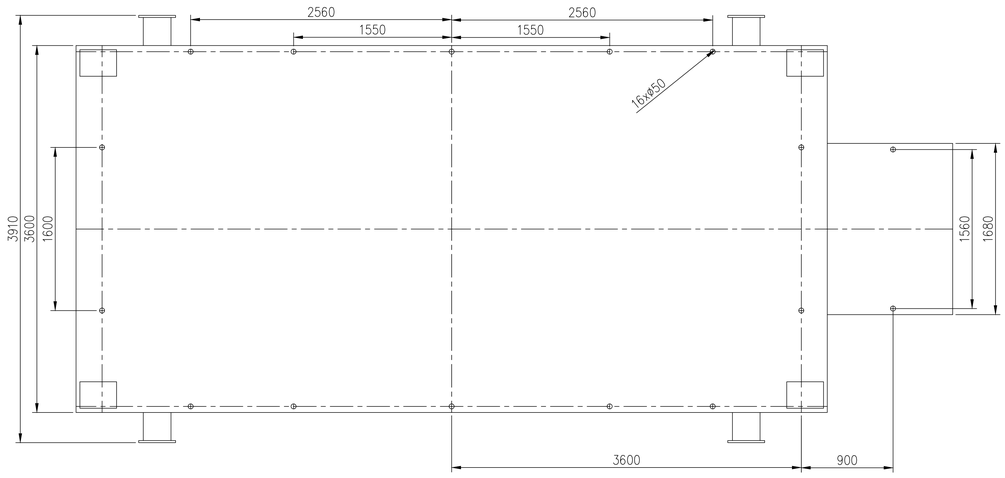
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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

LIFTING ARRANGEMENT





AT THE FOUR CORNERS, 4 NOS MACHINED PLATE WELDED.
IT SHOULD BE PROTECTED WHILE TRANSPORTATION.



WEIGHT IN TONNES

GENERATOR PACKAGE (WITHOUT TRANSPORT FRAME) : 187 TON

********** OUTPUT TERMINAL IS PROJECTED DOWNWARD BY 700MM FROM BOTTOM OF THE GENERATOR. IT SHOULD BE PROTECTED WHILE TRANSPORTATION.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: TARI 930-36P, RIL, HAZIRA,7X90 MW

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	SHAUKAT		28.11.13	
CHD.	K C PANDA		28.11.13	
APPD.	U.SRIDHAR		28.11.13	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
EME		N.T.S	N.A	NA	NA	NA
CODE 425						

TITLE: GENERATOR TRANSPORTATION DETAILS

CARD CODE

DRAWING NO. 1-139-12-31403 REV. 00

SHEET No. 01 NO OF SHEETS 02

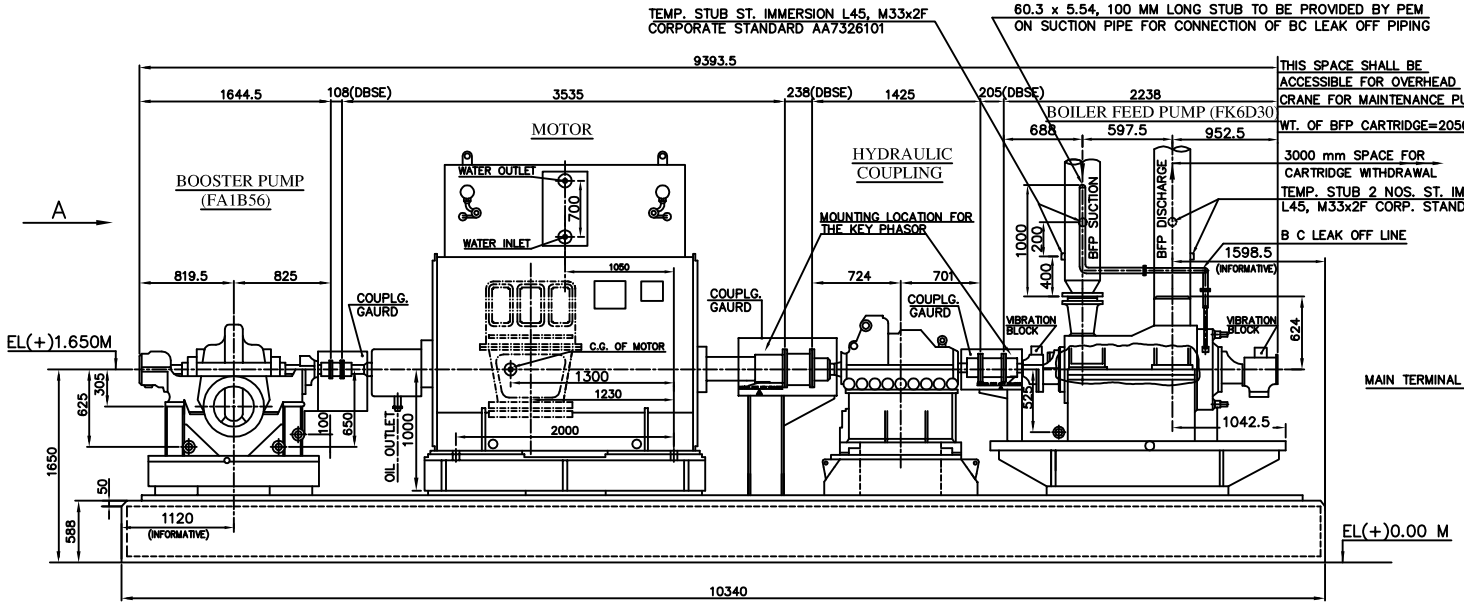
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

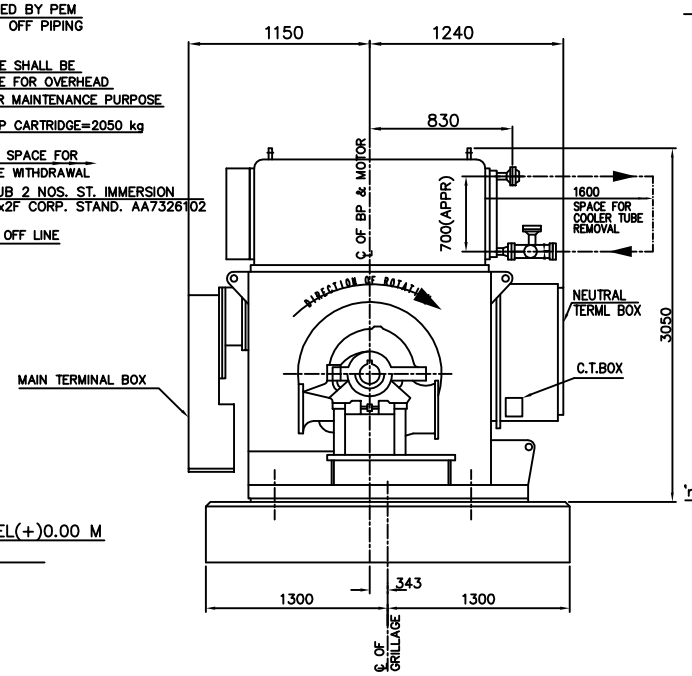
DRG. NO. 1 180 005 7626

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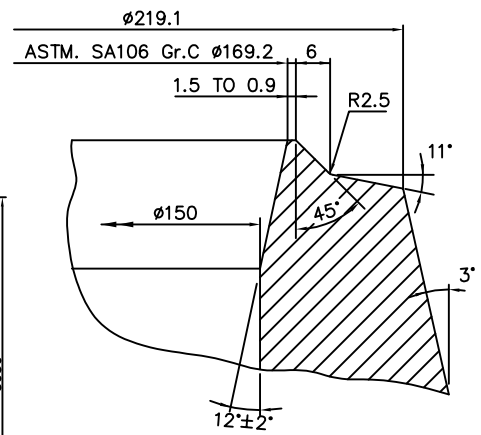
COMPUTER FILE NAME : FP1180005762 6-00



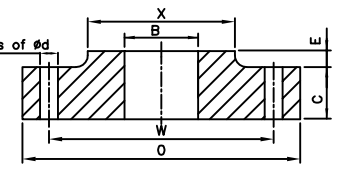
ELEVATION (WITHOUT COOLERS)



VIEW–A



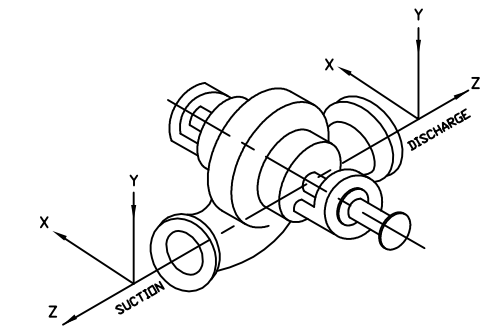
B.F.P. DISCHARGE BRANCH WELD END DETAIL



COUNTER FLANGE DETAILS

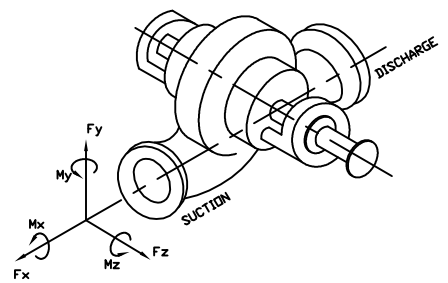
COUNTER FLANGE DIMENSIONS

DESCRIPTION	O	W	X	B	C	E	d	n
BFP SUCTION	360	310	278	221	32	3	27	12
B.P.SUCTION	505	460	430	359.2	24	4	22	16
B.P.DISCHARGE	405	355	320	275	23	3	26	12



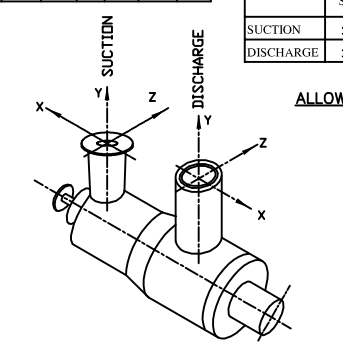
MOVEMENT	SUCTION BRANCH (mm)	DIS. BRANCH (mm)
X	0.67	0.67
Y	0.21	0.21
Z	0.815	0.889

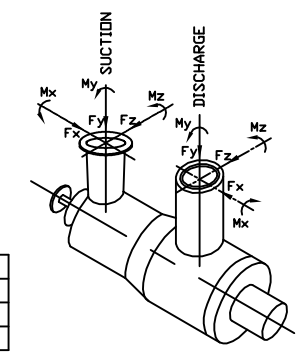
THERMAL MOVEMENTS OF BP BRANCHES

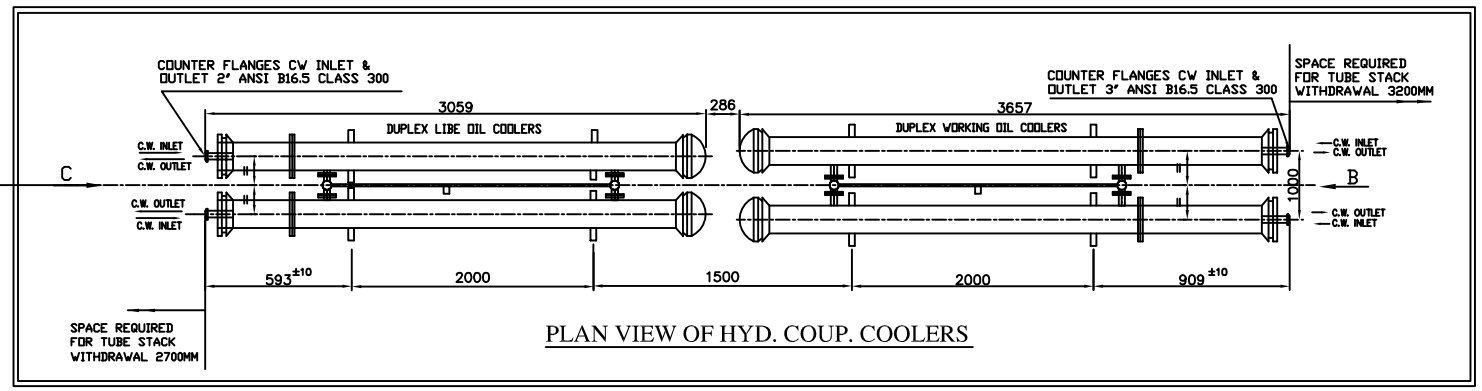


	NOZZLE SIZE	MOMENT Mx Kgm	MOMENT My Kgm	MOMENT Mz Kgm	FORCE Fx Kg	FORCE Fy Kg	FORCE Fz Kg
SUCTION	14"	±130	±130	±178	±342	±342	±342
DISCHARGE	10"	±130	±130	±185	±342	±342	±342

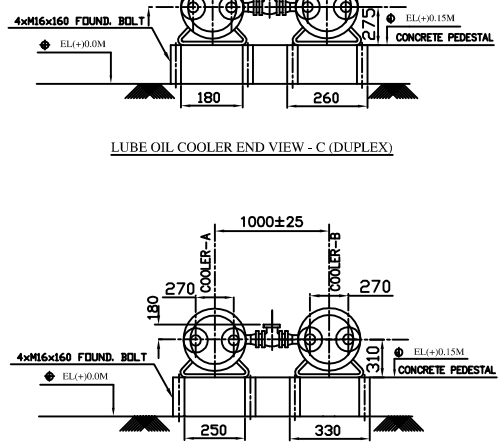
ALLOWABLE FORCES & MOMENTS ON BP NOZZLES







PLAN VIEW OF HYD. COUP. COOLERS



WORKING OIL COOLER END VIEW - B (DUPLEX)

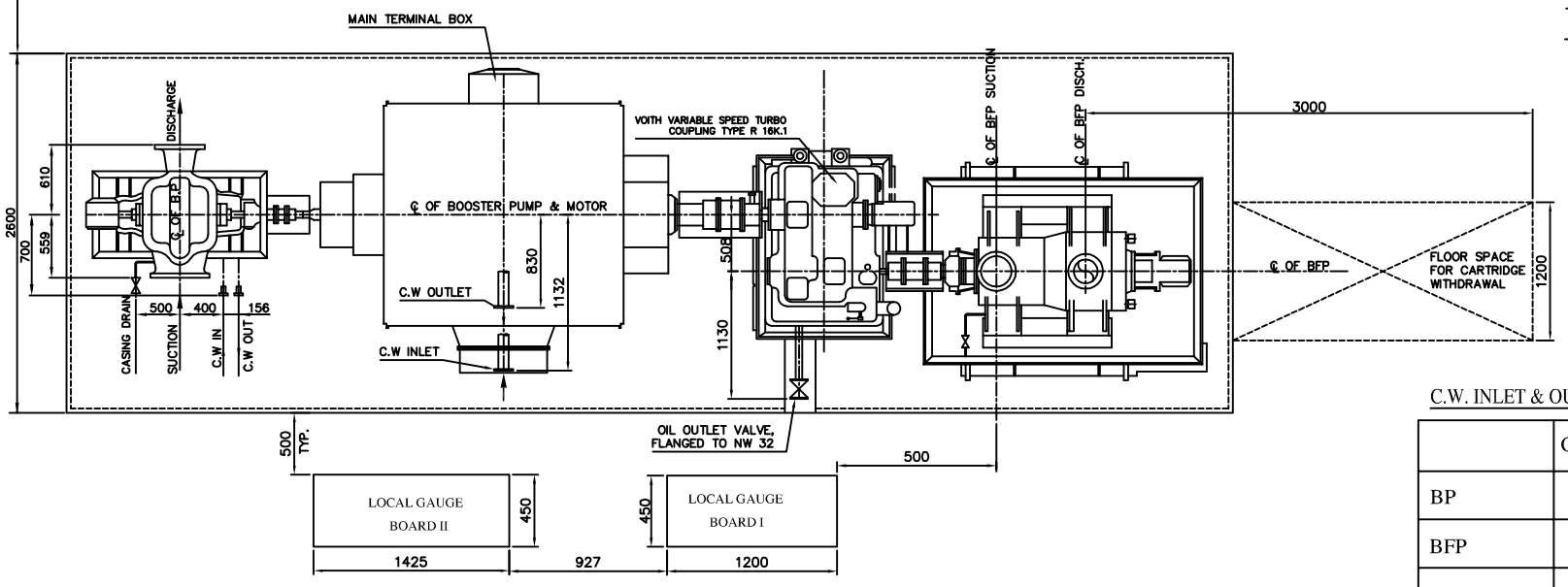
LUBE OIL COOLER END VIEW - C (DUPLEX)

MOVEMENT	SUCTION BRANCH (mm)	DIS. BRANCH (mm)
X	0	0.739
Y	0.19	0.19
Z	0	0

THERMAL MOVEMENTS OF BFP BRANCHES

	NOZZLE SIZE	MOMENT Mx Kgm	MOMENT My Kgm	MOMENT Mz Kgm	FORCE Fx Kg	FORCE Fy Kg	FORCE Fz Kg
SUCTION	8"	±444	±493	±444	±357	±446	±357
DISCHARGE	6"	±448	±551	±448	±266	±333	±266

ALLOWABLE FORCES & MOMENTS ON BFP NOZZLES



PLAN OF BFP SET

NOTE :

1. FOR MOTOR DETAILS, REFER MOTOR DRG FURNISHED BY BHEL BHOPAL.
2. FOR FOUNDATION DETAILS, EQUIPMENT WEIGHTS AND CENTRE OF GRAVITIES, REFER DRG.NO. HY–DG–1–18000–57627
3. DBSE DENOTES DISTANCE BETWEEN SHAFT END'S
4. ALL ELAVATIONS ARE EXPRESSED IN METERS
5. LOCATION OF LGBs IS SHOWN FOR REFERENCE ONLY & HEIGHT OF LGBs SHALL BE APPROXIMATELY 1.8 M.
6. THIS DRG IS ISSUED FOR LAYOUT PURPOSE ONLY. i.e. FOR THE PURPOSE OF DIMENSIONS, LOCATION OF TERMINAL POINTS, WEIGHTS OF EQUIPMENTS AND FOUNDATION LOADS. THIS DRAWING SHALL NOT BE REFERRED FOR INTERNAL AND EXTERNAL CONSTRUCTION DETAILS OF THE EQUIPMENT.
7. ELEVATION METERS

C.W. INLET & OUTLET FLANGE DIMENSIONS

	C.W. INLET	C.W.OUTLET
BP	SORF FLANGE NB 1" CL 150	SORF FLANGE NB 1" CL 150
BFP	SORF FLANGE NB 2" CL 150	SORF FLANGE NB 3" CL 150
MOTOR	SORF FLANGE NB 4" CL 150	SORF FLANGE NB 4" CL 150

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, USA
BECHTEL DRG. NO.	
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091–M43–CAT000–BHL–P003
RIL DRG. NO. (HAZIRA):	10090–M43–CAT000–BHL–P003

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	B.H.NAIK	S.D/–	17.10.13
CHD.	D.K.GUPTA		17.10.13
APPD.	B.RAJKUMAR		17.10.13

NO.OF VAR. NA

DEPT.	CODE	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
PUMPS ENGG.	410	NTS	NA	NA	NA	NA

TITLE: GENERAL ARRANGEMENT OF BFP SET

DRAWING NO. HY–DG–1–18000–57626 REV. 00

SHEET NO. 01 NO OF SHEETS 01

REV.	DATE	ALTERED	CHECKED	APPD.	ZONE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 1 180 005 7627

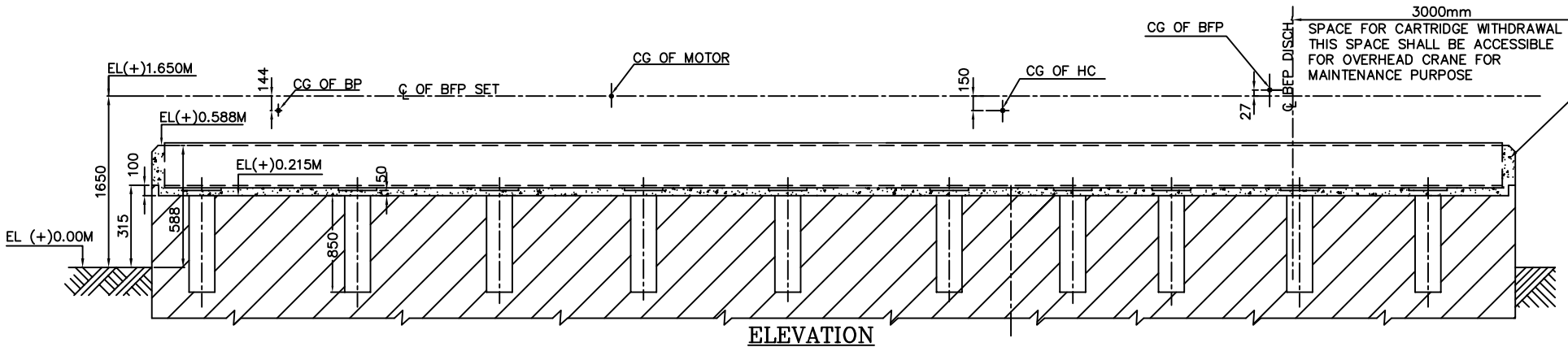
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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

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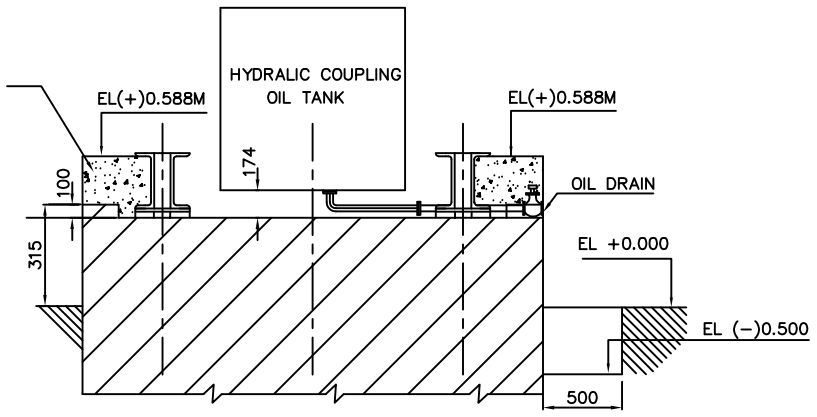
REF. DRG. NO.

SIGN. AND DATE

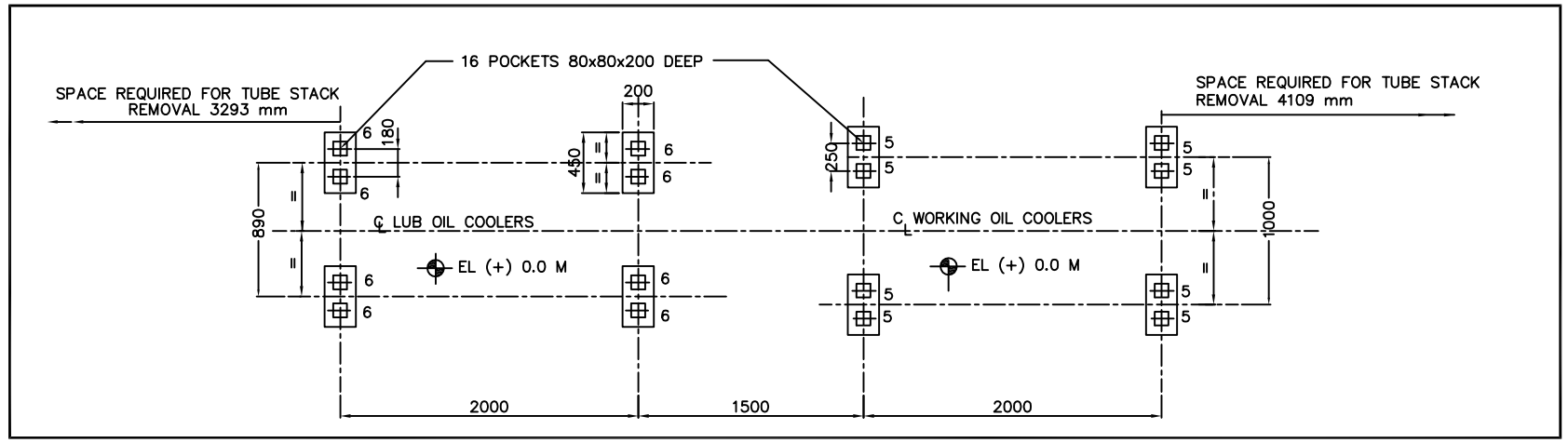
INVENTORY NO



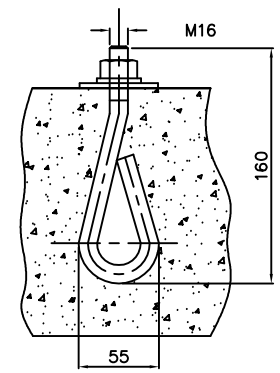
ELEVATION



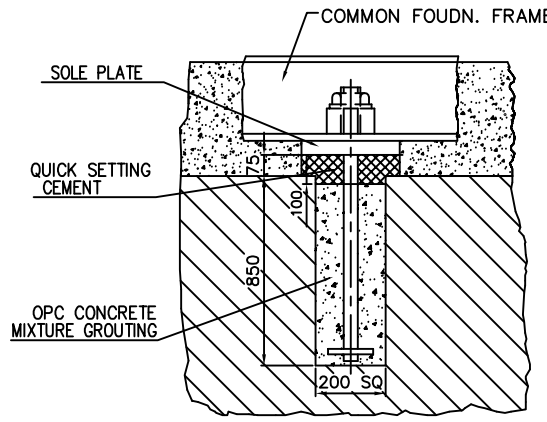
VIEW ON A–A



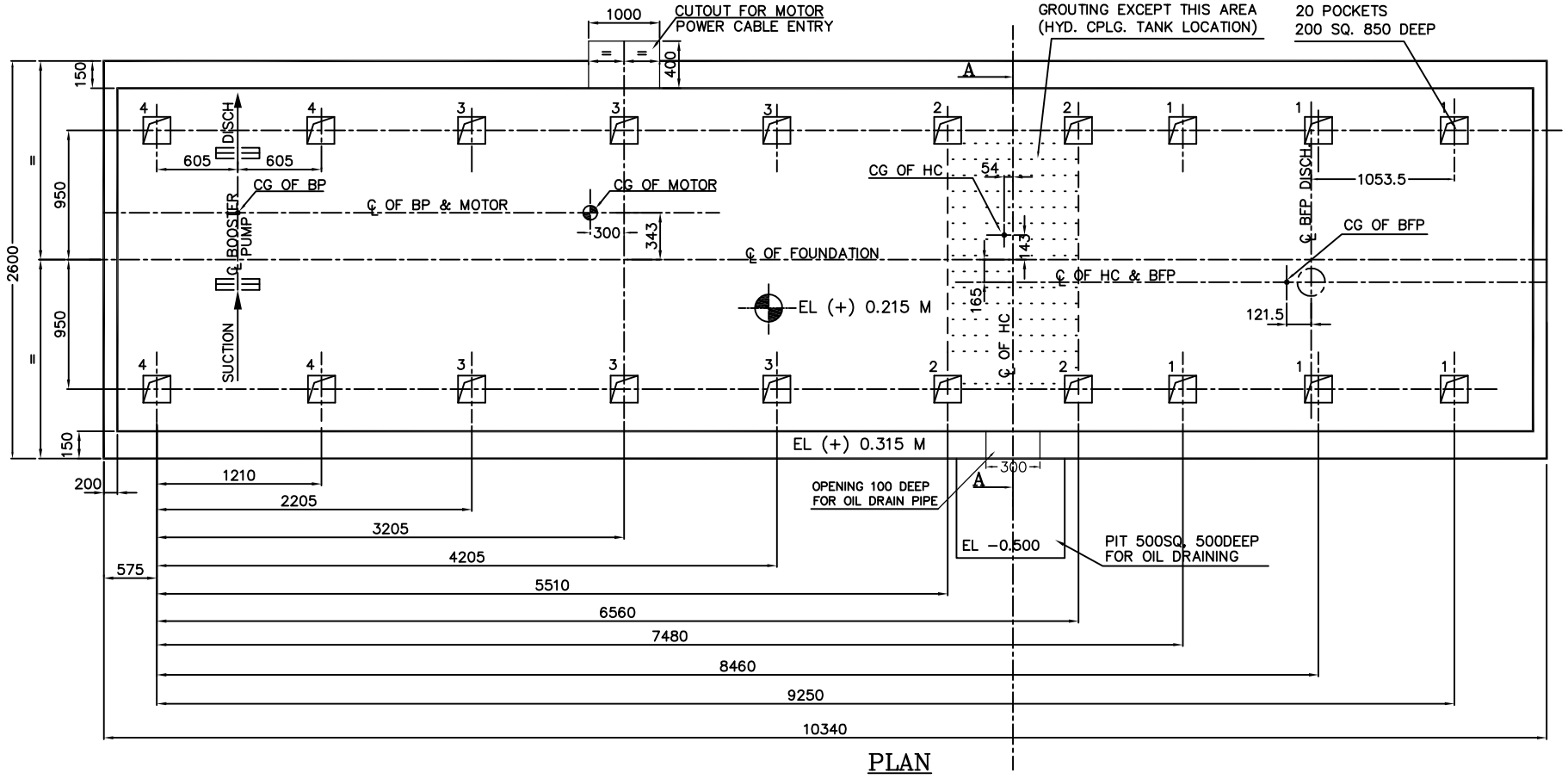
TYPICAL FOUNDATION DETAILS OF
HYD. COUPLING COOLERS AT 0.0 M



FOUND. BOLT DETAILS OF
L.O. & W.O. COOLERS



FOUNDATION BOLT ARRANGEMENT
FOR BFP SET



PLAN

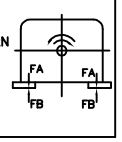
No.OF POCKETS	FOUNDATION POCKET No.	DESCRIPTION OF THE EQUIPMENT	WT. OF THE EQPMT.(KG)	ROTOR ECC. VERTICAL (MICRONS)	SPEED (rpm)	ROTOR WT. (Kg.)	GD^2 (Kg. m^2)	TOTAL DYNAMIC LOAD VERT. (Kgs.)	LOADING ON EACH POCKET STATIC (KG)	LOADING ON EACH POCKET DYNAMIC(KG)
20	1,2,3,4	COM.FOU.FRAME	8752	–	–	–	–	–	481	–
6	1	B.F.P.	5770	50	5100	298	6.12	833	1486	530
4	2	HYD. COUPLING	3000	200/50	–	540 (INPUT) 221 (OUTPUT)	97 (INPUT) 1.24 (OUTPUT)	1667/785 LOW SPEED SHAFT/ HIGH SPEED SHAFT	1090	1900
6	3	MOTOR	15000	200	1485	3250	520	✡✡ SEE MOTOR LOADING DETAILS	3232	6606
4	4	BOOSTER PUMP	2190	–	1485	135	4.9	441	1085	368
8	5	WOR.OIL COOLER	2120	–	–	–	–	–	292	–
8	6	LUB OIL COOLER	1350	–	–	–	–	–	186	–

LEGEND

- CAST FOUNDATION
- SECONDARY GROUTING (QUICK SETTING CEMENT)
- SECONDARY GROUTING (OPC CONCRETE)
- BLIND POCKET/OPENING
- THROUGH OPENING
- ELEVATION (METRES)

✡✡ LOADING ON FOUNDATION (BFP MOTOR)

MAX. FORCE CALCULATED FROM THE MAX.
IMPULSE TORQUE ---------- FM = 207 kN
FORCE EXERTED BY THE WEIGHT ON EACH SIDE – FG = 59 kN
FOUNDATION LOAD ON EACH SIDE
COMPRESSION ------ FA = FM+FG = 266 kN
TENSILE FORCE – – – – – – – – FB = FM–FG = 148 kN
THE FORCE OCCUR ALTERNATIVELY INDEPENDENT OF THE DIRECTION OF ROTATION.



THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, USA
BECHTEL DRG. NO.	
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091-M43-CAT000-BHL-P010
RIL DRG. NO. (HAZIRA):	10090-M43-CAT000-BHL-P010

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	B.H.NAIK	S.D/-	17.10.13	NA
CHD.	D.K.GUPTA		17.10.13	
APPD.	RAJ KUMAR		17.10.13	

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
PUMPS ENGG.	NTS	NA	NA	NA	NA
CODE 410					

TITLE: FOUNDATION DETAILS OF BOILER FEED PUMP SET

DRAWING NO. HY-DG-1-18000-57627 REV. 00

SHEET NO. 01 NO OF SHEETS 01

REV.	DATE	ALTERED	CHECKED	APPD.
ZONE				

1 3 4 5 6 7 8 9 10 11

List of Main Assemblies for HNK 90/3.2-3(RUPPL Project)
Project: 7x90MW

S.No	Assembly	Size in MM			Weight (Kgs)
		Length	Width	Height	
1.	Outer Casing Upper Part	4865	5600	3500	34162
2.	Outer Casing Lower Part	4700	3060	1400	23335
3.	Inner Casing Assembly	1784	1740	1600	8960
4.	Guide Blade Carrier-1	490	1780	1735	3500
5.	Guide Blade Carrier-2	540	1780	1735	3400
6.	Guide Blade Carrier-3	620	1980	1935	4500
7.	Guide Blade Carrier-4	520	2200	2185	6900
9.	Exhaust hood Upper Part	2050	5800	2500	11980
10.	Exhaust Hood Lower Part	2230	6140	2700	20731
11.	Rear Bearing Housing Assembly	1405	1400	900	1928
12.	Front Bearing Housing Assembly	1690	2610	950	15791
13.	Rotor Assembly	8650	Dia 2230	----	34000
14.	Upper Part of Outer Casing & Exhaust Hood (Bolted Condition)	6915	5800	3500	55000
15.	Lower Part of Outer Casing & Exhaust Hood (Bolted Condition).	6930	6140	2700	53000

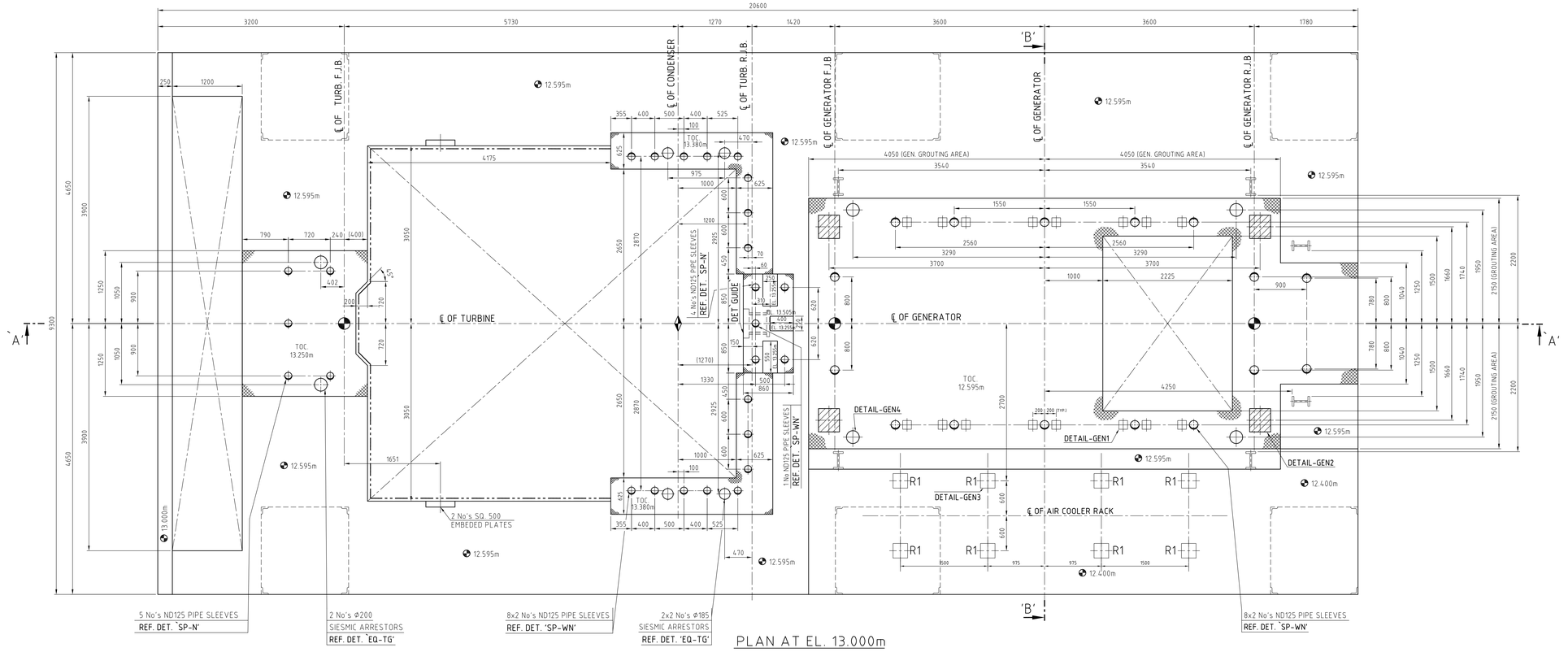
NOTE:

FOR LAY DOWN SPACE REQUIREMENTS FOR MAINTENACE PURPOSE, THE FOLLOWING SL.NOS ARE TO BE CONSIDERED: **3 TO 7, 11 TO 14.**

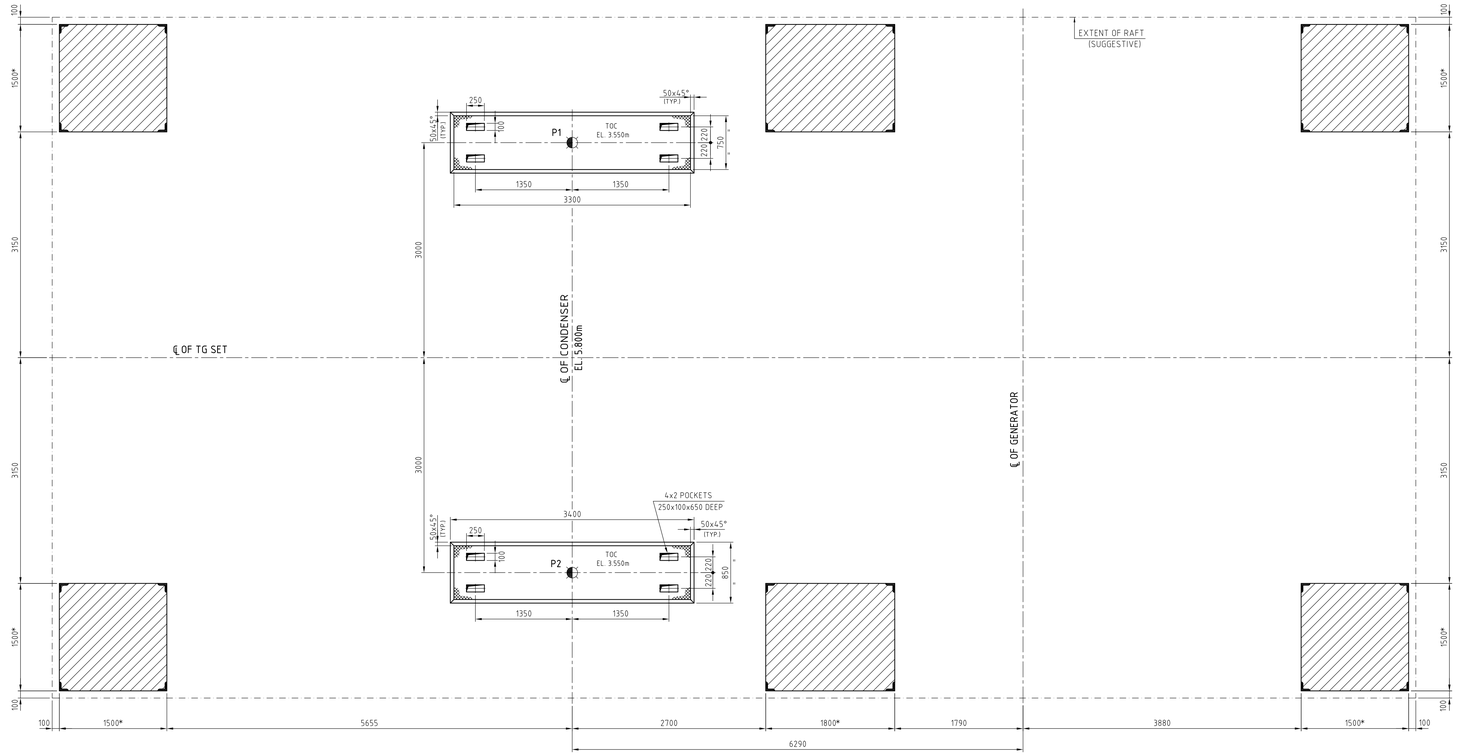
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635 SH. 01 OF 05



PLAN AT EL. 13.000m



PLAN AT 0.000m

LEGEND:

- GROUTING
- THRU. HOLES
- LOAD POINT
- OPENING
- ELEVATION
- TOC TOP OF CONCRETE

NOTES:

1. ALLOWABLE TOLERANCE IN HORIZONTAL AND VERTICAL DIRECTION :
   a) FOUNDATION DIMENSIONS ±10mm
   b) LOCATION OF EMBEDDED ANCHOR BOLTS ±5mm
   c) LOCATION OF SLEEVES FOR PIPING AND THROUGH HOLES FOR ANCHOR BOLTS ±10mm
2. SOUND CONCRETE MATERIAL IS EXPECTED BELOW EQUIPMENT BASEPLATES PERMITTING COMPLETE ADHERENCE OF SECONDARY GROUT CEMENT.
3. IF FIX POINTS ARE EMBEDDED IN A WRONG LOCATION THERE IS NO POSSIBILITY OF ADJUSTMENT OR CORRECTION ON MACHINE PARTS.
4. ALL EMBEDDED STEEL SECTIONS (FLATS & ANGLES) TO BE EMBEDDED MATCHING WITH CONCRETE SURFACE.
5. ALL THE COLUMN DIMENSIONS AND DECK THICKNESS ARE ONLY INFORMATIVE. CIVIL DESIGNER TO DECIDE THE DIMENSIONS.
6. ALL DIMENSIONS ARE IN "mm" AND ELEVATION ARE IN METRES.
7. * DIMENSIONS TO BE DECIDED BY CIVIL DESIGNER.
8. ALL ELEVATIONS CORRESPOND TO FINISHED CONCRETE LEVELS.
9. TG DECK AREA SHALL BE COVERED BY GRATING AFTER COMPLETION OF PIPING CABLING & ERECTION ETC. TOP OF GRATING SHALL BE AT EL. 13.000m. GRATING AND CORRESPONDING SUPPORTS NOT IN B.H.E.L. SCOPE.

STATUS : FINAL

OWNER: Reliance Industries Limited — RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL — BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE	NO.OF YAR.
DRN.	J.C.S/C.BALAJI	15.10.2013	
CHD.	G.N.P.A.V.APPA RAO	15.10.2013	N.A.
APPD.	M.A.HAMEED	15.10.2013	

DEPT. TEPP CODE 675 | UNTOL. DIMS. OR ±0.5 | SCALE 1:30 | WEIGHT (KG) -N.A.- | REF. TO ASSY. DRG. -N.A.- | ITEM NO. -N.A.- | NO.OF ITEMS -N.A.-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO.

CARD CODE N.A.

SHT. No 01 NO. OF SHT. 05

REV.	DATE	ALTERED	CHD/APPD
00	15.10.2013	FIRST ISSUE	

AVIATION/NO — COA AND DATE — REF. DRG. NO. — COMPUTER FILE NAME

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

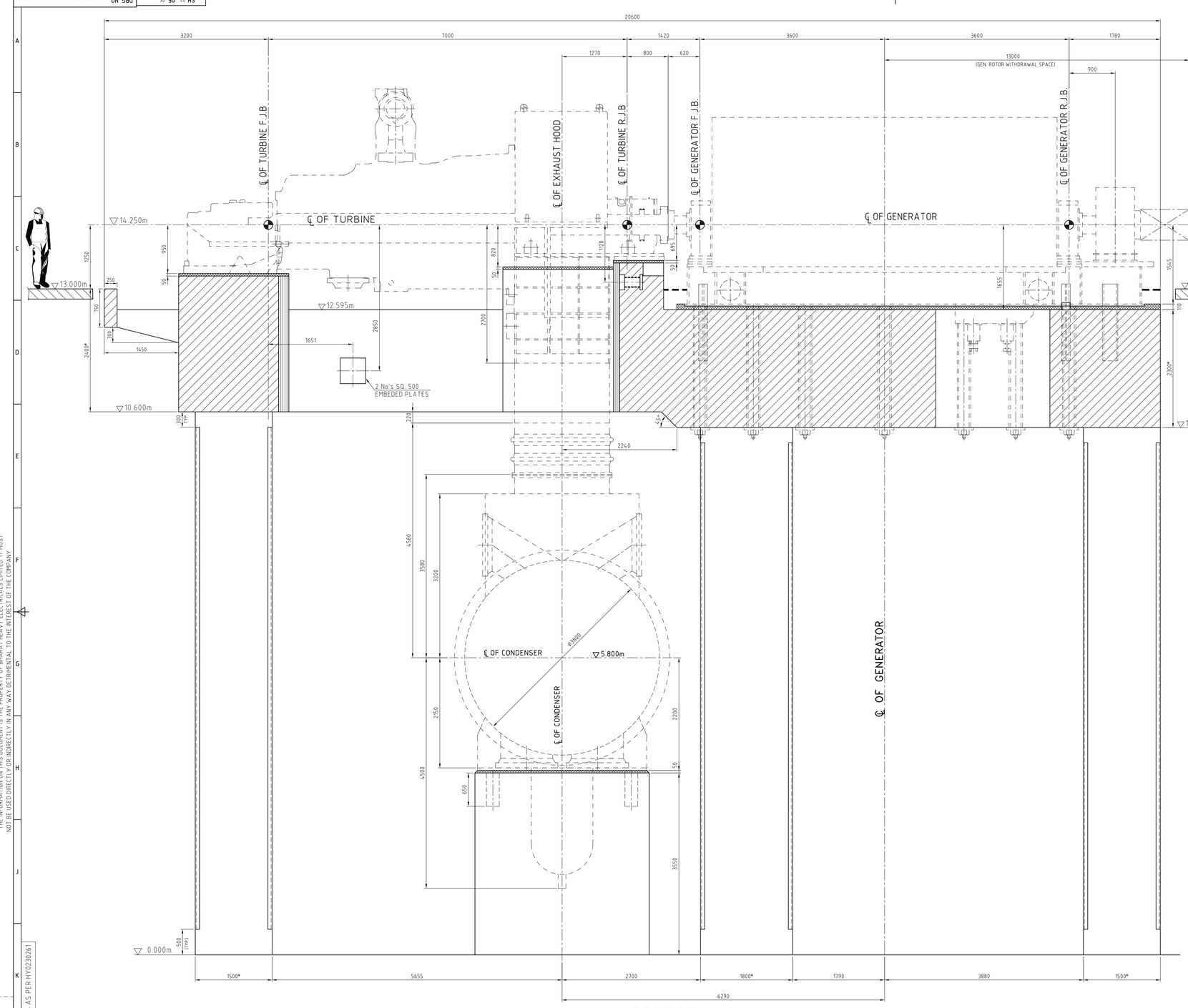
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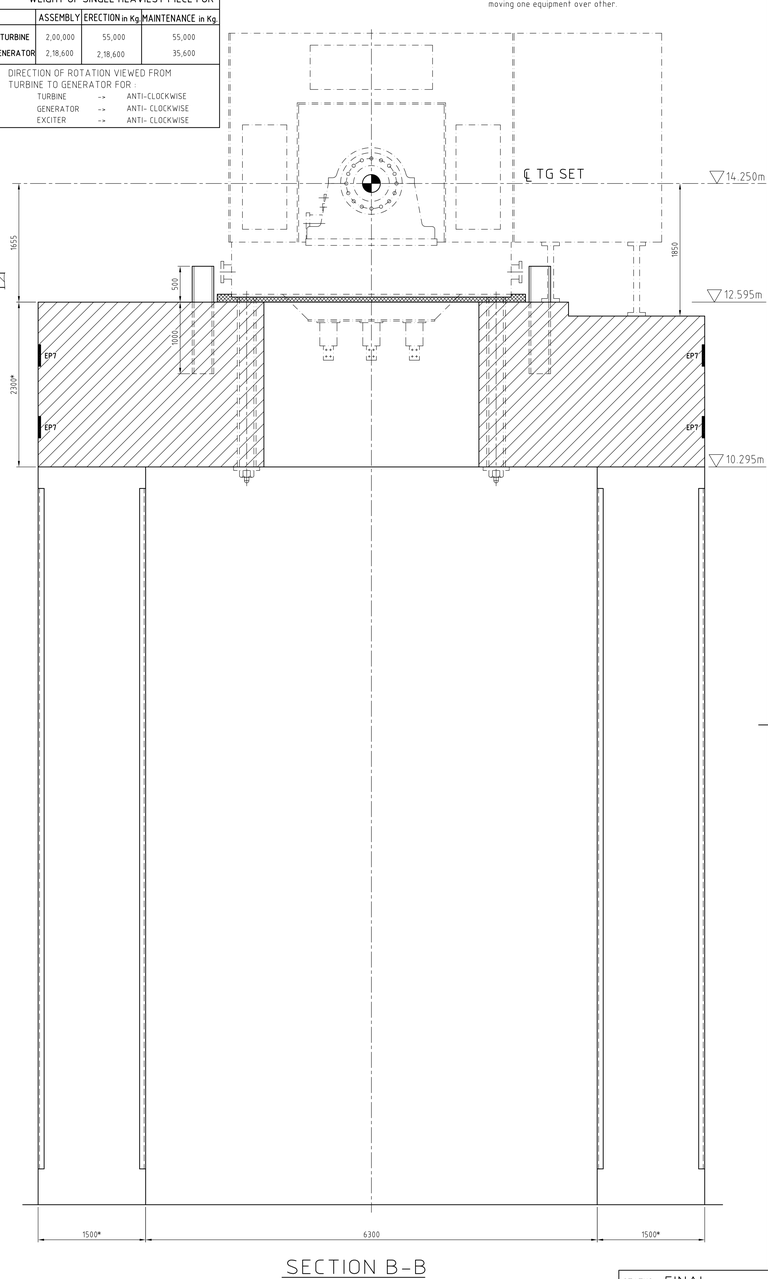
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635 SH. 02 OF 05



SECTION A-A



SECTION B-B

TYPE OF TURBINE	--	HNK 90/3.2-4
TYPE OF GENERATOR	--	TARI 930-36P

WEIGHT OF SINGLE HEAVIEST PIECE FOR

	ASSEMBLY	ERECTION in Kg	MAINTENANCE in Kg
TURBINE	2,00,000	55,000	55,000
GENERATOR	2,18,600	2,18,600	35,600

DIRECTION OF ROTATION VIEWED FROM TURBINE TO GENERATOR FOR :

TURBINE	->	ANTI-CLOCKWISE
GENERATOR	->	ANTI- CLOCKWISE
EXCITER	->	ANTI- CLOCKWISE

1. The crane hook height is arrived based on Turbine/Generator requirement only.
2. The crane hook height is arrived at considering the equipment individually without considering moving one equipment over other.

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY023061

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REV.	DATE	ALTERED	CHD/APPD

STATUS : FINAL

OWNER:
Reliance Industries Limited
RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT:
BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME		DATE	NO.OF VAR.
DRN	J.C.S/C.BALA		15.10.2013	-N.A.-
CHD	G.N.P.A.V		15.10.2013	
APPD	M.A.P.S.S		15.10.2013	

DEPT.	UNTOL DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
TCEP	GR	1:30	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE 475						

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO.

SHT. No 02 NO. OF SHT. 05

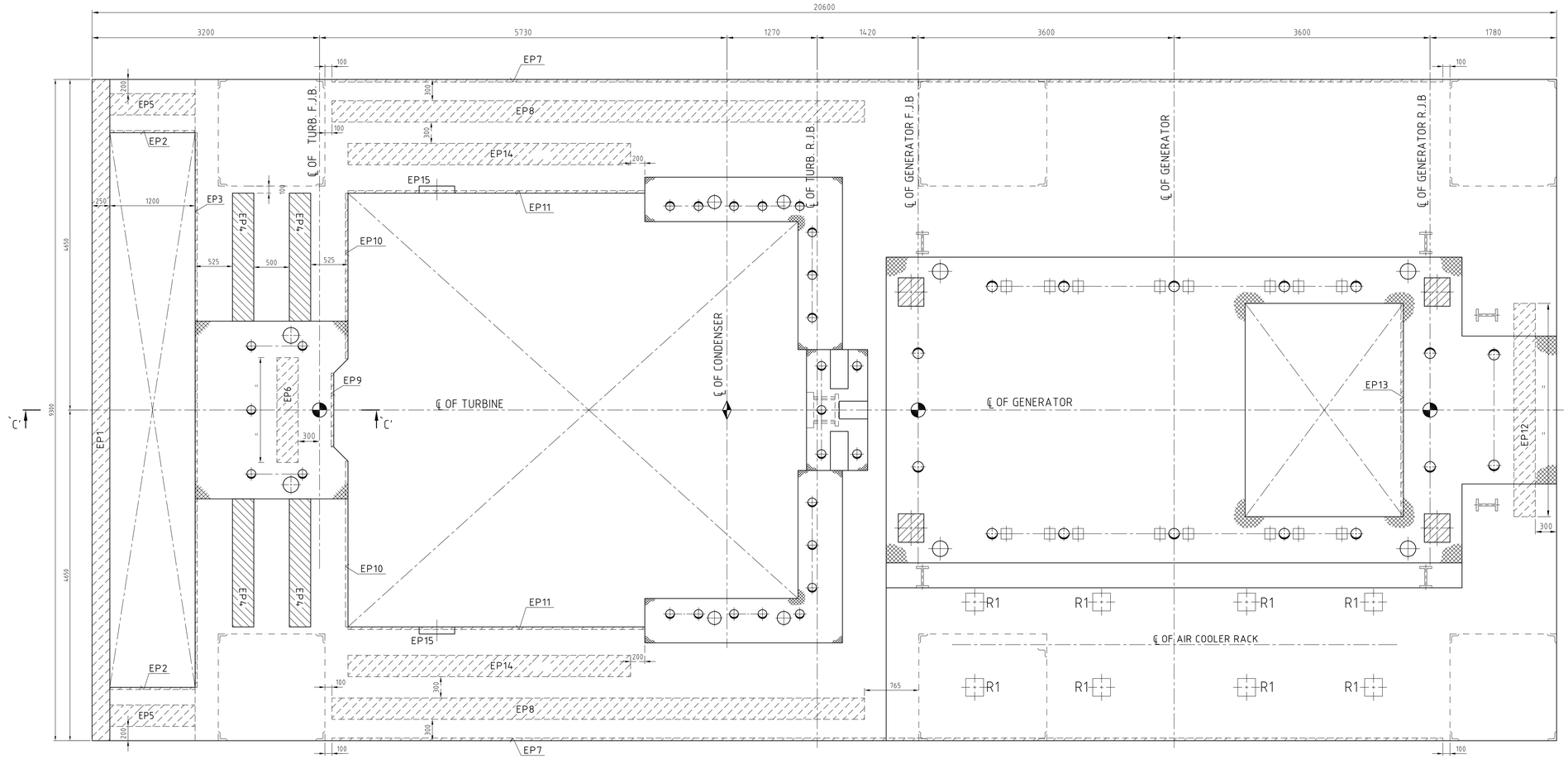
INVENTORY NO. | SOFA AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

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FIRST ANGLE PROJECTION

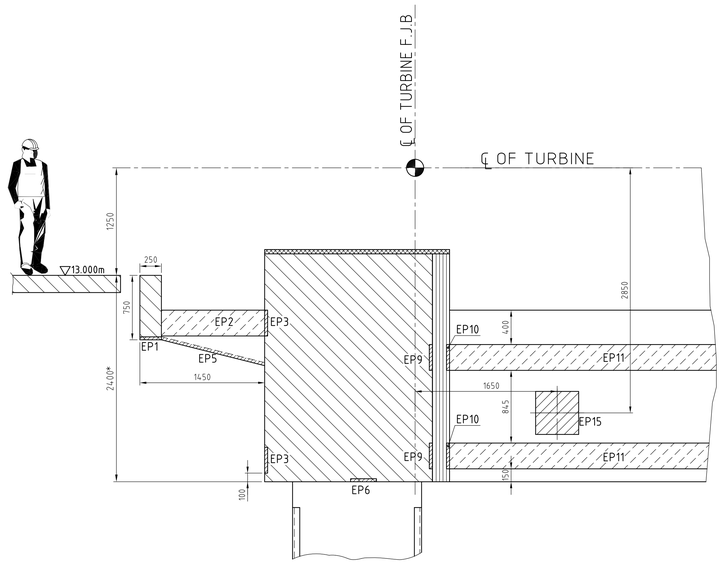
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635 SH. 03 OF 05



LOCATION OF EMBEDED PLATES

(NOT IN B.H.E.L SCOPE OF SUPPLY)



SECTION C-C

EMBEDED PLATE DETAILS

PLATE	SIZE	LOAD (IN Kg/M)	LOCATION	Q.TY.
EP1	PL. 12x250x9300	1000	BOTTOM OF DECK	1
EP2	PL. 12x300x1200	2000	℄ OF PLATE EL. 12.445m	2
EP3	PL. 12x300x7800	2000	TURBINE FRONT CUTOUT	2
EP4	PL. 12x300x1800	2000	TOP OF DECK	4
EP5	PL. 12x300x1200	2000	BOTTOM OF CANTILEVER	2
EP6	PL. 12x300x1475	2000	BOTTOM OF DECK	1
EP7	PL. 12x300x15625	2000	℄ OF PLATE EL. 10.850m/11.850m	4
EP8	PL. 12x300x7490	1000	BOTTOM OF DECK	2
EP9	PL. 12x300x1040	500	TURBINE CUTOUT	2
EP10	PL. 12x300x2330	500	TURBINE CUTOUT	4
EP11	PL. 12x300x4175	500	TURBINE CUTOUT	4
EP12	PL. 12x300x3000	1000	BOTTOM OF DECK	1
EP13	PL. 12x300x3000	1000	GENERATOR CUTOUT	1
EP14	PL. 12x300x3975	1000	BOTTOM OF DECK	1
EP15	PL. 12x500x500	3000	TURBINE CUTOUT	1

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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

SCALE AND DATE: COMPUTER FILE NAME: REF. DRG. NO: REVISION NO:

REV.	DATE	ALTERED	CHD/APPD
ZONE			

STATUS : FINAL

OWNER: RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE
DRN	J.C.S/C.BALAJI	15.10.2013
CHD	G.N.P.A.V.PRASAD	15.10.2013
APPD	M.A.HAMEED	15.10.2013

NO.OF VAR. -N.A.-

DEPT: TCEP | CODE: 215 | UNITOL: DIMS. GR. ELANGE | SCALE: 1:30 | WEIGHT (KG): -N.A.- | REF. TO ASSY. DRG: -N.A.- | ITEM NO. -N.A.- | NO.OF ITEMS -N.A.-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO. 0-313-01-08635 REV 00

CUSTOMER DRAWING NO.

SHT. No 03 NO. OF SHT. 05

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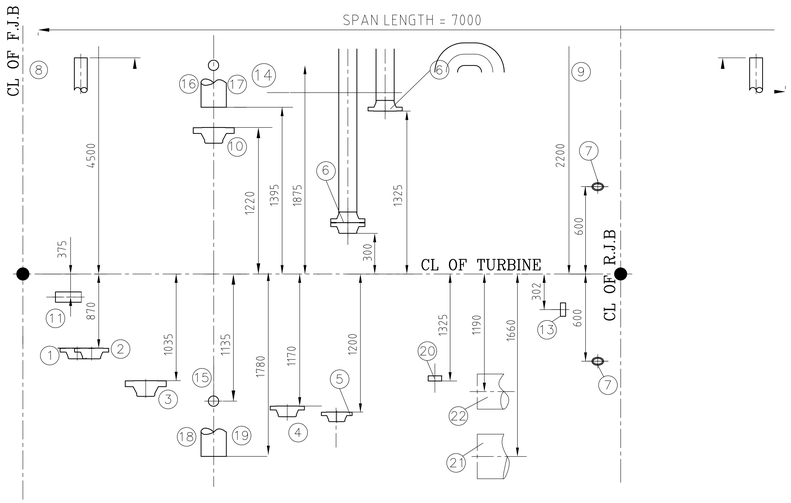
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

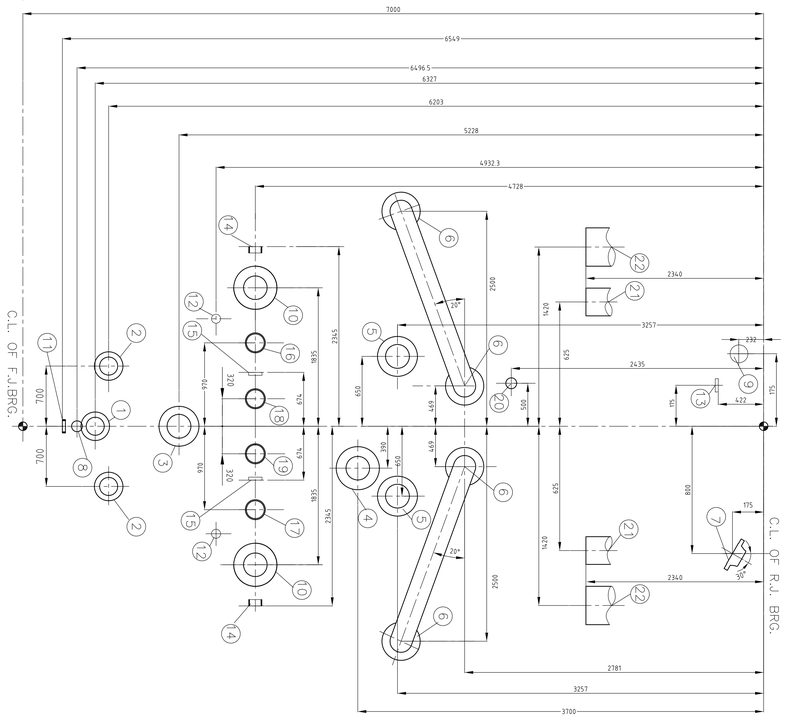
DRG. NO. 0-313-01-08635 SH. 04 OF 05

CASING STEAM AND DRAIN FLANGE CONNECTIONS

ELEVATION

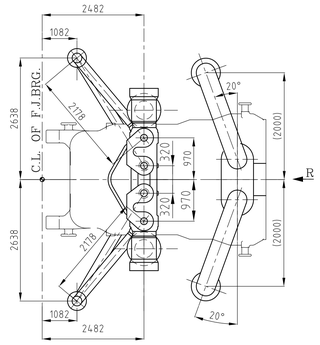


PLAN

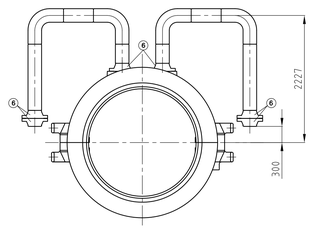


GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

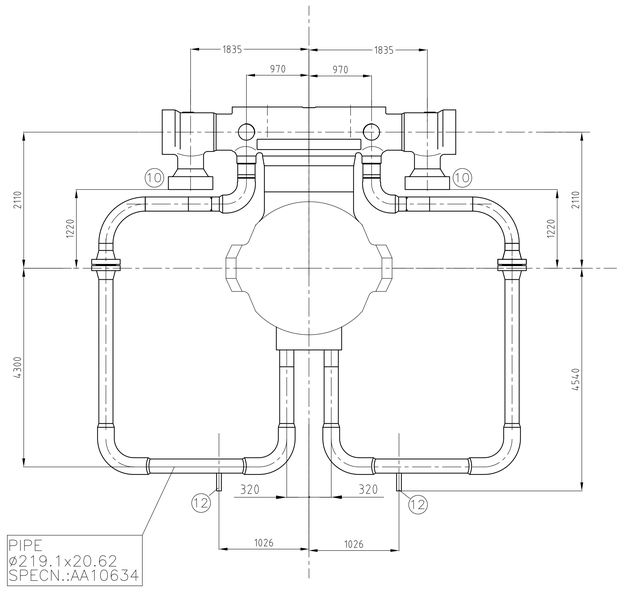
TOP VIEW OF INLET INTER CONNECTING PIPING



PARTIAL VIEW–R



INLET INTER CONNECTING PIPING AS VIEWED FROM TURBINE FRONT



SL. NO.	DESCRIPTION	QTY	TYPE OF FLANGE	REMARKS
1.	Front Steam Gland Connection	1	8" #300 WNRF,SCH=40(SA105)	1.1ata./313°C
2.	Balance Piston Leak off–1	2	8" #300 WNRF,SCH=40(SA105)	9.1ata./322°C
3.	Uncontrolled Extraction to HPH2	1	8"#600 WNRJ,SCH=40(SA105)	34.2ata./348°C
4.	Uncontrolled Extraction to HPH1	1	10" #300 WNRF,SCH=30(SA105)	18.9ata./273°C
5.	Uncontrolled Extn. to Deaerator	2	10"#300 WNRF,SCH=30(SA105)	9.1ata./192°C
6.	Uncontrolled Extraction to LPH3	2	14"#150,SCH=30(SA106)	4.5ata./147°C
7.	Rear Steam Gland Inlet	2	3"#300 WNRF SCH.40(SA105)	—
8.	Steam Vent (front)	1	PIPE ø88.9x5.49(SA335 P11)	—
9.	Steam Vent (rear)	1	PIPE ø48.3x5.08(CS)	—
10.	Main Steam Connection**	2	10"#2500 WNRF. With weld ring Gasket(SA182 F91)	120ata/529°C
11.	Drain connection(Front gland)	1	G1/2" Dilo union (SA335 P11)	—
12.	Drain connection (Inn. piping)	2	NIPPLET Dia. 60.3x11 BW ends (SA182 F91)	—
13.	Drain connection (rear gland)	1	G 1/4" Dilo Union (CS)	—
14.	Drain connection(Stop valve)	2	G1" Dilo Union (SA182 F321))	—
15.	Main Steam Inlet(U ring) Drain	2	NIPPLET dia. 22x5 BW ends (SA182 F11)	—
16.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
17.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
18.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
19.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
20.	DRAIN Connection.	1	1",#300, WNRF, SCH. 40(SA105)	10.85ata./253°C
21.	Uncontrolled Extraction to LPH–2	2	PIPE DIA 457.2X6.35 (SA106)	1.5ata/111°C
22.	Uncontrolled Extraction to LPH–1	2	PIPE DIA 609.4X6.35 (SA106)	0.5ata./83°C

**MAIN STEAM INLET FLANGE SCHEDULE TO BE DECIDED AND INFORMED TO PE GROUP

NOTES:

1) POSITIONS SHOWN IN THIS DRAWING ARE FOR MATING FLANGES OF TURBINE CASING FLANGES ISSUED BY BHEL.

STATUS : FINAL

OWNER: Reliance Industries Limited — RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL — BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE	NO.OF VAR.
DRN.	J.C.S/C.BALA.J	16.9.2013	-
CHD.	G.N.P.A.V.A.PRASAD	16.9.2013	N.A.
APPD.	M.A.HAMEED	16.9.2013	

DEPT. TEEP | CODE: 435 | UNTOL. DIMS. OR CLASS. | SCALE 1:30 | WEIGHT (KG) -N.A.- | REF. TO ASSY. DRG. -N.A.- | ITEM NO. -N.A.- | NO.OF ITEMS -N.A.-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO.

SHT. No 04 NO OF SHT. 05

REVISION NO. — SIGN AND DATE — REF. DRG. NO. — COMPUTER FILE NAME

REV.	DATE	ALTERED	CHD/APPD	ZONE

JCS

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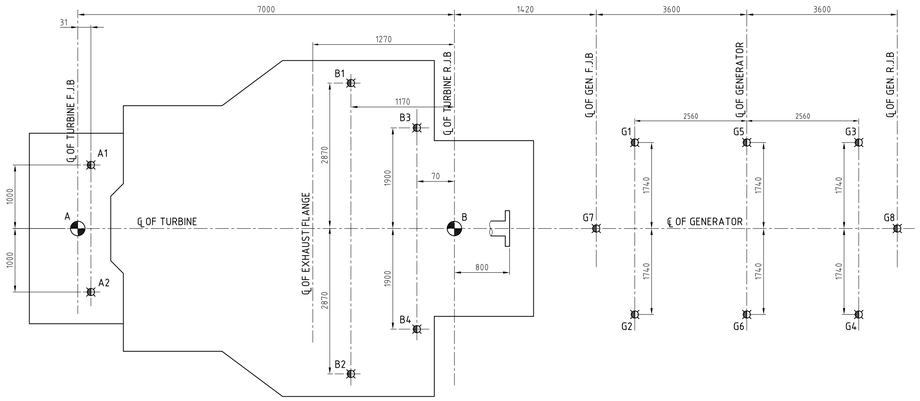
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FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635

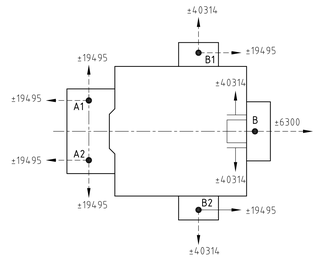
SH. 05 OF 05



HORIZONTAL FRICTIONAL FORCES IN kgf

A	Working point of forces	: 790 mm
B1	Working point of forces	: 695 mm
B1, B2	Working point of forces	: 820 mm

below turbine axis



——— COLD TO HOT
- - - - - HOT TO COLD

THE FORCES ALTERNATE IN DIRECTION

FORCES ON FOUNDATION IN kgf

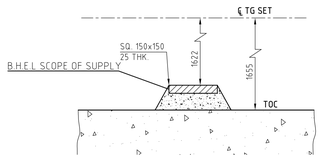
LOAD POINT / LOAD CONDITION		1 STATIC LOAD WITHOUT ROTATING WEIGHT	2 ROTATING WEIGHT	3 OPERATING WEIGHT OF CONDENSER/VACUUM PULL	4 SHORT CIRCUIT LOAD *	5 LOAD DUE TO OPERATING TORQUE	6 OPERATING UNBALANCE DYN. LOAD (ROTATING) **	7 FAILURE MODE LOAD ** (Turbine : Blade breakage Generator : End-Ring Breakage)	8 PIPING FORCE
TURBINE	A	-	16300	-	-	-	3260	19560	-
	A1	30828	-	8130	-	7706	-	-	∓5000
	A2	30828	-	8130	-	-7706	-	-	∓5000
	B	-	19924	-	-	-	3985	23910	-
	B1	25530	-	18885	-	1343	-	-	∓5000
	B2	25530	-	18885	-	-1343	-	-	∓5000
	B3	25530	-	18885	-	2028	-	-	-
	B4	25530	-	18885	-	-2028	-	-	-
GENERATOR	G1	23000	-	-	∓40500	4600	-	-	-
	G2	23000	-	-	∓40500	-4600	-	-	-
	G3	23000	-	-	∓40500	4600	-	-	-
	G4	23000	-	-	∓40500	-4600	-	-	-
	G5	23000	-	-	∓20250	2300	-	-	-
	G6	23000	-	-	∓20250	-2300	-	-	-
	G7	25500	17800	-	-	-	∓3600	∓21600	-
	G8	28500	17800	-	-	-	∓3600	∓21600	-
	R1	2000	-	-	-	-	-	-	-
CONDENSER OPERATION		-	-	-	-	-	-	-	-
	P1	115000	-	-	-	-	-	-	-
	P2	115000	-	-	-	-	-	-	-

** At each supporting point acting in radial direction over 360 deg.

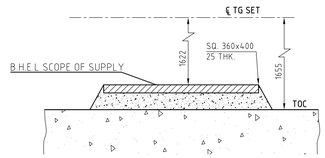
* Loads on either side of TG axis act in opposite directions and the direction changes at 50 cycles/sec.

NOTE :- DOWNWARD FORCES ARE POSITIVE

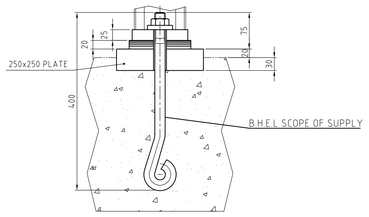
DETAIL-GEN1



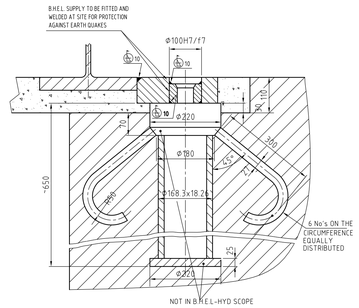
DETAIL-GEN2



DETAIL-GEN3

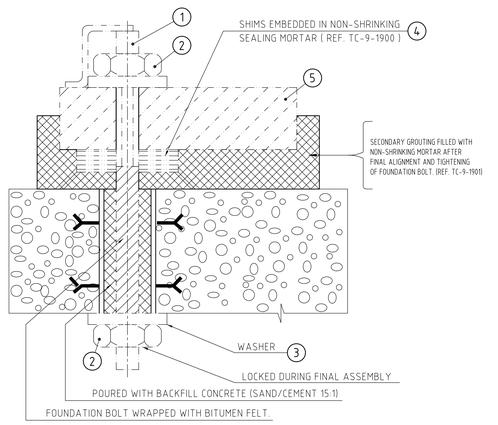


DETAIL-GEN4



MATERIAL - CARBON STEEL

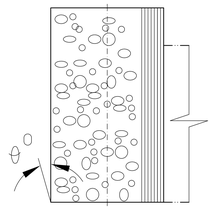
DETAIL `SP-N'



POS (1) TO (5) IN B.H.E.L SCOPE OF SUPPLY

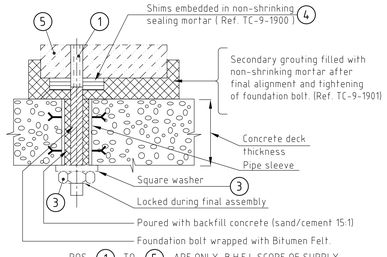
(REFER NOTE 14)

DETAIL `PED'



THE THICKNESS OF THE CONCRETE MEMBER MUST BE SUFFICEINT TO ENSURE THAT THE ANGULAR DEFLECTION DOES NOT EXCEED : 0.0115 DEG. WITH THE HORIZONTAL FORCES SPECIFIED.

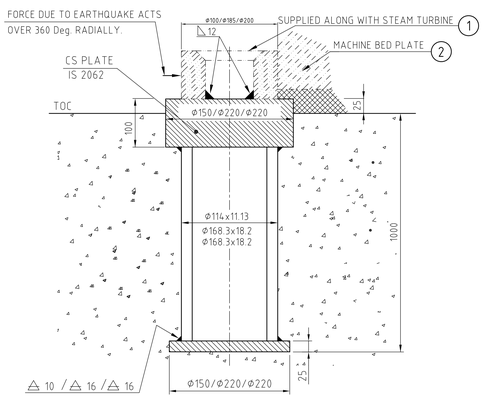
DETAIL `SP-WN'
FOUNDATION BOLT ASSEMBLY



POS (1) TO (5) ARE ONLY B.H.E.L SCOPE OF SUPPLY

(REFER NOTE 14)

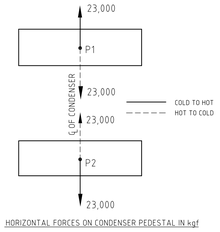
DETAIL `EQ-TG'



POS (1) & (2) IN B.H.E.L SCOPE OF SUPPLY

Speeds in rpm

EQUIPMENT	RATED SPEED	CRITICAL SPEEDS		
		FIRST	SECOND	THIRD
TURBINE	3000	1050 TO 1420	CRITICALLY DAMPED	4870
GENERATOR	3000	1170	3650	-



HORIZONTAL FORCES ON CONDENSER PEDESTAL IN kgf

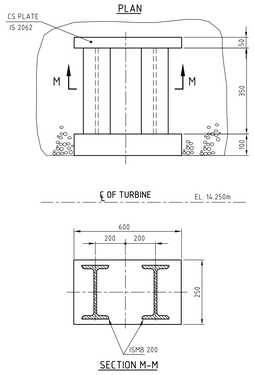
NOTES :-

1. All dimensions are in mm and elevations are in metres.
2. This foundation drawing is only intended as basis for preparing the layout for foundation (by the customer). All civil structural dimensions are tentative and same shall be decided by the civil engineer concerned. The foundation design calculations shall consider all the static and dynamic loads acting simultaneously.
3. Suitable earth quake coefficient applicable for the project site should be adopted for seismic design of foundation as per IS 1893.
4. The foundation block should be designed so that natural frequencies of foundation are sufficiently away from the frequencies of machines. The design shall be as per DIN 4024 standard and IS.2974 part III.
5. Design of the foundation shall consider the allowable limits of vibration behaviour of machines (Group - T) as per VDI 2056.
6. Bearing failure loads are less than failure load condition loads specified in col. 7 of the "Forces on Foundation " table.
7. It is recommended that at all corners of the foundation columns, embedded iron angles of size 100 x 100 x 8 mm shall be provided to support pipes, instruments etc.
8. Dynamic loads in axial direction are negligible.
9. Magnitude of unbalanced forces can be taken in vertical and horizontal directions as equal.
10. Max. live load on top of the deck is :1000 kg./sq.m
11. Foundation block must not be joined to any other structure to avoid vibration transmission.
12. Portions shown thus ▨ in top deck are filled with secondary grouting. The concrete surface in these areas is to be ensured free from dust, grease and oil. Any wooden plugs present in these areas are to be removed. The packing plates below the machine sole plates shall be embedded into a 20 mm thick layer of special grout (local to plates) and are to be levelled horizontally. later, total secondary grouting may be completed.
13. For grouting instructions ref. TC-9-1901 (4 sheets). And for grouting cement specification ref. TC-9-1900.
14. All embedded plates, angles, sleeves, pipes, ducts and any other structurals are NOT part of B.H.E.L. scope of supply unless otherwise specified.

DETAIL `GUIDE'

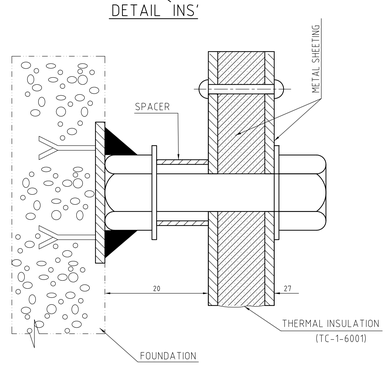
(FOR EXHAUST HOOD GUIDE SUPPORT)

(REFER NOTE 14)



SECTION M-M

DETAIL `INS'



THERMAL INSULATION SHIELD IS NOT IN BHEL SCOPE
CIVIL FOUNDATION SHALL BE DESIGNED FOR CUTOUT FACE TEMPERATURE OF 70°

THERMAL INSULATION SHIELD FOR CIVIL FOUNDATION

(REFER NOTE 14)

STATUS : FINAL

OWNER: RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE
DRN.	J.C.S/C.BALAJI	15.10.2013
CHD.	G.N.PAWAR	15.10.2013
APPD.	M.A.HAQUE	15.10.2013

DEPT. TCEP | CODE 415 | UNTOL. DIMS. GR. G/MAJR | SCALE N.T.S | WEIGHT (KG) -N.A- | REF. TO ASSY. DRG. -N.A- | ITEM NO. -N.A- | NO.OF ITEMS -N.A- | NO.OF VAR. -N.A-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

BHEL DRAWING NO. 0-313-01-08635 | REV. 00

CARD CODE N.A | CUSTOMER DRAWING NO. | SHT. No 05 | NO. OF SHT. 05

REV.	DATE	ALTERED	CHD/APPD
ZONE			

JCS

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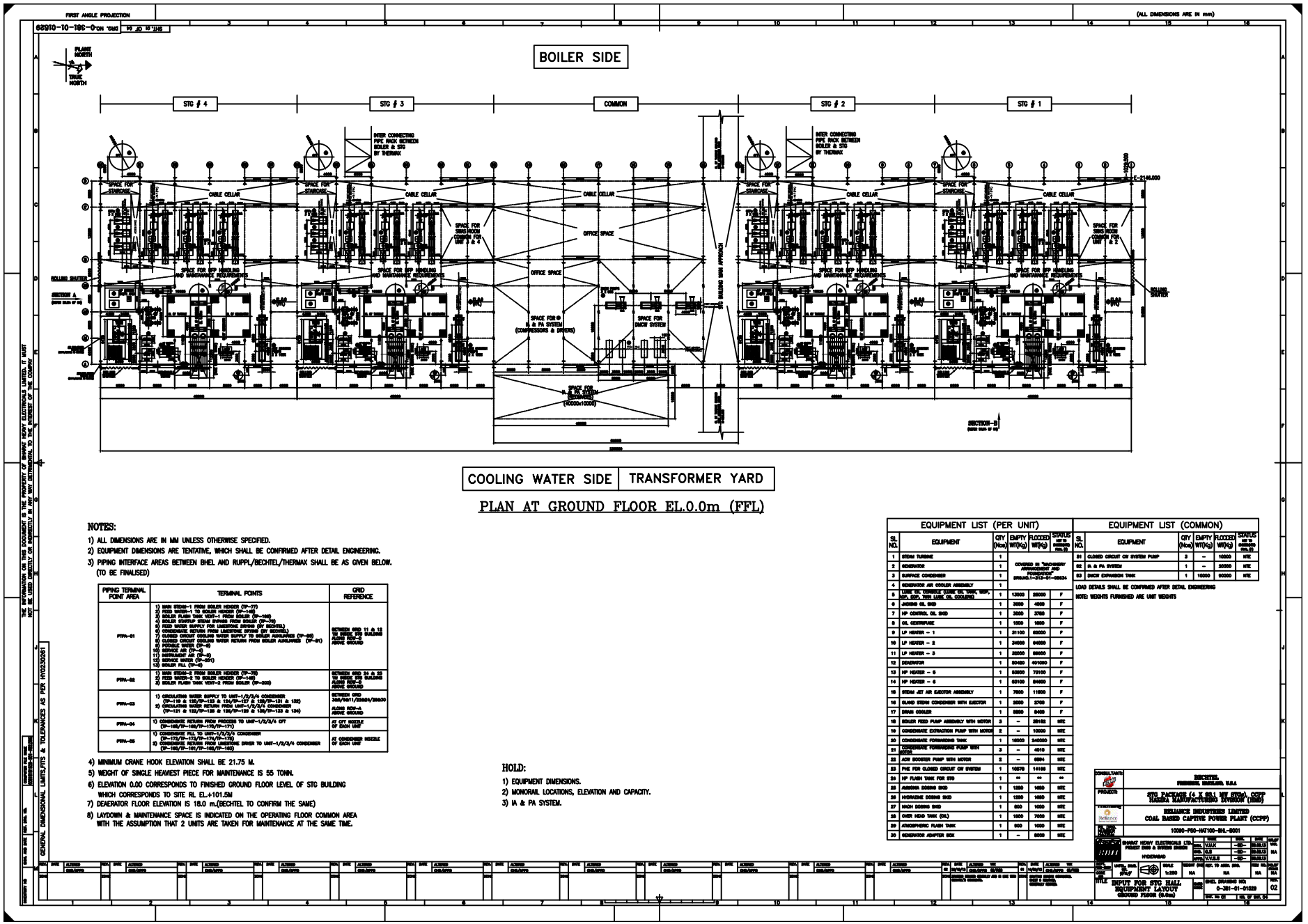
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

REVISION NO ---- SIGN AND DATE ---- REF. DRG. NO. ---- COMPUTER FILE NAME

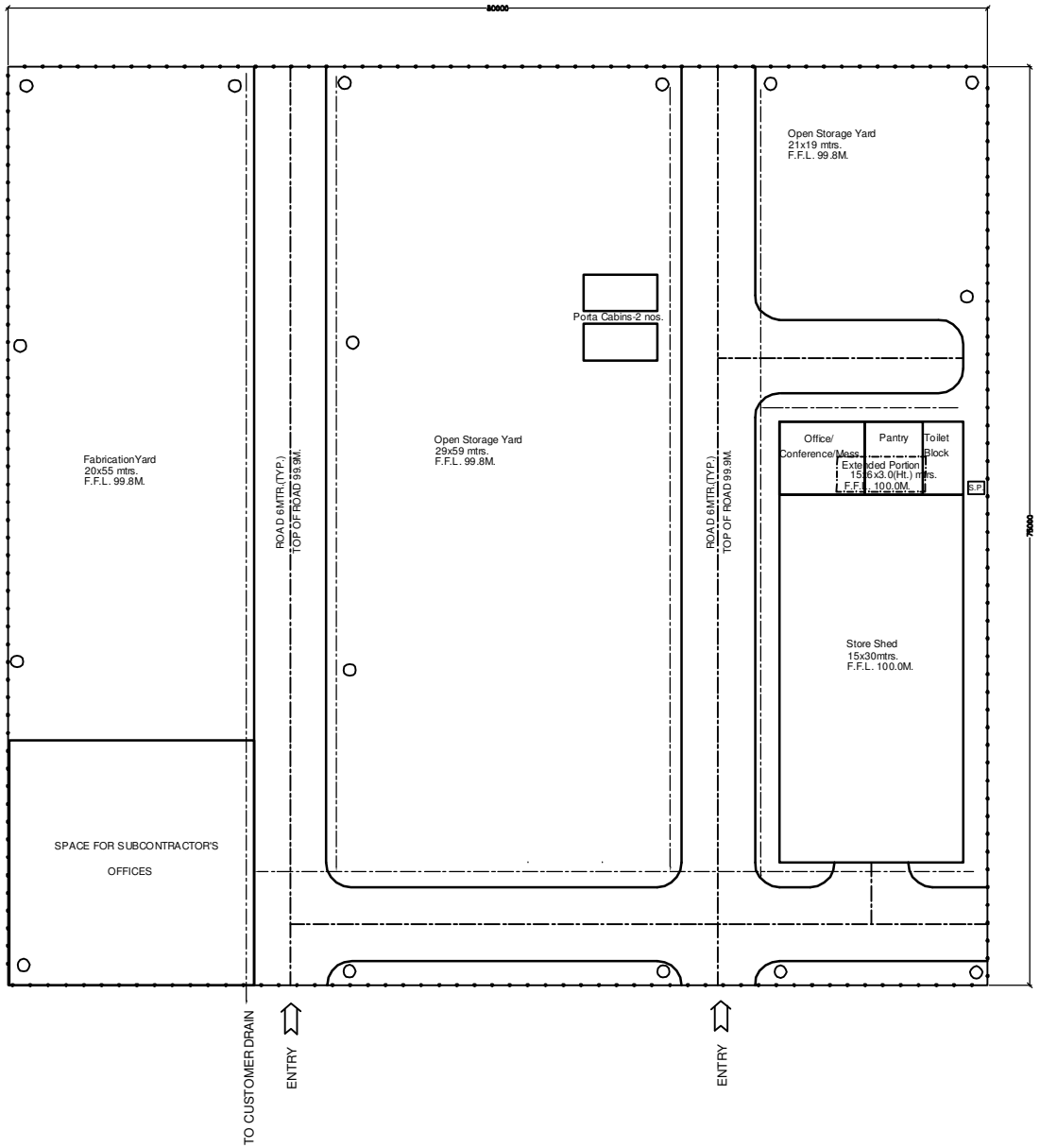
Oct Thu 17 12:27 2013

Printed by : CHEKKA BALAJI-FME3025 / 6031358 on 17-10-13 13:40:25

This Drawing is printed from Engineering Digital Archive System (EDAS). Therefore signatures are not essentially required.


BOILER SIDE
STG # 4
STG # 3
COMMON
STG # 2
STG # 1
COOLING WATER SIDE
TRANSFORMER YARD
PLAN AT GROUND FLOOR EL.0.0m (FFL)
NOTES:
1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2) EQUIPMENT DIMENSIONS ARE TENTATIVE, WHICH SHALL BE CONFIRMED AFTER DETAIL ENGINEERING.
3) PIPING INTERFACE AREAS BETWEEN BHEL AND RUPPL/BECHTEL/THERMAX SHALL BE AS GIVEN BELOW. (TO BE FINALISED)
PIPING TERMINAL POINT AREA
TERMINAL POINTS
GRID REFERENCE
PIPA-01
PIPA-02
PIPA-03
PIPA-04
PIPA-05
4) MINIMUM CRANE HOOK ELEVATION SHALL BE 21.75 M.
5) WEIGHT OF SINGLE HEAVIEST PIECE FOR MAINTENANCE IS 55 TONN.
6) ELEVATION 0.00 CORRESPONDS TO FINISHED GROUND FLOOR LEVEL OF STG BUILDING WHICH CORRESPONDS TO SITE RL EL.+101.5M
7) DEAERATOR FLOOR ELEVATION IS 18.0 m.(BECHTEL TO CONFIRM THE SAME)
8) LAYDOWN & MAINTENANCE SPACE IS INDICATED ON THE OPERATING FLOOR COMMON AREA WITH THE ASSUMPTION THAT 2 UNITS ARE TAKEN FOR MAINTENANCE AT THE SAME TIME.
HOLD:
1) EQUIPMENT DIMENSIONS.
2) MONORAIL LOCATIONS, ELEVATION AND CAPACITY.
3) IA & PA SYSTEM.
EQUIPMENT LIST (PER UNIT)
SL. NO.
EQUIPMENT
QTY (Nos)
EMPTY WT(Kg)
FLOODED WT(Kg)
STATUS
1 STEAM TURBINE
2 GENERATOR
3 SURFACE CONDENSER
4 GENERATOR AIR COOLER ASSEMBLY
5 LUBE OIL STORAGE TANK
6 JACKING OIL SKID
7 HP CONTROL OIL SKID
8 OIL CENTRIFUGE
9 LP HEATER – 1
10 LP HEATER – 2
11 LP HEATER – 3
12 DEAERATOR
13 HP HEATER – 5
14 HP HEATER – 6
15 STEAM JET AIR EJECTOR ASSEMBLY
16 GLAND STEAM CONDENSER WITH EJECTOR
17 DRAIN COOLER
18 BOILER FEED PUMP ASSEMBLY WITH MOTOR
19 CONDENSATE EXTRACTION PUMP WITH MOTOR
20 CONDENSATE FORWARDING TANK
21 CONDENSATE FORWARDING PUMP WITH MOTOR
22 ACW BOOSTER PUMP WITH MOTOR
23 PHE FOR CLOSED CIRCUIT CW SYSTEM
24 HP FLASH TANK FOR STG
25 AMMONIA DOSING SKID
26 HYDRAZINE DOSING SKID
27 MACH DOSING SKID
28 OVER HEAD TANK (OHL)
29 ATMOSPHERIC FLASH TANK
30 GENERATOR ADAPTER BOX
EQUIPMENT LIST (COMMON)
SL. NO.
EQUIPMENT
QTY (Nos)
EMPTY WT(Kg)
FLOODED WT(Kg)
STATUS
01 CLOSED CIRCUIT CW SYSTEM PUMP
02 IA & PA SYSTEM
03 DMCW EXPANSION TANK
LOAD DETAILS SHALL BE CONFIRMED AFTER DETAIL ENGINEERING
NOTE: WEIGHTS FURNISHED ARE UNIT WEIGHTS
BECHTEL
RELIANCE INDUSTRIES LIMITED
COAL BASED CAPTIVE POWER PLANT (CCPP)
10080-P00-HK100-BHL-0001
BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
INPUT FOR STG HALL EQUIPMENT LAYOUT GROUND FLOOR (0.0m)
0-351-01-01529
02

ANNEXURE - 44



PROPOSED PLAN FOR SITE DEVELOPMENT WORKS AT RUPPL,HMD, HAZIRA SITE

ROAD 6MTR.(TYP.)

BHEL SITE AREA 80 x 75m

LEGEND:

- ELECTRICAL LIGHTING POLES
- BARBED WIRE FENCING, 1.8M. HIGH
- STORM WATER DRAIN, SLOPE 1:250
- S.P — SOAK PIT

CROSS-SECTIONAL DETAIL OF DRAINS:



A – VARIES FROM 300MM TO 600MM
B – 75MM THICK COMPACTED P.C.C.(1:4:8)

CROSS-SECTIONAL DETAIL OF ROADS:



X – 75MM THICK COMPACTED WBM
Y – 75MM THICK COMPACTED WBM
Z – 230MM THICK COMPACTED BOULDER SOLING

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. THE LAYOUT IS TENTATIVE. ORIENTATION AND SIZING MAY BE CHANGED BASED ON THE EXACT LOCATION OF THE AREA PROVIDED BY RUPPL FOR BHEL SITE OFFICE, STORAGE & FABRICATION YARDS, ETC.
3. FINISH GROUND LEVEL : 99.7 M.

TENTATIVE DETAIL OF STORE BUILDING(1 NOS. 15X30M.):

1. PRE FABRICATED STEEL STRUCTURE WITH PRECOATED SHEET ROOF & WALL CLADDING
2. FLOORING OF STORE SHED WILL BE 150 MM THICK M–20 CONCRETE.

TENTATIVE DETAIL OF OTHER INFRASTRUCTURE:

1. G.I. BARBED WIRE FENCING: 300.0M. Ht. – 1.8m.
2. DETAILS OF ROAD: TWO LAYERS OF WBM(TOTAL COMPACTED THICKNESS–150MM) OVER 230MM THICK BOULDER FILLING. TOTAL ROAD LENGTH – 80M. LEVEL 200MM ABOVE finish GROUND LEVEL
3. OPEN STORAGE/FABRICATION YARD: 200MM THICK COMPACTED HARD MURUM.
4. BHEL OFFICE– PORTA CABIN – 20X10' – 4 NOS.

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY023/0261

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: SITE DEVELOPMENT WORKS FOR 4X96 STG PROJECT
HMD, RUPPL,HAZIRA,GUJARAT.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A. SHIVA KUMAR		07.01.14	
CHD.	MANOJ KUMAR		07.01.14	NA
APPD.	S.MALLICK		07.01.14	

DEPT/ PED CODE	UNITOL. DIMS. OR. /C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
450			NA	NA	NA	NA

TITLE: PRELIMINARY PLAN
SITE DEVELOPMENT WORKS

CARD CODE: NA

DRAWING NO. [redacted] REV. 00

SHT. No 1 NO. OF SHT. 1

REV	DATE	ALTERED	CHD/APPD
00			

Site development, Pantry, toilet block & meeting rooms for 4X93.1 MW STG Packages for CCPP Project at RUPPLL, HMD, Hazira

Tender No: HY/PE&SD/E&C-SUBCON/RIL-HMD/DMD/E&C-MECH./003

Bill of Quantities for 4X93.1 MW STG Packages for CCPP Project at RIL, Hazira

Item. No.	Item Description	Unit	Quantity	Remarks
1.1	**Sub grade preparation**: Cutting & disposal of grass, vegitations, bushes, trees (girth less 300mm), levelling, watering and consolidation (90% of proctor density) by means of 10-12 mt capacity power/vibro roller for sub base preparation. this will include average cutting & filling up to ± 250mm thick, grading the area with proper slope for draining out the rain water with all T&P, labours, materials, dewatering (if required) etc. complete. for development of Open Storage Yard.	SQ M	**6000**	
1.2	**Earthwork in excavation** in all types of soil including ash which can be excavated by any means including setting out, levelling, dewatering (but excluding special type of dewatering viz. well point method), shoring & strutting (wherever required), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 500 m, spreading/levelling of disposed materials etc all complete up to2.5 m depths below ground level, all complete as per spec and directions of the Engr.	CU M	**280**	
1.3	**Back filling upto any depth** below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 250 mm thickness using/with selected materials from compulsorily excavated soil available within a lead upto 500m and compacted as specified including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following.each layer compacted so as to achieve at least 90% maximum dry density as per is-2720 (Part-VII)	CU M	**112**	
1.4	**Providing & filling of 200 mm compacted thick granular hard murum in layers** (thickness of each layer should not exceed 100mm) for preparing hard surface for storage of materials during monsoon period in the specified area as shown in indecative drawing/sketch "as monsoon yard", watering and compaction with 8-10 Ton power/vibro roller complete. rate shall include transportation, royalty, dewatering (both ground water as well as rain water) and keep the area dry till completion of all the works, labours, materials and required T&Ps etc. complete as per standard specification and instructed by BHEL engineer.	CU M	**600**	
1.5	**Disposal of surplus earth & debris** beyond battery limit upto 1 Km lead including transportatin, loading and unloading , dumping, stacking, levelling and dressing etc.complete as per specifications and drawings.	CU. M.	**168**	
1.6	**Providing and laying Stone Soling 230 mm** compacted thickness with 150 -200 mm thick boulder size and filling of voids with hand broken metal of size 40-60 mm, spreading & packing murrum , rolling and compaction including watering, with 8 - 10 MT capacity road roller.	CU M	**132**	
1.7	**Providing 150 mm compacted thick water bound macadam (WBM) in two layers** of each 75 mm, with 40mm to 60mm metal (stone aggregate) including supplying and spreading gravel/murrum over the soling/consolidated base, compacting the same with power roller including necessary labour, watering, materings etc. complete, all as per relevant specifications and directions of BHEL engineer (rate shall be inclusive of all labour, materials etc., complete).	SQ M	**525**	
1.8	**Concrete of grade M7.5** (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume) as filling course at any depth below finished floor level, under and around foundations/floors, mass fill etc.	CU M	**60**	
1.9	**Providing & laying reinforced cement concrete of M20 grade** under floors, paving,plinth protection, lintels columns, beams, etc. at any depth below floor level and also at any height above floor level as per design, drawing & as per specifications & directions of BHEL engineer.	CU M	**35**	
1.10	**Providing and fixing of Reinforcement steel** including cutting, bending and binding of reinforcement using Tor steel (Fe-500) at all elevations, as per drawing and specification and as directed by BHEL engineer including cost of all materials, labour and MS binding wire of 18/20 gauge etc. all complete.	MT	**3.5**	
1.11	**Providing Brick Work in CM 1:6 (1 cement & 6 coarse sand)** using OPC/PPC/PSC of grade 43/53 with locally available burnt clay bricks (Min strength 50 kg/cm^2) as per drawing and specification for drains, culverts and wherever required, including cost of all materials, labour, scaffolding, at all elevations and levels, curing, raking out joints etc. all complete and as directed by BHEL engineer .	CU M	**51**	
1.12	**Providing and plastering with cement mortar 1:6 (12mm thick)** over both internal and external faces of brickwork and concrete surfaces etc. of all heights including preparing the surface, raking joints, cutting grooves at joints of brick work & concrete, rounding corners, curing, cost of all materials, labour, scaffolding etc., all complete as per drawings & Spec.	SQ M	**435**	
1.13	**Supplying & fixing in position of RCC hume pipe** of NP2 wherever drain crosses the roads including aligning, levelling etc. complete as per the direction of engineer. including P.C.C. & collar joints, encasement with concrete 1:3:6, (encasing shall be paid extra under respective items of concrete), all complete as per spec & direction of the Engineer..			

Item. No.	Item Description	Unit	Quantity	Remarks
a)	300mm dia	RM	**50**	
1.14	**Providing and fixing barbed wire fencing** around open storage yard as per BHEL drawing. posts shall be spaced at 3m c/c and struts at 30m centres and at all turnings with foundations, supplying and fixing gi barbed wires, 10 horizontal lines, two diagonals between posts by means of GI staples as per standard practice. the barbed wire shall conform to IS:278 and be made of two strands of galvanised twisted 2.5mm dia (12.5 gauge) steel wire with four point bars. rate quoted shall be inclusive of excavation, disposal of surplus earth, concrete (1:3:6), form work and all materials, cost of posts, barbed wires, transporting, fixing in position etc. including cost of all labour and two coats of enamel paint of approved shade with a shop coat of primer in all structural steel members etc all complete as per drgs & instructions of the engr. (Fabrication & erection of Structural steel posts shall be paid under relevant items of this SOQ)	RM	**340**	
1.15	**Providing & filling in soak pit** with brick bats 40-80mm including sand packing etc. complete, as per standard specification and instructed by BHEL engineer.	CU M	**3**	
1.16	**Providing and laying DPC (damp proof course)** 50mm thick in 1:2:4 cement concret layer using OPC grade 43/53and with 6mm down aggregate, including formwork, bitumen felt using cement with water proofing compound etc. complete	SQ M	**16**	
1.17	**Providing and fixing of best quality country wood doors** comprising of frame 95 x 70mm and 38/40mm thick flush shutters of solid core type using commercial ply including hold fasts, wind appliances, handles, tower bolts, aldrops, mortise of reputed make like Link/and applying two coats of synthetic enamel paint of approved shade & color over a coat of primer complete with all materials and as directed by BHEL engineer.	SQ M	**11**	
1.18	**Providing and fixing 24 mm thick best quality PVC doors** of sintex make or approved equivalent for toilets including pvc frame of size 48mm x 40mm, all fittings, fixtures, frames, hold fast, tower bolts, aldrops etc., all complete with all materials, as per specifications and instruction of BHEL engineer.	SQ M	**4**	
1.19	**Suppling, manufacturing and fixing in position of steel windows** including frames & iron barred (guard bar of square section @ 100 mm c/c) and glazed with 4mm plain glass as per standard specifications & relevant IS code and instructions of BHEL engineer. The cost shall be inclusive of all accessories fittings, latch, hold fasts, painting with two coats of synthetic enamel paint of approved colour and shade over one coat of red oxide primer etc. all complete as per spec and directions of the .	SQ M	**15**	
1.20	**Providing and fixing of IPS flooring 40mm thick** using opc grade 43/53 with cement concrete 1:2:4 (using 12 mm down aggregates) as per standard practice in panels of size Eacht exceeding 2.0 x 2.0 sq.m by providing, fixing glass strips.including curing & cleaning.	SQ M	**500**	
1.21	**Supplying and fixing of white glazed tiles flooring** of required sizes (8.0mm thick of size 300mm x 300mm) laid over the bed of cm - 1:4 (1 cement & 4 coarse sand) using OPC/PPC/PSC of grade 43/53 for pantry room, toilet and wherever required etc. including pereparation of base, laying underbed, finishing and rounding corners and junctions, curing etc. all complete as per drawings and specifications.	SQ M	**90**	
1.22	**Supplying and fixing of white glazed tiles in DADO** of required sizes laid over the bed of cm - 1:4 (1 cement & 4 coarse sand) using OPC/PPC/PSC of grade 43/53 for pantry room, toilet and wherever required etc. including pereparation of base, laying underbed, finishing and rounding corners and junctions, curing etc. all complete as per drawings and specifications.	SQ M	**38**	
1.23	**Providing & applying washable distemper of** two coats over one coat primer on newly plastered surface of reputed make like ASIAN/Shalimar/Nerolac make to given an even shade including preparation of surface like cleaning and brushing of walls and as per manufacturer's recommendations including cost of paint, primer, scaffolding etc., at all elevations, complete as per drgs & spec.	SQ M	**430**	
1.24	**Providing and fixing over head hydraulic door closer** (heavy duty) of approved brand and size on necessary doors as directed by BHEL engineer.	Each.	**2**	
1.25	**Providing and fixing white glazed vitreous wash basin** of 55 cm x 40 cm size of approved reputed make like Hindustan/Parryware/Cera etc., including cold water piller tap, brackets, stop cock, chromium plated bottle trap and necessary pipe connections including upvc waste pipe and trap upto the out side face of the wall, making good the damaged surface, testing etc. complete. as per drgs & spec and as directed by BHEL engineer.	Each	**4**	
1.26	**Providing and fixing european type white glazed vitreous W.C.pan of approved reputed make like Hindustan/Parryware/Cera etc.,** with UPVC seat and lid with chromium plated brass hinges and rubber buffers including UPVC vent pipe (approx. 2m. ht. with cowl)) on the outside face of wall, 10 litre PVC low level flushing cistern with all fittings, pipe and stop cock, brackets for fixing cistern, 32 mm dia. UPVC flush pipe with fittings and clamps, 20 mm dia. UPVC overflow pipe, float valves, cutting and making good to the walls and floors, testing etc., all complete. as per spec & directions of the BHEL Engineer.	Each	**2**	

Item. No.	Item Description	Unit	Quantity	Remarks
1.27	**Providing and fixing in position of white glazed earthenware flat back/corner type lipped front urinals** of 430mm x 260mm x 350mm / 340x460x265 mm of approved make and quality with flushing cistern,GI flush pipe and spreaders with brass unions, GI clamps, cutting of walls and making good of all damages and finishing to match the existing work etc. complete. rate quoted shall include cost of all materials and labour for carrying, laying & fixing and all other incidental charges etc. complete.	Each	**2**	
1.28	**Providing and fixing in position of high class belgium or approved equivalent make of bevelled edge mirror** of size 450mm x 550mm x 6mm with 16 mm dia & 550mm length nickel plated towel rod mounted on 6 mm thick plywood or plastic folder sheet, including cost of all materials, labour for fixing the wooden plugs with cp brass screws and washers etc. all complete. as per spec & directions of the BHEL Engineer..	Each	**4**	
1.29	Providing and fixing in position of **15 mm dia concussion push button type brass/ gun metal self closing tap of reputed make like Jaguar/ Parryware/ Hindustan** including nacessary socket, testing etc., all complete for urinals as per spec & direction of BHEL engineer.	Each	**4**	
1.30	Providing and fixing in position of **15 mm dia nominal size wash down type chromium plated brass bib cocks** of approved reputed make like Parryware/ Cera/ Hindustan, all complete all complete as per spec & directions of the BHEL Engineer...	Each	**2**	
1.31	Providing and fixing in position of **25 mm dia gate valve of approved make** including all nacessary fitting & fixture etc. all complete as per standard specification.	Each	**2**	
1.32	Providing and fixing in position of **15 mm dia nominal size screw down type chromium plates brass stop cocks** of approved reputed make and quality like Jaguar/ Parryware/ Hindustan including cost of jointing materials, sockets, union nut, testing, labours for carrying and fixing etc. complete as per spec & directions of the BHEL Engineer.	Each	**5**	
1.33	Providing and fixing in position of **100mm x 50mm HCl "Nahani" trap** with HCl gratings, bends, connecting pieces of CI pipe upto outside face of the wall. making good the damaged surface, testing etc complete as per drgs & specifications	Each	**4**	
1.34	Providing and fixing in position of **150mm salt glazed stone ware gully trap** with HCl gratings and CI cover of size 300x300 mm of approved make (weight Each less than 2 kg) and quality as per drgs & specifications.	Each	**2**	
1.35	Providing and laying with required **grading & leveling in trenches medium grade (type) galvanised iron (GI) pipe** having embossed ISI mark on it, of required diameter with screwed, sockets, joints, necessary galvanised iron fittings such as sockets, back nuts, elbows, bends, tees, reducers, enlargers, plugs, clamps etc. including all necessary excavation, back filling, fixing with clamps, testing etc. complete. (prior approval of sample and brand by BHEL engineer is necessary before use.)			
a)	25mm dia	RM	**50**	
b)	15mm dia	RM	**20**	
1.36	Providing at working site, carrying and lowering into trenches, laying to proper alignment, level and grade, jointing with cm (1:1) and testing of joints etc. of the following size of salt **glazed stoneware pipe** inclusive of all necessary specials tarred hemp yarn and all jointing materials complete as per standard specifications including all necessary excavation, backfilling, disposal of surplus earth ,lead and lift as per site conditions. rate shall include cost of all materials, labour charges and incidental charges etc. complete.			
a)	100mm dia stoneware pipeline including all specials complete.	RM	**10**	
1.37	Providing and fixing in position of **PVC overhead water tank** of sintex/ Polycon/ Duracon approved make of following litre capacity with lid & provision for overflow arrangement valves, inlet and outlet etc., all complete as per drgs & spec and as directed by BHEL engineer.			
a)	500 litre capacity	Each	**2**	
1.38	Construction of 230mm thick burnt **clay / fly ash lime brick chamber** (using OPC/PPC/PSC of grade 43/53) of the following dimensions (inner dimension) with 20mm thick internal & external cement plaster of mix cm 1:5 (1 cement & 5 coarse sand) , neat cement finish, top CI – cover and connectors for sewer lines. rate shall be inclusive of all necessary excavation & filling, PCC-100 mm thick of 1:3:6 for bedding on 100mm thick oversizer soling with 80 mm metal etc., all complete as per drgs & spec and as directed by BHEL engineer.			
a)	600x450x450 with C.I cover	Each	**2**	
1.39	Providing and fixing **chromium plated towel rod 16 mm dia.** and 75cm. in length including all accessories complete. (prior approval of sample and brand by BHEL engineer is necessary before use).	Each.	**1**	
1.40	Providing & fixing of **liquid soap dispenser** at all wash basin location.	Each.	**4**	
1.41	Providing & fixing in position of **CI vent pipe of dia. 100mm** (approx. ht. 3m) in septic tank. rate to include all necessary fitting & fixture, labour etc.	RM	**6**	
1.42	Providing, fixing and removing **plyboard formwork** at any depth and elevation for all structures(foundations, footings, base of columns, beams, slabs, mass concrete, trenches,walls etc.) as per the specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer-in-charge	SQ M	**250**	

Item. No.	Item Description	Unit	Quantity	Remarks
1.43	Providing and fixing of 1 Each. 18"x24" size **stainless steel sink** with all fittings like drain pipe, stop valve etc.rate to include all necessary fitting & fixture, labour etc.as approved & directed by BHEL engineer.	Each.	**1**	
1.44	**Providing and fixing 18mm thick best quality single piece granite slab** of required shape and colour for fixing ss sink for kitchen counter of pantry block cut out for sink shall be made as per the dimension.cost inclusive of making opening, polishing cut peices/drop/facia and required finishing all complete as per drgs & spec..	SQ M	**4**	
1.45	Providing ang making **edge moulding and nosing to 18mm thick granite stone slab**, counters,vanities and wherever required.including polishing to edge to give high gloss finish etc . complete as per design approved by BHEL engineer.	RM	**4**	
1.46	**Supplying, fabricating and erecting all categories of Structural Steelwork,** using approved quality electrodes of 6013 or low hydrogen 7018 for plate thickness above 20 mm, with pre-heating, packing and delivering at the stores or at site including cost of steel, necessary bolts, nuts & washers with a shop coat of approved Inorganic Red oxide primer of 45-50 micron DFT after cleaning with wire brush, including erecting to all required elevations, necessary welding after erection, all complete as per drawings and specification.	MT	**3**	
1.47	Two or more coats of **synthetic enamel paint Asian/Berger/ICI/Nerolac or** approved make made from synthetic resins and drying oil with rutile titanium dioxide and other selected pigments to give smooth, hard, durable & glossy finish to wooden and Steel surfaces complete.(For Measurement of steel works cosisting of angle, channel, beams, flats etc., 18 sq. m of surface area will be taken as equivant to 1 MT)	SQM	**54**	
1.48	**Roofing / side cladding work** including all labour, material, equipment, transportation, handling, scaffolding, laps, hooks, washers, corner pieces etc. at any level as per specification, drawings and as directed by engineer - in - charge.			
a)	**Designing, providing and fixing galvanised MS sheet** measurement of profile sheeting shall be of the plan area of roof covered by MS trough metal decking span upto 1800mm	SQ M	**116**	
1.49	**Supplying & installing power distribution board** complete with: common board for all sheds. 1) Incoming MCB TPH 100 amps. - 1 No. 2) Outgoing MCB TPH 32 amps. -3Nohs. 3) RCCB DP 25/20 amps. - 2Nos. 4) outgoing MCB SP 6 amps - 6Nos. all RCCBS, MCBS shall be MDS/INDO KOPP make. distribution boards shall be SIEMENS / MDS / INDO KOPP make with internal busbars, internal wiring, 2 nos. earthing terminals, earth connections, including glands, lugs.	Set	**2**	
1.50	**Supplying & fixing wall mounting type lighting panels**, each with : . (1) Incoming MCB TPN -32 amps - 1No.. (2) RCCB DP 32 amps - 2Nos (3) MCB SP 6amps - 30 Nos. all RCCBS, MCBS shall be MDS/INDO KOPP make. lighting panel shall be SIEMENS / MDS / INDO KOPP make with internal busbars, 2 nos. earthing terminals, earth connections, including glands, lugs & wiring from main DB	Set	**3**	
1.51	**Providing and installing wiring using 2.5 sq.mm copper conductor through PVC conduit** of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by BHEL engineer in PVC conduit of required size.the make of the wire shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**36**	
1.52	**Providing and installing wiring for using 4.0 sq.mm** copper conductor through PVC conduit of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by bhel engineer in pvc conduit of required size. the make of the wire shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**3**	
1.53	**Providing and installing wiring for using 6.0 sq.mm** copper conductor through PVC conduit of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by BHEL engineer in PVC conduit of required size. the make of the wire shall be only fromKEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**3**	
1.54	**Providing and installing wiring for using 16.0 sq.mm** copper conductor through PVC conduit of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by BHEL engineer in PVC conduit of required size. the make of the wire shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**4**	
1.55	**Poviding and installation of plug point of 5A socke**t (ANCHOR or equv.) outlet including wiring termination.	Each	**3**	
1.56	**Poviding and installation of plug point of 15A socket** (ANCHOR or equv.) outlet including wiring termination. this includes tube light fittings.	Each	**5**	
1.57	**Providing and fixing ordinary tubelight** with frame 1x40 w with electronic choke of standard manufacturer like PHILLIPS/BAJAJ or equivalent as approved by BHEL. this includes tube light fittings etc. complete.	Each.	**40**	

Item. No.	Item Description	Unit	Quantity	Remarks
1.58	**Providing and fixing exhaust fans 12" diameter** with frame of standard manufacturer like cromptan greeves or equivalent as approved by BHEL.	N0.	**8**	
1.59	**Providing and fixing ceiling fan 48" diameter** of approved company such as Cromptan Greeves or any other standard manufacturer as directed by BHEL. this includes tube light fittings etc. complete.	Each	**2**	
1.60	Providing and fixing **calling bells (**with indicator light)	Each	**1**	
1.61	Providing **earthing pits with 2 " dia** , 2 m long GI pipes with flange & GI wires with charcoal, salt and as per the standard practice for electrical connection rate shall be inclusive of all materials, labours, etc complete.	Each	**2**	
1.62	**Supply of cables 3 -1/2 corex 35 sqmm aluminium armoured PVC insulated cable** (three and half core) confirming to is 1554 (Part-I) the make of the cable shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	RM	**400**	
1.63	Installation of cables **3 -1/2 corex 35 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I) including laying of cable below ground , excavation of trench of 600 mm depth in all kind of soil, termination of cables cores with crimp type lugs, providing sand layer below/ above the cable, brick laying both side /above the above the cable and back filling etc. cables are to be laid from main distribution board to 415 volt AC distribution board of store bldg, porta cabins, street light pillar distribution board and industrial power point.	RM	**400**	
1.64	Supplying, **installation & commissioning of sodium vapour lamp street light fitting** 150 watt SSG-2315 IH of crompton or similar philips make, complete with one piece canopy, integral controlgear comprising of copper wound choke , ignitor , hpf capacitor, hpsv lamp and suitable for directly slipping over light mounting bracket made out of 40 mm OD pipe and suitable for lamps, control gear box cabling & termination of items supplied (to be mounted on 9 mtr pole - item no. 1.65).	Each	**20**	
1.65	**Supply and erecting steel tubular swaged poles**, 9 mtr long made of sheet steel having ultimate tensile strength 42 kg f/sq.mm confirming to bis :2713 (Part-II) complete with 300x300x6 mm thick m. s. base plate for welding at site and size as per configuration given in bis for 410 sp-28 (113 kg- pole weight) with 1.5 mtr. deep exacavation, concreting in 1:4:8 ratio size 45 cms x 45 cms x 150 cms and pole plinth in 1:3:6 cement concreting having 300 mm height and 300 mm dia .including double earthing of pole with suitable arrangement, duly painted with two coats of red oxide paint and one coat of aluminium paint to be applied after erection; the length of pole below ground to be painted with two coats of black bituminus paint. the pole shall be complete with JB, fuse and minor fabrication as below : i) Drilling 20 mm dia hole at about 2.5 mtr from ground level for wire leads from junction box to light fixture . ii) Drilling 15mm dia holes at about 0.7 and at 2.5 mtr froom ground level and welding 12 mm nuts for using a 12 mm G.I bolt for fastening earth conducters. iii) welding requiored holes for fixing pole cap of street light bracket. iv) welding diametrally 10 mm M.S. round 30 mm below pole top edge for clipping wire leads .	Each set	**20**	
1.66	**Supply of cables 2 core x 10 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I). the make of the cable shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	M	**400**	
1.67	Installation of cables **2 core x 10 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I) including laying of cable below ground , excavation of trench of 600 mm depth in all kind of soil, termination of cables cores with crimp type luggs, providing sand layer below/ above the cable, brick laying both side /above the above the cable and back filling etc complete. cables are to be laid from 415 volt AC power feeder pillar board to lighting poles & pole to pole .	M	**400**	
1.68	Supply of **415 volt AC , 3 phase /four wire power feeder pillar board** , board shall be comprises of three number and one number aluminium bus bar for phase & neutral respectively. bus bar rating shall be 200 amps and shall be mounted on epoxy insulator of 1.1 KV grade, each bus bar shall have drilled hole for connecting incoming / out going cables, provision for earthing the panel enclosure. panel enclosure shall be made of sheet metal thichnness Not less than 1.6 mm and suitable for out door installation, hinged door with locking arragement , base frame , should have slopped canopy, duly painted with first coat with primer and two coats of synthetic enamel paint (interior with white paint and exterior with smoke grey as per is), suitable stool made out of ms structure of 1.2 meter high for mounting of panel with anchoring arragement at foundation .	Each	**1**	

Item. No.	Item Description	Unit	Quantity	Remarks
1.69	Supply & installing **3 phase metering and power distribution board** complete with : (1) Incoming SFU TPN 400 amps- 1No, (2) Outgoing SFU TPN 200 amps -1Nos. (3) Outgoing SFU TPN 100 amps -3Nos. (4) Outgoing SFU TPN 32 amps -2Nos. 3 phase electronic energy meter - BHEL /L & T / GEC make. ammeter, voltmeter and selector switches for both - AE and KAYCEE make. phase indication lamps, HRC fuses for I/C and O/G feeders, cable glands, power terminals for cables termination, cable lugs and provision for doubly earthing the panel enclosure. panel enclosure shall be made of sheet metal thichknness not less than 1.6 mm and suitable for out door installation, modular construction, hinged door with locking arrangement, base frame, should have slopped caEachpy, duly painted with first coat of primer and two coats of synthetic enamel paint (interior with white paint and exterior with light grey as per shade 5, IS 630) internal power distribution to devices shall be with al busbars or copper flexible single core pvc cables of 1.1 kv grade, control wiring with 1.5 sqmm, suitable stool made out of ms structure of 1.2 meter high for mounting of panel with anchoring arragement at foundation, suitable for bottom entry of cables.	Each	**1**	
1.70	**Supply of cables 3 -1/2 corex 185 sqmm aluminium armoured PVC insulated cable** (three and half core) confirming to is 1554 (Part -I) the make of the cable shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	RM	**200**	
1.71	**Installation of cables 3 -1/2 corex 185 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I) including laying of cable below ground , excavation of trench of 600 mm depth in all kind of soil, termination of cables cores with crimp type lugs, providing sand layer below/ above the cable, brick laying both side /above the above the cable and back filling etc. cables are to be laid from transformer sub station to 415 volt AC distribution board.	RM	**200**	
1.72	**Supply and installation suitable electrical pump** for minimum head of 10m (but Eacht less than 2 H.P.) of reputed manufacturer like SUGUNA/ CRI/ KIRLOSKAR/ SHAKTI/SHARP/ CROMPTON including all accessories, starter, D.B., etc. and to be connected to over head tank from water storage tank below G.L. guarranty/warranty card to be submmitted to BHEL. suction, discharge GI pipes shall be paid seperatly under relevant items.	Each	**1**	
1.73	**Industrial power recepticale 63A IPS 65, TPNE socket** with on/off interlock with MCB	Each	**6**	

11 Mar 2014

VOLUME – IA, BLOCK-2 TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
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		BHL-B002		
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36.	Lube Oil P & ID	1-317-01-08662	01	2
37.	Jacking Oil P & ID	2-317-01-08663	01	1
38.	Turbine Integral Steam and Drain P & ID	0-317-01-08661	01	1
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1.0	**Project Information (RUPPL, DMD, Dahej)**			
	1	Purchaser	:	M/s Reliance Utilities and Power Pvt. Limited
	2	Project Title	:	3X90.3 MW STG Packages for CCPP Project
	3	Location	:	Dist-Bharuch, State–Gujarat(India)
	4	Address Detail	:	3x90.3 MW STG Package Reliance Utilities and Power Pvt Ltd Taluka – Vagra , Dist.- Bharuch Pin Code-392130 , Gujarat State, India"
	5	Nearest Railway Station	:	Bharuch, Gujarat
	6	Road Approach	:	NH8 & SH6 (Dahej Road)
	7	Nearest Air Port	:	Vadodara
	8	Nearest Port	:	Gujarat Chemical Terminal Port Company Limited
	9	Data of Seismic Design	:	As per IS 1893
	10	Average Annual Rainfall	:	1002 mm
	11	Ambient Air Temperature (Average)	:	a) Maximum : 47.0^0 C b) Minimum : 5.6^0 C:
	12	Soil Bearing Capacity	:	20 T / m^2
	13	Average Relative Humidity	:	50 – 85 %
	14	Climatic Condition	:	Tropical Climate

Bidder is advised to visit the project sites at both the locations of HMD, Hazira and DMD, Dahej and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

2.0 SCOPE OF WORK

This section list major scope of work for Unit 1,2 & 3 of 3 x 90.3 MW STGs at Dahej to be carried out by contractor, but not limited to following for safe, speedy erection and commissioning of this package.

a) Design, manufacture, supply, erection (at a place to be specified by the BHEL engineer), final fitup , touchup, painting (and other associated works) of Removable/Re- Erectable Pre - Engineered, Pre-Fabricated Steel Closed Storage Shed of size 30m (Length)X 15 m (width) X 5.25 m(height), one number at HMD, Hazira site.

b) Site development, viz. leveling, grading, storm water drain, development of open storage yard with 200mm thick hard granular murum, base/foundation preparation for installation of Porta cabins, barbed wire fencing with gates of site and storage areas, laying of water distribution network, laying of sewerage lines, soak pit, installation of water storage tanks, etc. for the site office area allotted to BHEL. Illumination of the site office area and open storage yard, Electrical distribution & other light fittings. Provision of Pantry, toilet & meeting area in the extended portion of the Pre-fab shed referred in 2.0(a) above(approximate size 15m.(L) x 6.0m.(W) x 3.0m.(Ht.).

c) Supply of 2nos Portable cabins each of size 20ft. x 10ft. x 8ft. with furniture & other fittings on hiring basis for a period of 19 months.These porta cabins shall be used as BHEL site office & bidder shall taken back the cabins after 19 months. Details of porta cabins are given in Part-II, chapter III of TCC.

d) Receipt of materials from Manufacturing Units of BHEL, BHEL Sub Vendor, Customer stores, Storage yard etc. Handling at stores/storage yard, site of work, transportation to site of work. Exclusive crane for material handling of around 50 T to be provided. Preservation of all materials / equipments under custody of the contractor during storage, pre-assembly and erection, commissioning etc. shall be carried out by Contractor.

e) Rotating Equipments (Steam turbine, Turbo generator, BFP, DMCW Pump, ACW Pump, CEP, CFP and auxiliary pumps including Bought out Items (BOI)): Inspection, preparation of foundation for erection, erection, leveling, centering, alignment, grouting & final alignment. Pre commissioning & commissioning.

   Generator Assembly erection (All Units) is planned with Strand Jack method only. The Contractor has to arrange for the strand jack system for handling & erection Generator Assembly as per the detailed specification provided in in Part-II, chapter VII of TCC.

f) Piping between various equipment & customer battery limit (Steam, Utility, Oil, CW) : Piping above 2" will be supplied as Pre-fabricated spool pieces. 2" and below sized pipes will be loose supply in commercial length.

   i. Fabrication, Preassembly, erection, alignment, welding, Insulation, NDT, Fabrication of supports, fixing hangers & supports, installation of valves, instruments installation, chemical cleaning / pickling, card board blasting, oil flushing, water flushing, hydro testing, & supply of target plates for steam blowing. Pre commissioning & commissioning.

ii. Fabrication & erection of Temporary Piping alongwith supports & insulation, Installation of fixtures (blinds etc) not limited to Hydrotesting, steam blowing, chemical cleaning etc.

iii. Lifting, laying, erection, bolt tensioning, bolt torque tightening, supporting and installation, pre and post weld heat treatment, inspection, nondestructive testing including radiography and hydrostatic test, water / steam flushing, air drying, nitrogen purging and other testing of piping installations above ground

g) Vessels (HP Flash Tank, Overhead Oil tank, Atm. Flash tank, DMCW Expansion tank, Generator Adaptor Box): Pre assembly, preparation of foundation for erection, erection, welding, NDT. Pre commissioning & commissioning.

h) Heat Exchangers (Surface Condenser, Generator Air Cooler, LP Heaters, HP Heaters, Deaerator, SJAE, GSC, Drain Cooler, PHE for DMCW) : Pre assembly, preparation of foundation for erection, erection, welding, insulation, NDT. Pre commissioning & commissioning.

i) Static Equipment (Lube Oil Console, Jacking Oil Skid, HP Control Oil skid, Oil Centrifuge, Ammonia & NaOH Dosing Skids) : Inspection, preparation of foundation for erection, erection, leveling, centering, alignment, grouting & final alignment. Pre commissioning & commissioning.

j) Support for commissioning (IA / PA System, Condensate Forwarding tank): Contractor to provide support for interface activities for commissioning, under BHEL supervision.

k) Associated surface finish, supply & application of primer & finish paints / Anti corrosive / steamwash paints including labeling on equipments, Piping, platforms, structure etc.

l) Execute all mechanical jobs identified during check list, Technical audits, pre-commissioning and commissioning, including additional supports required to restrain pipe movement avoiding interference with nearby structural / piping.

m) Obtain clearances and approvals from all applicable statutory / Government agencies e.g. IBR, etc.

n) Installation of any necessary blind or additional valves to isolate lines to facilitate phased commissioning and start-up.

o) Dewatering inside building for equipment erection facilitating is contractor scope.

p) Provision of crane for erection activities as and when required.

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT TECHNICAL SPECIFICATIONS PROVIDED IN THE SUSEQUENT CHAPTERS IN THE TCC

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Fire fighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labour colony (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity For construction purposes** of Voltage 415/440 V			FREE
a	Single point source	Yes		At a distance of approx. 1000 M from site (Distance is only estimated, it may vary up to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.2	**Electricity for the office, stores, canteen etc of the bidder**			FREE
a	Single point source	Yes		At a distance of approx. 1000 M from site (Distance is only estimated, it may vary up to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc**		Yes	Bidder has to take care.
a	Single point source		Yes	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	**WATER SUPPLY**			
3.3.1	**For construction purposes**			FREE
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	**Water supply for bidder's office, stores, canteen etc**			FREE
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	**Water supply for Living Purpose**		**Yes**	Bidder has to take care.

S. No.	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Téléphone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

Sl. No	Description PART II 3.9.0 ERECTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.9.1	**Engineering works for construction:**			
a	Providing the erection drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes		
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		**YES**	In consultation with BHEL
d	Shipping lists etc for reference and planning the activities	Yes		In consultation with BHEL
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on S. No. e. Hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
h	Daily erection / work plan based on S. No. g. Hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
i	Periodic visit of senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	
l	Arranging the materials required for preassembly		Yes	

Sl. No	Description PART II 3.9.0 ERECTION FACILITIES	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
M	Coordination for inspection (IMIR etc) and getting clearance from Client / PMC		Yes	
N	Preparation of formats for completion of activities		Yes	

A. List of minimum major Tools & Plants to be deployed by the contractor:

4.1. All the tools & plants and Measuring Monitoring Equipment (MME) required for this scope of work, except the tools & plants provided by BHEL, are to be arranged by the contractor within the quoted rates.

4.2. Experienced Crane operator for EOT crane shall be arranged by the bidder within the quoted rate / price.

4.3. Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

4.4. For loading and transportation, all necessary T&P such as Trailers, Cranes, Winches, Chain pulley, welding generators, slings, de-shackle, jacks, sleepers, rails etc., are to be arranged by the contractor. All the tools & plants required for this scope of work, except the tools & plants provided by BHEL, are to be arranged by the contractor within the quoted rates /prices.

4.5. All the tools and plants including suitable Jacks / Hydraulics jacks / pressurizing pumps for Hydraulic test of all Piping, required for satisfactory completion of the work has to be arranged by the contractor.

4.6. Contractor has to arrange required pumps and suitable piping with sufficient capacity for filling water in the lines for conducting Hydro test. For testing Steam lines (High Pressure) necessary Hydraulic Test pumps / Hand pumps are to be arranged by the contractor.

4.7. Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work.

4.8. Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor‘s account.

4.9. For lifting, shifting and placement on foundation, Generator Assemblies the contractor will have to arrange Strand Jack system as per the time schedule informed by BHEL. The details of mobilization, demobilization & other details are provided in part-II, chapter VII of TCC.

4.10. Besides the T & P mentioned below, which is being made available to the contractor on free of hire charges, any additional crane and other T & P which may be required for successful and timely execution of the work covered within the scope of this tender shall be arranged and provided at site by the contractor at his cost. In case if the contractor fails to provide such equipment’s, BHEL will arrange for the same and the cost will be recovered from the contractor‘s bill with BHEL overheads, as applicable from time to time which may vary even during contract period.

4.11. All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.

4.12. In case of non-availability of power DG welding sets are to be deployed for faster execution of job.

B. **MEASURING AND MONITORING DEVISES (MMD):**

TO BE FINALIZED AT SITE IN CONSULTATION WITH SITE ENGINEER IN CHARGE/CM.

NOTE:

THIS ABOVE LIST IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. CONTRACTOR SHALL DEPLOY ALL NECESSARY T&P TO MEET THE SCHEDULES & AS PRESCRIBED BY BHEL ENGINEER AND REQUIRED FOR COMPLETION OF WORK.

SN	DESCRIPTION & CAPACITY OF T&P	QUANTITY	PURPOSE
01	EOT CRANE IN TG HALL	1 No. of 55 T Capacity (For four units)	FOR HANDLING AND ERECTION WITHIN TG HALL ON SHARING BASIS AS AVAILABLE AND SUBJECT TO THEIR ACCESSIBILITY AND APPROACHABILITY.

NOTE:

1. Customer will provide one no. EOT crane of 55 T capacity (for all units), however contractor will have to provide the EOT crane operator for his operations and will carry out the day today operational maintenance, general cleanliness, attending of gear box leakages etc., applying caladium Compound on slings and holding/supporting the supply cables etc. as part of scope of work.

2. EOT cranes will be used on sharing basis by other agencies working within the TG hall under the instruction of BHEL. Contractor has to plan his activities well in advance and inform BHEL engineer in charge/ Construction Manager the date of actual use.

6.1 **TIME SCHEDULE**

6.1.1
For all Units the entire work of erection testing and commissioning of the Steam Turbine, Generator & their auxiliaries and other BOI (Bought Out Items) as detailed elsewhere in the Tender Specification shall be completed within **19 (Nineteen) months** from the date of commencement of work at site.

6.1.2
During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

6.1.3
The work of Design, manufacture, supply & erection of Pre-engineered & Prefabricated store shed cum office and site development works shall be completed in all respect within **3 (three) months** from the date of issue of LOI.

6.1.
The erection work shall be commenced on the mutually agreed date between the bidder and BHEL engineer and shall be deemed as completed in all respect only when the unit is in operation. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer will be final.

6.3 MOBILISATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIOING ETC.,

6.3.1
The activities for erection, testing etc. shall be started as per directions of Construction manager of BHEL.

6.3.2

The contractor has to augment his resources in such a manner that following major milestones of erection & commission are achieved on specified schedules:

TENTATIVE SCHEDULE

A. For DMD, Dahej (3 sets)

Activity	Tentative Schedule for completion		
	Unit 1	Unit II	Unit III
Erection of Pre-Engineered & Prefabricated steel structure store shed	May'14		
Site Development works	May'14		
Start of erection Work	June' 14	June'14	July'14
Completion of Oil Flushing	Mar'15	Apr'15	May'15
Barring Gear Operation	Apr'15	May'15	June'15
Steam Blowing Completion	**Apr'15**	May'15	June'15
Rolling & Synchronization	**May'15**	Jun'15	July'15
Trial Operation Completion	**May'15**	Jun'15	July'15
Support for operation & H/O			

6.3.3
In order to meet above schedule in general, and any other intermediate targets set, to meet customer / project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.

6.4 CONTRACT PERIOD
For all units the contract period for completion of entire work under scope shall be **19 (Nineteen) months** from the –COMMENCEMENT OF CONTRACT PERIOD as specified earlier for completion of the entire work under this package.

6.5 GUARANTEE PERIOD (For Each Unit)
The guarantee period of twelve months shall commence from the date of handing over of the Unit to Customer or six months from the date of first synchronization of the set, whichever is earlier (Provided all erection, testing, and commissioning works are completed in all respects)

The progressive payment for erection, testing and commissioning on accepted price of contract value per unit of STG Package rates will be released as per the break up given hereinafter:

7.1. Pre-Engineered & Prefabricated store shed cum office, site development work & hiring of Porta cabins

The following are the weightages assigned for various activities against prices for Part A of the Price bid specification.

Sl. No.		Item	Weightage
7.1.1	**Store shed, site development & Porta cabins**		
	1.	SUPPLY & ERECTION OF PREFABRICATED STORE CUM OFFICE SHED	40%
	2.	COMPLETION OF ENTIRE SITE DEVELOPMENT WORKS	40%
	3.	HIRING CHARGES OF TWO NOS. PORTA CABIN FOR FIRST TWELEVE MONTHS PAYABLE ON SUPPLY & FIXING OF PORTA CABINS ALONGWITH ALL FURNITURES, FIXTURES, ETC.	12%
	4.	HIRING CHARGES OF TWO NOS. PORTA CABIN FOR BALANCE PERIOD PAYABLE AFTER COMPLETION OF TWELEVE MONTHS FROM THE DATE OF FIXING OF CABINS AS DEFINED IN S. NO. 3 ABOVE	08%
	Total		**100.00%**

7.2. Erection,Testing, Insulation, Painting & Commissioning of Mechanical & Piping works

7.2.1 Summary : The following is weightage for each unit. The total price allotted as per Part B of Price Bid specification to be divided into four equal parts and Unit prices for billing purpose is to be arrived.

Sl	Item	Weightage
1	**Surface Condenser**	**15%**
2	**Steam Turbine**	**18%**
3	**Generator**	**15%**
4	**Pump and Auxiliary Equipment's**	**12%**
5	**Heat Exchanger & Deaerator**	**10%**
6	**Miscellaneous Item**	**10%**
7	**Piping**	**20%**
	Total	**100.00%**

7.2.2 Detailed activity / work description for pro-rata payment of 85%

Sl. No.		Item	Weightage
7.2.2.1	**Surface Condenser**		
	1.	PREPARATION OF FOUNDATION	2%
	2.	PLACEMENT, ALIGNMENT, ASSEMBLY AND WELDING OF, HOT WELL, NDT	10%
	3.	ASSEMBLY AND POSITIONING OF CONDENSOR SHELL, FOUNDATION BOLT FIXING AND GROUTING	12%
	4.	ASSEMBLY, ALIGNMENT AND WELDING & NDT OF TUBE SUPPORT PLATES AND INTERNALS LIKE BAFFLE PLATES, AIR EVACUATION PIPES ETC.	5%
	5.	ASSEMBLY, WELDING & NDT OF DOME WALLS AND DOME STIFFENERS, STAND PIPE, SURGE PIPE ETC.	10%
	6.	INSERTION, EXPANSION, CUTTING ETC. OF CONDENSER TUBES	20%
	7.	HYDRO TEST OF STEAM AND WATER SIDE	10%
	8.	WELDING OF CONDENSER NECK JOINT, BELLOW AND NDT& COMPLETION OF BALANCE WORKS	10%
	9.	VACCUM TEST, ERECTION, COMMISSIONING,	3%
	10.	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.2	**Steam Turbine**		
	1	PREPARATION OF FOUNDATION, PLACEMENT, ALIGNMENT AND GROUTING OF BASE PLATES AND BEARING PEDESTALS	9%
	2	PLACEMENT AND ALIGNMENT OF OUTER CASING BOTTOM PORTION AND CENTRE GUIDE KEYS	8%
	3	PLACEMENT OF ROTOR ON BEARINGS AND ALIGNMENT WITH INNER CASING AND CHECKING OF BLADE CLEARANCE	9%
	4	ASSEMBLY, ALIGNMENT & BOLTING OF OUTER CASING UPPER HALF	9%
	5	BOXING UP OF INNER-INNER & INNER-OUTER AND ROLL CHECK	7%
	6	ALIGNMENT OF ROTORS INCLUDING REAMING, HONING AND FIXING OF COUPLING BOLTS	9%
	7	ASSEMBLY OF GOVERNING SYSTEM/EQUIPMENT	5%
	8	INSTALLATION OF ESVS, VALVES, MS STRAINERS (INTERNALS)	9%
	9	ERECTION, ALIGNMENT AND WELDING OF CROSS AROUND PIPING	5%
	10	FINAL BOX UP OF TURBINE INCLUDING FIXING OF RUPTURE DISK ETC.	5%

	11	ASSEMBLY AND PREPARATION OF HYDRO-TEST, STEAMBLOWING DEVICES AND NORMALISATION ETC	5%
	12	FINAL BOXING UP OF PEDESTALS AFTER OIL FLUSHING COMPLETION	5%
	Total		85.00%
7.2.2.3	**Turbo Generator**		
	1	PREPARATION OF FOUNDATION, LEVELLING, MATCHING AND GROUTING OF FOUNDATION PLATES	5%
	2	LIFTING, LEVELLING AND ALIGNMNET OF GENERATOR USING STRAND JACK METHOD (INCLUDING ERECTION AND DISMANTLING OF STRAND JACK)	50%
	3	ALIGNMENT OF GENERATOR ROTOR WITH TURBINE ROTOR, RUN-OUT CHECKS AND REAMING, HONING OF COUPLING HOLES AND FIXING OF COUPLING BOLTS	10%
	4	ERECTION OF EXCITATION EQUIPMENTS & ALIGNMENT OF GEN-EXCITER ROTORS INCLUDING SWING CHECK AND COMPLETION OF BALANCE WORKS	10%
	5	INSTALLATION OF ENCLOSURES OF GENERATOR/EXCITER WITH ALL AUXILIARIES	5%
	6	GROUTING OF GEN BASE FRAME	5%
	Total		**85.00%**
7.2.2.4	**PUMPS AND AUXILIARIES**		
	1	ERECTION / TESTING AND COMMISSIONING OF MAIN OIL PUMP, JOP, EOP, AOP, MIST OIL EXTRACTION FAN, OIL MIST SEPERATOR, OIL ACCUMULATORS CENTRALISED LUBE OIL PURIFICATION SYSTEM, GOVERNING OIL, HP CONTROL OIL ALONG WITH ALL AUXILLIARIES	17%
	2	ERECTION / TESTING AND COMMISSIONING OF THREE MOTOR DRIVEN BFP, ALONG WITH ALL AUXILLIARIES	16%
	3	ERECTION, TESTING, GROUTING ETC. OF CCW (COMMON FOR ALL UNITS) PUMPS AND TANKS ALONG WITH ALL AUXILLIARIES	17%
	4	ERECTION, TESTING, GROUTING ETC. & COMMISSIONING OF CONDENSATE EXTRACTION PUMPS ALONG WITH ALL AUXILLIARIES	17%
	5	ERECTION, TESTING, GROUTING ETC. & COMMISSIONING OF ACW, CONDENSATE FORWARDING PUMPS, RELATED ITEMS	15%
	6	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.5	**HEATERS AND DEAERATORS**		
	1	ERECTION, TESTING & COMMISSIONING OF HP, LP HEATERS	15%

	2	ERECTION, TESTING & COMMISSIONING OF SJAE, GLAND STEAM CONDENSER, DRAIN COOLERS	15%
	3	ERECTION, TESTING & COMMISSIONING OF DE-AERATOR, FEED STORAGE TANK AND ASSOCIATED APPROACH PLATFORM WITH LADDERS ETC.	22%
	4	ERECTION, TESTING & COMMISSIONING OF PHE'S FOR CCW SYSTEM (COMMON FOR ALL UNIT)	10%
	5	ERECTION, TESTING & COMMISSIONING OF TWIN OIL COOLERS OF LOC, DUPLEX LUBE OIL COOLERS & DUPLEX WORKING OIL COOLERS OF BFP, HP GOVERNING OIL COOLERS	15%
	6	ERECTION, TESTING & COMMISSIONING OF STG AIR COOLERS	5%
	7	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.6	**MISCELLANEOUS ITEMS**		
	1.	ERECTION, TESTING & COMMISSIONING OF CCW EXPANSION TANK, CARBON DIOXIDE BREATHERS, HYDROSTATIC SEAL ETC	7%
	2.	ERECTION, TESTING & COMMISSIONING OF HP FLASH TANK, ATM FLASH TANKS IN STG AREA AND COMMON AREA	8%
	3.	ERECTION, TESTING & COMMISSIONING OF BOILER STARTUP PRDS AND DESUPERHEATERS.	7%
	4.	ERECTION, TESTING & COMMISSIONING OF AUXILARY PRDS AND DESUPERHEATERS.	8%
	5.	ERECTION, TESTING & COMMISSIONING OF DEAERATOR PEGGING STEAM PRDS AND DESUPERHEATERS.	7%
	6.	ERECTION, TESTING & COMMISSIONING OF STRAINERS	5%
	7.	ERECTION, TESTING & COMMISSIONING OF OVERHEAD OIL TANK	6%
	8.	ERECTION, TESTING & COMMISSIONING OF VENT SILENCERS	5%
	9.	COMMISSIONING SUPPORT FOR IA / PA COMPRESSOR (COMMON FOR ALL UNIT)	6%
	10.	COMMISSIONING SUPPORT FOR CONDENSATE FORWARDING TANK.	5%
	11.	ERECTION, TESTING AND COMMISSIONING OF BELLOWS, BUTTERFLY VALVE FOR SURFACE CONDENSOR	5%
	12.	ERECTION, TESTING & COMMISSIONING OF LP DOSING SKIDS (NaOH, HYDRAZINE, AMMONIA)	8%
	13.	ERECTION TESTING AND COMMISSIONING OF SWAS ROOM INTERCONNECTING LINES	5%
	14.	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**
7.2.2.7	**PIPING**		
	1	FABRICATION OF PRE-FABRICATED (UPTO 2") NON – IBR PIPING, IBR PIPING, PRE-ASSEMBLY WHEREVER APPLICABLE	15%
	2	PLACEMENT IN POSITION	17%
	3	ALIGNMENT	15%

	4	WELDING / BOLTING / FIXING OF VALVES, INSTRUMENTS	10%
	5	INSULATION / CLADDING	10%
	6	NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT	5%
	7	FABRICATION OF SUPPORTS, HANGERS & SUPPORTS ETC WHEREVER NECESSARY AS PER DRG	5%
	8	STEAM BLOWING ,HYDRAULIC TEST/PNEUMATIC TEST WHERE EVER APPLICABLE ALONGWITH TEMPORARY PIPING	5%
	9	DEPLOYMENT OF CRANE & OTHER T & P	3%
	Total		**85.00%**

7.2.3 Detailed activity / work description for stage/milestone payments (15%)

Sl. No.		Item	Weightage
7.2.2.8		**STAGE/MILESTONE PAYMENTS (15%)**	
	1	STEAM BLOWING / CHEMICAL CLEANING	1%
	2	OIL FLUSHING (TG)	1%
	3	BARRING GEAR (TG)	1%
	4	ROLLING AND SYNCHRONISATION	2%
	5	FULL LOAD	2%
	6	TRIAL OPERATION OF UNIT	2%
	7	PAINTING (INCLUDING ARROW MARKING, NOMENCLATURE, ETC)	2%
	8	AREA CLEANING, TEMPORARY STRUCTURES CUTTING/REMOVAL AND RETURN OF SCRAP	1%
	9	PUNCH LIST POINTS/PENDING POINTS LIQUIDATION	1%
	10	MATERIAL RECONCILIATION	1%
	11	COMPLETION OF CONTRACTUAL OBLIGATIONS	1%
	Total for Milestone/Stage payments (15%)		15.00%

7.3 Material Handling Works

The following are the weightages assigned for various activities against prices for Part C of the Price bid specification.

Sl. No.		Item	Weightage
7.3.1	**MATERIAL HANDLING FOR STORE, SITE (COMMON)**		
	1	Deployment of Crane, Hydra & Other material Handling T & P	20%
	2	Receipt and Unloading of Consignments	50%
	3	Storage and Preservation	20%
	4	Manpower Support (as per cl. 8.8, Part-II, Chapter-VIII)	10%
			100.00%

7.4 Mode of Payment and measurement of work completed

Refer General Conditions of Contract

Note:

1. Wherever application of INSULATION is applicable, same shall be covered under the respective item/equipment for 'Terms of Payment'.
2. BHEL at discretion may further split up the above percentage and effect payment to suit the site conditions, cash flow requirements, according to the progress of work.
3. Payments against the above Billing break up will be subject to the other statutory deductions, viz. retention amount, TDS towards income tax, security deposits, etc. as per the provisions contained in GCC,SCC, NIT & other contract documents.

8.0 TAXES, DUTIES, LEVIES

8.1. For All types of works
8.1.1
The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.
However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

8.1.2 Service Tax & Cess on Service Tax

Contractor's price/rates shall be exclusive of Service Tax and Cess on Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and pay the same to the concerned tax authorities, such applicable amount will be paid by BHEL at the prevailing Service Tax Rate (presently 12.36 %) on the admitted bill value.

Contractor shall submit to BHEL documentary evidence of Service Tax registration certificate specifying name of services covered under this contract. Contractor shall submit serially numbered Service Tax and Cess Invoice, signed by him or a person authorized by him in respect of taxable service provided, and shall contain the following, namely,

1. **The name, address and the registration number of the contractor,**
2. **The name and address of the party receiving taxable service,**
3. **Description, classification and value of taxable service provided and,**
4. **The service tax payable thereon.**

All the Four conditions shall be fulfilled in the invoice before release of service tax payment.

Wherever, more than one route/option are available for discharge of service tax liability under a particular service, (e.g. "works contract Service"), contractor shall obtain prior written consent from BHEL site before billing the amount towards Service Tax.

8.1.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT)/CST on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be inclusive of the same and in no case input or output VAT/CST will be reimbursed extra.

In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. Contractor will submit all the details of VAT/CST paid for the contract in the prescribed format of the respective state VAT laws. Also, the contractor will issue the tax Invoices to BHEL as per the Tax laws of respective state on monthly basis. Contractor shall also be required to furnish to BHEL necessary proof of VAT remittance on monthly basis.

Deduction of tax at source shall be made as per the provisions of law and is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made.

Further, if BHEL, at the instance of customer or otherwise adopts the specific route for discharging output VAT liability itself, benefit of the reduction in liability of the contractor will be passed on to BHEL.

In case, BHEL is forced to pay any VAT liability on behalf of contractor, the same will be recovered from contractor's bill or otherwise as deemed fit

8.2 New Taxes/Levies

In case the Government imposes any new levy/tax etc.(that are not existing as on date of Technical Bid opening only) on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual against documentary proof.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of Price Bid. Claim for any such impact after opening the Price Bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

No reimbursement/recovery on account of increase/reduction in the rate of taxes, levies, duties etc. on input goods/services/work shall be made. Such impact shall be taken care of by the Price Variation/Adjustment Clause (PVC) if any. In case PVC is not applicable for the contract, Bidder has to make his own assessment of the impact of future variation if any, in rates of taxes/duties/ levies etc. in his price bid.

8.3 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998.

In case any portion of work involves execution through building or construction workers, then compliance to the above titled Acts shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under:-

i. It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.

ii. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these act and rules including that of payment / deposit of 1% cess on the extant of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.

iii. It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building workers) engaged by the sub-contractor during the preceding month.

iv. It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

9. WEIGHT SCHEDULE - SUMMARY

Sl.No.	Equipment/Package	Approximate Weight in MT/Unit	Total weight for DMD, Dahej (3 Units)
A	Surface Condenser	122.226	366.678
B	Steam Turbine	213.014	639.042
C	Generator	187	561
D	Pump and Auxiliary Equipment's (Common Eqp - 40 MT)	207.084	561.252
E	Heat Exchanger (Common Eqpt - 10.578 MT)	258.698	744.36
F	Miscellaneous Item (Common Eqp – 20 MT)	61.775	65.325
	Common Equipment	70.578	70.578
G	**Piping**		
	Common :		408.74
	Per Unit :	314.36	943.08
	Integral Piping :	20.8	62.4
	Support (10%) :	88.014	264.042
	Total Weight (MT)	2017.948	4686.497

Hazira : Piping Weights (Common and 4 Units)

SL NO	LINE DESCRIPTION	IBR	PIPE MATERIAL	WEIGHT (Kg)	TOTAL WEIGHT (Kg)
A	COMMON				
1	MAIN STEAM FROM TP TO HEADER	IBR	A335GRP91	7896	7896
2	MAIN STEAM HEADER	IBR	A335GRP91	152975	152975
3	BOILER STARTUP STEAM FROM TP UPTO PCV	IBR	A335GRP91	38303	38303
4	BOILER STARTUP STEAM FROM FROM PCV UPTO DS	IBR	A335GRP11	9516	9516

5	BOILER STARTUP STEAM HEADER	IBR	A106GRB	33246	33246
6	FEED WATER HEADER	IBR	A106GRB	95687	95687
7	FEED WATER FROM HEADER TO TP	IBR	A106GRB	18416	18416
8	DEAERATOR OVERFLOW & DRAIN HEADER	IBR	A106GRB	5894	5894
9	CCCW PIPING		IS3589GRFE330	136827	136827
10	DRAIN PIPING (P91)	IBR	A335GRP91	7839	7839
11	DRAIN PIPING (P11)	IBR	A335GRP11	1176	1176
12	DRAIN PIPING (CS)	IBR	A106GRB	5828	5828
13	SWAS PIPING (IBR)	IBR	A335GRP91	1037	1037
14	SWAS PIPING (CS)		A106GRB	3578	3578
15	SWAS PIPING (SS)		A312GRTP304	894	894
16	SERVICE AIR DISTRIBUTION PIPING		IS1239	11269	11269
17	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	11269	11269
18	LP DOSING PIPING		A312GRTP304	3327	3327
	COMMON PIPING			**544977**	**544977**
B	**PER UNIT**				
1	MAIN STEAM PIPING FROM HEADER TO TURBINE	IBR	A335GRP91	27426	109704
2	TURBINE WARM UP VENT PIPING	IBR	A335GRP91	494	1976
3	BOILER STARTUP STEAM PIPING FROM HEADER TO CONDENSER	IBR	A106GRB	7475	29900
4	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-6	IBR	A106GRB	1792	7168
5	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-5	IBR	A106GRB	3659	14636

6	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	8063	32252
7	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	11014	44056
8	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-2	IBR	A106GRB	8766	35064
9	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-1	IBR	A106GRB	16469	65876
10	BALANCE PISTON LEAK-OFF PIPING	IBR	A106GRB	708	2832
11	BFP DISCHARGE PIPING	IBR	A106GRB	20584	82336
12	BFP RECIRCULATION PIPING TO DEAERATOR	IBR	A106GRB	5548	22192
13	BFP DISCHARGE HEADER	IBR	A106GRB	3236	12944
14	FEED WATER PIPING FROM BFP DISCH HEADER TO HPH-5 (INCL HPH-5 BYPASS)	IBR	A106GRB	27636	110544
15	FEED WATER PIPING FROM HPH-5 TO HPH-6 (INCL HPH-6 BYPASS)	IBR	A106GRB	27764	111056
16	FEED WATER PIPING FROM HPH-6 TO FEED WATER HEADER	IBR	A106GRB	16190	64760
17	OVERFLOW & DRAIN PIPING FROM DEAERATOR	IBR	A106GRB	2603	10412

	TO HEADER				
18	CCCW PIPING		IS3589GRFE330	18164	72656
19	CW/ACW PIPING		IS3589GRFE330	25096	100384
20	CONDENSATE PIPING (CS)		A106GRB	14890	59560
21	CONDENSATE PIPING (SS)		A312GRTP304	34581	138324
22	BFP SUCTION PIPING		A106GRB	9720	38880
23	HP HEATERS DRAIN PIPING		A106GRB	10263	41052
24	LP HEATERS DRAIN PIPING		A106GRB	10361	41444
25	VENT PIPING		A106GRB	1858	7432
	PER UNIT PIPING			**314360**	**1257440**
	TOTAL PIPING				**1802417**

Dahej : Piping Weights (Common and 3 Units)

SL NO	LINE DESCRIPTION	IBR	PIPE MATERIAL	WEIGHT (Kg)	TOTAL WEIGHT (Kg)
A	**COMMON**				
1	MAIN STEAM FROM TP TO HEADER	IBR	A335GRP91	5922	5922
2	MAIN STEAM HEADER	IBR	A335GRP91	114732	114732
3	BOILER STARTUP STEAM FROM TP UPTO PCV	IBR	A335GRP91	28728	28728
4	BOILER STARTUP STEAM FROM FROM PCV UPTO DS	IBR	A335GRP11	7137	7137
5	BOILER STARTUP STEAM HEADER	IBR	A106GRB	24935	24935
6	FEED WATER HEADER	IBR	A106GRB	71766	71766

7	FEED WATER FROM HEADER TO TP	IBR	A106GRB	13812	13812
8	DEAERATOR OVERFLOW & DRAIN HEADER	IBR	A106GRB	4421	4421
9	CCCW PIPING		IS3589GRFE330	102621	102621
10	DRAIN PIPING (P91)	IBR	A335GRP91	5880	5880
11	DRAIN PIPING (P11)	IBR	A335GRP11	882	882
12	DRAIN PIPING (CS)	IBR	A106GRB	4371	4371
13	SWAS PIPING (IBR)	IBR	A335GRP91	778	778
14	SWAS PIPING (CS)		A106GRB	2684	2684
15	SWAS PIPING (SS)		A312GRTP304	671	671
16	SERVICE AIR DISTRIBUTION PIPING		IS1239	8452	8452
17	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	8452	8452
18	LP DOSING PIPING		A312GRTP304	2496	2496
	COMMON PIPING			**408740**	**408740**
B	**PER UNIT**				
1	MAIN STEAM PIPING FROM HEADER TO TURBINE	IBR	A335GRP91	27426	82278
2	TURBINE WARMUP VENT PIPING	IBR	A335GRP91	494	1482
3	BOILER STARTUP STEAM PIPING FROM HEADER TO CONDENSER	IBR	A106GRB	7475	22425
4	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-6	IBR	A106GRB	1792	5376
5	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-5	IBR	A106GRB	3659	10977
6	TURBINE EXTRACTION	IBR	A106GRB	8063	24189

	STEAM PIPING TO DEAERATOR				
7	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	11014	33042
8	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-2	IBR	A106GRB	8766	26298
9	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-1	IBR	A106GRB	16469	49407
10	BALANCE PISTON LEAK-OFF PIPING	IBR	A106GRB	708	2124
11	BFP DISCHARGE PIPING	IBR	A106GRB	20584	61752
12	BFP RECIRCULATION PIPING TO DEAERATOR	IBR	A106GRB	5548	16644
13	BFP DISCHARGE HEADER	IBR	A106GRB	3236	9708
14	FEED WATER PIPING FROM BFP DISCH HEADER TO HPH-5 (INCL HPH-5 BYPASS)	IBR	A106GRB	27636	82908
15	FEED WATER PIPING FROM HPH-5 TO HPH-6 (INCL HPH-6 BYPASS)	IBR	A106GRB	27764	83292
16	FEED WATER PIPING FROM HPH-6 TO FEED WATER HEADER	IBR	A106GRB	16190	48570
17	OVERFLOW & DRAIN PIPING FROM DEAERATOR TO HEADER	IBR	A106GRB	2603	7809
18	CCCW PIPING		IS3589GRFE330	18164	54492

19	CW/ACW PIPING		IS3589GRFE330	25096	75288
20	CONDENSATE PIPING (CS)		A106GRB	14890	44670
21	CONDENSATE PIPING (SS)		A312GRTP304	34581	103743
22	BFP SUCTION PIPING		A106GRB	9720	29160
23	HP HEATERS DRAIN PIPING		A106GRB	10263	30789
24	LP HEATERS DRAIN PIPING		A106GRB	10361	31083
25	VENT PIPING		A106GRB	1858	5574
	PER UNIT PIPING			**314360**	**943080**
	TOTAL PIPING				**1351820**

Turbine Integral Piping

Sl. No.	Item	Material	Weight (kg)/ Unit	Hazira (4 Units)	Dahej (3 Units)
1.	Carbon Steel Flanges	A105	800	3200	2400
2.	Carbon Steel Piping	A106B	14400	57600	43200
3.	Carbon Steel Fittings	A234WPB	1900	7600	5700
4.	Alloy Steel Piping	A335P22	1000	4000	3000
	SS Piping	A321	2700	10800	8100
		Total	**20800**	**83200**	**62400**

Insulation for Equipment & Piping : 92 MT
Painting Area : Approximately 18638 $M^{2,}$
Misc. Equipment / Items : 356 MT

Note:

1. A Lump sum price is to be quoted in the price bid for Erection & Commissioning of STG system consisting of all equipment's detailed under Clause no. 9 (Weight schedule-summary) of this chapter that shall also cover works like integral piping, and final painting, as applicable. The Lump sum quoted value for Erection works shall include the variation of +/-15% (Fifteen percent) in total indicated weight. In case of variation in weight beyond +/- 15%, the compensation will be as per clause 2.14.2 of GCC.

2. The list is tentative and is given to enable the contractor to study the nature of the work. The approximate weight and dimensions of the various sub-assemblies of turbine, generator and its auxiliaries and other brought out item and Piping system etc.is indicated above. The weights &

Dimensions given are only approximate and for general guidance and they are subject to variation as per design consideration.

3. The information furnished is only a description regarding the items to be erected by the contractor. BHEL reserves the right to add or exclude any components / items/ system according to the site requirements / customer requirements to complete various systems in all respects.

4. Any other systems/ components supplied by BHEL manufacturing units which are integral to Steam turbine & Generator and its auxiliaries and other bought out items are also to be erected and commissioned by the contractor within the quoted / accepted tonnage rate /lump sum value.

5. Details regarding components, sub-assemblies, and auxiliaries etc., to be erected, tested and commissioned under the scope of this tender are given in this tender. The schedule of weights given are only approximate and meant for giving a general idea to the tenderer, about the magnitude of the work involved. This should not be taken for billing or any other claims. All weights for such purposes will have to be taken from design documents only (shipping list).

1.1
The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for fabrication, engineering and construction management. The Bidder should ensure timely completion of work. The Bidder must have adequate quantity of tools, construction aids, equipment's etc., in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel.

1.2
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Bidder and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

1.3
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

1.4
The Bidder shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work.

1.5
Contractor shall erect all the equipment as per sequence prescribed by BHEL at site. The sequence of erection, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the Contractor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets or for any reasons whatsoever.

1.6
All the necessary certificates and licenses required to carry out this work are to be arranged by the Contractor expeditiously at his cost.

1.7
The work to be carried out under the scope of these specifications covers the complete work of collection from stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, leveling, cold pulling, adjusting, Non-destructive testing, Post weld heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries covered under these specifications, commissioning and all other activities till handing over of the unit. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. That will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL at the cost and risk of the contractor.

1.8
The terminal points as decided by BHEL shall be final and binding on the Contractor.

1.9
During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feedback from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/rectification/fabrication/repairs etc., promptly and expeditiously. Claims of contractor, if any, for such works will be dealt as per relevant clauses of General Conditions of Contract.

1.10
Daily log sheets indicating the details of work carried out, man-hours, consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day.

1.11
All tools and tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

1.12
The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

1.13
All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.

1.14
Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

1.15
Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

1.16
Contractor shall mobilize sufficient quantity of sleepers for stacking of materials in his custody.

1.17.1
Utility Points : Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N2) etc., shall be indicated in the P & I diagram. Contractor to locate the utility points as advised by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with Bill of Material (BOM) to BHEL for approval.

1.17.2

The utility points shall be located at convenient point to handle and to be terminated with brass / bronze valve with suitable connection for hose pipe.

1.18
As Built Drawings : Contractor shall be supplied with two extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copy with Red ink all the changes / deviations / alterations etc carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

1.18
Site Inspection : The owner / employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

1.19
Field Quality Assurance Formats: It is the responsibility of the contractor to collect and fill up the relevant FQA Log sheets / Welding logs & Heat treatment charts and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL / Customer in token of their acceptance. Monthly Running Bill Payment to the contractor will be linked with the submission of these Log sheets.

1.20
For other agencies, such as cabling, instrumentation etc., to commence their work from / on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

1.21
For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

1.22
Contractor should obtain the formal statutory clearance from Chief Inspector of Boilers to carry out erection & Welding of piping / tanks under IBR purview. All IBR piping layout drawings received from BHEL for pipeline erection to be submitted to Boiler Inspector for approval. Arrangement for the visit of Boiler inspector for field inspection, hydraulic test etc., is in the scope of contractor, and necessary drawing / details only will be given by BHEL. Inspection fee, if any shall be paid by BHEL. After approval of the drawings, Erection of pipe lines / tanks to be started.

2.0 PRE ENGINEERED & PREFABRICATED STEEL STRUCTURE STORE SHED, SITE MESS/CONFERENCE HALL/TOILET & OPEN STORAGE AREA

The contractor's scope of services for Pre Engineered & Prefabricated steel structures, site mess/conference Hall/Toilet & development of open storage areas are detailed in this chapter.

2.1 SCOPE

This Specification covers Design, Manufacturing, supply, Receipt at site, Erection, site Painting etc. of closed shed removable/Re-erectable type Pre-Engineered, Pre-fabricated Steel Storage sheds, construction of site mess/conference Hall/Toilet & development of open storage areas. After completion of the entire project, i.e. erection & commissioning & handing over to the client, the contractor will be required to dismantle/remove the entire temporary structures referred in this chapter and make good the area in the original condition, as it was received from the customer. The contractor can take back all the serviceable materials received after the dismantling of these temporary structures. All unserviceable materials will have to be disposed at a specified location within the premises of the customer or outside as per the direction & instructions of BHEL engineer. A detailed instruction for dismantling/removal will be provided by BHEL engineer in this regard at appropriate time during the currency of the contract.

2.2 PRE ENGINEERED & PREFABRICATED STEEL STRUCTURE STORE SHED

2.2.1 DESIGN AND CONSIDERATIONS

- Size of closed sheds – 15 M c/cX30M c/cX5.25 M (approximately)
- Clear height of the closed shed (between FFL & Bottom of truss/Structural member)-5.25M
- Columns shall spanning – 6.0M c/c long span & 5.0M c/c short span.
- All design work of sheds shall be of pressed steel sections. The bidder will submit structural stability certificate for the same.
- All Side cladding/roof sheets shall be fitted in such a way that they can be removed at any point of time.
- Sliding doors (4.00 M Width x 4.5 M Height) shall be provided at front entrance shed at center location. Suitable arrangement shall be made for easy operation of gates (gear operated).
- One man entry gate to be provided on at one side of each shed (front entrance by the side of sliding door).
- For Local site conditions, bidder to refer to enclosed write up (refer SCC).
- The bidder should submit a guarantee for 3 years of operations for the materials supplied and erected by him.

2.2.2 STRUCTURAL STEEL WORK

All materials for structural steel works have to be supplied by the contractor and necessary test certificates of the materials procured for this work has to be submitted for scrutiny. All fabrication and erection of structures must be executed according to the specification and drawings. Erection

of trusses is true to line and level and aligned properly, as per drawing and instruction of Engineer-In-charge.

- Structural/steel members will have 1 coat of Zinc Chromate primer (surface preparation of the section as per the standards to suit the climatic conditions) followed by 2 coats of synthetic enamel paint, if not pre coated. The roof truss should have bolted joints at crown and at both ends.
- All accessories like G.I. bolts, washers and nuts complete from reputed manufacturer shall be included in the scope. All bolts, nuts (IS 4759) shall be galvanized (hot dip) min. 270 gm/m^2. Galvanized spring/plain washer shall be as per IS 1573.
- Since these are detachable sheds & to be in repetitive use at other locations, proper marking (permanent) shall be so designed that it can be dismantled at any time and may be transported to be re-erected at other location.
- Roof and side cladding with Galvalume Sheet confirming to ASTM A 792 of thickness 0.47 mm with zinc coating not less than 150gm/Sq.m (both side mass) of 550Mpa (min) of approved make. Translucent (Poly Carbonate) sheet of approved make shall be provided for alternative bays (10% of the sheeting area). Both roof and side cladding are to be made "Water Tight".
- Purlins for walls & roof Cladding shall be made up-up with pressed steel.
- Providing ventilators 900 mm (W)x 600mm (H) – 16 nos should be at a height of 4.5m from FFL, made of suitable Aluminum section with wired glass open-able type.
- Store In-charge room shall be of 50 mm Thick PUF insulated sand witch panels. These panels are to be made out of 0.47 thick colour coated G.I. Sheet as exterior on both sides with PU Foam of density 38 Kg/Cu.Mtr. and tensile strength of 4 kg/Sq.Cm inside. Compressive strength (10% deformation) 2.1 Kg/Sq. Cm. Thermal Conductivity at 10 Deg 0.02 W/M Deg K Temparatue Range – 80 Deg C to + 100 Deg C The PU Foam thickness is 60 mm.
- False Ceiling shall be provided with sandwich panels of thickness 30mm thick.
- 1nos. table of 1200mm width X 600 mm depth X 750mm height consisting 3 drawer unit left side, should also have CPU & keyboard provision (table in beech/black colour0, 1nos executive chair (Width -70.0 Cm, Depth-70 Cm, Height-84.0 Cm-96.5Cm Seat Hight-46.5-59.0CM)&3nos visitor chairs of approved make shall be provided.
- 1nos. file cabinet consisting 4 drawers of size 470mm width X 1320 mm height X 620mm depth and 1nos. single side steel file/book rake consisting of 3 rakes of size 900mm width X 1850 mm heightX316mm depth shall be provided.
- Suitable long span shelve system shall be provided throughout the length of both opposite longitudinal spans of closed sheds. It should have two shelves with on shorter top & one wider middle rack at height of 600 mm from floor adding to a total height of 1200mm. The shelves shall be design to with stand SKU loading (125Kg/Sq.m) with suitable angle section. The width of top shelf shall be of 600mm & intermediate/middle shelf is 750mm.

2.3 SITE MESS,CONFERENCE HALL/TOILET & OPEN STORAGE AREA

- The entire site development works, viz. leveling, grading, access way(two layers of WBM), development of open storage yard with 200mm thick compacted murrum, concrete base/foundation preparation for installation of Porta cabins, barbed wire fencing(1.8m. high, angle iron posts & minimum 5 layers of barbed wires) with gates of site and storage areas, laying of water distribution network, soak pit, installation of water storage tanks, etc. for the site office area allotted to BHEL are in the scope of the contractor.

- A meeting cum mess room of approximate size 15.0m.(L) x 6.0m.(W)x 3.0 m.(Ht.) is to be constructed in the extended portion of the closed store shed for BHEL's office for meeting, pantry, toilet, etc. A toilet block having WC & urinal facilities with wash basin and another Kicthen & dining hall is to be constructed in one portion of the store building.. These areas will have separate access and will cater to the daily need of the BHEL site staffs.

Indicative drawing with Bill of quantities for various miscellaneous items to be provided/ executed by the contractor are attached as Annexure 44 & Annexure 45 respectively.

NOTE:

THIS ABOVE REFERRED DRAWING & BILL OF QUANTITIES FOR SITE DEVELOPMENT IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. THE DRAWING & BILL OF QUANTITIES ARE SUBJECT TO CHANGE DEPENDING UPON THE EXACT LAND PROVIDED BY THE CUSTOMER. THE CONTRACTOR WILL BE REQUIRED TO CARRY OUT THE WORK AS PER THE REVISED LAYOUT & BILL OF QUANTITIES IN SUCH CASE WITHOUT ANY EXTRA PAYMENT.

3.0 PORTABLE CABIN

3.1 Supply of 2 No's of brand new Portable Cabins (Size: 20 ft X 10 ft X 8.0 ft) on hiring basis for 19 months for BHEL's site office use at DMD, Dahej. If Project schedule is extended, BHEL reserves the right to extend the hiring period for another 6 months at the same rates, terms and conditions.
Amenities to be included in each Cabin are given below
Furniture and Fixtures suitable for 6 members

- Executive Table with Side Table - 01 no.
- Executive Revolving Chair - 01 no.
- Visitor Revolving chair - 03 nos.
- Office Table - 05 nos.
- Office Revolving Chair - 05 nos.
- Wall mounted cabinet - 05 nos.
- Window Air Conditioner 1.5 ton - 02 no.
- White board of size 750x1000mm - 01 no.
- Perforated Board of size 750x1000mm - 01 no.

Interior cum Insulation

- Insulated walls with Pre-Laminated Sheet
- Ceiling : Glass Wool Covered with Pre-Laminated Sheet
- Flooring : Cement fiber sheet with PVC vinyl carpet

Other accessories:

- Tube Lights-4, Wall mounted Fans-5,LAN Points-6, TELE Point-1, External Light-1 Aluminum sliding windows, 15 Amp Switch-2, 5 Amp Switch-4,Electrical switch board-1
- Insulated paneling Doors, Safety Grills for all windows, Vertical Blinds For all Windows
- Weather sheds for all door and windows, Partition(laminated sheet both sides) with internal Door facility, Corrosion free and fire proof paints

Maintenance:

- During hiring period, maintenance of the Porta cabin and accessories shall be in the scope of bidder.

Note:

- Supply, transportation & installation of Porta cabins to the worksite shall be in the scope of bidder.
- Removal of Porta cabins from the work site & transportation after completion of all the activities of E&C related to this project shall be in the scope of bidder. Porta Cabins shall remain the property of the supplier after the completion of the hiring period.
- Power Cable (approx. 50m of length) shall be in the scope of bidder.

4.0 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

4.1
Contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc from the storage yard/stores/sheds of BHEL/ client. The Contractor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the Contractor, in appropriate manner as per BHEL's instructions.

4.2
The contractor shall return all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost of parts/materials used in excess or misused, with departmental charges.

4.3
Transportation of lube oil, Chemicals, Gas cylinders etc. from stores, is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores.

TEST TAPPING POINTS

Installation and welding of Tapping Points for taking performance test measurements shall be carried out by the contractor as part of this work for the equipments covered under this tender specification under the guidance of BHEL engineer. The scope will be limited to all the tapping points for which materials are available and their locations identified within the regular contract period and extensions thereof.

4.4
All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.

4.5
All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established up to National Physical Laboratory.

4.6
Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis.

5.0 PREPARATION OF FOUNDATION

5.1

Buildings, foundations and other necessary civil works for supporting structures, equipments etc, will be provided by the customer. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits and also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipment contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations up to 25mm for achieving proper levels will be within the scope of work/specification.

5.2

All minor foundations and anchor points required for installing erection equipments like winches, anchors etc. are to be cast by the contractor.

5.3

Grouting of equipments is included in the scope of contractor. All the materials required for grouting including special cements like PAGEL, CONBEXTRA- GP2, SHRINKOMB or its equivalent grade free flow cement as approved by BHEL and other materials like Portland cement, sand, gravel etc., are to be arranged by the contractor within the quoted rate. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.

5.3.1

Contractor shall arrange the required nos. of mixing machines and vibrators at their cost for carrying out the grouting operation. All the materials like cement and cleaning consumables shall also be arranged by the contractor at his cost.

12.3.2

The certificates of the grout is to be submitted BHEL. If necessary test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.

The approximate Quantity of grouting cement required for each unit is 10T

5.3.3

Cleaning of the foundation surfaces, pocket holes, anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods will be within the scope of this work.

5.4

BHEL will provide only shims and packer plates (either machined or plain), which are received from BHEL's manufacturing plants and go as permanent part of the equipment. Additional packer plates and shims if required will have to be prepared by the contractor out of steel plates, steel sheets to meet site requirements. Necessary steel plates for this purpose will be provided by BHEL free of cost.

5.5
The contractor shall carry out scrapping and matching of embedded plates, permanent spacers and all the matching parts of turbine, generator, pumps and other equipments under scope wherever required. The support and sole plates matching and concrete surface bedding is also covered in the scope of work. The fine dressing of concrete shall be with Prussian blue-match checks.

5.6
Packer plates shall not only be blue matched with foundations but also inter-packer contact surfaces, contact surfaces between packer and pedestals, contact surface between packer and foundation frame etc. shall also be blue matched and required percentage contact shall be achieved by chipping and scrapping as per engineer's instructions.

6.0 The scope of the erection works will comprise of but not limited to the following:
(All the works mentioned hereunder and covered under the scope of work shall be carried out within the accepted rate unless otherwise specified.)

6.1
The work to be carried out at quoted / accepted rates by the contractor under the scope of these specification covers the complete work of handling, loading at stores, transporting to site of erection, inspection, preparation of foundation, erection, leveling, centering, alignment, grouting& final alignment of Steam turbine, Turbo Generator and auxiliaries, preassembly, erection, alignment welding, NDT, fixing hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing, &steam blowing of Piping, Water cooling system, Preassembly, erection welding, NDT of water cooled Condensers, feed water storage tank, de-aerator, LP / HP heaters, GSC & other coolers, flash tanks etc., erection and commissioning of Turbine driven and Motor Driven Boiler feed pumps, Motor driven Condensate Extraction Pumps, surface finish, Supply & application of primer & finish paints inclusive of Anti corrosive epoxy resin based, steam wash paints including labeling, on equipment,& piping, pre-commissioning, commissioning, trial operation & handing over.

6.2
Brief list of equipment / sub-assemblies to be erected by the contractor &approximate weight and size of individual heavy components are given under the Part-I, Chapter-IX, Annexure-I (Bill of quantity) and is meant for giving general idea to the tender only about magnitude of the work involved. The components are sent in parts for convenient transportation. They are to be cleaned, assembled in stage by stage, fastened / welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers**. The bidders may note that lifting, shifting & placing/erection of Generator Assemblies have to be done only by Strand Jack method for which the detailed specifications are provided in Part-II, chapter VII of TCC**

6.3
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.

6.4
All the works such as cleaning, leveling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rate.

6.5
Contractor shall erect all the equipments as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineers 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 STG set in other places.

6.6
All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out all of them. Absence of any

specific reference will not absolve the contractor of his responsibility for the particular operation. These would include Scaffolding and rigging operations Flame / electric cutting, grinding, welding, radiography and stress relieving. Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, cleaning, checking, leveling, blue matching, aligning and assembly. Surface grinding, drilling, doweling, shaping Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication

6.7
Bolt stretching fixtures for TG anchor bolts are to be arranged by the contractor.

6.8
Auxiliary Oil Pump / Jacking Oil Pump / Emergency Oil Pump etc., and their motors will be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.

6.9
Sand / Grit / shot blasting of condenser / turbine components / piping is to be carried out by the contractor wherever necessary as instructed by BHEL Engineer. Contractor has to arrange Sand / Grit / shot blasting machine, compressor required consumables, etc. at his cost.

6.10
The contractor shall also carry out erection, testing, and commissioning of the oil centrifuge within their quoted rate.

6.11
Generator Assembly will be transported from Hyderabad works to site on special wagon / Trailer. This will be received at site nearer to the lifting point of Portal Gantry Crane (near 'A' row). Unloading of Generator Assembly from wagon / trailer, assembling the terminal box & cooler housing and placing in position is in the scope of this specification. The Generator Assembly placement on TG Deck is planned only by Strand Jack.

6.12
Contractor to provide suitable Crane for lifting and placement of De-aerator and FST from area / place near to TG Building to place them at suitable location / elevation of equipment foundation depending upon accessibility and approachability of crane. Individual sections of Deaerator / FST are to be lifted to de-aerator floor and to be assembled and / erected / welded at de-aerator floor. Deaerator including all loose items, valves, stand pipes, root valves, fittings are included in the scope of contract. Drawing-GA of spray cum tray deaerator is enclosed. Contractor shall also arrange other T&P as required for installation of De-aerator and Feed water Storage Tank (FST). Contractor shall plan his activities so as to carry out the work in a minimum possible time period. In case of any accessibility and approachability limitations of crane to place the FST and Deaerator on required foundation, the contractor shall make necessary arrangement temporary platform / approach including providing the materials as per requirement as part of scope of work. The erection, alignment & welded in position and Welding, NDT & heat treatment shall be carried out by the contractor with in quoted rate.

6.13
The feed water storage tank will be supplied in different sections with feed pipe, heating steam header, spray nozzles, supports etc., in loose components. These are to be erected, aligned & welded in position. Welding, NDT & heat treatment if required shall be carried out by the contractor within quoted rate.

6.14
Erection of platform and supporting structures around feed water storage tank / De-aerator / equipments / valves / filters etc. is covered in the scope of contract and shall be erected by the contractor within the quoted rate.

6.15
Erection, testing & commissioning of BFP & BP along with mechanical seal, end chambers cooling lines, lube oil & working oil lines are also included in the scope of contractor.

6.16
BFP, BP & its auxiliaries will be supplied in parts consists of lube oil console, oil pumps, gear box, couplings, coolers etc., which are to be assembled at site and erected.

6.17
The condenser will be supplied in components / parts and contractor shall have to carry out assembly and erect on the condenser foundation. This includes complete fabrication of shell out of steel plates, welding of hot well with bottom plates, assembly of water chambers and welding with side walls, bottom plates and dome wall, assembly of water chambers, assembly of support plates, baffles and stiffening structures etc.. While carrying out the assembly stitch welding shall be done only after the due approval for alignment from BHEL Engineer. Final welding shall have to be carried out by step back seam method to ensure minimum deformation within acceptable limits of the welding parts.

6.18
The condenser main tube plates will be dispatched to site from works with surface protection only for water box side. The same shall be removed suitably by sand/ grit / shot blasting or with steam mixed with caustic soda as per the instructions of the BHEL Engineer before erecting the same.

6.19
The contractor shall have to carry out the condenser tubes insertion and expansion at site after the installation of condenser on their foundation. Before insertion of tubes the contractor shall check for absence of any dents mechanical damages or any other defects of tubes caused during storage or transportation. Tube should be thoroughly internally cleaned of all extraneous matter. Only fine emery paper shall be used for cleaning the tubes at the ends where expansion has to be carried out.

6.20
Before insertion of tubes the contractor shall clean the surface of the holes in the tube plates and tube support plates for paint / corrosion spots, oxide scales etc., using chemical cleaning agent like carbon tetra chloride.

6.21
Condenser tube expansion to be carried out by contractor's experienced operators, as per the erection procedure / BHEL engineer's instruction.

6.22
The tube shall be inserted such that it shall project 2 to 3 mm beyond the tube plate outer surface. The tube shall be expanded using an automatic electronic torque control tube expanding unit or pneumatic tube

expander so as to get the % thinning of the tube walls and elongation of tube ends as recommended by the supplier / Drawing / Tube expansion procedure. The length of expansion in no case shall exceed a length of 70 to 80% of the tube plate thickness. Finally, proper trimming of the excess length of the tube shall be carried out and flare-up / bell mouthing has to be done by the contractor at his cost.

6.23
The contractor shall carry out the condenser neck welding with Turbine casing. It shall be ensured that all spring supports are evenly loaded and the gap between the condenser and the different spring supports is within 1.0 mm. The clearance between the condenser neck and the exhaust hood should be within 3 mm by suitably lifting the condenser. Machined packers of suitable thickness are to be used under the spring supports and condenser load is to be gradually transferred on these packers. The neck welding shall be subjected to non-destructive testing.

6.24
The hydrostatic testing of steam space with the condenser vacuum system and hydraulic testing of water space with the circulating water (CW) lines after assembly of water boxes are also included in the scope of the contractor. Dummies are to be provided by the contractor at inlet and outlet for Hydraulic Test. Required MS plates shall be supplied by BHEL free of cost. Fabrication of dummies shall be done by the contractor at his cost.

6.25
Water boxes inside Carbon steel surfaces are to be Sand / Grit / shot blasted before hydraulic testing. After hydraulic testing water boxes and the water chambers of Circulating water side, they are to be thoroughly cleaned for removal of all traces of dirt, grease, oil, rust etc., it shall be dry and free from burns and shall have a metallic surface. The (Sand / Grit / shot) Blasting machine and accessories and also the required consumables shall be arranged by the contractor within the quoted rate.

6.26
Handling equipment & Structures for Condenser and associated equipments and auxiliaries shall be erected by the contractor within the quoted rate.

6.27
One no LP Heater is to be erected inside the condenser in rear side, for which contractor has to cut open the condenser dome plate already erected. After erection, condenser plates have to be strengthened / stiffened as per the instruction of BHEL Engineer.

6.28
The foundation of all equipment shall be checked, before placing the respective equipment on the foundation.

6.29
The contractor shall carryout the erection of Rubber /Steel expansion bellows, stretching bolt assembly and connected joints within the quoted rate.

6.30

All the weld seams shall be properly ground and subjected to examination. If any paint or rust (other than steam washable paints) noted in the steam side of the condenser parts, these are to be removed either by sand / shot / Grit blasting or buffing method.

6.31
All the weld seams shall be properly ground and subjected to radiographic examination as per manufacturer's recommendation. If any paint or rust (other than steam washable paints) noted in the steam side of the condenser parts, are to be removed either by Sand Grit / shot blasting or buffing method.

6.32
The Contractor shall carry out the reaming and honing of coupling holes with his own reamers, honing machine and honing accessories etc. at his own cost.

6.33
Erection of all the piping systems supplied along with turbine, generator, pumps and other auxiliaries covered in this contract, is to be erected by the contractor within the quoted rate.

6.34
Wherever pipes / bends / equipments are supplied in pre-fabricated / assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.

6.35
All the oil, steam piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.

6.36
All the lubricant oil for flushing and during trial run of the equipment including first fill up, chemicals for detergent flushing, acid pickling/cleaning/trail run etc., will be arranged by BHEL at free of cost. Required manpower shall be provided by the contractor for handling, filling, emptying and re-filling etc., as part of the work without any extra cost, till the unit is handed over. Transportation of all the above shall be arranged by the contractor from BHEL store / yard to work site and returning of the empty barrels / drums to stores at their cost. Care should be taken to avoid any spillage / wastage.

6.37
Normally weld neck valves will have prepared edges for welding. But, if it becomes necessary, the contractor shall prepare new edges, re-prepare the edges by grinding or chamfering to suit site conditions, which shall be done by the contractor at no extra cost.

6.38
All fittings like elbows, tees, reducers, weld neck flanges, inserts etc., shall be matched with pipes for welding which may require re-edge preparation, grinding etc., No extra cost shall be paid for this.

6.39
The valves will have to be cleaned, checked, lapped or overhauled in full or in parts before erection, after chemical cleaning, during commissioning. Any special tools required for lapping only will be arranged by BHEL.

6.40
All piping items including pipes, bends, tees, elbow, mitre bends, reducers, flanges, fittings, thruster blocks etc. shall be supplied as Pre-fabricated spool pieces for sizes above 2" (except for GI piping). However around 5% of piping items to be considered as non- prefab, minor length adjustments in the spool pieces for sizes 2" and above, etc. shall be included in the contractor's scope within the quoted rate.

6.41
For pipes nominal size 2" and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above size if the routing is shown in layout sit is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site engineer's advice.

6.42
Contractor should fabricate bends of ≤ 2" diameter size from running meters of pipe.

6.43
Wherever elbows of 45° deg or any other angle are required, the same shall be cut from 90° deg. Elbow supplied and used. No extra cost shall be paid.

6.44
All the drain lines should have sufficient slope towards drain. Slope of 1 : 500 shall be maintained towards drain point unless otherwise specified. Expansion loops shall be provided in all the vents and drains as per the drawings.

6.45
All the integral lube and control oil pipelines required TIG welding operations. Purging is required in case integral lube and control oil pipelines are of stainless steel material. The tubes / pipes are to be purged with Nitrogen Gas / Argon Gas for the purpose of creating inert atmosphere in the pipelines during the process of TIG welding. Nitrogen, Argon gas required for this purpose shall have to be arranged by the contractor at his cost.

6.46
Carrying out erection of 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, welding, 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.

6.47
Adjustment 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 NDT, heat treatment procedure shall be carried out by the contractor within the quoted rate.

6.48

Certain adjustments in length may be necessary while erecting pipelines / steel members. Removing / adding extra lengths to suit the final layout, preparing edges afresh and adopting specified NDT, heat treatment procedure are in the scope of work.

6.49
All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. Pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.

6.50
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 subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., by gouging/ grinding and not by hammering. 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 sub surface cracks in these ground areas.

6.51
All the weld joints on equipments and piping shall be ground or filed on completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,

6.52
Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.

6.53
Flame cutting of piping or any other equipments shall be strictly done as per BHEL Engineer‘s instructions and clearance only.

6.54
The work on piping systems (air, water, oil, steam, gas etc.,) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc., welded on the lines, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and / or as per approved drawings / documents.

6.55
Flow nozzles, orifice, spray nozzles etc., forming part of the system (under this scope of work) irrespective of the supplier shall be mounted / erected after chemical cleaning and / or steam blowing and / oil flushing at site at no extra cost.

6.56

The instrumentations other than an assembled part of the equipments / items are not included in the scope of this works and shall be carried out by other contractors. The fixing and assembly of the thermocouples for IP Turbine including assembly of junction box as per drawing is also in the scope within the quoted rate.

6.57
Certain instruments like pressure switches, gauges, air filters, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismantle such instruments and re erect whenever required prior to commissioning. Sometime this may have to be handed over to store or instrumentation contractor.

6.58
The dampers, actuators etc. will have to be cleaned, checked and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as maybe necessary.

6.59
Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting from BHEL / Customer stores, transport to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.

6.60
Erection of all the piping systems supplied along with equipments, pumps and other auxiliaries covered in this contract is to be erected by the contractor within the quoted rate.

6.61
All piping will be supplied in running metres, contractor has to cut and edge prepare as per the standards / drawings and as per the instruction of BHEL Engineer within the quoted rate.

6.62
Contractor shall also weld small length of piping with root valve to the pressure, temperature, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

6.63
All drains / vents / relief / escape / safety valve piping to various tanks / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.

6.64
Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc., shall be carried out at site by contractor within the quoted rate.

6.65
Tubes or pipes wherever deemed to be convenient will be sent in standard length and will be cut to suit the site conditions and the layouts. Bends less than or equal to NB 65 mm will have to be fabricated at site adopting specified NDT, heat treatment procedures, wherever required at no extra cost.

6.66
All site-fabricated pipes will be issued in running meters as straight. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing.

6.67
For all the site routed piping, as built drawings are to be submitted by the contractor immediately after erection.

6.68
Fine fittings, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. In case any minor modifications are required in these pipelines after completion to meet the system requirements, the same shall be carried out by the contractor within the quoted rate.

6.69
The contractor shall fabricate piping, install lube oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system; carry out the hydraulic test of oil coolers. etc.,

6.70
All the attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing. Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.

6.71
In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.

6.72
For any mismatch while matching the joints in tubes, the cutting, preparing edges afresh, re-welding, addition of spool pieces, adopting specified NDT, heat treatment procedure should be done by the contractor to match site conditions without any extra payment.

6.73
The surface of the pipes to be joined shall be suitably prepared as per instructions of BHEL Engineers. Edge preparation shall be done by chamfering machine, whenever required and all welding surfaces must be cleaned thoroughly.

6.74
Instrumentation drains, stubs which are sent in loose from manufacturing units are to be welded at site as per BHEL Engineer's instructions.

6.75
Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.

6.76
Contractor has to fabricate and erect temporary spool pieces wherever required due to non-receipt of valves in time and after receipt of valves the spool pieces are to be replaced with regular valves at no extra charges to BHEL. For spool pieces materials will be supplied free of cost by BHEL.

6.77
All the valve packing with asbestos base to be lubricated once in 6 months till handing over. Tightening of Stuffing box prior to pre – commissioning is in scope of Contractor. Contractor to check every valves for proper tightness of stuffing box and ensure no leakage from this area as well.

6.78
Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive within the quoted / accepted rate / price.

6.79
In the case of structural members / pipes, plates etc, in certain cases, or in small bore piping for integral cooling water or lubrication system, etc., the raw material will be supplied in random lengths and the contractor will have to make up the length/prepare the edges to suit the matching profiles, weld/bolt connect the joints at no extra cost.

6.80
Permanent Operating / Approach platforms, cross over, canopies, ladders etc., shall have to be fabricated from raw materials supplied by BHEL at free of cost and are to be erected as per instruction of BHEL, by the contractor within the quoted rate / price.

6.81
Additional platforms for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be assembled and erected by contractor. The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement within the quoted rate / price.

6.82
Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., to be provided on the components/ equipments/ pipelines erected by the contractor shall be carried out by the contractor, as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor‘s responsibility even if, the items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package.

6.83
All the dampers, valves, lifting equipments, actuators / power cylinders, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during precommissioning.

6.84
All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection by the contractor. If in the opinion of BHEL Engineer, the

equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor within the quoted rate.

6.85
All the shafts of rotating equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment.

6.86
All the equipments / material to be taken inside the plant building shall be cleaned thoroughly before taking them inside for erection.

6.87
The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints assembly and other components as per instruction of BHEL Engineer during erection.

6.88
All the bearings, Gearboxes etc., of the equipment and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing / gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing / lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.

6.89
All the motors / pumps shall be stripped opened, thoroughly serviced with proper care and re-assembled properly before erection by the contractor. During servicing, pre-commissioning & commissioning, if any deficiency is observed the same should be taken up with BHEL Engineer at site and rectified at site without any delay.

6.90
For skid mounted equipment, dismantling if any, for the convenience of erection / commissioning, checking and re-alignment required at site is in the scope of work.

6.91
Assistance for calibrating / testing the power cylinders/ actuators / valves, gauges, instruments, etc. and setting to actuators / gauges/ instruments shall be provided by contractor within the quoted rates. 1.13.93 Fixing / fitting / welding of thermo wells, stubs, hoses, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification.

6.92
The contractor shall also weld all thermo wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermo wells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermo wells and flow elements with branch pipes be installed and welded.

6.93
Wherever hanger and support materials of piping are not received from manufacturing unit in time, to suit the erection schedule contractor shall erect the piping system on temporary supports to ensure the progress of work. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports. The above work is within the scope of this contract.

6.94
Suspension for pressure parts, piping etc., will be supplied in running lengths and shall be cut to suitable sizes and adjusted as required. Hangers' components which are being supplied in loose shall be assembled at site and erected as part of the work.

6.95
Spring suspensions / constant load hangers have to be preassembled and adjusted for the required loading and erected as per instructions, of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers, etc., have to be carried out as and when required.

6.96
All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain are reliable and complete installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).

6.97
For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold / hot values and locking etc.

6.98
Normally, the machine profile will be cut for the structural members but the contractor will have to carry out suitable alterations / adjustments at site, without any extra payment, in case it becomes necessary. Also, it may sometimes be necessary to remove some of the erected members to facilitate erection of bigger pre assembled equipments. In such case, the removal and re-erection of such members which are essential and if so agreed by the BHEL Engineer will have to be done by the contractor without any extra payment.

13.99
All attachment welding including those for insulation and refractory work coming on the pressure parts shall be done by the contractor. The hooks are suitable for stud welding machines. Contractor's quoted rate shall include all these contingencies. Attachment welding on pressure parts shall be done by qualified and certified welders only.

6.100
Certain extra lengths of portions / parts of various site fabricated components / parts / bellows / piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout. Certain small length of portions / components / bellows / piping casing etc., may have to be added to suit conditions and layouts. Preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work. No extra payment will be admitted for such works.

6.101
All instrumentation impulse lines from equipment / component / pipings upto root valves shall also be erected and welded by TIG welding only by the contractor within their quoted value. The required piping and root valves will be supplied by BHEL free of cost.

6.102
The HT motor bearings shall be blue matched at site and checked for bearing clearance. Scrapping of bearing housing, if required to any extent shall be carried out by the contractor. No extra claim for blue matching of any two surfaces will be entertained. The HT motors will also be checked for air gap and adjustment stator / rotor to magnetic center shall be carried out as part of erection.

6.103
The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.

13.104
HSFG (High Strength Friction Grip) Bolts are to be tightened by turn of nut method / Torque Wrench, as per the instruction of BHEL Engineer. The bolted joints shall be jointly checked by BHEL / Customer personnel for the required tightness and retightened wherever necessary. The tightened bolts shall be identified by color paints. Facility for random checking with calibrated Torque Wrench shall also be provided by contractor.

6.105
The temporary structures / items welded to permanent members / pipes, temporary lugs / structures meant for transportation are to be cut and removed without any damage. In case of any damage, the same has to be made good by the contractor at his cost.

6.106
Contractor has to arrange required fire retardant covering material at their cost to protect the machined components / assembled parts drawn from BHEL before and after erection.

6.107
The contractor shall provide any fixtures, concrete blocks / wooden sleepers, steel structures etc., which are required for temporary supporting for checking / welding / lifting / handling / preassembly of the components at site.

6.108
Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be attended as per directions of BHEL engineer.

13.109
Before lifting the heavy components, soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the winch.

6.110
The end caps provided at shop for various stubs are to be removed during final fit up only.

6.111
For other agencies, such as cabling, instrumentation, insulation, civil works etc., to commence their work from / on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

6.112
The contractor shall conduct non-destructive tests like Radiography, Ultrasonic, Dye penetrant, Magnetic particle tests, etc. on welds, castings, valve bodies & other equipments etc. and Ultrasonic test for finding thickness of materials as per BHEL Engineer's instructions.

6.113
The contractor has to fabricate stainless steel orifice plate within the quoted rate. No extra payment will be made for fabrication of above orifice plates. The required stainless steel plate will be supplied by BHEL.

6.114
All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.

6.115
It is the responsibility of the contractor to do the alignment, checking, etc. if necessary, repeatedly to satisfy BHEL Engineer / Customer Engineers with all the necessary tools and tackles, manpower etc. without any extra cost. The alignment will be completed only when jointly certified so, by the BHEL Engineer & Customer. Also the contractor should ensure that the alignment is not disturbed afterwards.

6.116
Some of the packages may be sent in parts to suit the site condition / transportation, the same is to be assembled at site without any extra cost. Likewise, the package may be assembled together and sent as a single assembly. Contractor may have to dismantle and erect (or) erect as single assembly as per the instruction of BHEL Engineers within the quoted rates / prices.

6.117
The Contractor shall also submit to the Owner for approval a list of construction equipment, erection tools, tackle, etc., prior to commencement of site activities. These tools and tackle shall not be removed from site without written permission of the Owner.

6.118
The works under execution shall be open to inspection and supervision by the Owner at all times. The Contractor shall give reasonable notice to the Owner before covering up or otherwise placing beyond the reach of inspection any work in order that same may be verified, if so desired by the Owner.

6.119
It is responsibility of the Contractor to do the alignment, etc., if necessary, repeatedly to satisfy Owner, with all the necessary tools and tackles, manpower, etc. The alignment will be complete only when jointly

certified by the Contractor's Owner and Owner. The Contractor should also ensure that the alignment is not disturbed afterward.

6.120
All combustible waste and rubbish shall be collected and removed from the worksite at least once each day. Use of undercoated canvas paper, corrugated paper, fabricated carton, and plastic or other flammable materials shall be restricted to the minimum and promptly removed.

6.121
The Contractor shall provide adequate number of fire protection equipment of the required types for its stores, office, temporary structures, labor colony, etc. Personnel trained for fire-fighting shall be made available by the Contractor on site during the entire period of the Contract.

6.122
All workers of the Contractor working in construction site shall wear safety helmets, safety boots, and safety belts. The Contractor shall take appropriate insurance cover against accidents for its workers as well as third parties.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VII Lifting, Shifting & Placement Of Generator Assembly On Foundation By By Strand Jack Method

7.0 LIFTING, SHIFTING & PLACEMENT OF GENERATOR ASSEMBLY ON FOUNDATION BY BY STRAND JACK METHOD

7.1 SCOPE OF WORK

The intent of this specification is to provide on turn-key basis complete design, development of scheme, works & services of fabrication at shop and site as may be required, erection/ installation/ rigging of all temporary structures along with all lifting & shifting equipments (e.g. hydraulic & telescopic lifting & shifting system, strand jacks, power packs with centralised control system, modular structural towers , lifting beams, high capacity wire rope slings, steel plates rolled section for on-site fabrication etc. as may be necessary), all Tools & Plants (e.g. cranes for site handling/ erection /dismantling, welding machines, gas cutting sets, slings, D-shackles, wire ropes, etc), and all manpower requirement i.e. technical and supervisory, skilled, semiskilled, & unskilled manpower for handling, lifting, shifting, lowering and placement of Generator Stator on its specified foundations included but not limited to following:

- Design of the Jacking System
- Supply of Jacking System and its accessories
- All necessary consumables, excluding fuel and or LT Power for the equipments.
- Fuel for the Power Packs
- Provision of all necessary supervision to oversee lifting, operating & dismantling the bidder's equipments.
- Communication system for the jacking operations.
- Manufacturers test certificates for each coil of strand
- Procedure & Write Up for lifting of Generator Assembly from start to Finish.

7.2 Details of Equipment to be lifted:-

Sl No.	Description	Approx. Weight	Aprrox. Dimensions	Approx. CL Elevation of Stator	Likely Lifting Schedule at site
7.2.1 RIL DMD Dahej (3x 90.3 MW)					
1	Generator Assembly Unit# 1	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Nov'14
2	Generator Assembly Unit# 2	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Dec'14
3	Generator Assembly Unit# 3	187 MT	10 m(L)X5.0 m(W)X4.8 m (H)	14.25 m	Jan'15

Chapter-VII Lifting, Shifting & Placement Of Generator Assembly On Foundation By By Strand Jack Method

7.3 Preparatory Civil works

(a) The civil foundations for installation of lifting and shifting arrangements of Strand & Jack system shall be provided by BHEL. Foundation details for Strand Jack tower footings along with load details of Strand jack system on foundations & co-ordinates of the lifting and shifting arrangement will be provided by the contractor well in advance as per requirement of BHEL. (The location of foundation for Strand Jack shall be provided by the bidder). Design of the foundation will be done by BHEL. Inserts for Strand Jack arrangement on TG Deck will be provided by BHEL. Supply of foundation bolts shall be in the scope of contractor.

(b) All other works related to civil foundation other than those mentioned in 7.3(a) above, are to be arranged by the contractor on his own within the quoted rates.

(c) GA and Layout drawings of various equipments of the Power Plant are provided as part of tender document for information of bidders.

7.4. LIFTING, SHIFTING & PLACEMENT OF GENERATOR ASSEMBLY ON ITS FOUNDATION:

(a) The Generator Assembly has to be lifted directly from the transport carrier or from the trailor or from stools /supports & placed on specified foundation. In case packer/ distance piece are required to be provided between the Generator Assembly and the foundation, these will be made available by BHEL to the contractor.

(b) Alignment, Leveling, Bolting & grouting of the Gen. Assembly on their foundations is not included in Contractor scope. However while placing the Generator Assembly on its foundation, this has to be suitably maneuvered to ensure placement in rough alignment with axes and elevation in line with tender conditions.

(c) The Generator Assembly is to be lifted by using lugs/ lifting facility provided specifically for the purpose of lifting /handling on the equipments. No other mode of tying/jacking over the body of Generator Stator is possible/ allowed for lifting/ shifting/lowering purposes.

(d) In any case dragging of Generator Assembly will not be allowed.

(e) Generator Assembly lifting will be done from the service bay.
Generator Assembly has to be lifted directly from the transport carrier and placed on designated foundation. In case if generator stator arrives before arrival / readiness of Strand jack system by contractor, BHEL will unload the stator at the specified position. Contractor shall depute their representative at site at the time of unloading to finalize the suitable position of unloading.

(f) Contractor shall provide swivel arrangement for rotation of Generator Assembly where ever rotation is required.

7.5 Providing temporary structures, access platforms, ladders etc. as required including necessary steels, others materials, consumables, fabrication and erection there of and dismantling after completion of work is part of contractor's scope.

7.6 Contractor should arrange for adequate stock of spares for the entire system so as to ensure continuation of work with least disruption in case of any failures/ faults encountered during operation. Such disruptions/ hold ups should not pose any danger to the safety of equipments being handled. However for erection purpose, power source will be provided by BHEL.

7.7 Before deployment on the job, contractor has to furnish the load test certificates, including overload test certificates as applicable, of all the lifting equipment, wire rope (strand), and material test certificate for the steel being used in the system. Contractor should also submit certificate towards Design adequacy and other safety clearances as applicable.

7.8 After completion of work, contractor shall dismantle the total installation (excluding foundations made for this purpose as specified in foregoing para) and clear the premises of all debris scrap etc and take back all the equipments.

7.9 Contractor shall be solely responsible for watch and ward of his equipment, including while in storage as the case may be.

7.10 Way bills / Entry Permits for movement of Strand Jack Equipment are to be discussed later.

7.11 DRAWINGS AND DOCUMENTS

7.11.1
The technical details and drawing of the Generator Assembly given in this tender specification are only for guidance and only indicative of the requirement. The contractor shall take note of all the aspects of technical details furnished while arranging the required equipments/ materials/services as the case may be.

7.11.2
The detailed drawings, specifications available with BHEL engineers will also form part of this tender specification. Revision of drawings/documents may take place due to various considerations as is normal in such large project. Work will have to be carried out as per revised drawings/ documents. These documents will be made available to the contractor during execution of work at site.

7.11.3
One set of necessary drawings/documents to carry out the erection work will be furnished to the contractor by BHEL.

7.11.4
If any error or ambiguity is discovered in the specification/information contained in the documents/drawings and tender, the contractor shall forthwith bring the same to the notice of BHEL before submission of offer.

7.11.5
In case an ambiguity is detected after award of work, the same must be brought to the notice of BHEL before commencement of the work/activity. BHEL's interpretation in such cases will be final and binding on the contractor.

7.11.6

In case of discrepancy between quoted item rate and corresponding amount in the rate schedule, the quoted item rates shall be reckoned as correct and amount recalculated. Quoted item rates shall also prevail for arriving at the total price quoted for offer evaluation. Offers will evaluated on the total amount for the entire Rate Schedule and the work will be awarded without splitting the scope.

7.11.7

Bank Guarantees to be furnished by the contractor towards Security Deposit shall have a claim period of six months over and above the validity period required for the respective cases.

LIST OF DRAWINGS ATTACHED

- TG Equipment Layout Plan at 0.0M (Refer Ann. – 1)
- TG Hall Equipment Layout Plan at 13.0 M Level (Refer Ann. – 1)
- Plan showing tentative tower foundation arrangement for Generator Assembly lifting (Refer Ann.-1)
- Interface /Route plan for trailer movement at Hazira location(Refer Ann.-43)

8.0 **MATERIAL HANDLING & SITE STORAGE**

8.1
Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.

8.2
Contractor shall plan and transport equipments, components from storage yard to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.

8.3
The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

8.4
Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

8.5
Materials shall be stacked neatly, preserved and stored in the contractor‘s shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

8.6
Open ends of piping valves, pipes and tubes shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

8.7
The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting of the components at site.

8.8
The contractor shall deploy minimum two (2) persons continuously on daily basis for organizing, receiving the consignment, checking the complete list of material received with each consignment, entering into the receipt records, organizing for storage at the proper place, maintain the store records. These persons will provide all logistic support to the BHEL material management personnel. Besides these two persons, the contractor will be required to deploy continuously minimum three (3) more workers on daily basis for material handling functions. However, based on the instructions of the BHEL Engineer more manpower shall be deployed by the contractor as per the requirement for material handling functions.

9.0 HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS

9.1
Contractor shall carry out the following tests required to complete the erection and commissioning of the TG Set:

(1) Hydraulic testing of individual equipments like coolers, heaters, other auxiliaries, equipment's and piping. Required capacity Hydraulic test pump/Fill pump and other necessary arrangement shall be provided by contractor to carry out hydraulic testing. Chemical cleaning of the equipments and piping as part of scope of work under this tender specification.
(2) Ultrasonic test
(3) Dye Penetrant test
(4) Magnetic Particle Test.

All above facilities (men, materials, equipments, consumables etc) with operating engineer/experienced person and proper approach wherever required shall be provided by the contractor for satisfactory completion of the above tests.

9.2
Contractor shall lay all necessary temporary piping, welding, supports, install pumps, valves, pressure gauges, electric cables and switches etc, required for the Hydro test, Air leak test, Chemical cleaning, Steam blowing etc.. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting above tests will be done by the contractor. No separate payment shall be made for this purpose.

9.3
All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.

9.4
Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by contractor. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

9.5
Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

9.6
While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions. Blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some–times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same

as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor.

The contractor shall carry out any other tests as desired by BHEL engineers on erected equipment covered in the scope of this contract during testing and commissioning to demonstrate the satisfactory completion of any part or whole of work performed by the contractor.

10.0 PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING

10.1
Commissioning of the TG equipments with associated Aux. and other Equipments with auxiliaries shall involve the following tests and activities of the equipments erected:

(a) Trial run of Boiler Feed Pumps, CEP, Booster Pump, etc and other pumps/equipments like Misc. pumps etc. and other various rotating machineries / pumps as per tender specification.

(b) Trial run of motors/ drives for various auxiliaries.

(c) Hydraulic Test, Chemical Cleaning, Oil flushing of lube oil system, Jacking oil/Lifting oil, HP oil supply system, Governing oil system/Control oil system, Air cleaning/blowing of pipelines, closed systems, Tanks and Vessels.

(d) Flushing of all pipelines by air/oil/water/Chemicals/steam as the case may be.

(e) Servicing of all valves, Hydraulic Power cylinders, HP Valves (ESV), HP Control valves, QCNRV etc. and fittings.

(f) Manual/mechanical cleaning of Oil tanks, Suction Strainers / Filter elements of BFP, Booster Pump, Misc. Pumps, and other various equipments & tanks /vessels erected by the contractor. This may have to be repeated several times during the commissioning process.

(g) Chemical cleaning of piping systems, as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components gauges, instruments etc. as instructed by BHEL during this process.

(h) Putting turbine on barring gear.

(i) Rolling and synchronization.

(j) Full load operation.

(k) Trial operation

The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements.

10.2
Contractor shall lay temporary pipelines with fittings and accessories etc. as instructed by BHEL engineer for the purpose of pre-commissioning and commissioning activities like Hydraulic testing, chemical cleaning, oil flushing, steam blowing etc. of piping and other equipments as part of the scope of work. Temporary installations shall be dismantled by contractor and returned to BHEL stores as specified elsewhere in this T.S.

10.3
The contractor shall provide necessary assistance to facilitate/enable electrical and instrumentation testing and commissioning of equipments under this scope of work, to BHEL and their Testing & Commissioning agency.

10.4
The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor.

10.5
In case any malfunctioning and / or defect is found during tests / trial runs such as loose components, undue noise or vibrations, strain on connected equipments etc. The contractor shall immediately attend to these defects/ malfunctioning and take necessary corrective measures. If any readjustment and realignments are necessary, the same shall be done as per BHEL engineer's instructions, free of cost.

10.6
The cleaning of Lube oil tank etc. is in general by wire brush / abrasive paper etc. In case of tenacious rusting spots found if any, the same shall be cleaned thoroughly mechanically by buffing wheel etc. If manual / mechanical cleaning is not proper, the cleaning by sand blasting as per instructions of BHEL engineer before and after oil flushing is responsibility of contractor.

10.7
The contractor shall associate for initial and subsequent fillings of gas in generator gas system as and when required till unit is handed over to Customer.

10.8
The contractor shall carry out leak test of generator air cooling system to the satisfaction of BHEL engineer.

10.9
Replacing/changing mechanical/other seals of equipment, pumps etc. during commissioning stage is within the scope of work.

10.10
During the stages of commissioning, and till Unit is handed over, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to the contractor will be governed by relevant clauses of 'General Conditions of Contract'. The parts to be replaced shall however, be provided by BHEL free of cost.

10.11
During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned units are taken over by the customer.

10.12
In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, strain on connected equipment etc., The contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment or realignment is necessary, same shall be done as per BHEL engineer's instruction.

10.13
The pre-commissioning activities will start prior to Lube oil, HP Oil supply System, Governing/ Control oil flushing etc. of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need specialized gangs including electricians, Instrument Technicians, Fitters, in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required.

10.14
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, without any extra payment.

10.15
After the start of commercial operation of machine, commissioning activities will continue. It shall be the responsibility of contractor to provide following manpower along with supervisor as part of commissioning assistance for a period of three months per Unit.

1) Supervisor	2 Nos.
2) Pipe fitter/Millwright fitter	2 Nos.
3) Welder	2 Nos.
4) Rigger	2 Nos.
5) Electrician/instrument technician	1 No. each
6) Unskilled worker	6 Nos.

10.16
The above figures shows only minimum required over and above labour required for completing pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand.

10.17
It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL commissioning engineers.

10.18
During commissioning, opening of valves, changing of gaskets, checking, realigning of rotating and other equipment, attending to leakages in piping, tanks etc. and adjustments of erected equipment may arise. Valves shall be serviced and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions.

10.19
It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specifications, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

The scope of the work will comprise of but not limited to the following: (All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

11.1
The equipments and piping shall be erected in conformity with the standard / Indian Boiler Regulations / and as may be directed as per any other standard / specification in practice in BHEL. The method of welding (viz) MMAW, Gas, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions.

11.2
The technical particulars, specifications and other general details of work
shall be in accordance with ASME / IBR / BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.

11.3
The contractor shall conduct nondestructive tests like radiography ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc., on weld joints, castings, valve bodies and other equipments etc., as per BHEL Engineer's instructions.

11.4
Welding of pressure parts, piping & fittings (under IBR code) shall be done by certified high pressure welders who possess valid certificate of CIB of the State in which the equipment is erected as per provision of IBR. The H.P. welder who possesses necessary certificate shall ensure re-validation as per relevant provisions of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired shall not be utilized for high pressure works.

11.5
Welding of high tensile structural steel shall be done by “certified high pressure welders” who possess valid certificate and who are approved by BHEL Engineer.

11.6
All welders including tack welders, structural and high pressure welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification AND performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.

11.7
All charges towards testing of welders for destructive and non-destructive testing and approval of welders for engaging in the erection work shall be borne by the contractor.

11.8
All expenses for testing of contractor's welders (pre-production test) including destructive and Non-destructive tests conducted by BHEL or by the inspecting authority at site or at laboratory shall have to be borne by the contractor only. Limited quantity of tube and pipe material required for making test pieces will be supplied by BHEL free of cost and all testing facility shall be made available by the contractor.

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

11.9
BHEL Engineer is entitled to stop any welder from the work if his performance is unsatisfactory for any technical reason or if there is a high percentage of rejection in the joints welded by him. The welders having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.

11.10
The contractor shall carry out the root run welding of all Piping, valves by TIG welding method as specified in the Drawing / EWS. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall carry out purging the pipes with inert gas before and during welding.

11.11
All welded joints for temporary piping required for chemical cleaning and steam blowing should be got done by HP welders only. The root run should be done by TIG welding. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.

11.12
The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.

11.13
The thermostat and thermometer of electrode drying oven shall be also calibrated. All welders shall have electrodes drying portable oven at the work spot.

11.14
Pre -heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary are part of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer and as specified in Erection Welding Schedule, Welding, Heat Treatment & NDT manuals and Field Quality Plan. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

11.15
Preheating, post weld heating and stress relieving after welding are part of erectors work and shall be performed by the contractor in accordance with the instructions of BHEL Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the contractor shall have to arrange for labour, all heating elements thermocouples etc. insulating materials like mineral wool, asbestos, clothes, ceramic beads, asbestos ropes etc., required for heat treatment and stress relieving works.

11.16
Preheating, post weld heating and stress relieving after welding are part of erectors work and shall be performed by the contractor in accordance with the instructions of BHEL Engineer.

11.17
Oxy-acetylene flame heating or exo-thermic chemical heating for stress relieving is not permitted. Heating shall be by means of Electric Induction coil or Electric resistance coil. Potentiometric type recorders shall only be used for temperature recording purposes.

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

11.18
Contractor shall arrange all necessary heating and stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, compensating cables, thermo-chalks, temperature recorders, thermocouple attachment units, graph sheets, insulating materials like wools, asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress-relieving operations. The contractor should take a note of the following, Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL. All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost. The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of Stress Relieving operations.

11.19
The contractor shall also be equipped for carrying out other NDT like LPI / MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required also has to be arranged by the contractor.

11.20
All arrangements for carrying out radiography work including radiography source & equipments and consumables, dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies shall be submitted to BHEL Engineer and approval obtained before the actual deployment of agency for radiography work.

11.21
Contractor shall note that 100% radiography will be done at the initial stages on the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radiographed shall not be less than the requirement of BHEL welding schedule / specifications / drawings / Customer‘s requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. For LP Piping, as per site engineer‘s instructions, NDT method and other tests to be carried out.

11.22
Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including safety, labour, supervisors/ Engineer required for the work as per directions of BHEL.

11.23
The Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR, enclosed. However percentage radiography shown in the respective drawings shall be final and binding on the contractors.

11.24

Low speed high contrast fine grain films (D7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5. to 2.00 1.15.25 Penetrameter as per ASME / ISO shall be used for all exposures.

11.26
All radiographs shall be free from mechanical / chemical process marks to the extent that they shall not confuse the radiographic image and defect finding penetrameter as per ASME / SI shall be used for all exposures.

11.27
Lead numbers and letters (generally of 6mm size) are to be used for identification of radiographs. Contract No., joints identification, sources used, welders identification, SFD used are to be noted down in the paper cover of radiography. Lead intensifying screens for front and back of the film shall be used as per the instructions of BHEL Engineer.

11.28
The weld joint is to be marked with permanent mark A, B, C, etc. to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the downstream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.

11.29
The contractor shall be fully equipped with radiography equipments, films, chemicals and other dark room facilities. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor‘s radiographers shall also be registered with BARC for film badge service.

11.30
Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work.

11.31
If the contractor does not carry out radiography work in time due to nonavailability of film, chemicals etc. BHEL shall get the work done through some other agency at the risk and cost of the contractor.

11.32
All the radiographic films of joints radiographed at site in connection with work of this tender shall be properly preserved in air-conditioned rooms and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL/customer.

11.33
Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced immediately.

11.34

The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radiographed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.

11.35
Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radiographed and new film submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and reradiographed at contractor's cost.

11.36
Radiography work of the welds connected with this contract shall be arranged by the contractor including provisions of services of technicians and necessary equipment and consumables like Isotope camera, X-Ray films, chemicals and other dark room facilities etc. Also contractor has to provide necessary labour required such as Riggers, Helpers etc. to assist the technicians for carrying the above radiography work and making other arrangements. Such as providing scaffolding, approaches, platform lighting arrangements at his cost as per the instructions of BHEL. It may please be noted that invariably the radiography will be carried out after the normal working hours only.

11.37
Radiography inspection of welds shall be performed in accordance with the requirements and recommendation of BHEL Engineer. The Minimum extent of radiographic inspection shall be as per BHEL Drawings / provision of IBR Regulations. They may however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer / Boiler inspection authority.

11.38
Contractor has to make his own arrangements for air conditioned dark room to process the radiographs.

11.39
BHEL Engineer reserves the right to alter the quantum of radiography of joints. The decision of the BHEL Engineer in this regard is fixed and final and binding on the contractor. Any defects as pointed out by BHEL Engineer shall have to be rectified by the contractor at his cost.

11.40
It may also become necessary to adopt inter layer Radiography / MPT/ UT depending upon the site / technical / requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The tenderers shall take all this into account and quote the price inclusive of all such work and radiography.

11.41
All field joints shall be subjected to dye penetrant examination as specified in the respective drawings and shall have to be accepted by BHEL Engineer. Any rectifications required shall have to be done by the contractor at his cost.

11.42

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.

11.43
The welded surface irrespective of place of welding shall be cleaned of slag and painted with primer paint to prevent corrosion at no extra cost.

11.44
The contractor shall have to do root run by TIG process, wherever required as per the instruction of BHEL Engineer.

11.45
All welds shall be painted with primer as specified in the painting schedule, once radiography and stress relieving works are over.

11.46
Erection of equipment involves good quality of Welding, Heat treatment and Non Destructive Testing. Wherever required, 100% dye penetration tests have to be carried out as per instructions of BHEL Engineer. Contractor's Engineers, Supervisors, Technicians and workers engaged should have adequate knowledge on the above works.

11.47
The contractor shall maintain a record in the format as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or otherwise of the welds shall be final.

11.48
Approval Given by Customer / BHEL for welding, results tests etc. shall also be recorded in the log book.

11.49
All site welded joints shall be subjected to acceptance by BHEL / Customer Engineer.

11.50
All the data such as heating temperatures, heating rate, soaking time, maximum temperature reached during heat treatment shall be properly recorded and documented which will be property of BHEL.

17.51
Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. Prior to any repair approval shall be obtain from BHEL Engineer for the procedure for the repair of defective welds. After the repair has been carried out, the compliance document shall be submitted to the quality engineer.

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

11.52
The contractor shall carry out the edge preparation of weld joints at site in accordance with details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting will be allowed only for edge preparation.

11.53
All the prepared / patched edges will have to be suitably protected to prevent rusting or foreign material ingression.

11.54
All necessary preheating, post heating of welds and stress relieving operation of welds are part of the erection work and shall be performed by the contractor in accordance with the relevant regulations and standards of BHEL practice and to the satisfaction of BHEL Engineer and in accordance with the drawings and specifications.

11.55
Welding of Hangers, supports, stubs and impulse piping to be carried out by the contractor as per drawing specification and as per BHEL Engineer's instructions. According to drawing specifications and as per BHEL Engineer's instructions preheating post-heating stress relieving etc. have to be carried out by the contractor wherever necessary.

11.56
All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination, magnuflux, and ultrasonic testing shall be employed wherever necessary / recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed.

11.57
Statutory payments in respect of IBR approvals including inspection for design and manufacturer of equipment shall be made by the Contractor. All payment for erection and testing at site shall also be made by the Contractor. In such case, Contractor's scope shall also be extended to preparation of all necessary documents, coordination, and followup with IBR authorities for above approval.

11.58
All safety precautions shall be taken for welding and cutting operations as per IS-818.

11.59
Welding shall be done in accordance with IS-813, IS-816, IS-9595, and other relevant IS/international standards and as per instructions of Contractor. Only those welders who are qualified as per IS-817 for ordinary welds and as per IBR/ASME Section-IX for high pressure welds shall be employed on the job.

11.60
All welders shall be tested and approved by Owner before they are actually engaged on the work even though they may possess the requisite certificates. The Owner reserves the right to reject any welder without assigning any reason. The welder identification code as approved by the Owner shall be stamped by

the welder on each joint done by him or her. The Contractor will be responsible for the periodic renewal and re-testing of the welders as demanded by Owner.

11.61
All electrodes shall be baked and dried in the electric/electrode drying oven to the required temperature and for the period specified by the Owner before they are used in erection work. The electrodes used shall be as per IS-814, IS-815, IS-1442, IS-7280, and other codes as applicable, and shall be of approved reputed manufacture. The electrodes shall meet the requirement of the pipe material. No electrode manufactured more than 12 months ago and the type covered under certificate issued after conducting tests more than 6 months ago shall be used. All electrodes shall be preserved at works and at site as per manufacturer's recommendations.

11.62
Following will be stages of inspection during welding:
a) Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensionally and to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage will depend upon on criticality as specified by Owner.
b) Joint fit-up will be a stage of inspection. Misalignment after fit-up may vary from 0.3 mm to 1.6 mm depending on outside diameter and thickness.
c) All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

11.63
All welded joints shall be painted with anti-corrosive paint immediately on completion of radiography and stress-relieving.

11.64
All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other international equivalent standard acceptable to the Owner.
All brazers, welders, etc., employed on any part of the contract at the Contractor's / subcontractors' works or at the site shall be qualified as per ASME Section IX or BS-4871 or equivalent international standard approved by the Owner. Such qualification tests shall be conducted in the presence of the Owner/Authorized Representative.

11.65

Welding Electrodes for P91, Filler wires for IBR piping will be provided free of cost, Bidder to take utmost care for preservation and provide utilization report. Procurement of balance electrodes, filler wires are in bidder's scope.

11.66
Contractor to adopt following "Field Welding Schedule" for Piping Field Joints

Chapter-XI WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

FIELD WELDING SCHEDULE

PROJECT: FWS NO.:

CONTRACTOR: REV NO.:

PACKAGE: FIELD WELDING CODE:

SYSTEM: PAGE NO.:

Sl No.	Drawing No. for Weld Locations & Identification Mark	Description of Parts to be Welded	Material Specification	Dimensions	Process of Welding	Type of Weld	Electrode Filler Specification	WPS No.	Minimum Pre-heat Temperature	Heat Treatment Temperature [Holding Time in secs]	NDT Method Quantum	NDT Specifi-cation Number	Accep-tance Norm Ref.	Remarks

The Field Welding Schedule should be submitted for:

- Pressure Parts
- Tanks/Vessels
- Piping
- Heavy/Important Structural Steel
- Heat Exchangers
- Bus Ducts

Chapter-XII ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

12.1
Contractor shall lay and erect temporary pipelines with fittings and accessories and also erect/commission the chemical cleaning/circulating pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing of piping and shall provide all other arrangements as per requirement as part of scope of work. Contractor has to be arranged the chemical cleaning pumps. The required DM water and Steam will be provided by BHEL free of cost.

It shall be specifically noted by the contractor that all pipes for above works shall be supplied in random length and in loose condition. Contractor has to assemble and erect them as per schemes / drawings provided by BHEL. Further, flanges bend etc. for completing the scheme shall be machined/ fabricated by the contractor at his own cost. However, plates / steel etc. for the same will be provided by BHEL free of charges.

12.2
After the chemical cleaning/Flushing have been successfully completed, dismantling of all temporary installations as instructed by BHEL is within the scope of work under this specification. The dismantled materials shall be dressed and returned to BHEL as stated elsewhere in this tender spec.

12.3
Preservation of the cleaned surfaces will be the responsibility of contractor under the guidance of BHEL engineer.

12.4
Hydraulic test of temporary piping is to be carried out as per the instructions of BHEL Engineer. Carrying out repairs, if any, is in the scope of work/specification.

12.5
For chemical cleaning of the piping system, contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected is in the scope of contractor or not. Decision of BHEL Engineer in this regard will be final and binding on the contractor.

12.6
During the initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging and emptying. Necessary low point drains and temporary piping for this will have to be provided by contractor from materials provided by BHEL.

12.7
Laying effluent discharge line from mixing tank (for acid cleaning or any other chemical cleaning process) as per the instructions of BHEL engineer and dismantling, servicing for preservation and handing over the same to BHEL stores after completion of the job is within the scope of work/specification.

12.8
Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge should be carried out.

Chapter-XII ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

12.9

Contractor shall also carry out the repairs or attend leaks etc., in the temporary piping and equipments for the above operations / activities while carrying out the above activities / operations.

12.10

For chemical cleaning of system which consist of equipment/piping erected by the contractor and also equipment/piping erected by other contractors of BHEL/customer's contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilized by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decisions on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on the contractor.

12.11

Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL. No separate payment on this account shall be entertained.

12.12

After acid cleaning/pickling of lubricating system (including oil piping of lube oil system, HP Oil supply system, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems etc. as per instructions of BHEL Engineer is carried out, Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc. is the responsibility of the contractor.

12.13

For full welding of structures, tanks and piping etc., only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.

12.14

Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load shall be the responsibility of contractor as part of scope of work.

12.15

The guidelines stipulated in the Technical specification for Main steam system chemical cleaning (10090/91-SS-M31-BEF-0003) and air steam blowing (10090/91-SS-M31-BEF-0001) shall be followed.

The same is enclosed in Annexure

Chapter-XII ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

13.0 FINAL PAINTING

13.1

All exposed metal parts of the equipment including piping, structures, railings etc wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by BHEL engineer for painting. Afterwards, the above parts shall be finished with two coats as per painting specification.

13.2 Touch-up painting on damaged areas –

a) For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.
Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush/spray within maximum seven (7) days of application of touch up primer.
Painting scheme is enclosed for information at relevant annexure. However, for execution only the latest document shall be applicable and no claim whatsoever shall be entertained in case of any variance between such documents. Similarly, documents as provided progressively during the execution of work for all other products/ equipments etc shall be applicable.

13.3

Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.

(a.) Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.
(b.) Painting procedure to be followed as mentioned above for touch-up painting on damaged areas.

13.4

The scope of work includes painting of colour bands, lettering, marking and signs for direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/customer engineer at site for the equipments/ components covered in these specifications.

13.5

All exposed metal parts of the equipment including piping, structures, hand railing, grating etc shall be thoroughly cleaned off dust, rust, scales and other foreign materials by manual or mechanised wire brushing, scrapping, sand blasting etc and the same being inspected and approved by BHEL/customer engineer before application of primer. Afterwards, the above parts shall be finish painted with specified number of coats as per specification.

13.6

In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

13.7 Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents. The contractor at his own cost shall provide all the consumables and application implements.

13.8

During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, contractor shall repair the same free of cost to BHEL.

13.9

Specified drying time shall be permitted from one to another coat.

13.10

This work requires working at higher altitudes from ground level to as high as 30 m and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

13.11

Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by contractor, BHEL shall have the right to recover the cost of such damages from the contractor.

13.12

Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the contractor without any extra charges.

13.13

In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush/spray painting. However, areas/equipment inaccessible for manual painting has to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the contractor. For the purpose of spray painting, air at one point will be made available by BHEL free. Laying of air hose pipe and any other line required shall be done by contractor at his cost. The contractor shall provide spray equipment set.

13.14

The contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during execution of the work.

13.15

Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions

14.1
Application of thermal insulation (Pyrogel-Mineral Wool), finishing, cladding and outer casing etc of the following:

1 TG Piping
2. Other equipments including BOI's, though not listed above but required for completion
3. ST-TG auxiliaries including, but not limited, to heat exchangers, pumps, tanks and vessels and other equipments
4. Application of spray insulation on turbine is by others

14.2
The work shall conform to dimension and tolerances specified in the various drawing and documents that will be provided during the execution. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost. Failing which the work will be got done by engaging other agencies or departmentally and recoveries will be dedicated from contractor's bills towards expenditure incurred including 30% departmental charges.

14.3
The terminal points as decided by BHEL shall be final and binding on the contractor.

14.4
All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc required will be supplied by BHEL and the same have to be erected/ applied as per the drawings and specifications of BHEL by the contractor.

14.5
The contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.

14.6
Contractor shall observe all precaution for laying, curing etc of pourable insulation. The contractor at his own cost shall redo any defective works found.

14.7
Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipments. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipments/ systems covered under the scope of work.

14.8
Cutting & dressing of insulation bricks to suit the site area of application is incidental to work.

14.9
Removable type of insulation has to be provided for valves fittings, expansion joints etc as per drawing or as directed by BHEL engineer.

14.10
The cladding and outer casing are aluminium sheets. All relevant specifications and procedures with regards to beading, sealing etc for alunimium sheets have to be adhered to.

14.11
Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather.

14.12
The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by BHEL free of cost.

14.13
To take care of bimetal corrosion due to variety of metals in contact of each other viz retainer to support, support to outer casing/cladding, cladding-to-cladding etc, suitable paints specified by BHEL, to be applied and/or neoprene rubber packing/strips or any other insert may have to be fixed as required.

14.14
The contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL engineer to facilitate inspection or during commissioning to fix gauges, fittings, instruments etc. These gaps will have to be finished as per drawings at later date by the contractor at his cost.

Contractor shall cut open works in needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.

14.15
A log book shall be maintained by the contractor for the clearance of the area for application of refractory and insulation where the contractor does the work on his own accord without prior permission. The work should be re-done, at his own cost, where necessitated.

14.16
Wastage allowances for the material issued are envisaged as follows:

A	Pourable & castable insulation	-	2%
B	Insulation bricks and motor	-	2%
C	Wool mattresses	-	2%
D	Cladding sheets	-	2%

The wastage allowance will be applicable on the net issued quantity i.e. Total quantity issued reduced by the quantity returned to stores as unused/fresh item. Contractor shall reconcile the material issues periodically as prescribed by BHEL site. Payment for the done will be regulated as per relevant section.

14.17
The following works are also included in the scope of this contract:

- Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint shall be arranged by contractor.

- Cutting of the wool mattresses to the required shape and application of finishing cement of required thickness wherever required.

14.18
Insulation work of temporary piping for alkali boil out, steam blowing and chemical cleaning has to be carried out at site. The same have to be removed and returned to the BHEL stores after the completion of activity. Rates quoted for application of wool for boiler and auxiliaries will be applicable for this work also. No separate payment will be made for removal of temporary insulation and return of the same to BHEL stores/yard.

14.19
In certain instances, co-ordinated/ phased application of castable refractory/ insulation on pressure parts etc may be necessitated in consideration of sequence of activities of other erection agencies. Contractor shall do such phased work as may be directed by BHEL.

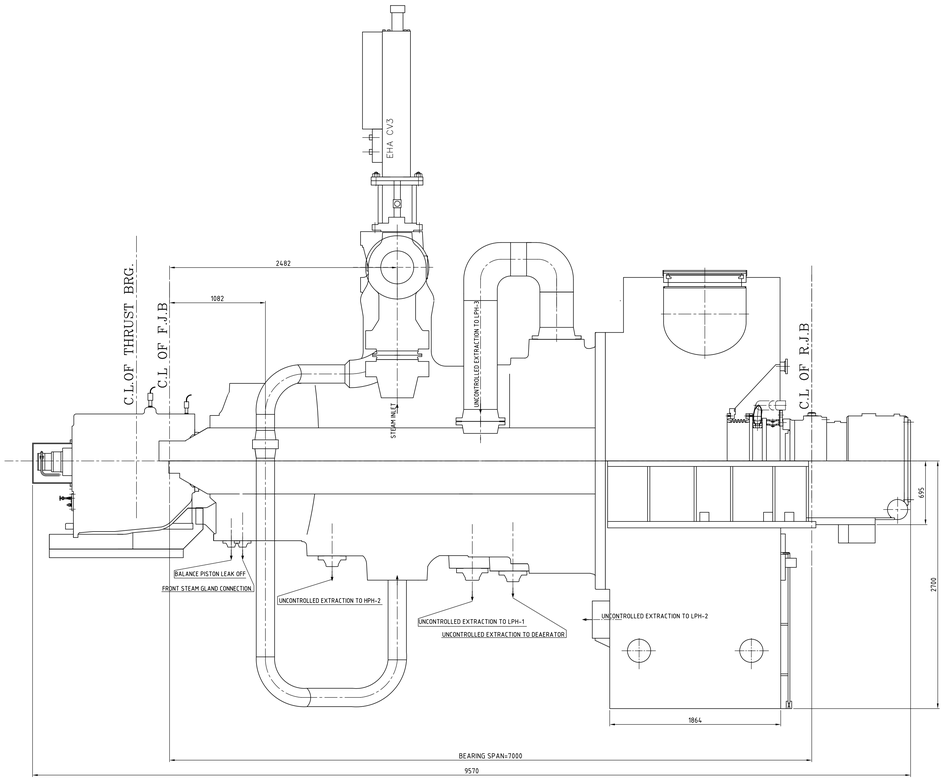
14.20
Prior to application of refractory bituminous painting on the pressure parts and other area is under contractor scope. The bituminous paint shall be arranged by contractor. No separate payment will be made for application of paint

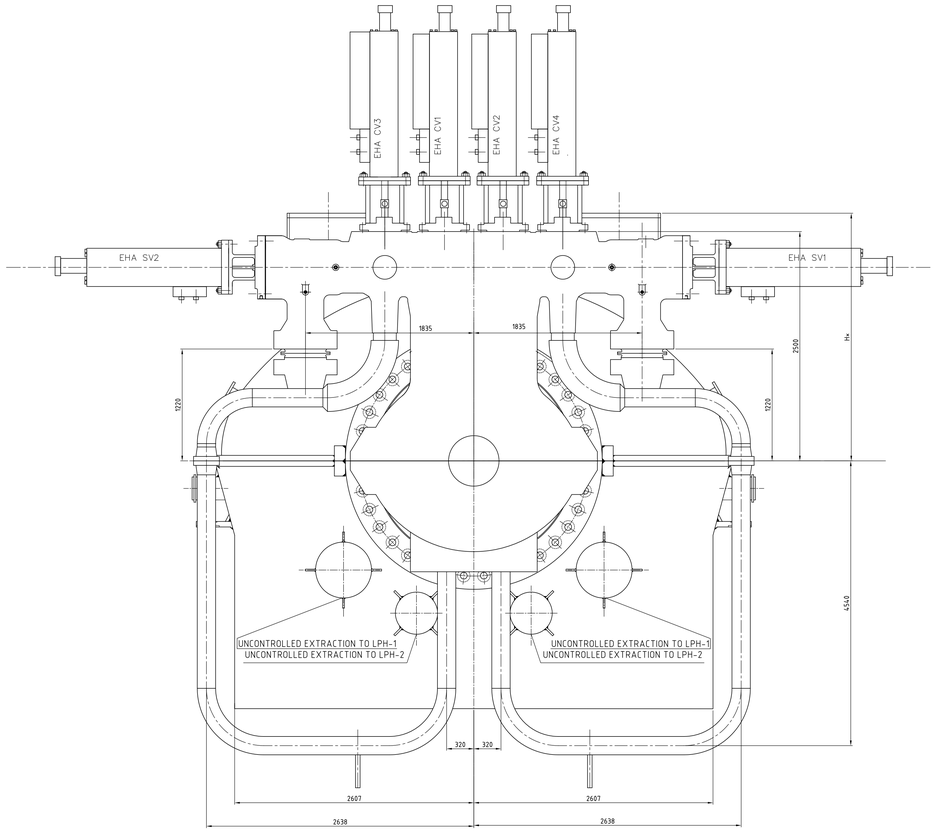
FIRST ANGLE PROJECTION

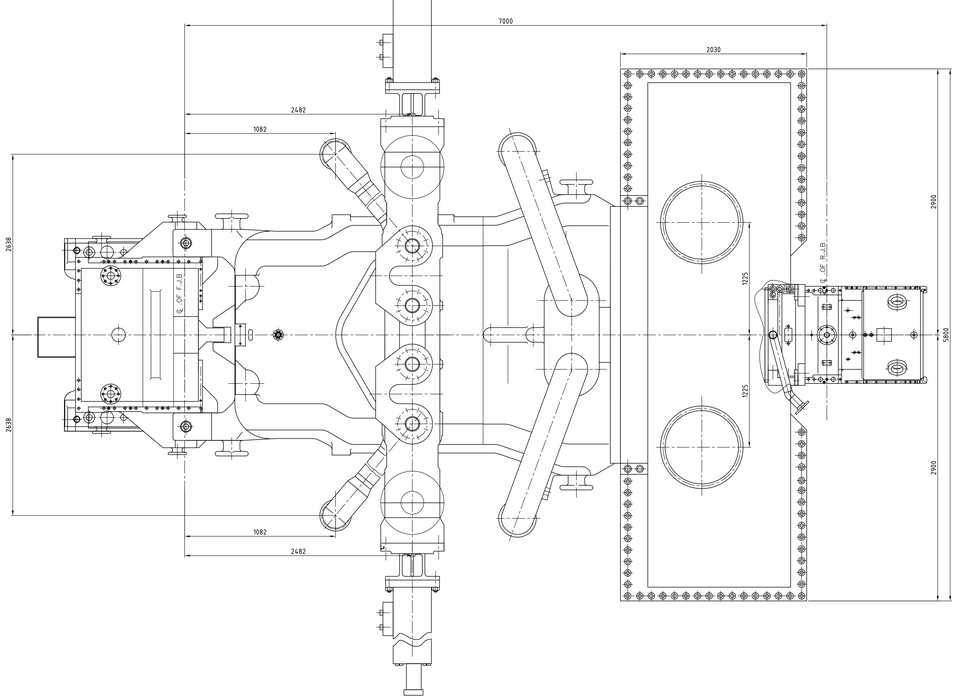
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-30771-00109

SHT. x OF x







WEIGHT OF TURBINE	180000 Kg.
WEIGHT OF ROTOR	34000 Kg.
WEIGHT OF THE SINGLE HEAVIEST PART (OUTER CASING U.P + EXH. HOOD U.P)	55000Kg.
DIRECTION OF ROTATION (WHEN VIEWED FROM TURBINE FRONT TO REAR)	COUNTER CLOCK WISE
TURBINE SPEED	3000RPM.
BEARING SPAN	7000mm.

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPAY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

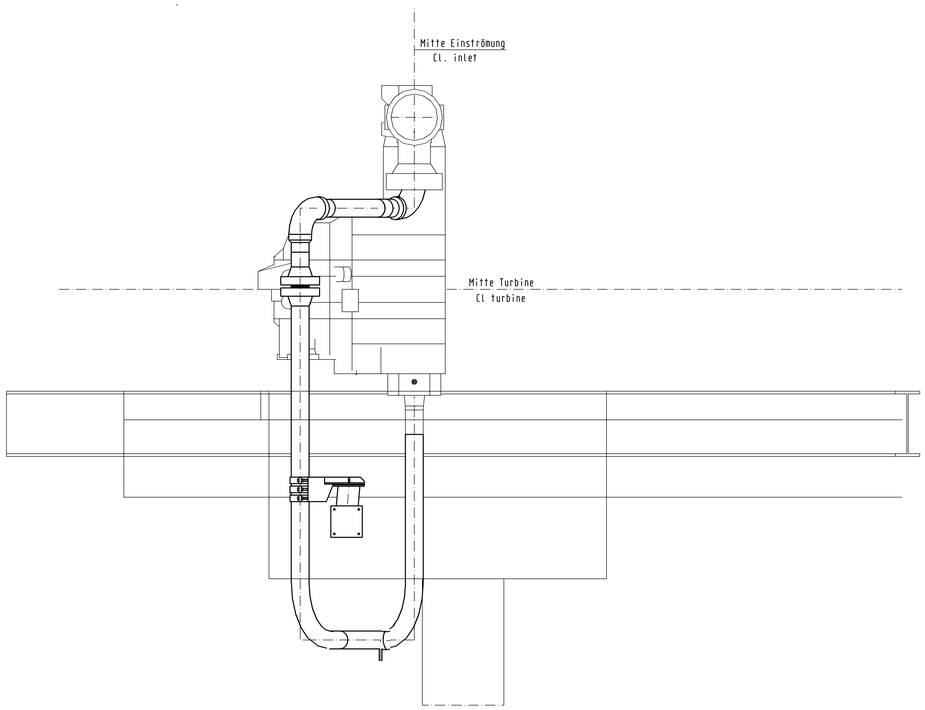
INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME XXXXXXXXXXX-SXX-RXX

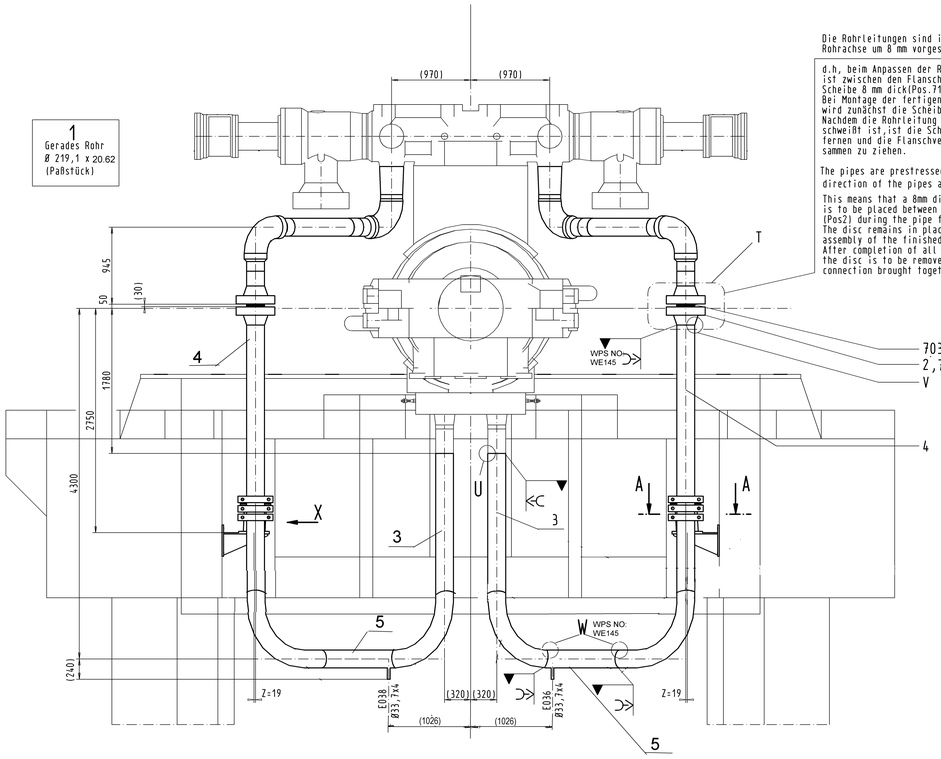
| REVISION REASON: IF1/ IFA/ IFD/ IFC/ CANC | | |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SH. 01 OF 01 DRG. NO. 0-308-59-00003



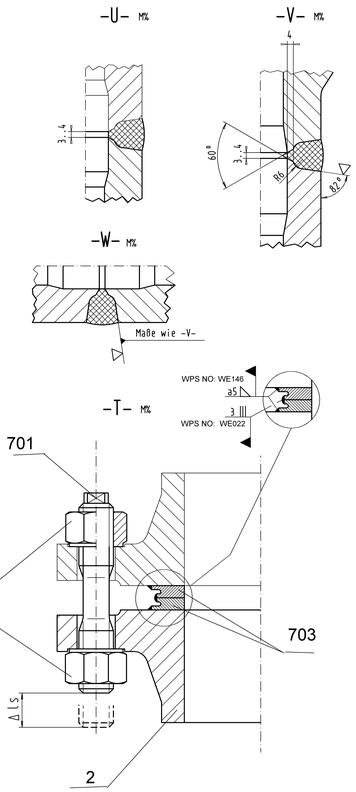


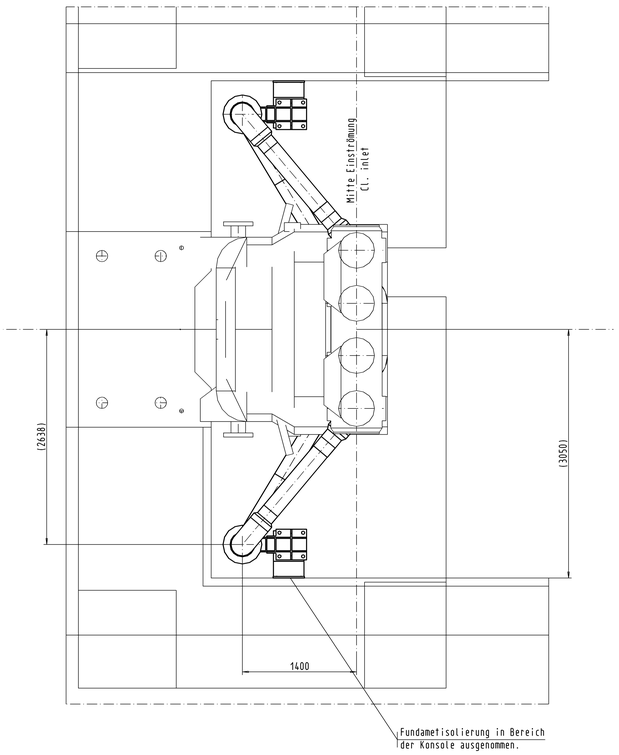
Die Rohrleitungen sind in Richtung der Rohrachse um 8 mm vorgespannt;

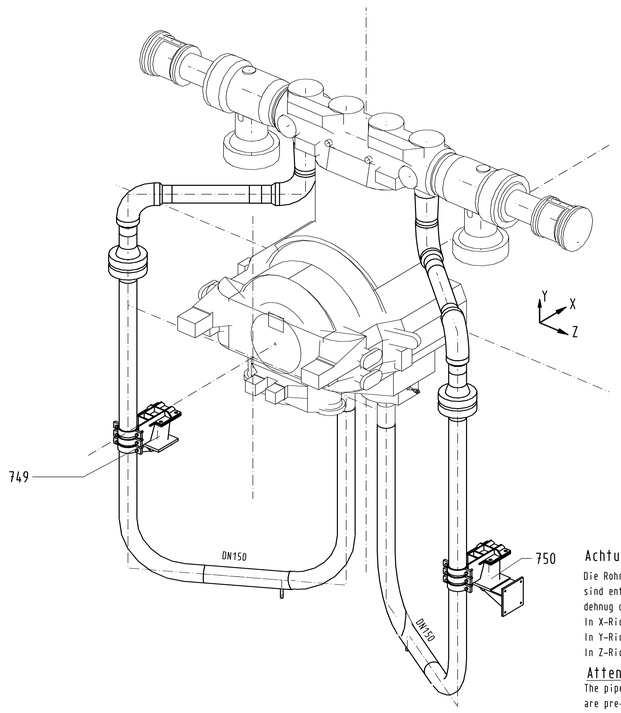
d.h, beim Anpassen der Rohrleitungen ist zwischen den Flanschen (Pos.2) eine Scheibe 8 mm dick(Pos.710)einzubauen. Bei Montage der fertigen Rohrleitung wird zunächst die Scheibe mit eingebaut. Nachdem die Rohrleitung kompl.verschweißt ist,ist die Scheibe zu entfernen und die Flanschverbindung zusammen zu ziehen.

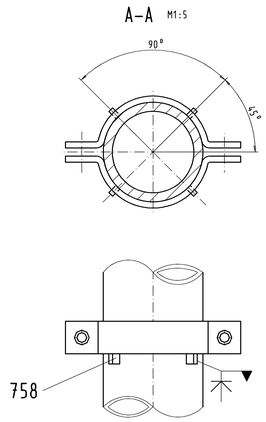
The pipes are prestressed by 8mm in the direction of the pipes axis.

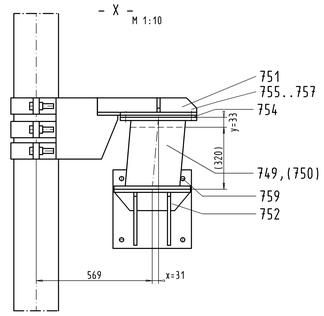
This means that a 8mm disc (Temporarily) is to be placed between the flanges (Pos2) during the pipe fitting work. The disc remains in place during the assembly of the finished pipe. After completion of all welding work the disc is to be removed and the flange connection brought together.











APPLICABLE WPS:

1) FOR POS. 703 TO 703 WPS NO: WE022
2) FOR POS. 2 TO 703 WPS NO: WE0146
3) FOR POS. 3 TO POS. 5 WPS NO: WE0145
4) FOR POS. 4 TO POS. 5 WPS NO: WE0145

NOTES:-

1. CLASSIFICATION OF WELDS ,THEIR INSPECTION,TESTING,AND ACCEPTENCE AS PER AA0622101 GRADE - I
2. TO BE PRESSURE TESTED TO 210 ata
3. INTER CONNECTING PIPING TO BE MATCHED WITH MAIN STEAM TOP & BOTTOM CONNECTING POINTS AND THEN ONLY FINAL WELDING IS TO BE CARRIED OUT.
4. ALL BUTT WELDS TO BE 100% RADIOGRAPHED AND FILLET WELDS TO BE 100% D.P TESTED.
5. FOR FUSION FACES REFER PLANT STANDARD:HY0620599
6. PIPING MATERIAL SPECIFICATION HY10634 ASTM SA335-P91
7. CLEANING & PAINTING OF PIPES AS PER PLANT STD: HY 0674162
8. GENERAL QUALITY REQUIREMENTS FOR PIPING AS PER PS: TC 76001
9. POST WELD HEAT TREATMENT AS APPLICABLE SHOULD BE AS PER PARA 132 OF ASME B31.1
10. HYDRAULIC PRESSURE TESTING SHALL BE CARRIED OUT AS PER PARA. 137 OF ASME B31.1

Achtung

Die Rohrleitungsdämpfer (Pos.749/750) sind entspr.der zu erwartenden Wärmedehnug der Einströmleitung voreingestellt.
In X-Richtung 31
In Y-Richtung 33
In Z-Richtung 19 / -19

Attention

The pipe dampers (Pos.749/750) are pre-adjusted to accept the expected head expansion.
X-direction 31mm
Y-direction 33mm
Z-direction 19mm / -19mm

Schraubenbolzen (Pos.701) sind wie folgt vorzuspannen: Bolts (Pos 701) are to be prestressed as follows.	
Schraubenlängung Δls Boltelongation	Anzugsmoment MA (relevanter Wert) tightening torgne (relevant value)
0,42 mm +0,06 −0,02	1217 Nm (Hilfswert) (provisional value)

Anmerkung: Die Kontrolle der Vorspannung erfolgt ausschließlich über die Feststellung der Längenänderung △ ls der Schraube nach dem Anziehen!
Note: The check of the prestress is to be carried out by establishing the elongation change △ ls of the bolt after tightening.

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME

ST. DRG. NO. 2-3885-1703-00

SIGN AND DATE

INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD
		GMM	DSR

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LIMITED
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	GMM		08.11.05	
CHD.	DSR		08.11.05	NA
APPD.	DSR		08.11.05	

DEPT. CODE 415 | ITD | UNTOL. DIMS. CR. B/M/F | SCALE NTS | WEIGHT (KG) 2903.00 | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

POS. 6 REMOVED WPS WE146, WE022,WE145 ADDED

TITLE
INTER CONNECTING PIPING

CARD CODE N.A.

DRAWING NO. 0-308-59-00003 | REV. 01

SHT. No 01 | NO. OF SHT. 01

RESTRICTED

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME: D381010152901-R03.DWG

REF. DRG. NO.

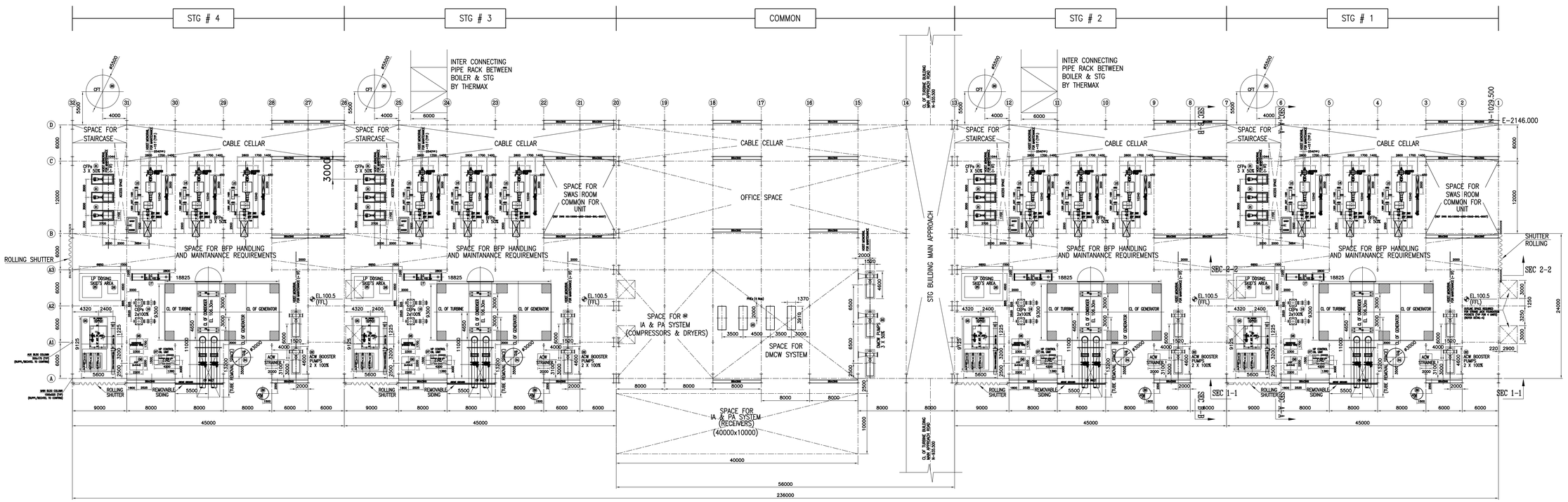
SIGN. AND DATE

INVENTORY NO

PLANT NORTH

TRUE NORTH

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

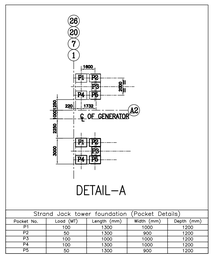
PLAN AT GROUND FLOOR EL.100.5m (FFL)

NOTES:

1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2) EQUIPMENT DIMENSIONS ARE TENTATIVE, WHICH SHALL BE CONFIRMED AFTER DETAIL ENGINEERING.
3) PIPING INTERFACE AREAS BETWEEN BHEL AND RUPPL/BECHTEL/THERMAX SHALL BE AS GIVEN BELOW. (TO BE FINALISED)

PIPING TERMINAL POINT AREA	TERMINAL POINTS	GRID REFERENCE
PTPA–01	1) MAIN STEAM–1 FROM BOILER HEADER (TP–77) 2) FEED WATER–1 TO BOILER HEADER (TP–148) 3) BOILER FLASH TANK VENT–1 FROM BOILER (TP–199) 4) BOILER STARTUP STEAM BYPASS FROM BOILER (TP–79) 5) FEED WATER SUPPLY FOR LIMESTONE DRYING (BY BECHTEL) 6) CONDENSATE RETURN FROM LIMESTONE DRYING (BY BECHTEL) 7) CLOSED CIRCUIT COOLING WATER SUPPLY TO BOILER AUXILIARIES (TP–80) 8) CLOSED CIRCUIT COOLING WATER RETURN FROM BOILER AUXILIARIES (TP–81) 9) POTABLE WATER (TP–9) 10) SERVICE AIR (TP–4) 11) INSTRUMENT AIR (TP–5) 12) SERVICE WATER (TP–201) 13) BOILER FILL (TP–6)	BETWEEN GRID 11 & 12 1M INSIDE STG BUILDING ALONG ROW–D ABOVE GROUND
PTPA–02	1) MAIN STEAM–2 FROM BOILER HEADER (TP–78) 2) FEED WATER–2 TO BOILER HEADER (TP–149) 3) BOILER FLASH TANK VENT–2 FROM BOILER (TP–200)	BETWEEN GRID 24 & 25 1M INSIDE STG BUILDING ALONG ROW–D ABOVE GROUND
PTPA–03	1) CIRCULATING WATER SUPPLY TO UNIT–1/2/3/4 CONDENSER (TP–119 & 120/TP–123 & 124/TP–127 & 128/TP–131 & 132) 2) CIRCULATING WATER RETURN FROM UNIT–1/2/3/4 CONDENSER (TP–121 & 122/TP–125 & 126/TP–129 & 130/TP–133 & 134)	BETWEEN GRID 3&5/9&11/22&24/28&30 ALONG ROW–A ABOVE GROUND
PTPA–04	1) CONDENSATE RETURN FROM PROCESS TO UNIT–1/2/3/4 CFT (TP–168/TP–169/TP–170/TP–171)	AT CFT NOZZLE OF EACH UNIT
PTPA–05	1) CONDENSATE FILL TO UNIT–1/2/3/4 CONDENSER (TP–172/TP–173/TP–174/TP–175) 2) CONDENSATE RETURN FROM LIMESTONE DRYER TO UNIT–1/2/3/4 CONDENSER (TP–160/TP–161/TP–162/TP–163)	AT CONDENSER NOZZLE OF EACH UNIT

4) MINIMUM CRANE HOOK ELEVATION SHALL BE 122.25 M.
5) WEIGHT OF SINGLE HEAVIEST PIECE FOR MAINTENANCE IS 55 TONN.
6) ELEVATION 0.00 CORRESPONDS TO FINISHED GROUND FLOOR LEVEL OF STG BUILDING WHICH CORRESPONDS TO SITE RL EL.+100.5M
7) DEAERATOR FLOOR ELEVATION IS 118.5 m.(BECHTEL TO CONFIRM THE SAME)
8) LAYDOWN & MAINTENANCE SPACE IS INDICATED ON THE OPERATING FLOOR COMMON AREA WITH THE ASSUMPTION THAT 2 UNITS ARE TAKEN FOR MAINTENANCE AT THE SAME TIME.
9) REVISED EQUIPMENT LOADS INDICATED BECHTEL TO CONSIDER THE SAME.



HOLD:

1) MONORAIL LOCATIONS, ELEVATION AND CAPACITY.
2) IA & PA SYSTEM.

EQUIPMENT LIST (PER UNIT) 03

SL NO.	EQUIPMENT	QTY (Nos.)	EMPTY WT(Kg)	FLOODED WT(Kg)	STATUS NOT TO EXCEED(NTE) FINAL (F)
1	STEAM TURBINE	1	COVERED IN "MACHINERY ARRANGEMENT AND FOUNDATION" DRG.NO.1–313–01–08634		
2	GENERATOR	1			
3	SURFACE CONDENSER	1			
4	GENERATOR AIR COOLER ASSEMBLY	1			
5	LUBE OIL CONSOLE (LUBE OIL TANK, MOP, AOP, EOP, TWIN LUBE OIL COOLERS)	1	13100	30450	F
6	JACKING OIL SKID	1	1800	2400	F
7	HP CONTROL OIL SKID	1	4150	5000	F
8	OIL CENTRIFUGE(TROLLEY TYPE)	1	1900	2200	F
9	LP HEATER – 1	1	31100	62000	F
10	LP HEATER – 2	1	34000	64000	F
11	LP HEATER – 3	1	32000	59500	F
12	DEAERATOR	1	80420	401090	F
13	HP HEATER – 5	1	53500	73100	F
14	HP HEATER – 6	1	63100	84600	F
15	STEAM JET AIR EJECTOR ASSEMBLY	1	7500	11500	F
16	GLAND STEAM CONDENSER WITH EJECTOR	1	2000	2700	F
17	DRAIN COOLER	1	5800	8400	F
18	BOILER FEED PUMP ASSEMBLY WITH MOTOR	3	–	38182	NTE
19	CONDENSATE EXTRACTION PUMP WITH MOTOR	2	–	10000	NTE
20	CONDENSATE FORWARDING TANK	1	15000	240000	NTE
21	CONDENSATE FORWARDING PUMP WITH MOTOR	3	–	4010	NTE
22	ACW BOOSTER PUMP WITH MOTOR	2	–	6894	NTE
23	PHE FOR CLOSED CIRCUIT CW SYSTEM	1	10578	14166	NTE
24	HP FLASH TANK FOR STG	1	**	**	**
25	AMMONIA DOSING SKID	1	1250	1650	NTE
26	HYDRAZINE DOSING SKID	1	1250	1650	NTE
27	NAOH DOSING SKID	1	800	1000	NTE
28	OVER HEAD TANK (OIL)	1	2100	10450	F
29	ATMOSPHERIC FLASH TANK	1	900	1000	NTE
30	GENERATOR ADAPTER BOX	1	–	8000	NTE

EQUIPMENT LIST (COMMON)

SL NO.	EQUIPMENT	QTY (Nos.)	EMPTY WT(Kg)	FLOODED WT(Kg)	STATUS NOT TO EXCEED(NTE) FINAL (F)
51	CLOSED CIRCUIT CW SYSTEM PUMP	3	–	10000	NTE
52	IA & PA SYSTEM	1	–	20000	NTE
53	DMCW EXPANSION TANK	1	10000	90000	NTE
54	SWAS PANEL (TOTAL PER SWAS UNIT)	2	–	6000	NTE
55	LOCAL GAUGE BOARD	2	–	800	F

LOAD DETAILS SHALL BE CONFIRMED AFTER DETAIL ENGINEERING

NOTE: WEIGHTS FURNISHED ARE UNIT WEIGHTS

REV.	DATE	ALTERED	CHD/APPD	DESCRIPTION
03	21/12/13	VUK	GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
02	29/10/13	VUK	GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	VUK	GS/WSS	DRAWING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE INDUSTRIES LIMITED, COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER HAZIRA: 10090–P50–HAT100–BHL–B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	DATE	NO.OF VAR.
DRN.	V.U.K	–SD– 09.09.13	
CHD.	G.S	–SD– 09.09.13	NA
APPD.	V.V.S.	–SD– 09.09.13	

DEPT. PESD–ENGG | CODE APP. | UNTOL. DIMS. CR. 0.1 M | SCALE 1:250 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT GROUND FLOOR (100.5m)

CARD CODE

BHEL DRAWING NO: 0–381–01–01529 REV. 03

SHT. No 01 NO. OF SHT. 04

RELEASED FOR CONSTRUCTION EDAS

Dec Mon 23 15:58 2013

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FIRST ANGLE PROJECTION

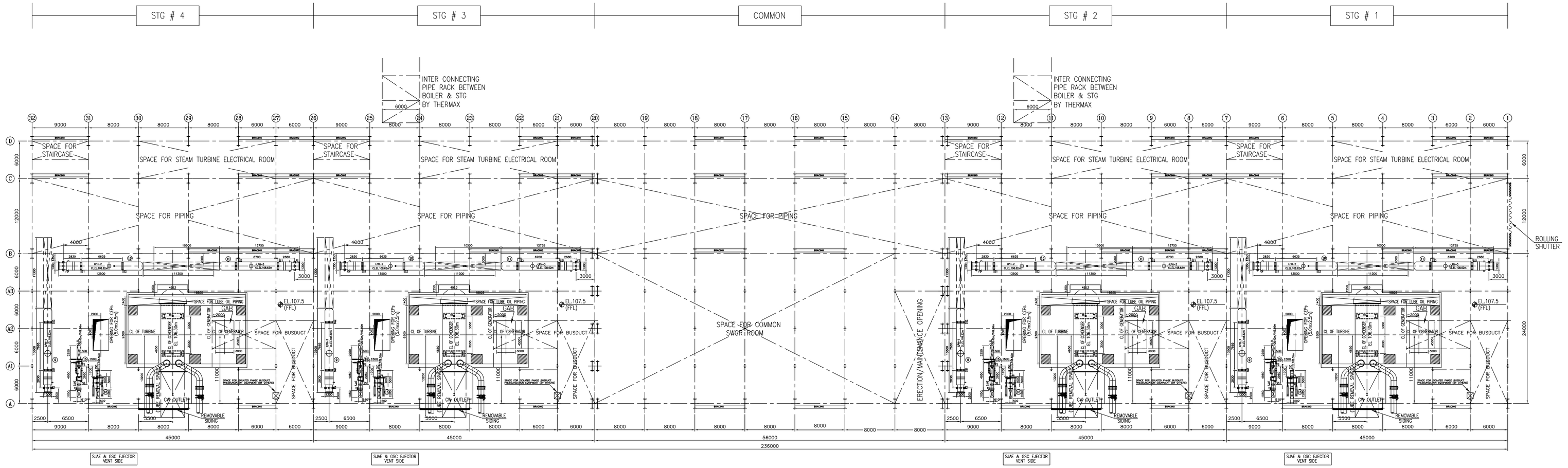
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-381-01-01529 SHT. 02 OF 04

PLANT NORTH

TRUE NORTH

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT MEZZANINE FLOOR EL.107.5m (FFL)

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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME (0381010529-S02-R01.DWG) | INVENTORY NO.

REV.	DATE	ALTERED	CHD/APPD	ZONE
03	21/12/13	ALTERED VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
02	29/10/13	ALTERED VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	ALTERED VUK	CHD/APPD GS/WSS	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NUMBER HAZIRA:	10090-P50-HAT100-BHL-B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	
CHD.	G.S	-SD-	09.09.13	NA
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 450	g/M/f	1:250	NA	NA	NA	NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT MEZZANINE FLOOR (107.5M)

CARD CODE

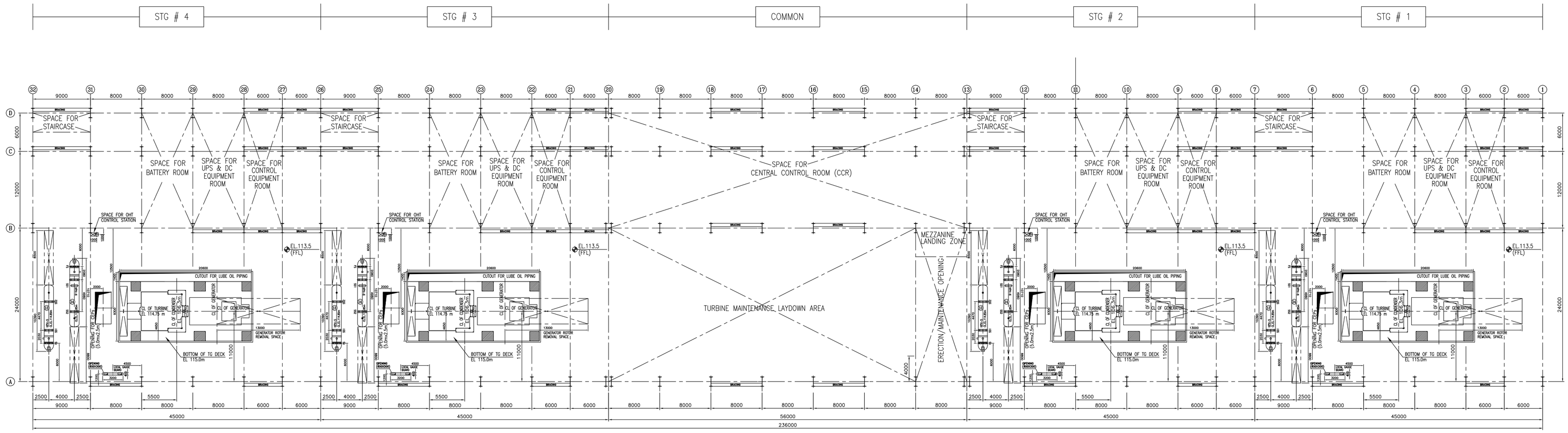
BHEL DRAWING NO: 0-381-01-01529 REV. 03

SHT. No 02 NO. OF SHT. 04

PLANT NORTH

TRUE NORTH

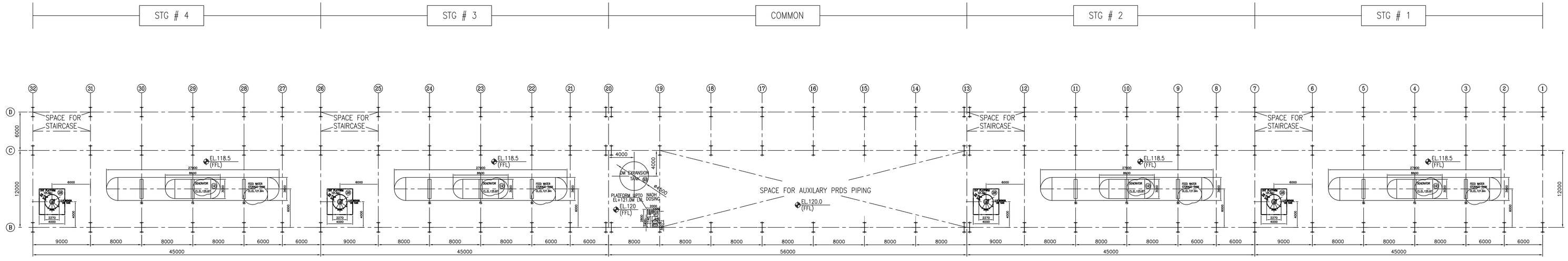
BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT OPERATING FLOOR EL.113.5m (FFL)

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT DEAERATOR FLOOR EL.118.5m (FFL)

PLAN AT COMMON BUILDING FLOOR EL.120m (FFL)

AND AT OHT PLATFORM EL.121.5m (TOS)

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME (0381010152 9-S03-R03.DWG)

SIGN. AND DATE | REF. DRG. NO. | INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD	ZONE
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02	29/10/13	VUK	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	VUK	CHD/APPD GS/WSS	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NUMBER HAZIRA:	10090-P50-HAT100-BHL-B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	
CHD.	G.S	-SD-	09.09.13	NA
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 450	DN. 9/W/F	1:250	NA	NA	NA	NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT OPERATING FLOOR (103.5M), DEAERATOR FLOOR (118.5M) & OHT PLATFORM (121.5M)

CARD CODE

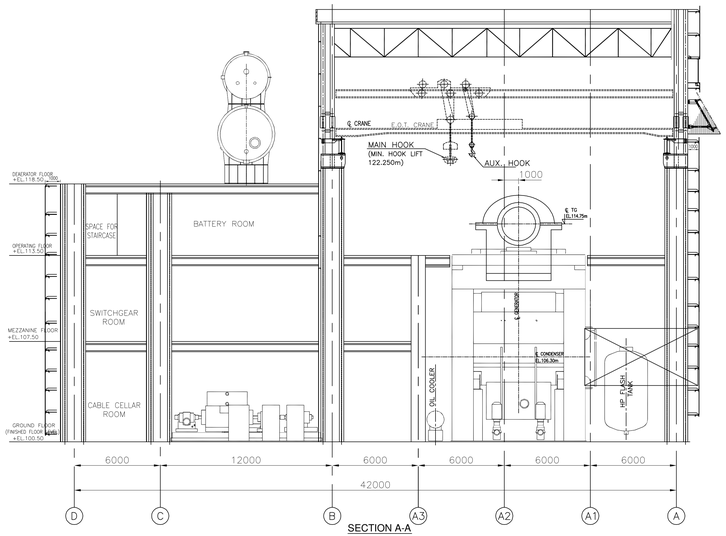
BHEL DRAWING NO: 0-381-01-01529 REV. 03

SHT. No 03 NO. OF SHT. 04

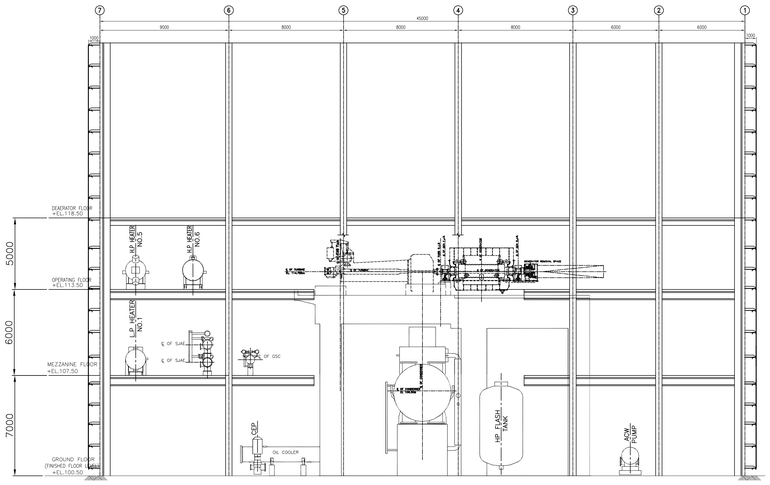
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

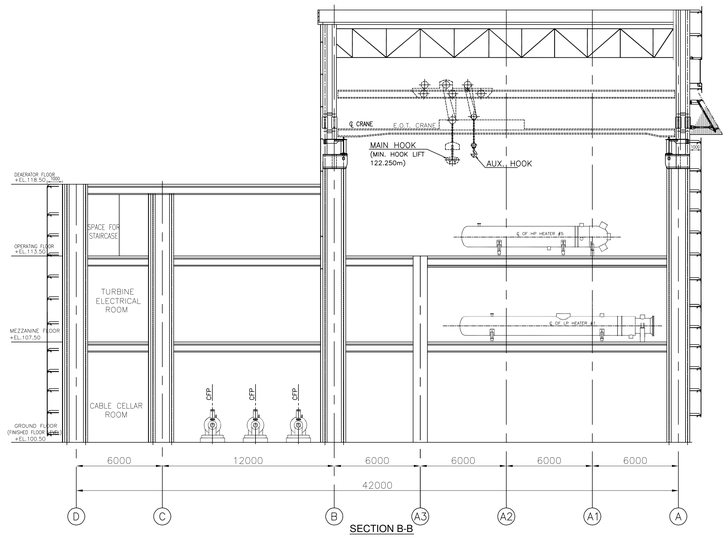
DRG. NO. 0-381-01-01529 SHT. 04 OF 04



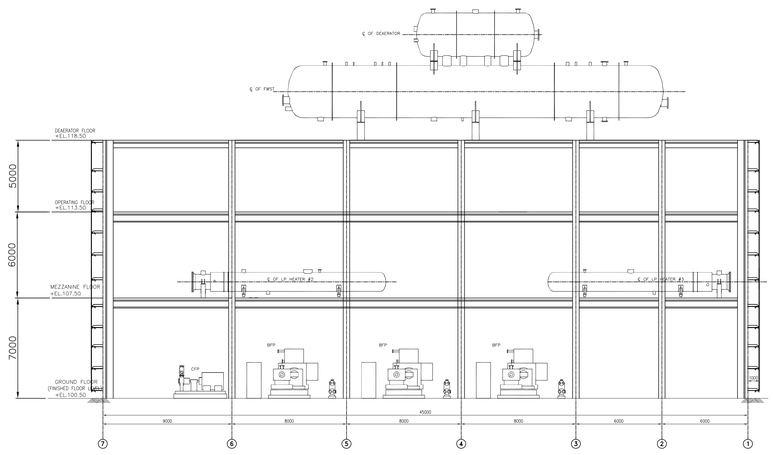
SECTION A-A



SECTION 1-1
(FOR STG # 1)
(TYPICAL)



SECTION B-B



SECTION 2-2
(FOR STG # 1)
(TYPICAL)

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY02302261

SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME

INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD
03	21/12/13	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.	CHD/APPD GS/WSS
02	29/10/13	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.	CHD/APPD GS/WSS
01	14/09/13	DRAWING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.	CHD/APPD GS/WSS

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE INDUSTRIES LIMITED, COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER HAZIRA: 10090-P50-HAT100-BHL-B001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION, HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	NA
CHD.	G.S	-SD-	09.09.13	
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG | CODE 450 | UNTOL. DIMS. CR. 9/M/F | SCALE 1:100 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

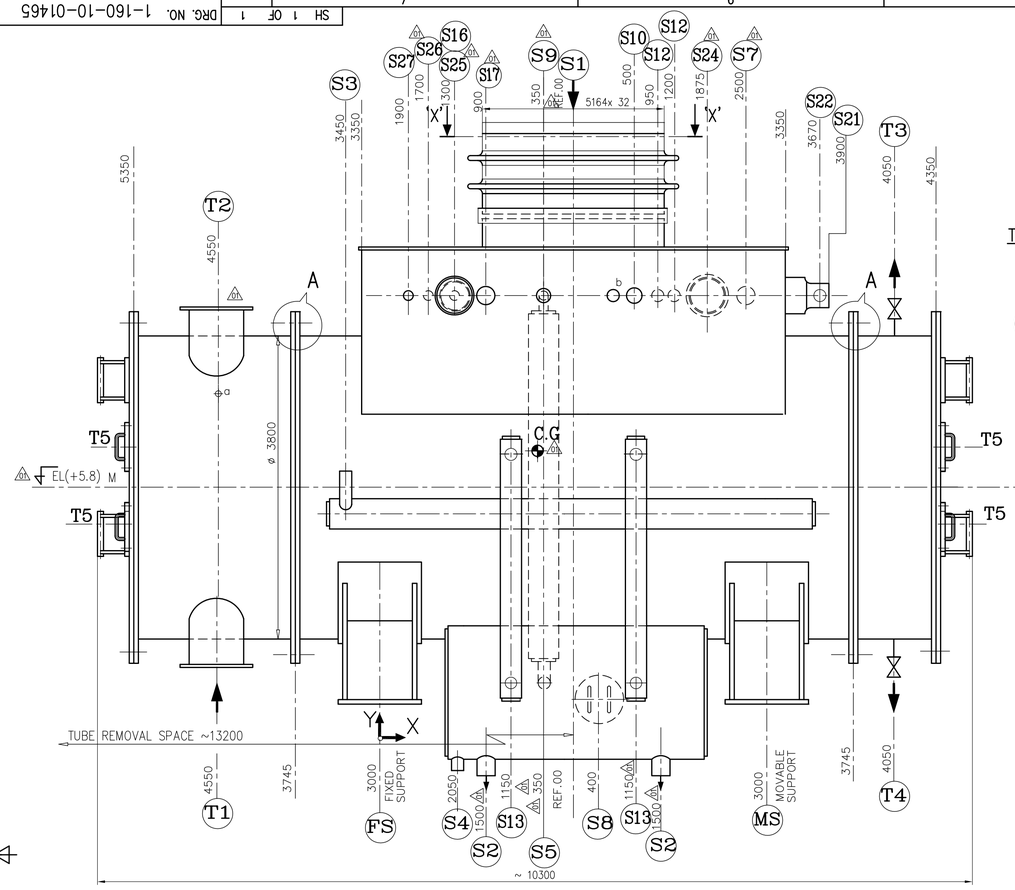
TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT, SECTIONAL VIEWS

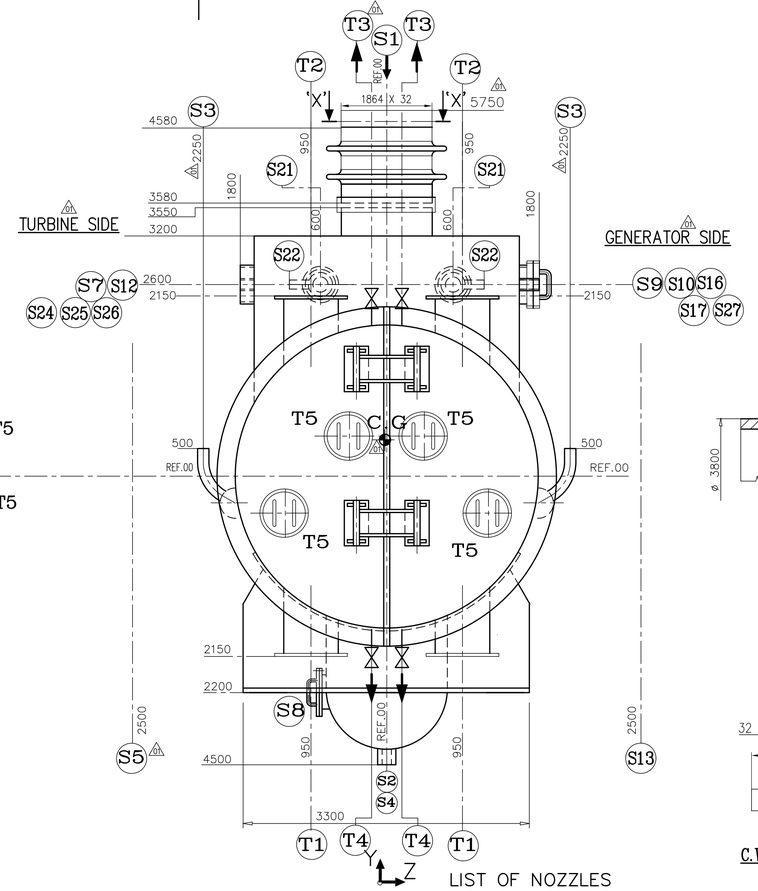
CARD CODE | BHEL DRAWING NO: 0-381-01-01529 | REV. 03 | SHT. No 04 | NO. OF SHT. 04

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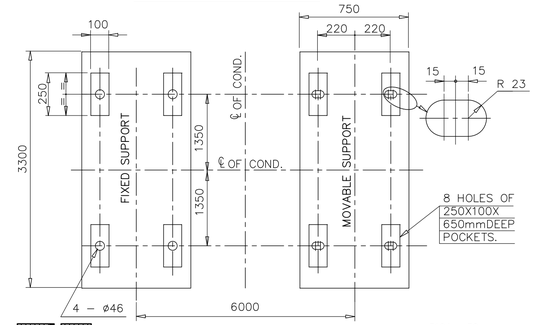
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

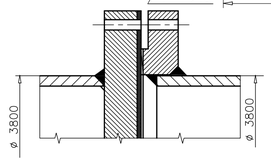
SH 1 OF 1 DRG. NO. 1-160-10-01465



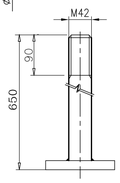


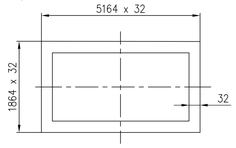
FOUNDATION DETAIL





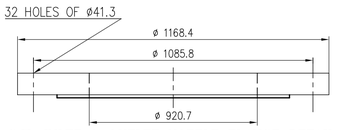
DETAIL – A





EXHAUST DETAIL (S1)
SECTION 'X X'

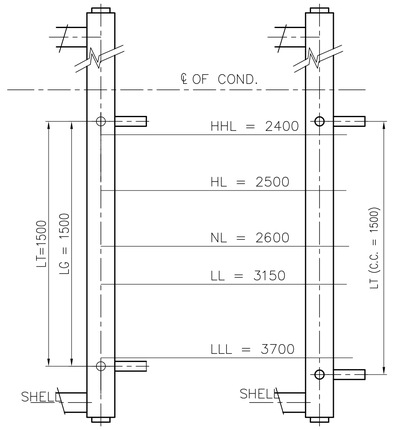
FOUNDATION BOLT DETAIL

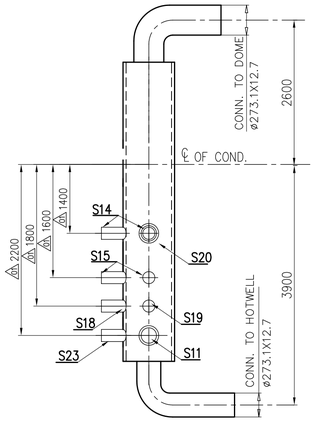


C.W. INLET & OUTLET NOZZLE FLANGE DETAIL

NOZZLE FORCES, MOMENTS AND THERMAL MOVEMENTS

NOZZLE REF	MOMENTS Kg-M	FORCES Kgs	THERMAL MOVEMENTS X mm	Y mm	Z mm
T1	7730	2900	−1.6	+0.1	±1.0
T2	7730	2900	−1.6	+4.4	±1.0
S2	2600	970	+3.0	−2.3	±0.3
S3	900	350	−0.5	+2.7	±2.2
S7	1350	500	+5.5	+2.6	−1.8
S9	700	260	+2.7	+2.6	+1.8
S10	700	260	+3.5	+2.6	+1.8
S17	700	260	+2.1	+2.6	+1.8
S21	2600	970	+10.0	+4.0	±1.0





DESIGN DATA

DESIGN CODE: H E I / B H E L			
DESCRIPTION		SHELL SIDE	TUBE SIDE
TYPE			2 PASS DIVIDED
DESIGN PRESSURE	Kg/sq.CM (g)	1.1 & FULL VC.	3.0
DESIGN TEMPERATURE	°C	100	65
TEST PRESSURE	Kg/sq.CM (g)	HY.FILL	3.9
TEST TEMPERATURE	°C	AMBIENT	AMBIENT
TOTAL SURFACE AREA	sq.M	4232	
TUBE SIZE (OD X THICK)		ø 22x22 BWG (AVG) / ø22x20 BWG	
NO. OF TUBES		8300	
PRESSURE DROP ON C.W. SIDE	M.W.C.	7.0	
HOTWELL CAPACITY (NL TO LLL)	MINUTES	5 MINUTE	
EMPTY WIEGHT		120000 Kgs.	
WORKING WIEGHT		180000 Kgs	
FLOODED WIEGHT		230000 Kgs	
INSPECTION		BHEL/CUSTOMER (AS PER APPD.QAP)	

LIST OF INSTRUMENTS CONNECTIONS

REF.	DESCRIPTION	SIZE	QTY	LOCATION
a	TEMPERATURE GAUGE CONN.	M 33X2	9	HOTWELL, STEAM INLET, C.W.INLET & OUTLET.
b	COMPOUND PRESSURE GAUGE CONN.	1/2"(SW)VALVE	9	ON SHELL
c	LEVEL GAUGE L = 1500	1"ANSI300 RF	2	ON STAND PIPE
d	LEVEL SWITCH CONNECTION	–	–	–
e	LEVEL CONTROLLER/TRANSMETER CONN.	2"ANSI 300 RF	8	ON STAND PIPE
f	WATER EXPANSION RELIEF VALVE	3/4" / 1" S.W	2	ON C.W. INLET

MATERIALS

TUBES – CONDENSING ZONE	SA249 TP316
TUBES – AIR COOLING ZONE	SA249 TP316
TUBE PLATE	SA516 Gr70 WITH SS CLADDING
SUPPORT PLATE	CS:IS 2062 OR EQUVT.
SHELL & OTHER PARTS	CS: SA516 Gr70 OR EQUVT.
INTERNAL BOLTS & NUTS	SA 193 B7, SA194 2H

C.G CENTER OF GRAVITY

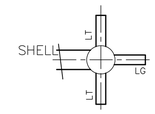
	EMPTY	OPERATING	FLOODED
XC	−370	−665	−440
YC	395	−230	−465
ZC	−25	−15	−10

LIST OF NOZZLES

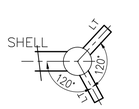
REF.	DESCRIPTION	SIZE	QTY	REMARKS
	TUBE SIDE NOZZLES			
T1	COOLING WATER INLET	36" – 150 SORF	2	FLANGED
T2	COOLING WATER OUTLET	36" – 150 SORF	2	FLANGED
T3	WATER BOX VENT	ø60.3 X 5.54	2	S.W.
T4	WATER BOX DRAIN	ø60.3 X 5.54	4	S.W.
T5	WATER BOX INSPECTION HOLE	18" ANSI 150 FLRF	8	FLANGED
	SHELL SIDE NOZZLES			
S1	EXHAUST STEAM INLET	AS PER SEC.X–X	1	FLANGED
S2	CONDENSATE OUTLET (WITH VORTEX PLATE)	ø323.9X12.7	2	B.W.
S3	AIR SUCTION	ø168.3X7.11	2	B.W.
S4	HOT WELL DRAIN	ø60.3 X 5.54	1	B.W.
S5	EXPANSION SURGE.	ø508 X 12.7	1	–
S6	–	–	–	–
S7	GLAND STEAM LEAKAGE CONN.	ø323.9X 12.7	1	B.W.
S8	HOTWELL INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S9	CONDENSATE RECIRCULATION	ø88.9 X 5.49	1	B.W.
S10	CONN. FOR MAKE UP WATER.	ø88.9 X 5.49	1	B.W.
S11	DRAIN FROM STEAM INLET (PIPING TO TURBINE)	ø219.1 X 12.7	2	B.W.
S12	CONDENSATE PUMP DEAERATION	ø33.4 X 4.55	2	B.W.
S13	STAND PIPE	ø114.3 X 6.02	2	--
S14	INTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S15	AFTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S16	DOME INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S17	VACCUM BREAKER CONNECTION	ø114.3 X8.56	1	B.W.
S18	G S C DRAINS	ø60.3 X 5.54	1	B.W. *
S19	DRAIN FROM EJECTOR AIR HEADER	ø33.4 X 4.55	1	B.W. *
S20	DRAIN FROM DRAIN COOLER	ø273.1 X 12.7	1	B.W. *
S21	HP STEAM DUMP NOZZLE	ø323.9 x 6.35	2	B.W.
S22	WATER CONN. TO DUMP NOZZLE	ø88.9 X 5.49	2	B.W.
S23	HPFLASH TANK DRAIN	ø273.1 X 12.7	1	B.W. *
S24	HPFLASH TANK VENT	ø910 X 9.53	1	B.W.
S25	LP HEATER–1 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S26	LP HEATER–2 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S27	LP HEATER–3 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.

NOTES:–

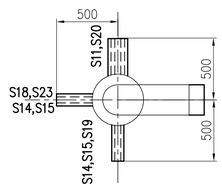
1. ALL COUNTER FLANGES, FASTNERS AND PACKINGS ARE UNDER B.H.E.L. SCOPE OF SUPPLY.
2. TUBES ARE PROVIDED WITH SELF DRAINING.
3. * CONNS. MOUNTED ON EXPANSION SURGE PIPE–S5.
4. PAINTING: –
   a). STEAM SPACE: 2 COATS OF STEAM WASHABLE PAINT
   b). EXTERNAL SURFACES: 2 COATS OF REDOXIDE ZINC PHOSPHATE PRIMER
   c). WATER SPACE: 2 COATS OF COAL TAR EPOXY.
5. TUBES,DOME ASSLY,HOTWELL,TOPCONNECTING PIECE, BELLOW,STAND PIPES & SURGE PIPES WILL BE SUPPLIED LOOSE TO SITE, FOR ERECTION & ASSLY. BY ERECTION AGENCY.



STAND PIPE–I



STAND PIPE–II



SURGE PIPE

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091–6239977–T000–M–M61–BHL–B02–H001
RIL DRG. NO. (HAZIRA):	10090–6239976–T000–M–M61–BHL–B02–H001

BHEL HYD EDAS RELEASED

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN	DATE	NO.OF VAR.
DRN.	SUDHAKAR	SUDHAKAR	04.09.13	N.A
CHD.	M VENKAT		04.09.13	
APPD.	M VENKAT		04.09.13	

REV.	DATE	ALTERED	CHECKED	APPD
01	17.10.13	VSN	MV	MV

DRAWING REVISED AS PER T&C ENGG.& PE.&SD COMMENTS AND CUSTOMER COMMENTS AND SHOWN AS REV.01

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE	g/m/f	NTS	NA	NA	N.A	N.A
CODE 405						

TITLE: SURFACE CONDENSER

CARD CODE

DRAWING NO. 1–160–10–01465 REV. 01

SHEET No. 1 NO OF SHEETS 1

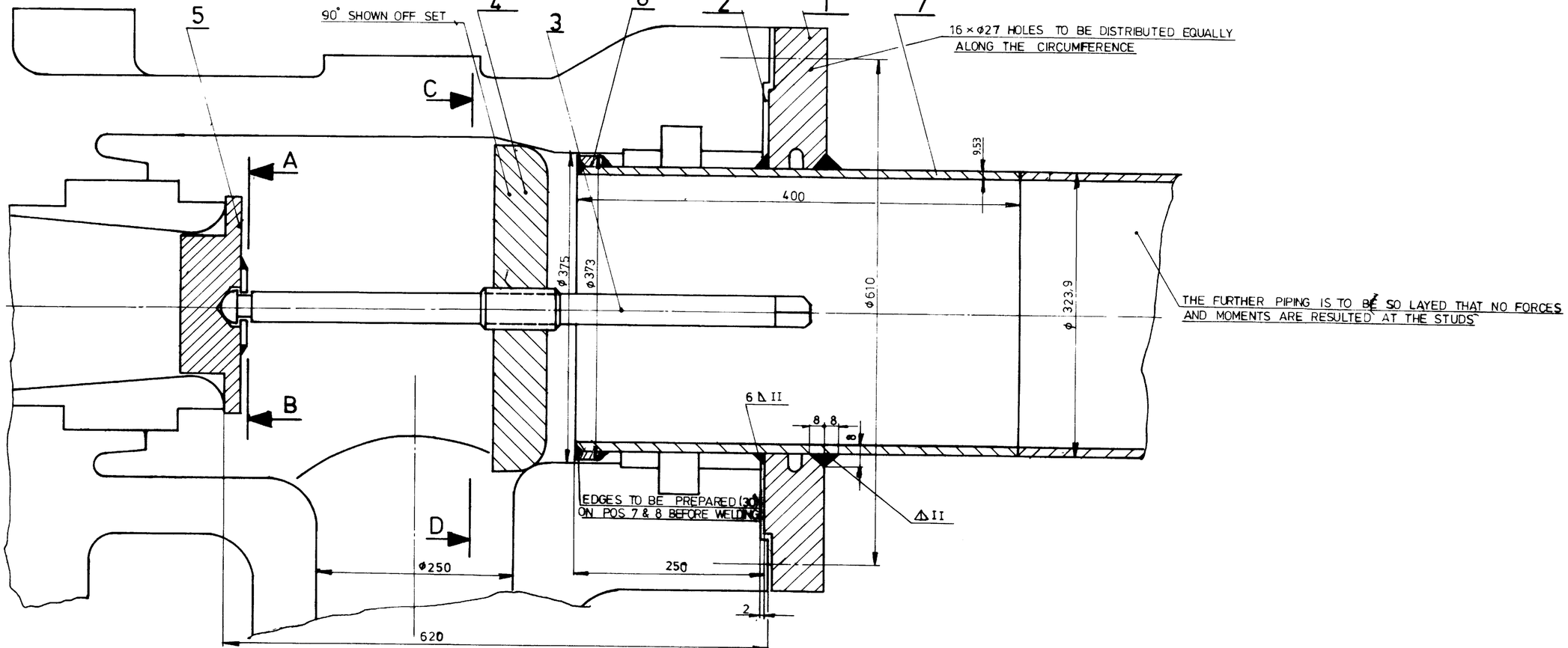
Nov Wed 27 14:10 2013
Printed by : V.SUDHAKAR-HME3166 / 6192726 on 27-11-13 14:28:23
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Therefore signatures are not essentially required.

DRG NO. 2-308-42-00015

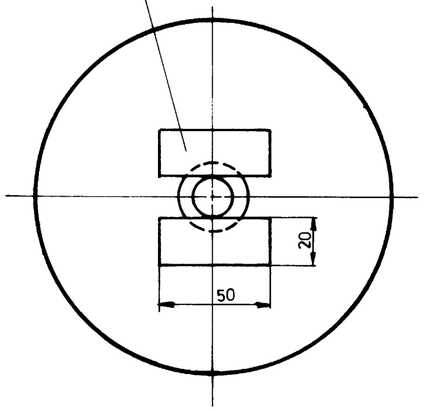
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

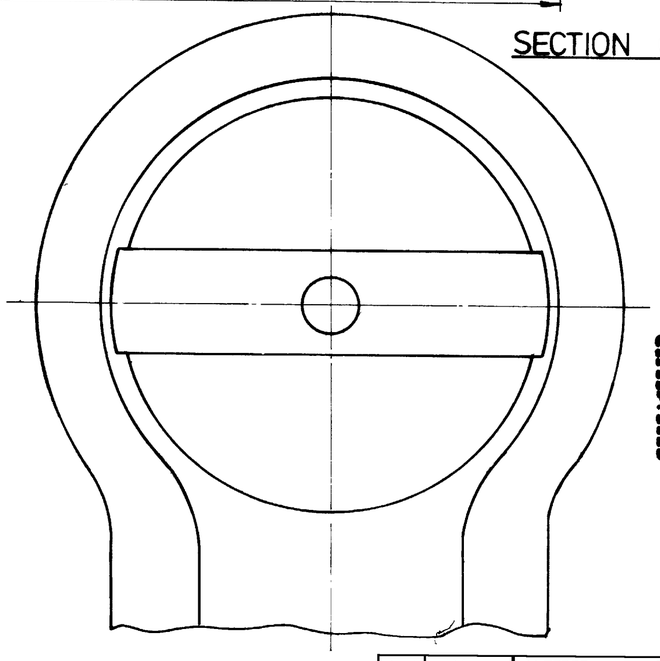
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6 SECTION A-B



SECTION C-D



SSV H250

MAX TEMP	MAX PRESSURE	VAR XX
500°	25 Kg/Cm²	00

VAR OO	REMARKS	VAR. NO	ITEM NO	DESCRIPTION	STD.	DRAWING NO	IT.NO.	MATL CODE	UNIT	UNIT WT	ZONE
							VAR	MATL. SPECN.		QTY.	

CARD TYPE -3 — CARD TYPE -2 — CARD TYPE -1

ADDITIONAL INFORMATION

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

TYPE OF PRODUCT
OR
NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE
DRN.	G.S RANI	G S Rani	12-4-85
CHD.	G.B RAO		12-4-85
APPD.	G B RAO		12-4-85

REV	DATE	ALTERED	PATIL
02	27.11.13	CHECKED	ASHOK

PIPE THICKNESS 9.53 WAS 7.1.
(POS. NO. 07)

REV	DATE	ALTERED	G Rao
01	17/7/85	CHECKED	

ZONE: 16 X φ 27 holes was 16 x φ28. (at F4)

DEPT.	GRADE OF MATL.	SCALE	WEIGHT (KG)
1:TD	SA 105 GR II	/	194.0
CODE 415			

REF TO ASSY. DRG.

TITLE
BLOWING DOWN EQUIPMENT
(H 250)

CARD CODE

DRAWING NO.
2-308-42-00015-XX 02

SHEET NO. 1 NO. OF SHEETS 1

INVENTORY NO. | SIGN AND DATE | REF. DRG NO. 2-8535-0507-00

TD-100-REV. NO. 1

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

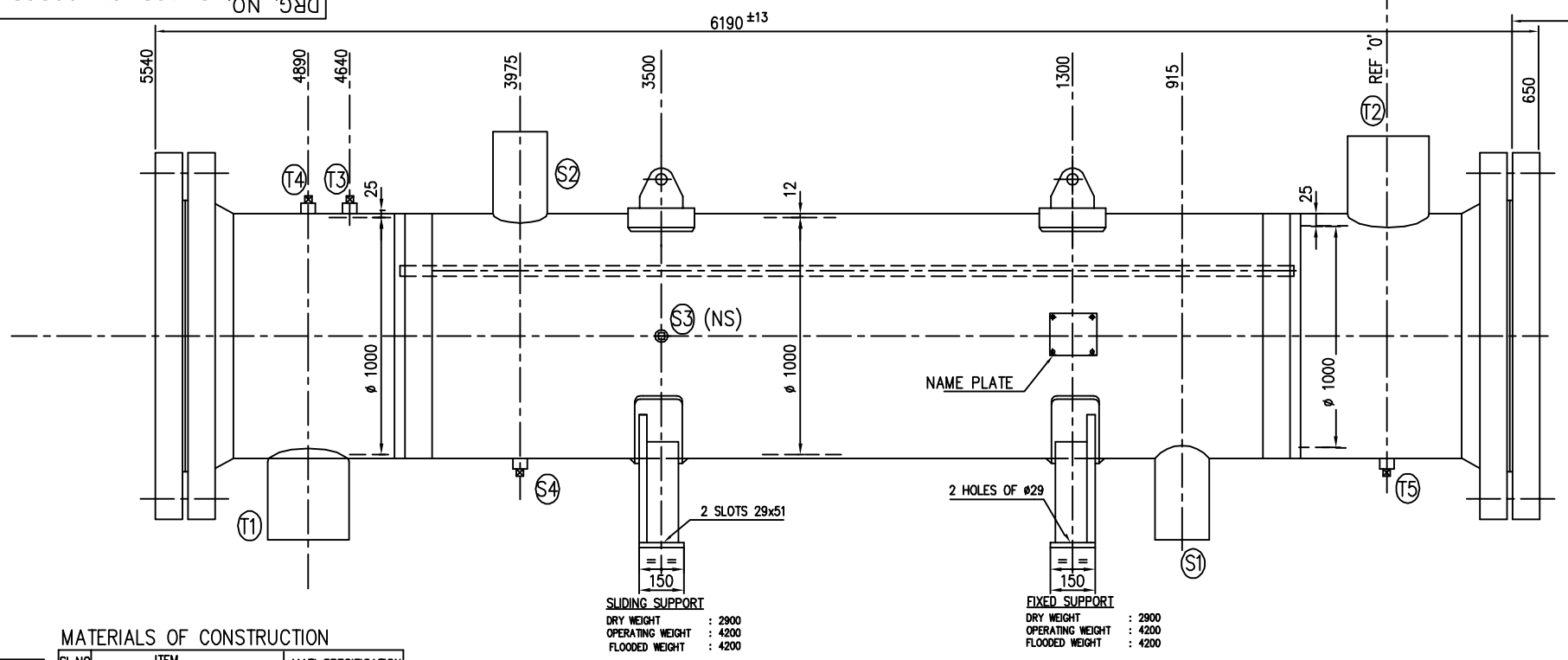
SHT. 1 OF 1

DRG. NO. 2-162-01-00363

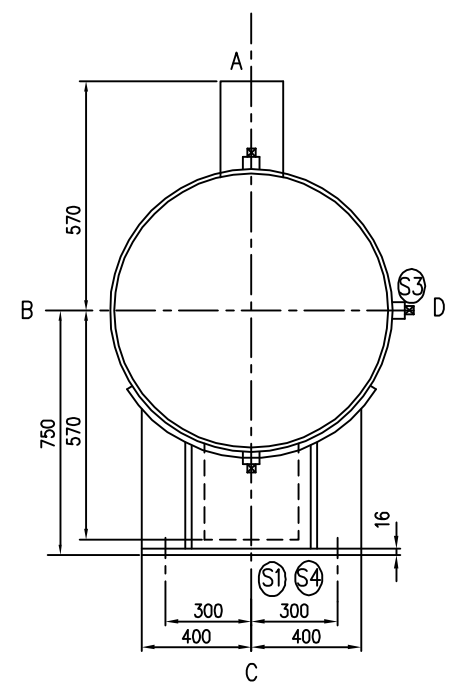
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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

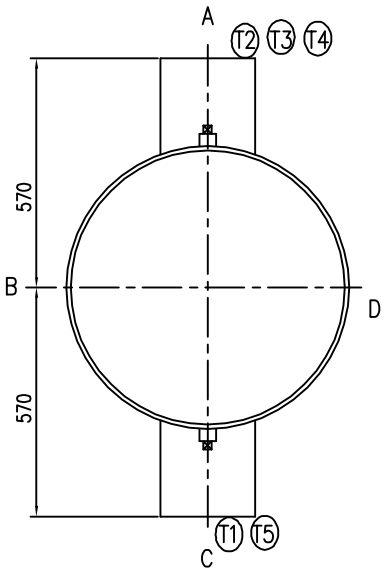
COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO



FS	FAR SIDE
NS	NEAR SIDE



SHELL SIDE NOZZLES



CHANNEL SIDE NOZZLES

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL.SPECIFICATION
1	SHELL	CS SA516 Gr.70
2	CHANNEL	SS SA240 TP304
3	TUBE SHEET	SS SA182 F304
4	CHANNEL FLANGE	SS SA182 F304
5	CHANNEL COVER	SS SA182 F304
6	BAFFLE PLATES	IS 2062
7	TUBES	SA249 TP304
8	NOZZLE PIPES SHELL SIDE	CS, SA106 Gr.B
9	NOZZLE PIPES TUBE SIDE	SS 304

WEIGHTS in Kgs.

DRY	5800
OPERATING	8400
FLOODED	8400

LIST OF NOZZLES

REF	QTY	DESCRIPTION	SIZE	CONNECTING PIPE THK.	TYPE
S1	1	DRAIN INLET	ø273.1X12.7	9.27	BW
S2	1	DRAIN OUTLET	ø 273.1X12.7	9.27	BW
S3	1	PRESSURE GAUGE CONNECTION	1/2" ANSI 6000# COUPLING	–	SW
S4	1	SHELL DRAIN	1" ANSI 6000# COUPLING	–	SW
T1	1	CONDENSATE INLET	ø 323.9X12.7	12.7	BW
T2	1	CONDENSATE OUTLET	ø 323.9X12.7	12.7	BW
T3	1	CHANNEL SAFETY RELIEF VALVE CONN.	3/4" ANSI 6000# COUPLING	–	SW
T4	1	CHANNEL START UP VENT	1" ANSI 6000# COUPLING	–	SW
T5	1	CHANNEL DRAIN	1" ANSI 6000# COUPLING	–	SW

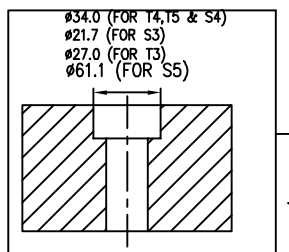
THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

NOZZLE	THERMAL MOVEMENT IN mm			FORCE IN KGF.			MOMENT IN KGM		
	Δx	Δy	Δz	fx	fy	fz	Mx	My	Mz
T1	−4.70	−0.27	0.0	±1200	±1200	±1200	±2400	±2400	±2400
T2	1.70	1.28	0.0	±1200	±1200	±1200	±2400	±2400	±2400
S1	0.50	−0.28	0.0	±700	±700	±700	±1400	±1400	±1400
S2	−3.50	1.29	0.0	±700	±700	±700	±1400	±1400	±1400

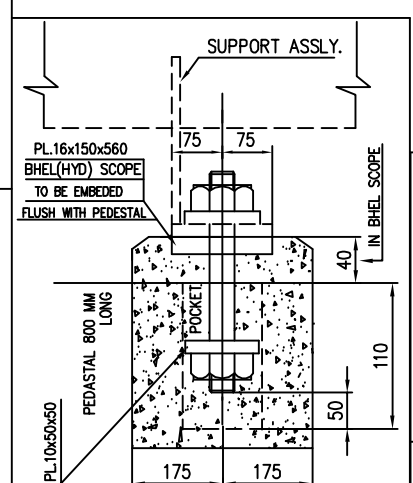
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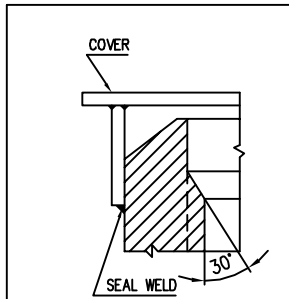
DESCRIPTION		SHELL SIDE	TUBE SIDE
DESIGN PRESSURE	Kg/sq.cm(g)	3.5 & FULL VACUUM	25 & FULL VACUUM
TEST PRESSURE	Kg/sq.cm(g)	4.55	32.5
DESIGN TEMP *	°C	140	140
NO OF PASSES or ZONES		ONE ZONE	ONE PASS
CORROSION ALLOWANCE	mm	3.2	3.2
TUBE SIZE	mm	ODXTHKXL	OD 19.05X0.889X4000L
POST WELD HEAT TREATMENT		NO	NO
RADIOGRAPHY		SPOT	FULL
No. OF TUBES REQUIRED		917	



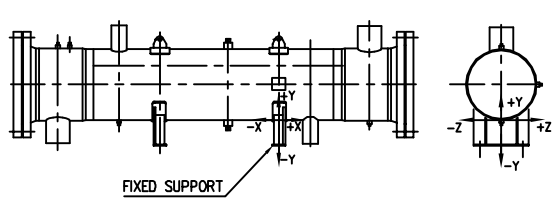
SOCKET WELD CONNECTION



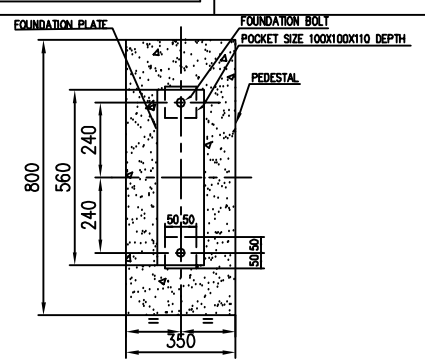
FOUNDATION DETAIL
(POCKET SIZE: 100x100x110)



HYD.TEST & SHIPPING COVER ATTACHMENT DETAIL



NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS WITH RESPECT TO AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.



FOUNDATION PLAN

NOTES: –
1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES.
3. ALL COUPLINGS ARE 6000 LBS AND PLUGGED.
4. START UP VENTS SHOULD NOT BE USED DURING NORMAL OPERATION.
5. TUBES ARE WELDED AND ROLLED INTO TUBE SHEET HOLES.
6. INSULATION CLIPS WELDED ON 240mm CENTRES AT SITE.
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. TWO LIFTING LUGS WITH 30mm DIA HOLES PROVIDED.
9. (a) 7 EXCESS TUBES PROVIDED FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISSIONING FOR PLUGGING PURPOSE.
10. FOUNDATION BOLTS STUD WITH TWO NUTS M24x150 – 4 Nos.
11. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.
12. TEMP.GAUGE CONNS.& PRESSURE GAUGE CONNS. FOT T1,T2,S1,S2 NOZZLES SHELL BE PROVIDED ON PIPING NEAREST TO THE NOZZLES.

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FICILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FICILITIES

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAMESH G	Ramesh G	06.09.13	
CHD.	K.K.K		06.09.13	N.A
APPD.	B.SRINIVAS		06.09.13	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR.		N.T.S	4800	N.A	N.A	N.A
CODE 405	¢/M/F						

TITLE: GENERAL ARRANGEMENT OF DRAIN COOLER

CARD CODE

DRAWING NO. 2-162-01-00363 REV. 00

SHT. No 1 NO. OF SHT. 1

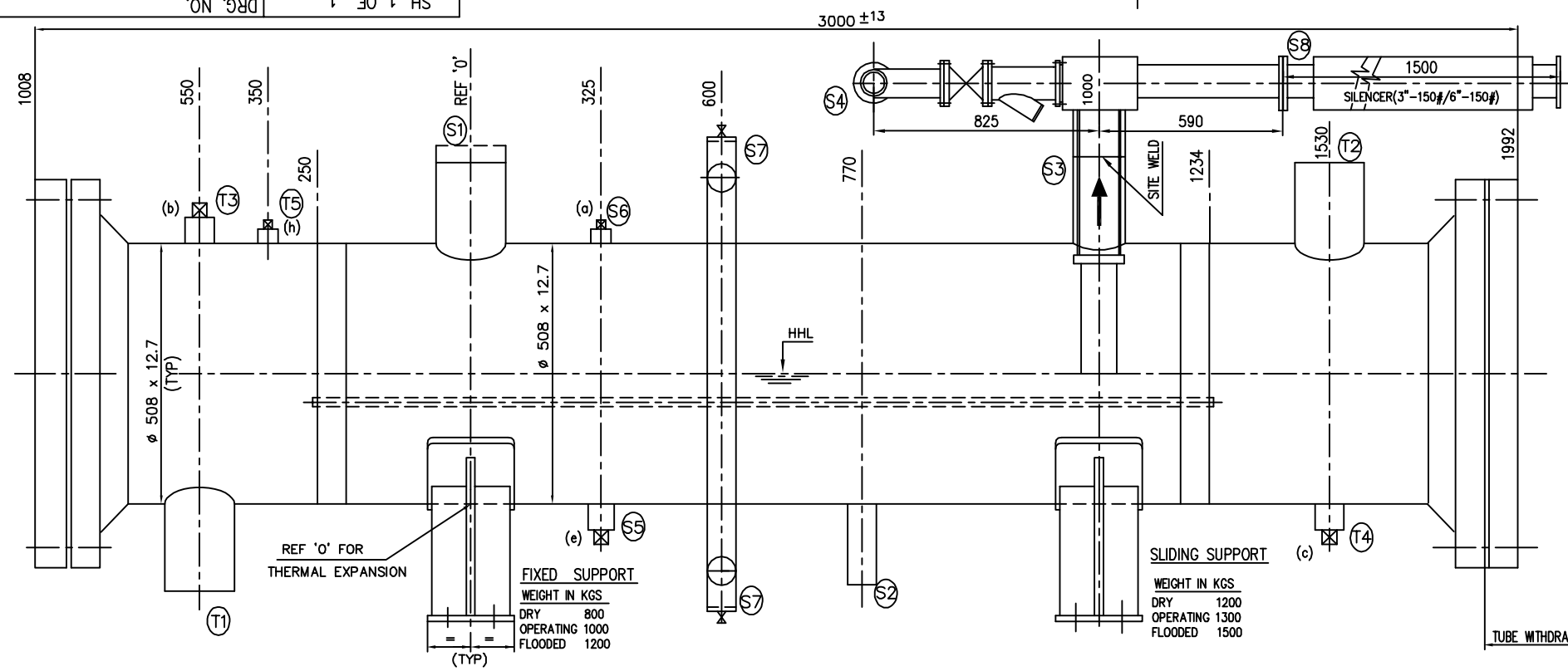
REV.	DATE	ALTERED	CHD/APPD	ZONE

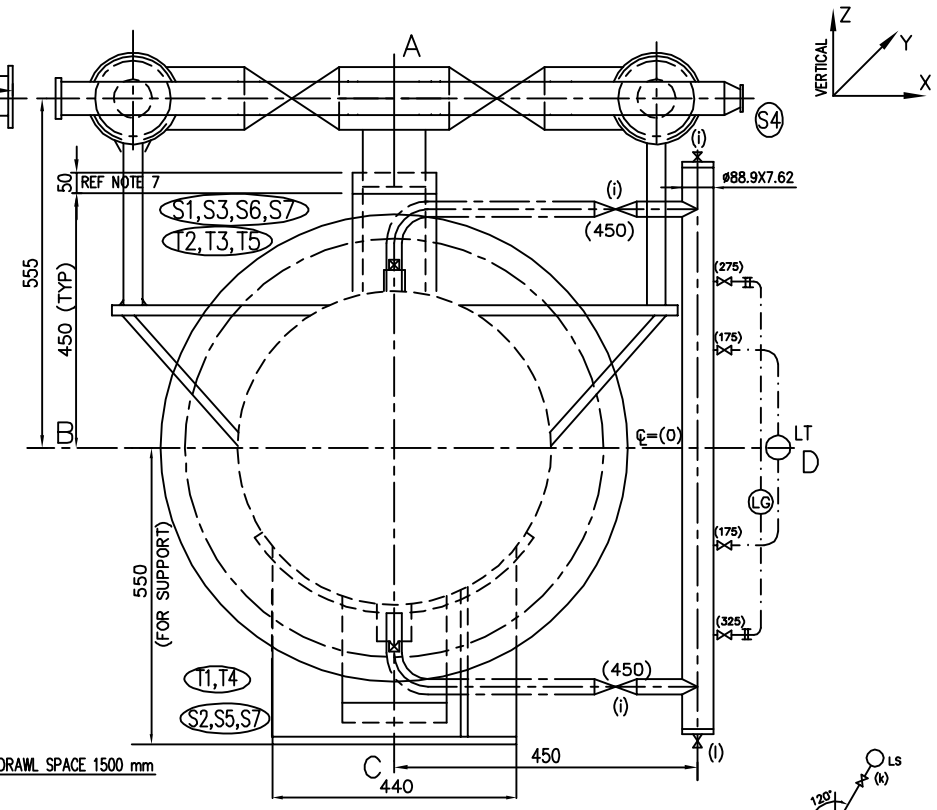
FIRST ANGLE PROJECTION

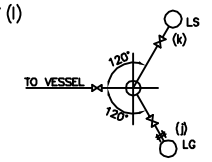
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-14-00573

SH. 1 OF 1







WEIGHTS IN KGS

EMPTY	2000
OPERATING	2300
FLOODED	2700

BILL OF MATERIAL

SL.NO	MATERIAL	SPECIFICATION
1	SHELL AND CHANNEL	CS SA106 Gr B/EQVT.
2	TUBE PLATE, CHANNEL COVER	CS SA516 GR70
3	BAFFLE PLATES	IS 2062 / EQVT.
4	CHANNEL FLANGE	CS SA 105
5	TUBES	SA 249 TP 304
6	IMPINGEMENT PLATE	SS SA240 TP304/EQVT.
7	NOZZLES (PIPES)	CS SA106 GRB EQVT.

EJECTOR DATA

MOTIVE STEAM		
PRESSURE	ATA	16
TEMPERATURE	°C	230
CONSUMPTION	Kg/Hr	200
SUCTION STEAM + AIR		
LEAKAGE STEAM & AIR MIXTURE QTY. (MAX.)	Kg/Hr	450
SUCTION PRESSURE	ATA	0.9

LIST OF NOZZLES

REF	DESCRIPTION	SIZE	QTY	END CONN.
T1	CONDENSATE INLET	ø273.1X12.7/6.35	1	BW
T2	CONDENSATE OUTLET	ø273.1X12.7/6.35	1	BW
T3	FRONT WATER BOX VENT	1" ANSI 6000# CPLG	1	SW
T4	REAR WATER BOX DRAIN	1" ANSI 6000# CPLG	1	SW
T5	WATER EXPANSION REL VALVE CONN.	3/4" SW	1	SW
S1	STEAM INLET	ø168.3x12.7 / 6.35	1	SW
S2	DRAIN OUTLET	ø60.3X8.74/5.54	1	BW
S3	AIR OUTLET	ø114.3X11.13	1	BW
S4	MOTIVE STEAM TO EJECTOR	ø48.3X5.08	1	BW
S5	SHELL DRAIN	1" ANSI 6000# CPLG	1	SW
S6	PRESSURE GAUGE CONNECTION	1/2" ANSI 6000# CPLG	1	SW
S7	STAND PIPE CONNECTION	ø60.3X8.74/5.54	2	BW
S8	EJECTOR OUTLET (SILENCER INLET 3"–150# / OUTLET 6"–150#)		2	FLANGED

VALVE SCHEDULE

REF	DESCRIPTION	CONN SIZE	QTY	LOCATION
a	PR. GAUGE ISOLATING VALVE	1/2" SW	7	ON SHELL,COND IN/OUT AIR & STEAM TO EJECTOR
b	WATER BOX VENT VALVE	1" SW	1	ON FRONT WATER BOX
c	WATER BOX DRAIN VALVE	1" SW	1	ON REAR WATER BOX
d	—	—		—
e	SHELL DRAIN VALVE	1" SW	1	ON SHELL
f	—	—		—
g	AIR OUTLET VALVE	3" BW	2	ON S3 PIPE LINE
h	WATER EXPANSION RELIEF VALVE	INLET 3/4" SW OUTLET 1" SW	1	ON FRONT WATER BOX
i	STAND PIPE ISOLATING VALVES	2" SW	2	—
j	STAND PIPE VENT&DRAIN VALVES	1/2" SW	2	ON STAND PIPE
k	L G ISOLATION VALVES	1" SW	2	ON STAND PIPE

DESIGN DATA

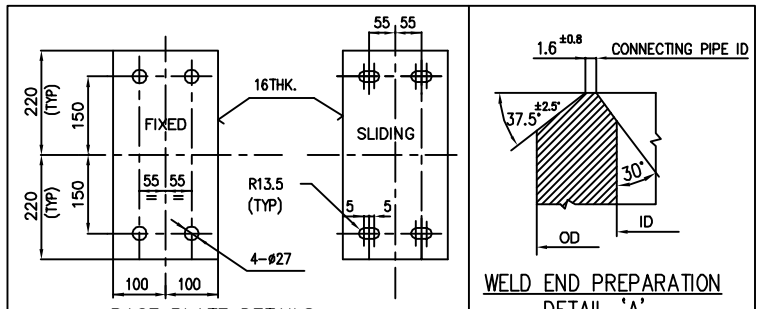
DESCRIPTION		SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/sq.cm(g)		25 & FULL VACUUM	25
TEST PRESSURE Kg/sq.cm(g)		32.5	32.5
DESIGN TEMP	°C	210	100
TEST TEMP	°C	AMBIENT	AMBIENT
CORROSION ALLOWANCE	MM	3.2	3.2
STRESS RELIEVING		—	—
JOINT EFFICIENCY		N.A	N.A
NO. OF PASSES		ONE	ONE
MEDIUM		STEAM & AIR	CONDENSATE
RADIO GRAPHY		N.A	N.A
TUBE SIZE	ODxTHKXL	ø19.05X0.889X1500	
No. OF TUBES REQUIRED		200	

ALLOWABLE FORCES, MOMENTS & MOVEMENTS

NOZZLE	FORCE IN KGF.			MOMENT IN KGM			THERMAL MOVEMENT INmm		
	fx	fy	fz	Mx	My	Mz	Δx	Δy	Δz
T1	±400	±400	±400	±800	±800	±800	−0.27	0.00	−0.1
T2	±400	±400	±400	±800	±800	±800	+1.8	0.00	+0.34
S1	±250	±250	±250	±500	±500	±500	0.00	0.00	+1.21
S3	±250	±250	±250	±500	±500	±500	+6.0	0.00	+1.21

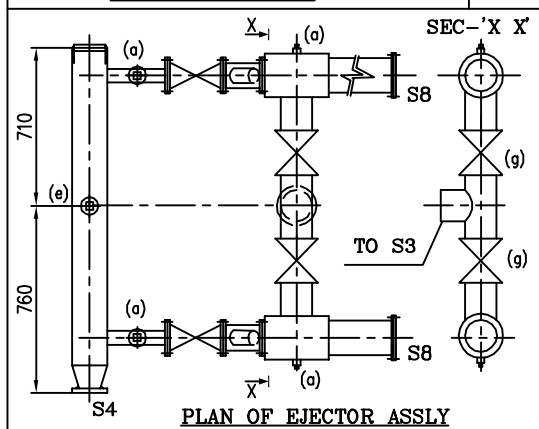
LIST OF INSTRUMENT CONNECTIONS(DATA AWAITED)

SL.No	DESCRIPTION	CONNECTION	LOCATION	QTY
1	PRESSURE GAUGE	1/2"SW	ON SHELL,T1,T2 PIPELINES AIR & STEAM TO EJECTOR	7
2	LEVEL GAUGE (C–C 600)	1" 300# RF	ON STAND PIPE	2
3	TEMPERATURE GAUGE	M33 x 2	ON S1,T1,T2 PIPELINES & STEAM TO EJECTOR	4
4	LEVEL SWITCH (C–C 350)	1" SW	ON STAND PIPE	2



BASE PLATE DETAILS

WELD END PREPARATION DETAIL–'A'



PLAN OF EJECTOR ASSLY

NOTES:–

1. DESIGN CODE : (a) THERMAL ----- HEI 8th EDN
   (b) MECHANICAL -- HEI/ASME SEC. VIII DIV.1 2010 INCLUDING ADD 2011.
2. INSPECTION : BHEL / CUSTOMER
3. PAINTING :
   (a) INSIDE ---- NIL
   (b) OUTSIDE --- 2 COATS OF HEAT RESISTANT ALUMINIUM PAINT.
4. FOUNDATION BOLTS (STUD+2NUTS M24x300) –8Nos.+ WASHERS BY BHEL (HYD.)
5. S3 NOZZLE IS TO BE CONNECTED WITH 2x100% EJECTOR ASSEMBLY AT SITE.
6. ALL BOLT HOLES TO STRADDLE CENTER LINES.
7. NOZZLES T1,T2,S1,S2,S3,S7 ARE PROVIDED WITH 50 MM EXTRA LENGTHS. FOR REMOVAL OF HYDRO–TEST BLANKS AT SITE & EDGE PREPARATION AS PER DETAIL–A.
8. 6 Nos. OF TUBES ARE PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
9. SILENCER SHALL BE SUITABLLY SUPPORTED ALONG WITH PIPING AT SITE

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FICILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FICILITIES

BHEL BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAMESH G		02.09.13	
CHD.	K.K.K.		02.09.13	NA
APPD.	B.SRINIVAS		02.09.13	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE		NA	–	NA	NA	NA
CODE 405						

TITLE: G.A OF GLAND STEAM CONDENSER

CARD CODE

DRAWING NO. 2–162–14–00573 REV. 00

SHEET No. 1 NO OF SHEETS 1

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY DETRIMENTAL TO THE INTEREST OF THE COMPANY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY DETRIMENTAL TO THE INTEREST OF THE COMPANY

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

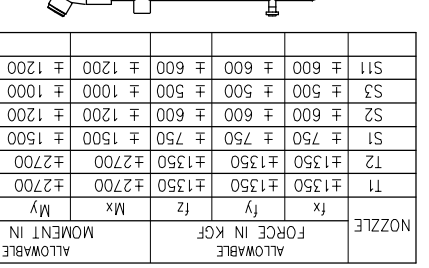
SCHEDULE OF VALVES

SL.NO	DESCRIPTION	SIZE/RATING	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE	1/2" SW 1500#	ON SHELL	2
b	ROOT VALVE FOR SHELL VENT & DRAIN	1" SW 1500#	ON SHELL	6
c	ROOT VALVE FOR CHANNEL VENT/DRAIN DOUBLE ISOLATION	1" SW 2500#	ON CHANNEL	8
d	ROOT VALVE FOR STAND PIPES	2" SW 1500#	ON SHELL	8
e	WATER EXPANSION RELIEF VALVE	INLET 3/4" SW(M)	ON CHANNEL	1
		OUTLET 1" SW(F)		
j	SHELL SAFETY RELIEF VALVE	INLET 4"ANSI 300#RF	ON SHELL	1
		OUTLET 6"ANSI 150#RF		

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

NOZZLE	ALLOWABLE FORCE IN KGF			ALLOWABLE MOMENT IN KGM			THERMAL MOVEMENT IN mm. NOZZLE	
	fx	fy	fz	Mx	My	Mz	ΔX	ΔY
T1	±1350	±1350	±1350	±2700	±2700	±2700	+2.5	−0.5
T2	±1350	±1350	±1350	±2700	±2700	±2700	+2.5	+5.0
S1	± 750	± 750	± 750	± 1500	± 1500	± 1500	−7.0	+9.0
S2	± 600	± 600	± 600	± 1200	± 1200	± 1200	−3.5	+1.8
S3	± 500	± 500	± 500	± 1000	± 1000	± 1000	−21.0	+2.1
S11	± 600	± 600	± 600	± 1200	± 1200	± 1200	−10.0	−0.6

VIEW–X1



NOTES :
1. MOVEMENT IN X DIRECTION IS WITH RESPECT TO & AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN Y DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.

DESIGN DATA

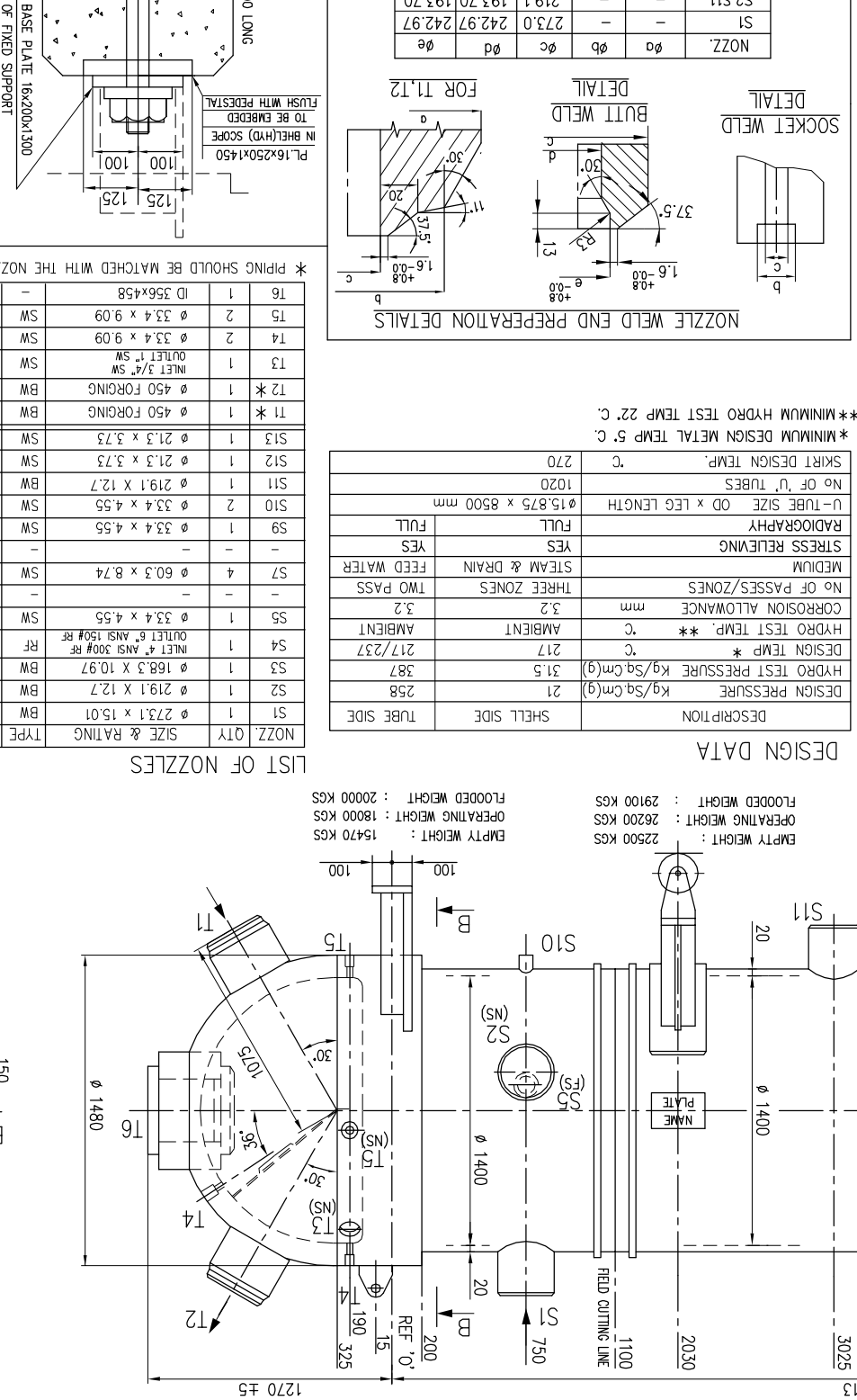
DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq.Cm(g)	21	258
HYDRO TEST PRESSURE Kg/Sq.Cm(g)	31.5	387
DESIGN TEMP * °C	217	217/237
HYDRO TEST TEMP. ** °C	AMBIENT	AMBIENT
CORROSION ALLOWANCE mm	3.2	3.2
No OF PASSES/ZONES	THREE ZONES	TWO PASS
MEDIUM	STEAM & DRAIN	FEED WATER
STRESS RELIEVING	YES	YES
RADIOGRAPHY	FULL	FULL
U-TUBE SIZE OD x LEG LENGTH	ø15.875 x 8500 mm	
No OF 'U' TUBES	1020	
SKIRT DESIGN TEMP. °C	270	

* MINIMUM DESIGN METAL TEMP 5° C.
** MINIMUM HYDRO TEST TEMP 22° C.

MATERIALS OF CONSTRUCTION

SL.NO	DESCRIPTION	MATERIAL
01	SHELL, DISHED END & HEMI HEAD	SA 516 GR.70
02	SHELL SKIRT	SA 516 GR.70
03	TUBE SHEET FORGING	SA 350 LF2 CL1
04	NOZZLE S1,S2,S3,S4 & S11	SA 106 GR.B
05	NOZZLE T1,T2 & MANWAY	SA 350 LF2 CL1
06	TUBES	SA 688 TP 304 N
07	IMPINGEMENT PLATE	SA 240 TP 304

NORMAL OPERATING RANGE
NORMAL LIQUID LEVEL
DO NOT USE FOR ALARM POINTS
NS – NEAR SIDE
FS – FAR SIDE



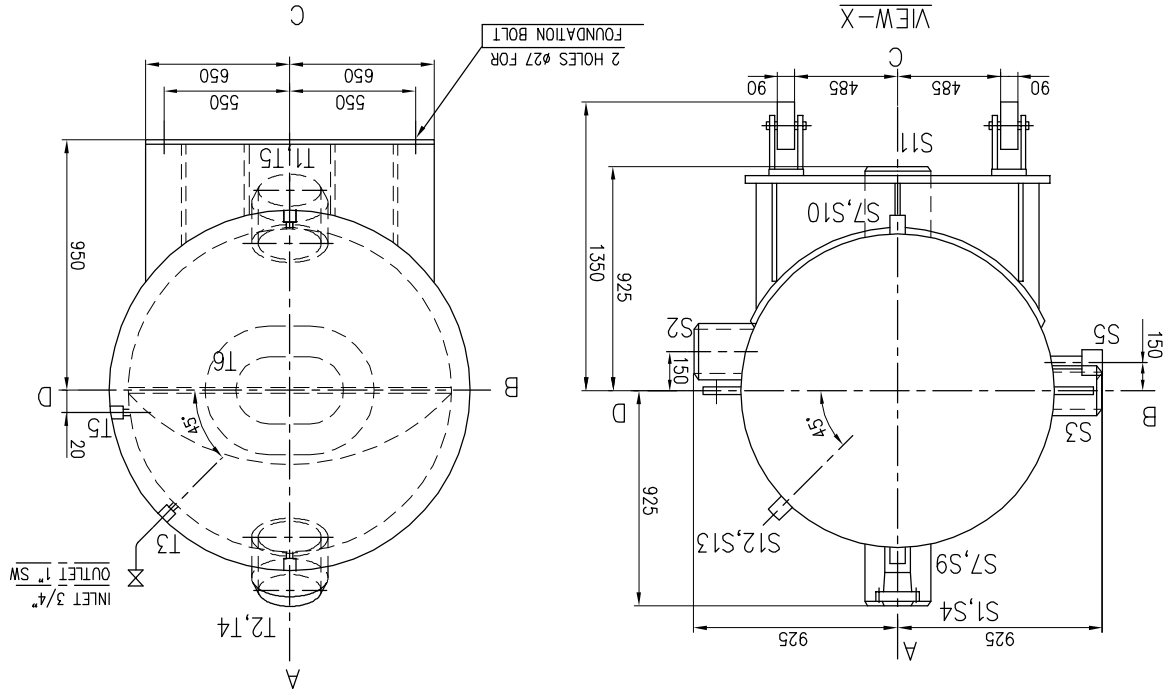
LIST OF NOZZLES

NOZZ.	QTY	SIZE & RATING	TYPE	DESCRIPTION
S1	1	ø 273.1 x 15.01	BW	STEAM INLET
S2	1	ø 219.1 x 12.7	BW	DRAINS OUTLET
S3	1	ø 168.3 x 10.97	BW	DRIP INLET
S4	1	ø 60.3 x 8.74 INLET 4" ANSI 300# RF OUTLET 6" ANSI 150# RF	RF	SHELL SAFETY RELIEF VALVE CONN.
S5	1	ø 33.4 x 4.55	SW	OPERATING AIR OUTLET
–	–	–	–	–
S7	4	ø 60.3 x 8.74	SW	LIQUID LEVEL STAND PIPE CONN.
–	–	–	–	–
S9	1	ø 33.4 x 4.55	SW	SHELL START UP VENT
S10	2	ø 33.4 x 4.55	SW	SHELL DRAIN
S11	1	ø 219.1 x 12.7	BW	D.C BYPASS (BLANKED)
S12	1	ø 21.3 x 3.73	SW	PRESSURE GAUGE CONN. FOR TESTING
S13	1	ø 21.3 x 3.73	SW	PRESSURE GAUGE CONN.
T1 *	1	ø 450 FORGING	BW	FEED WATER INLET
T2 *	1	ø 450 FORGING	BW	FEED WATER OUTLET
T3	1	INLET 3/4" SW OUTLET 1" SW	SW	CHANNEL SAFETY RELEIF VALVE CONN.
T4	2	ø 33.4 x 9.09	SW	CHANNEL START UP VENT
T5	2	ø 33.4 x 9.09	SW	CHANNEL DRAIN
T6	1	ID 356x458	–	GROUND MANWAY

* PIPING SHOULD BE MATCHED WITH THE NOZZLE SIZE PROVIDED ON THE VESSEL

WEIGHTS IN KGS

EMPTY	31000
OPERATING	36000
FLOODED	44000



1. DESIGN CODE : a) THERMAL ---- HEI 8th EDN.
b) MECHANICAL -- HEI / ASME SEC VIII DIV.1 2010 UPTO & INCL ADD 2011.
2. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP TEST VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLETS DURING OPERATION. CRITICAL ORIFICE FLOW PLATE (WITH DIA.6.1 HOLE) HAS NOT BEEN PROVIDED IN CONN. S5.
6. ALL BOLT HOLES TO STRADDLE CENTRE LINES
ORIFICE PLATE ASSLY WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
7. GRIT BLAST EXTERIOR OF VESSEL AND PAINT WITH TWO COATS OF HEAT RESISTANT ALUMINIUM PAINT.
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES WELDED AND ROLLED INTO TUBE SHEET.
10. INSULATION CLIPS WELDED ON 210 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 67MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH DIA 52 MM HOLE.
13. INSPECTION & CERTIFICATION BY D.O.B.(A.P)
14. FOR STAND PIPE DETAILS REF. DRG. No. 3-175-01-02211.
15. 7 Nos. U-TUBES ARE PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING. TESTING & COMMISIONING FOR PLUGGING PURPOSE.
16. THE LOAD INDICATED ON EACH SUPPORT IS MAXIMUM EXPECTED LOAD & IS FOR CIVIL DESIGN PURPOSE.
17. TEMPERATURE GAUGE & PRESSURE GAUGE CONNECTIONS FOR T1,T2,S2 & S3 NOZZLES SHALL BE PROVIDED ON PIPING NEARST TO THE NOZZLES.
18. FOUNDATION BOLTS M24x150 (STUD+2 NUTS) – 2 Nos.

RIL DRG. NO.:

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA IMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

	DRN.	NAME	SIGN.	DATE	NO.OF VAR.
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD	RAJESH M	M RAJESH		06.09.13	NA
	CHD.	K KIRANKUMAR		06.09.13	
	APPD.	B.SRINIVAS		06.09.13	

DEPT.	HEE	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
CODE	405		NTS	–	NA	NA	NA

TITLE: GENERAL ARRANGEMENT OF HP HEATER – 5

CARD CODE

DRAWING NO. 2-175-01-01595 REV. 00

SHEET No. 1 NO OF SHEETS 1

ZONE	REV.	DATE	ALTERED	CHECKED	APPD
1					
2					
3					
4					
5					

(ALL DIMENSIONS ARE IN mm)

FIRST ANGLE PROJECTION

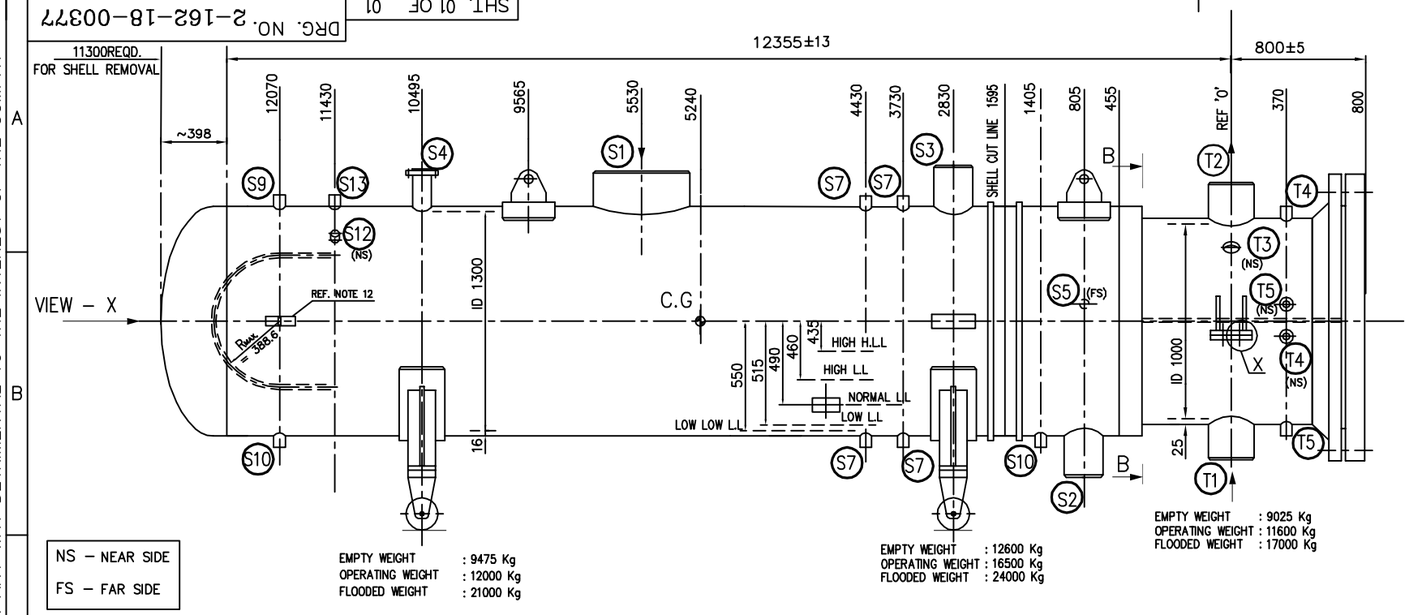
SH. 1 OF 1 | DRG. NO. 2-175-01-01595

| | | |

FIRST ANGLE PROJECTION

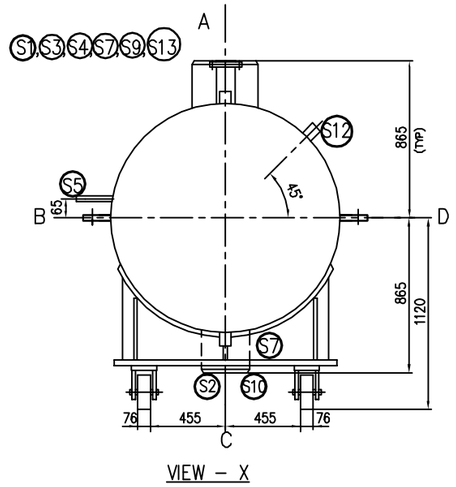
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-18-00377 SHT. 01 OF 01

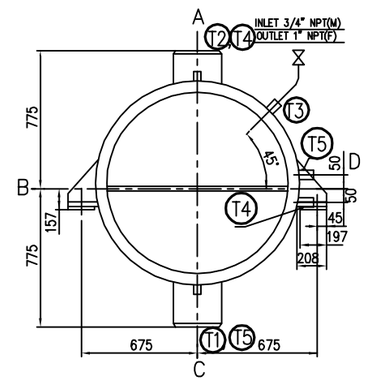


NS – NEAR SIDE

FS – FAR SIDE



VIEW – X



SECTION B.B

LIST OF NOZZLES

REF.	QTY.	DESCRIPTION	SIZE & RATING	CONNECTING PIPE THICKNESS	TYPE
S1	1	STEAM INLET	ø 965 x 12	9.53	BW
S2	1	DRAINS OUTLET	ø273.1 x 12.7	9.27	BW
S3	1	DRAINS INLET	ø273.1 x 12.7	9.27	BW
S4	1	SHELL SAFETY RELIEF VALVE CONN.	4" ANSI 150#	SRV OULET SIZE 6" ANSI 150#	RF
S5	1	OPERATING AIR OUTLET	ø 114.3 x 11.13	6.02	BW
–	–	–	–	——	–
S7	4	LIQUID LEVEL STAND PIPE CONN.	2" ANSI 6000# CPLG	——	SW
–	–	–	–	——	
S9	1	SHELL START UP VENT	1" ANSI 6000# CPLG	——	SW
S10	2	SHELL DRAIN	1" ANSI 6000# CPLG	——	SW
–	–	–	–	——	–
S12	1	PRESSURE GAUGE CONN.	1/2" ANSI 6000# CPLG	——	SW
S13	1	PRESSURE GAUGE CONN. FOR TESTING	1/2" ANSI 6000# CPLG	——	SW
T1	1	CONDENSATE INLET	ø 323.9 x 12.7	9.5	BW
T2	1	CONDENSATE OUTLET	ø 323.9 x 12.7	9.5	BW
T3	1	CHANNEL SAFETY RELEIF VALVE CONN.	3/4" ANSI 6000# CPLG	——	SW
T4	2	CHANNEL START UP VENT	1" ANSI 6000# CPLG	——	SW
T5	2	CHANNEL DRAIN	1" ANSI 6000# CPLG	——	SW

DESIGN DATA

CODE : ASME SEC.VIII DIV–1 2010 UPTO & INCL. ADD. 2011 & HEI 8th EDN.

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq cm (g)	3 & FULL VACUUM	25
TEST PRESSURE Kg/Sq cm (g)	3.9	32.5
DESIGN TEMPERATURE °C *	143	143
No. OF PASSES OR ZONES	ONE ZONE	TWO PASS
CORROSION ALLOWANCE	3.2 mm	3.2 mm
POST WELD HEAT TREATMENT	NO	NO
RADIOGRAPHY	SPOT	FULL
U–TUBE SIZE	OD 19.05 X LEG LENGTH 11800	
NO OF TUBES PROVIDED	439 'U'	

* MINIMUM DESIGN METAL TEMP. 5°C
MINIMUM HYDRO–TEST TEMP. 22°C

LIST OF FITTINGS & VALVES

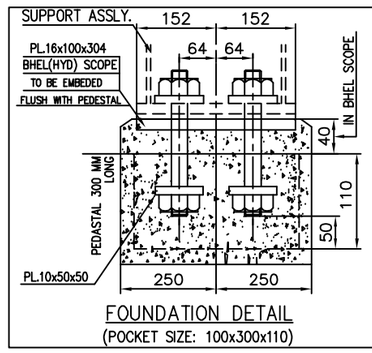
SL.NO	DESCRIPTION	CONN.	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE	1/2"SW ANSI 800#	ON SHELL	1
b	ROOT VALVE FOR DRAIN & VENT OF STAND PIPES	1/2"SW ANSI 800#	ON STAND PIPE	4
c	ROOT VALVE FOR STAND PIPES	2" SW ANSI 800#	ON SHELL	4
d	ROOT VALVE FOR SHELL VENT & DRAIN	1" SW ANSI 800#	ON SHELL	3
e	ROOT VALVE FOR CHANNEL VENT & DRAIN	1"SW ANSI 1500#	ON CHANNEL	4
i	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g)	INLET 4"ANSI150#	ON SHELL	1
		OUTLET 6"ANSI150#		
j	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g)	INLET 3/4" SW	ON CHANNEL	1
		OUTLET 1" SW		

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL. SPECIFICATION
1	SHELL	CS, SA516 Gr.70
2	SHELL DISHED END	CS, SA516 Gr.70
3	TUBE SHEET& CHANNEL END COVER	SS, SA182 F304
4	CHANNEL	SS, SA240 TP304
5	SUPPORT PLATES	CS, IS 2062
6	TUBES	SS, SA 688 TP 304
7	NOZZLES (SHELL SIDE)	CS, SA106 Gr.B
8	T1 & T2 NOZZLES	SS 304
9	IMPINGEMENT PLATE	SS, SA240 TP304

NOTES :–

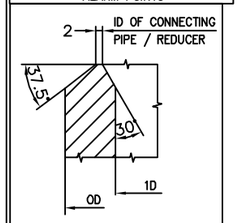
1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLET DURING OPERATION. CRITICAL ORIFICE FLOW PLATE HAS NOT BEEN PROVIDED IN CONN. S5. ORIFICE PLATE ASSLY. WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
6. CRITICAL ORIFICE FLOW PLATE HOLE DIA. 43 MM (FOR S5)
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES ARE ROLLED INTO TUBE SHEET HOLES WITH GROOVES.
10. INSULATION CLIPS WELDED ON 240 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 48 MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH 40 MM DIA. HOLE.
13. 7 No. OF TUBES PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
14. FOUNDATION BOLTS M24x150 STUD WITH TWO NUTS – 4 NOS.
15. FOR STAND PIPE DETAILS REFER DRG. No. 3–162–18–00961.
16. COUNTER FLANGE, FASTNERS & GASKET FOR SHELL SAFETY RELIEF VALVE – BY BHEL(HYD).
17. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.



FOUNDATION DETAIL
(POCKET SIZE: 100x300x110)

NORMAL OPERATING RANGE

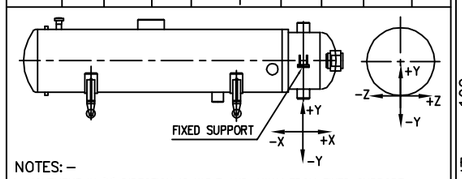
10	NORMAL LIQUID LEVEL
10	DO NOT USE FOR ALARM POINTS



DETAIL OF BUTT WELD CONN.
DETAIL–A

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

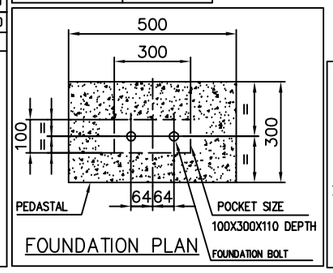
NOZZLE	NOZZLE THERMAL MOVEMENTS mm			MAX. ALLOWABLE FORCE Kgf			MAX. ALLOWABLE MOMENT KgM		
	Δx	Δy	Δz	Fx	Fy	Fz	Mx	My	Mz
T1	0.0	–1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
T2	0.0	+1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
S1	–9.9	+1.6	0.0	±3000	±3000	±3000	±6000	±6000	±6000
S2	–1.6	–1.6	0.0	±650	±650	±650	±1300	±1300	±1300
S3	–5.1	+1.6	0.0	±800	±800	±800	±1600	±1600	±1600



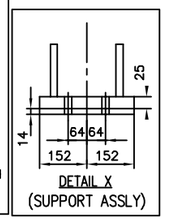
NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS W.R.T AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.

WEIGHTS IN Kgs

EMPTY	18500
OPERATING	23600
FLOODED	38000



FOUNDATION PLAN



DETAIL X
(SUPPORT ASSLY)

RIL DRG. NO.:

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.BHANU	BHANU	04.09.13	NA
CHD.	K KIRAN KUMAR		04.09.13	
APPD.	B.SRINIVAS		04.09.13	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE							
CODE 405	GR. C/M/F		NTS	---	NA	NA	NA

TITLE
GENERAL ARRANGEMENT OF LP HEATER No. 1

CARD CODE

DRAWING NO. 2–162–18–00377 REV. 00

SHT. No 01 NO. OF SHT. 01

REV.	DATE	ALTERED	CHD/APPD	ZONE

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

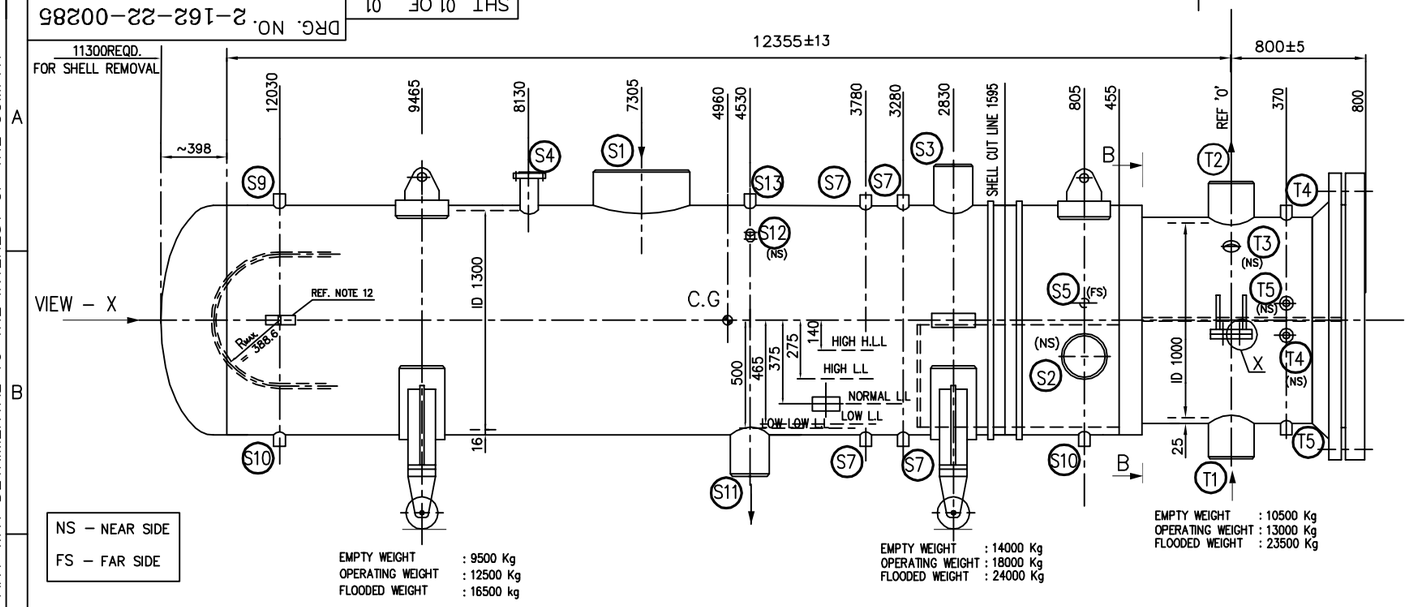
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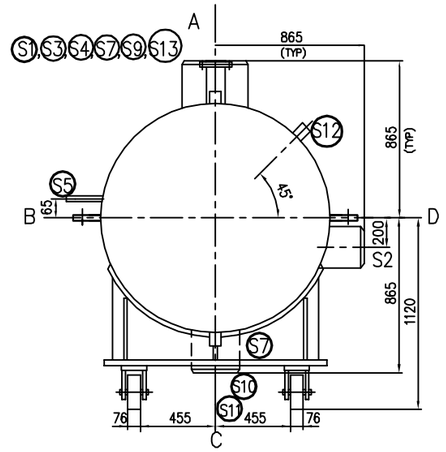
INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

FIRST ANGLE PROJECTION

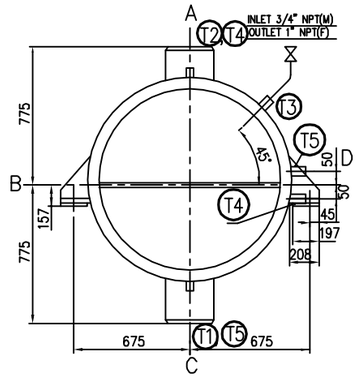
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-22-00285 SHT. 01 OF 01





VIEW – X



SECTION B.B

LIST OF NOZZLES

REF.	QTY.	DESCRIPTION	SIZE & RATING	CONNECTING PIPE THICKNESS	TYPE
S1	1	STEAM INLET	ø 610 x 9.53	6.35	BW
S2	1	DRAINS OUTLET	ø219.1 x 12.7	8.18	BW
S3	1	DRAINS INLET	ø273.1 x 9.27	7.8	BW
S4	1	SHELL SAFETY RELIEF VALVE CONN.	4" ANSI 150#	SRV OULET SIZE 6" ANSI 150#	RF
S5	1	OPERATING AIR OUTLET	ø 114.3 x 11.13	6.02	BW
–	–	–	–	——	–
S7	4	LIQUID LEVEL STAND PIPE CONN.	2" ANSI 6000# CPLG	——	SW
–	–	–	–	——	
S9	1	SHELL START UP VENT	1" ANSI 6000# CPLG	——	SW
S10	2	SHELL DRAIN	1" ANSI 6000# CPLG	——	SW
S11	1	DC ZONE BYPASS(LP DRAIN FT)	ø219.1 x 12.7	8.18	BW
S12	1	PRESSURE GAUGE CONN.	1/2" ANSI 6000# CPLG	——	SW
S13	1	PRESSURE GAUGE CONN. FOR TESTING	1/2" ANSI 6000# CPLG	——	SW
T1	1	CONDENSATE INLET	ø 323.9 x 12.7	9.5	BW
T2	1	CONDENSATE OUTLET	ø 323.9 x 12.7	9.5	BW
T3	1	CHANNEL SAFETY RELEIF VALVE CONN.	3/4" ANSI 6000# CPLG	——	SW
T4	2	CHANNEL START UP VENT	1" ANSI 6000# CPLG	——	SW
T5	2	CHANNEL DRAIN	1" ANSI 6000# CPLG	——	SW

DESIGN DATA

CODE : ASME SEC.VIII DIV–1 2010 UPTO & INCL. ADD. 2011 & HEI 8th EDN.

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq cm (g)	3 & FULL VACUUM	25
TEST PRESSURE Kg/Sq cm (g)	3.9	32.5
DESIGN TEMPERATURE °C *	143	143
No. OF PASSES OR ZONES	TWO ZONES	TWO PASS
CORROSION ALLOWANCE	3.2 mm	3.2 mm
POST WELD HEAT TREATMENT	NO	NO
RADIOGRAPHY	SPOT	FULL
U–TUBE SIZE	OD 19.05 X LEG LENGTH 11800	
NO OF TUBES PROVIDED	439 'U'	

* MINIMUM DESIGN METAL TEMP. 5°C
MINIMUM HYDRO–TEST TEMP. 22°C

LIST OF FITTINGS & VALVES

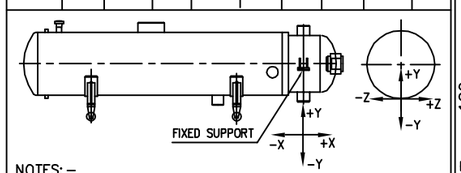
SL.NO	DESCRIPTION	CONN.	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE	1/2"SW ANSI 800#	ON SHELL	1
b	ROOT VALVE FOR DRAIN & VENT OF STAND PIPES	1/2"SW ANSI 800#	ON STAND PIPE	4
c	ROOT VALVE FOR STAND PIPES	2" SW ANSI 800#	ON SHELL	4
d	ROOT VALVE FOR SHELL VENT & DRAIN	1" SW ANSI 800#	ON SHELL	3
e	ROOT VALVE FOR CHANNEL VENT & DRAIN	1"SW ANSI 1500#	ON CHANNEL	4
i	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g) — INLET	4"ANSI150#	ON SHELL	1
	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g) — OUTLET	6"ANSI150#		
j	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g) — INLET	3/4" SW	ON CHANNEL	1
	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g) — OUTLET	1" SW		

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL. SPECIFICATION
1	SHELL	CS, SA516 Gr.70
2	SHELL DISHED END	CS, SA516 Gr.70
3	TUBE SHEET& CHANNEL END COVER	SS, SA182 F304
4	CHANNEL	SS, SA240 TP304
5	SUPPORT PLATES	CS, IS 2062
6	TUBES	SS, SA 688 TP 304
7	NOZZLES (SHELL SIDE)	CS, SA106 Gr.B
8	T1 & T2 NOZZLES	SS 304
9	IMPINGEMENT PLATE	SS, SA240 TP304

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

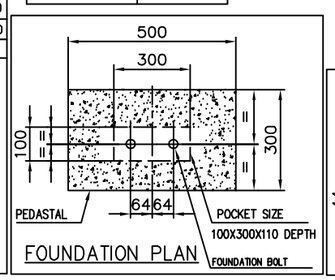
NOZZLE	NOZZLE THERMAL MOVEMENTS mm			MAX. ALLOWABLE FORCE Kgf			MAX. ALLOWABLE MOMENT KgM		
	△x	△y	△z	Fx	Fy	Fz	Mx	My	Mz
T1	0.0	–1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
T2	0.0	+1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
S1	–14.6	+2.1	0.0	±1800	±1800	±1800	±3600	±3600	±3600
S2	–2.1	–0.5	+2.1	±500	±500	±500	±1000	±1000	±1000
S3	–6.7	+2.1	0.0	±800	±800	±800	±1600	±1600	±1600
S11	–8.5	–1.6	0.0	±500	±500	±500	±1000	±1000	±1000



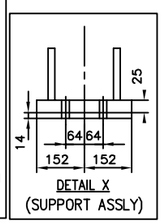
NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS W.R.T AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.

WEIGHTS IN Kgs

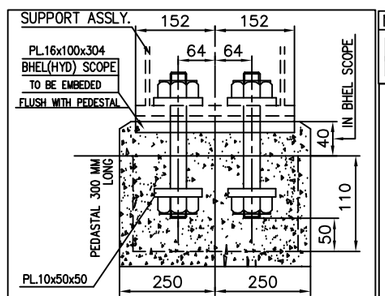
EMPTY	20000
OPERATING	25500
FLOODED	40000



FOUNDATION PLAN



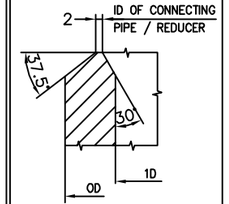
DETAIL X
(SUPPORT ASSLY)



FOUNDATION DETAIL
(POCKET SIZE: 100x300x110)

NORMAL OPERATING RANGE

10 10	NORMAL LIQUID LEVEL
10	DO NOT USE FOR ALARM POINTS



DETAIL OF BUTT WELD CONN.
DETAIL–A

NOTES :–

1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLET DURING OPERATION. CRITICAL ORIFICE FLOW PLATE HAS NOT BEEN PROVIDED IN CONN. S5. ORIFICE PLATE ASSLY. WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
6. CRITICAL ORIFICE FLOW PLATE HOLE DIA. 21 MM (FOR S5)
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES ARE ROLLED INTO TUBE SHEET HOLES WITH GROOVES.
10. INSULATION CLIPS WELDED ON 240 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 48 MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH 40 MM DIA. HOLE.
13. 7 No. OF TUBES PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
14. FOUNDATION BOLTS M24x150 STUD WITH TWO NUTS – 4 NOS.
15. FOR STAND PIPE DETAILS REFER DRG. No. 3–162–22–00469.
16. COUNTER FLANGE, FASTNERS & GASKET FOR SHELL SAFETY RELIEF VALVE – BY BHEL(HYD).
17. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.

REV.	DATE	ALTERED	CHD/APPD
ZONE			

RIL DRG. NO.:

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.BHANU	BHANU	04.09.13	NA
CHD.	K KIRAN KUMAR		04.09.13	
APPD.	B.SRINIVAS		04.09.13	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR.		NTS	---	NA	NA	NA
CODE 405	₵/M/F						

TITLE: GENERAL ARRANGEMENT OF LP HEATER No. 2

CARD CODE

DRAWING NO. 2–162–22–00285 REV. 00

SHT. No 01 NO. OF SHT. 01

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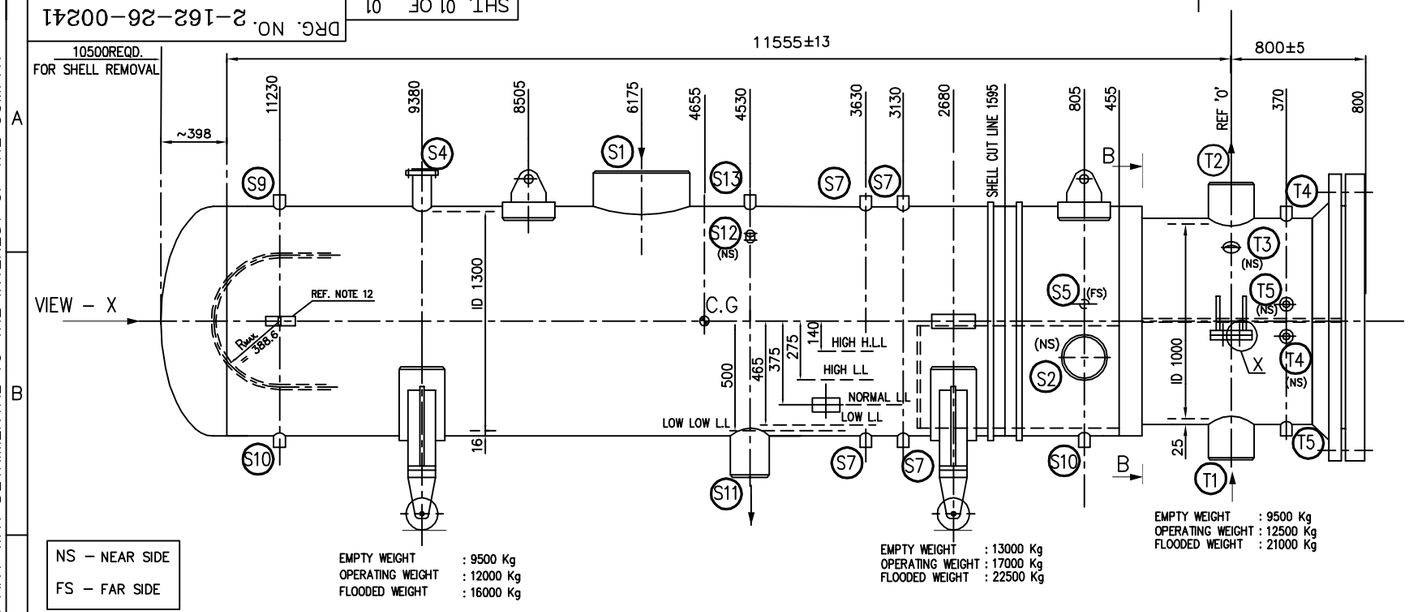
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

FIRST ANGLE PROJECTION

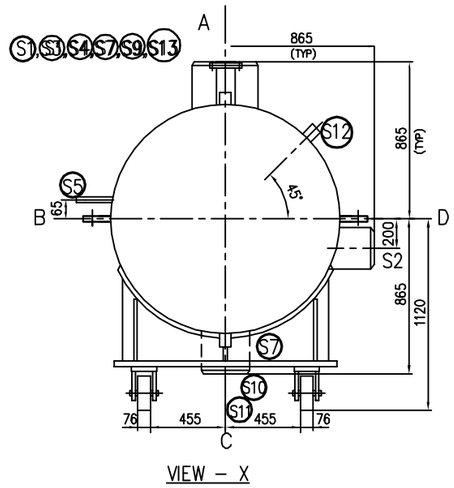
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-162-26-00241 SHT. 01 OF 01

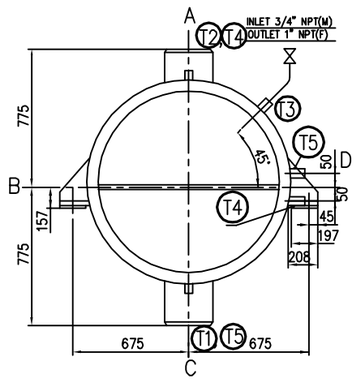


NS – NEAR SIDE

FS – FAR SIDE



VIEW – X



SECTION B.B

LIST OF NOZZLES

REF.	QTY.	DESCRIPTION	SIZE & RATING	CONNECTING PIPE THICKNESS	TYPE
S1	1	STEAM INLET	ø 406.4 x 9.52	6.35	BW
S2	1	DRAINS OUTLET	ø168.3 x 10.97	7.11	BW
–	–	–	–	—	–
S4	1	SHELL SAFETY RELIEF VALVE CONN.	4" ANSI 150#	SRV OULET SIZE 6" ANSI 150#	RF
S5	1	OPERATING AIR OUTLET	ø 114.3 x 11.13	6.02	BW
–	–	–	–	—	–
S7	4	LIQUID LEVEL STAND PIPE CONN.	2" ANSI 6000# CPLG	—	SW
–	–	–	–	—	
S9	1	SHELL START UP VENT	1" ANSI 6000# CPLG	—	SW
S10	2	SHELL DRAIN	1" ANSI 6000# CPLG	—	SW
S11	1	DC ZONE BYPASS(LP DRAIN FT)	ø168.3 x 10.97	7.11	BW
S12	1	PRESSURE GAUGE CONN.	1/2" ANSI 6000# CPLG	—	SW
S13	1	PRESSURE GAUGE CONN. FOR TESTING	1/2" ANSI 6000# CPLG	—	SW
T1	1	CONDENSATE INLET	ø 323.9 x 12.7	9.5	BW
T2	1	CONDENSATE OUTLET	ø 323.9 x 12.7	9.5	BW
T3	1	CHANNEL SAFETY RELEIF VALVE CONN.	3/4" ANSI 6000# CPLG	—	SW
T4	2	CHANNEL START UP VENT	1" ANSI 6000# CPLG	—	SW
T5	2	CHANNEL DRAIN	1" ANSI 6000# CPLG	—	SW

DESIGN DATA

CODE : ASME SEC.VIII DIV–1 2010 UPTO & INCL. ADD. 2011 & HEI 8th EDN.

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/Sq cm (g)	4 & FULL VACUUM	25
TEST PRESSURE Kg/Sq cm (g)	5.2	32.5
DESIGN TEMPERATURE °C *	152	152
No. OF PASSES OR ZONES	TWO ZONES	TWO PASS
CORROSION ALLOWANCE	3.2 mm	3.2 mm
POST WELD HEAT TREATMENT	NO	NO
RADIOGRAPHY	SPOT	FULL
U–TUBE SIZE	OD 19.05 X LEG LENGTH 11000	
NO OF TUBES PROVIDED	439 'U'	

* MINIMUM DESIGN METAL TEMP. 5°C
MINIMUM HYDRO–TEST TEMP. 22°C

LIST OF FITTINGS & VALVES

SL.NO	DESCRIPTION		CONN.	LOCATION	QTY
a	ROOT VALVE FOR PRESSURE GAUGE		1/2"SW ANSI 800#	ON SHELL	1
b	ROOT VALVE FOR DRAIN & VENT OF STAND PIPES		1/2"SW ANSI 800#	ON STAND PIPE	4
c	ROOT VALVE FOR STAND PIPES		2" SW ANSI 800#	ON SHELL	4
d	ROOT VALVE FOR SHELL VENT & DRAIN		1" SW ANSI 800#	ON SHELL	3
e	ROOT VALVE FOR CHANNEL VENT & DRAIN		1"SW ANSI 1500#	ON CHANNEL	4
i	STEAM SIDE SAFTEY RELIEF VALVE SET PR 3 Kg/Sq.Cm (g)	INLET	4"ANSI150#	ON SHELL	1
		OUTLET	6"ANSI150#		
j	WATER EXPANSION RELIEF VALVE SET PR 25 Kg/Sq.Cm (g)	INLET	3/4" SW	ON CHANNEL	1
		OUTLET	1" SW		

MATERIALS OF CONSTRUCTION

SL.NO	ITEM	MATL. SPECIFICATION
1	SHELL	CS, SA516 Gr.70
2	SHELL DISHED END	CS, SA516 Gr.70
3	TUBE SHEET& CHANNEL END COVER	SS, SA182 F304
4	CHANNEL	SS, SA240 TP304
5	SUPPORT PLATES	CS, IS 2062
6	TUBES	SS, SA 688 TP 304
7	NOZZLES (SHELL SIDE)	CS, SA106 Gr.B
8	T1 & T2 NOZZLES	SS 304
9	IMPINGEMENT PLATE	SS, SA240 TP304

THERMAL MOVEMENTS, ALLOWABLE FORCES & MOMENTS

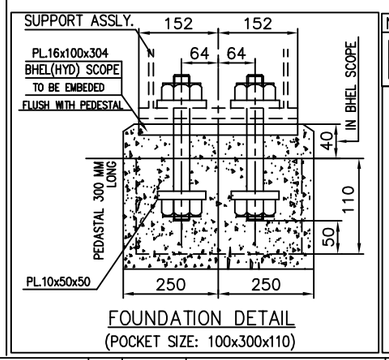
NOZZLE	NOZZLE THERMAL MOVEMENTS mm			MAX. ALLOWABLE FORCE Kgf			MAX. ALLOWABLE MOMENT KgM		
	Δx	Δy	Δz	Fx	Fy	Fz	Mx	My	Mz
T1	0.0	–1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
T2	0.0	+1.9	0.0	±1000	±1000	±1000	±2000	±2000	±2000
S1	–14.6	+2.1	0.0	±1200	±1800	±1800	±2400	±3600	±3600
S2	–2.1	–0.5	+2.1	±500	±500	±500	±1000	±1000	±1000
S11	–8.5	–1.6	0.0	±500	±500	±500	±1000	±1000	±1000

WEIGHTS IN Kgs

EMPTY	19000
OPERATING	24500
FLOODED	37000

NOTES :–

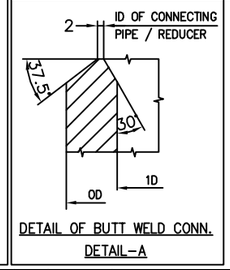
1. UNLESS OTHERWISE STATED ALL DIMENSIONS ARE WITHIN TOLERANCES SPECIFIED BY THE HEAT EXCHANGE INSTITUTE STANDARDS FOR CLOSED FEED WATER HEATERS.
2. ALL BOLT HOLES TO STRADDLE CENTRE LINES
3. ALL COUPLINGS ARE 6000 LB AND PLUGGED.
4. START UP VENT SHOULD NOT BE USED DURING NORMAL OPERATION.
5. HEATER MUST BE VENTED THROUGH OPERATING AIR OUTLET DURING OPERATION. CRITICAL ORIFICE FLOW PLATE HAS NOT BEEN PROVIDED IN CONN. S5. ORIFICE PLATE ASSLY. WILL BE SHIPPED LOOSE & HAS TO BE ASSEMBLED AT SITE.
6. CRITICAL ORIFICE FLOW PLATE HOLE DIA. 12.4 MM (FOR S5)
7. PAINTING : OUTSIDE: 2 COATS OF HEAT RESISTANT DRY ALUMINIUM PAINT
8. SAFETY RELIEF VALVE SHOULD BE INSTALLED IN VERTICAL POSITION.
9. TUBES ARE ROLLED INTO TUBE SHEET HOLES WITH GROOVES.
10. INSULATION CLIPS WELDED ON 240 SQ. PITCH AT SITE.
11. TWO LIFTING LUGS WITH 48 MM DIA. HOLE.
12. TWO SHELL PULLING LUGS WITH 40 MM DIA. HOLE.
13. 7 No. OF TUBES PROVIDED EXTRA FOR ANY EVENTUALITY DURING MANUFACTURING, TESTING & COMMISIONING FOR PLUGGING PURPOSE.
14. FOUNDATION BOLTS M24x150 STUD WITH TWO NUTS – 4 NOS.
15. FOR STAND PIPE DETAILS REFER DRG. No. 3–162–22–00469.
16. COUNTER FLANGE, FASTNERS & GASKET FOR SHELL SAFETY RELIEF VALVE – BY BHEL(HYD).
17. LOAD INDICATED AT EACH SUPPORT IS MAXIMUM EXPECTED LOAD AND IS FOR CIVIL DESIGN PURPOSE.



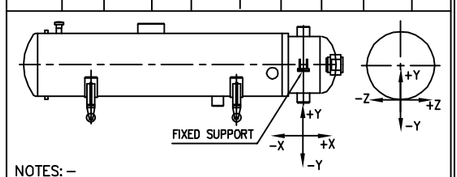
FOUNDATION DETAIL
(POCKET SIZE: 100x300x110)

NORMAL OPERATING RANGE

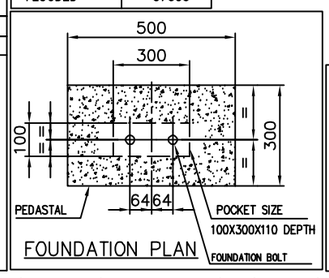
10	NORMAL LIQUID LEVEL
10	DO NOT USE FOR ALARM POINTS



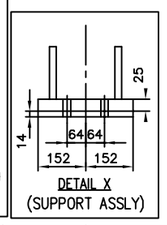
DETAIL OF BUTT WELD CONN.
DETAIL–A



NOTES: –
1. MOVEMENT IN 'X' DIRECTION IS W.R.T AND AWAY FROM FIXED SUPPORT.
2. MOVEMENT IN 'Y' DIRECTION IS WITH RESPECT TO BOTTOM OF THE SHELL.



FOUNDATION PLAN



DETAIL X
(SUPPORT ASSLY)

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

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INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

REV.	DATE	ALTERED	CHD/APPD
ZONE			

RIL DRG. NO.:

CONSULTANT: BECHTEL FREDERICK, MARYLAND, USA

OWNER: RELIANCE INDUSTRIES LIMITED

PROJECT: COAL BASED CAPTIVE POWER PLANTS
HAZIRA HMD 4X93MW CHEMICAL FACILITIES
DAHEJ DMD 3X90.3MW CHEMICAL FACILITIES

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.BHANU	BHANU	04.09.13	NA
CHD.	K KIRAN KUMAR		04.09.13	
APPD.	B.SRINIVAS		04.09.13	

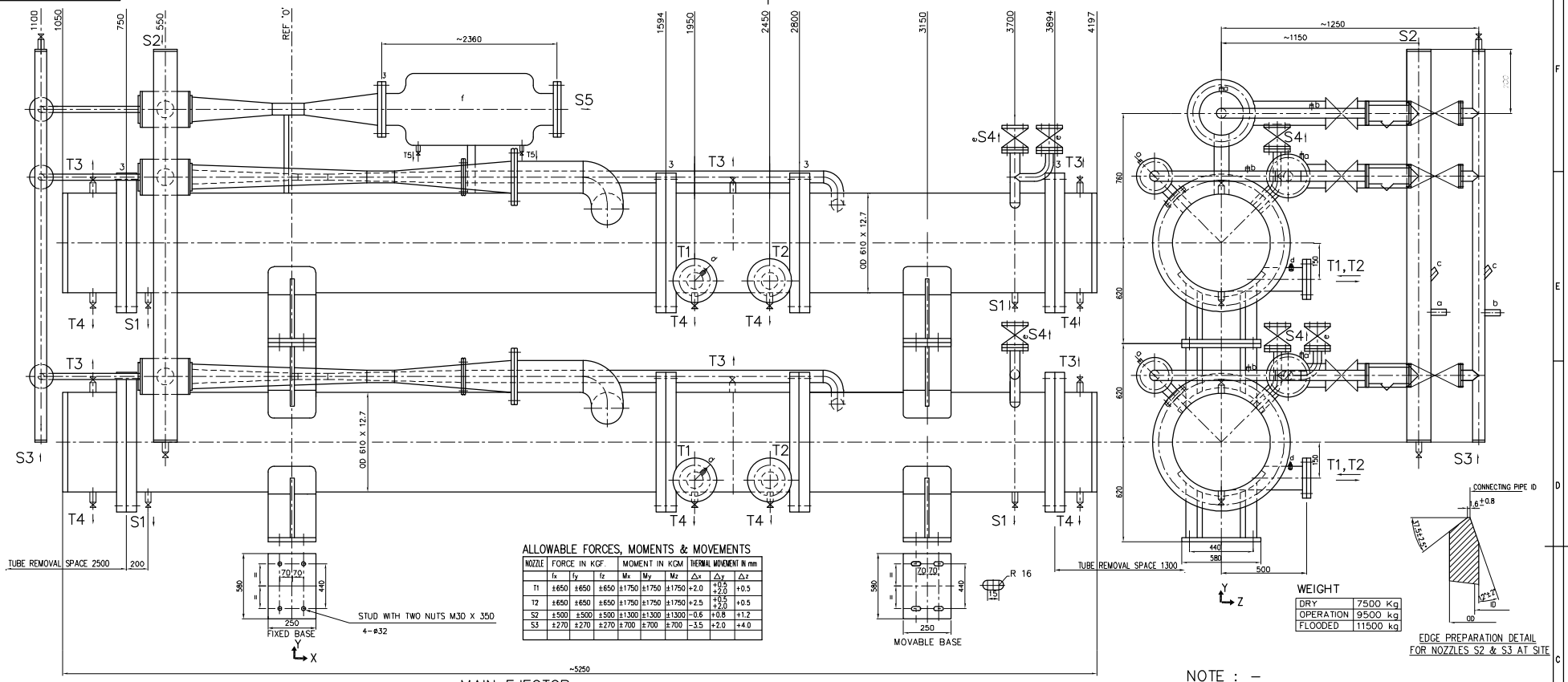
DEPT.	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	℄/M/F	NTS	---	NA	NA	NA
CODE 405						

TITLE: GENERAL ARRANGEMENT OF LP HEATER No. 3

CARD CODE

DRAWING NO. 2–162–26–00241 REV. 00

SHT. No 01 NO. OF SHT. 01



ALLOWABLE FORCES, MOMENTS & MOVEMENTS

NOZZLE	FORCE IN KGF			MOMENT IN KGM			THERMAL MOVEMENT IN mm		
	fx	fy	fz	Mx	My	Mz	Δx	Δy	Δz
T1	±650	±650	±650	±1750	±1750	±1750	+2.0	+0.5 +2.0	+0.5
T2	±650	±650	±650	±1750	±1750	±1750	+2.5	+0.5 +2.0	+0.5
S2	±500	±500	±500	±1300	±1300	±1300	−0.6	+0.8	+1.2
S3	±270	±270	±270	±700	±700	±700	−3.5	+2.0	+4.0

WEIGHT

DRY	7500 Kg
OPERATION	9500 kg
FLOODED	11500 kg

LIST OF NOZZLE CONNECTIONS

REF	DESCRIPTION	SIZE	QTY	END CONN
T1	CONDENSATE WATER INLET	10" ANSI 300 RF	2	FLG
T2	CONDENSATE WATER OUTLET	10" ANSI 300 RF	2	FLG
T3	WATER BOX VENT (WITH VALVE)	ø33.4 X 4.55	6	SW
T4	WATER BOX DRAIN (WITH VALVE)	ø33.4 X 4.55	8	SW
T5	SILENCER DRAIN (WITH VALVE)	ø33.4 X 4.55	2	SW
S1	INTER & AFTER COND. DRAIN (WITH VALVE)	ø60.3 X 5.54	4	BW
S2	AIR INLET	ø168.3 X 7.11	1	BW
S3	STEAM INLET	ø88.9x 7.62 / 5.49	1	BW
S4	AIR OUTLET	1 1/2" ANSI 300 # RF.	2	FLG
S5	SILENCER OUTLET	10" ANSI 150 SORF	1	FLG

LIST OF INSTRUMENTS

REF	DESCRIPTION	CONN. SIZE	LOCATION	
a	PR. GAUGE (-1 TO 1.5 Kg/Cm^2)	1/2" SW	ON 1 & 2 STG. ST. EJEC. AND S2	6
b	PR. GAUGE (0 TO 20 Kg/Cm^2)	1/2" SW	ON STEAM INLET PIPE (S3)	4
c	TEMP. GAUGE	M 33 X 2	ON T1&12 PIPING AND S2, S3	6
d	WATER EXPANSION RELIEF VALVE	3/4" X 1" SW	ON T1	2
e	ROTAMETER	1 1/2" ANSI 300 RF	ON S4	2
f	SILENCER	6" X 10" ANSI 150 RF	ON ST. EJECTOR OUTLET	1

MAIN EJECTOR:–

1. NO OF EJECTORS PROVIDED ---------- TWO
2. NO OF STAGES FOR EACH EJECTOR -------- TWO
3. CAPACITY OF EACH EJECTOR ---------- 100%
4. MOTIVE STEAM PRESSURE --------15 kg/cm^2 (g)
5. MOTIVE STEAM TEMPERATURE ----------260°C
6. DESIGN SUCTION PRESSURE---------- 0.035 kg/cm2 (a)
7. SUCTION QTY. :–
   - DRY AIR ----------20.4 Kg / hr
   - WATER VAPOUR ---------- 44.92 Kg / hr
   - TOTAL MIXTURE ---------- 65.4 Kg / hr
8. CONDENSATE FLOW :–
   - QTY. ---------- 378605 kg/hr (MAX.)
     292328 kg/hr (NRML.)
     189302 kg/hr (MIN.)
   - INLET TEMP.---------- 47.5°C
9. MOTIVE STEAM CONSUMPTION --------- 750 kg / hr

BILL OF MATERIALS:–

1. TUBES-----SS: SA 249 TP 304
2. TUBE PLATES-----CS: SA 516 Gr 70 OR EQUT
3. SHELL, WATER CHAMBERS....CS :SA 106 Gr.B/ SA 516 Gr.70 OR EQVT
4. SUPPORT PLATES, MIXING CHAMBERS, DIFFUSERS STEAM STRAINERS & VALVES---CARBON STEEL OR EQUT
5. NOZZLES---A 276, TP 304 OR EQUT.
6. EJEC. AIR & STEAM PIPING---CS: SA 106 Gr 'B' OR EQUT.

STARTING EJECTOR :–

1. NO OF EJECTORS PROVIDED --------- ONE
2. NO OF STAGES FOR EACH EJECTOR --- ONE
3. CAPACITY OF EACH EJECTOR-------100%
4. MOTIVE STEAM PRESSURE----15 kg / cm^2 (g)
5. MOTIVE STEAM TEMPERATURE------ 260°C
6. TIME TAKEN TO ATTAIN SUCTION PRESSURE OF 0.35 Kg / sq cm (a) FROM ATMOSPHERIC PRESSURE (AS PER HEI) --------- 30 MINUTES.
7. MOTIVE STEAM CONSUMPTION ------ 950 Kg / hr

DESIGN DATA :–

DESCRIPTION	INTER COND. (TUBE SIDE)	AFTER COND. (TUBE SIDE)	SHELL SIDE
DESIGN PRESSURE Kg/Cm^2(g)	25	25	3.5 & FULL VAC.
TEST PRESSURE Kg/Cm^2(g)	32.5	32.5	4.55
DESIGN TEMP. °C	100	100	250
TEST TEMP. °C	AMBIENT	AMBIENT	AMBIENT
SURFACE AREA M^2	50	22	–
NO. OF PASSES	2	2	–
NO. OF TUBES	378	378	–
TUBE SIZE	ø3/4"X20 BWG(AVG.)	ø3/4"X20 BWG(AVG.)	–
			–

NOTE : –

1. PAINTING:–
   INSIDE : NO PAINTING
   OUTSIDE : 2 COATS OF FERROTOL HEAT RESISTING ALUMINIUM PAINT
2. EACH WORKING EJEC. WILL BE FUNCTIONALLY TESTED AT WORKS
3. STARTING EJEC. WILL NOT BE FUNCTIONALLY TESTED AT WORKS
4. DESIGN CODE: HEI / BHEL
5. THE EJEC. WILL BE HYDROSTATIC TESTED AT WORK AS PER THE DETAIL GIVEN UNDER DESIGN DATA BEFORE DESPATCH.
6. INSPECTION BY BHEL / CUSTOMER
7. COUNTER FLANGES,FASTENERS & PACKINGS ARE IN BHEL(HYD) SCOPE OF SUPPLY.
8. 3NO'S OF MOTOR OPERATED VALVES ON STEAM SIDE AND 1NO ON AIR SIDE IS INCLUDED IN BHEL (HYD) SCOPE OF SUPPLY.

DRAWING CATEGORY: FOR INFORMATION ONLY

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: RIL 4x90MW HMD HAZIRA, GUJARAT
RIL 3x90MW DMD DAHEJ, GUJARAT

CUSTOMER: Reliance Industries Limited

CONSULTANT: BECHTEL

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	K VASAVI		07.09.13	
CHD.	M.VENKAT		07.09.13	NA
APPD.	M.VENKAT		07.09.13	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HED		N.T.S	7500.0	NA	NA	NA
CODE 405						

TITLE: G.A. OF STEAM JET AIR EJECTOR

CARD CODE

DRAWING NO. 1-161-01-00780 REV. 00

SHEET No. 1 NO OF SHEETS 1

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HYD230261

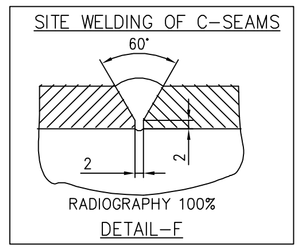
REF. DRG. NO. — SIGN. AND DATE — INVENTORY NO

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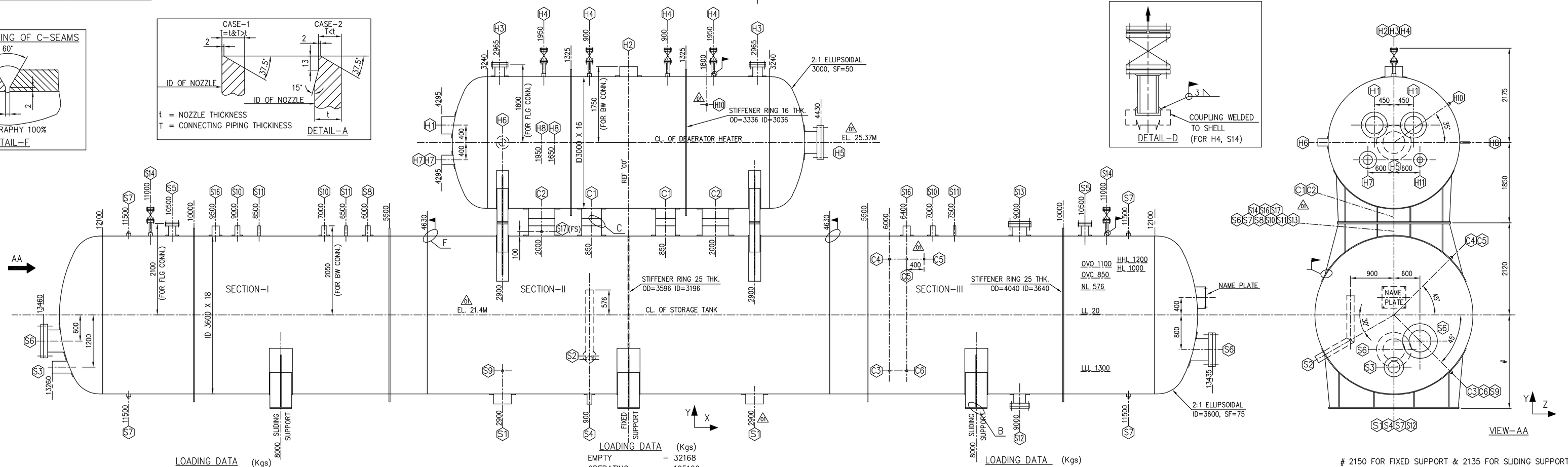
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SITE WELDING OF C-SEAMS



DETAIL-F



VIEW-AA

LOADING DATA (Kgs)
EMPTY – 24126
OPERATING – 78870
FLOODED – 120327
HORIZONTAL LOAD – 4813 (IN -X DIRECTION)

LOADING DATA (Kgs)
EMPTY – 32168
OPERATING – 105160
FLOODED – 160436
HORIZONTAL FORCE – 0

LOADING DATA (Kgs)
EMPTY – 24126
OPERATING – 78870
FLOODED – 120327
△6 HORIZONTAL LOAD – 4813 (IN X DIECTION)

2150 FOR FIXED SUPPORT & 2135 FOR SLIDING SUPPORT 15mm DIFFERENCE IN HEIGHT IS COMPENSATED BY TEFLON SHEET ASSLY. (REFER DET-B)

RESULTANT FORCES, MOMENTS AND THERMAL MOVEMENTS AT DESIGN CONDITION

REF.	F(Kg)	M(Kg-M)	△X	△Y	△Z	
H1	57266	7274	-14.23	22.12	±1.53	△6
H2	13084	5396	0	25.85	0	
H6	7809	1765	-9.84	20.77	-5.09	△6
H7	31696	2767	-14.23	19.41	-2.04	
H11	26747	1934	-14.23	19.41	2.04	
S1	16870	7220	±7.77	0.80	0	△6
S2	9891	2361	-2.41	3.35	-4.18	
S3	44927	4783	-34.43	2.55	0	
S4	8800	1604	-2.41	0.80	0	
S8	8800	1604	-16.08	10.59	0	
S10	8800	1604	####	10.59	0	

△6 #### = -24.12, -18.76, 18.77

DESIGN DATA

DESCRIPTION			
DESIGN PRESSURE		(atg)	9 & FULL VACUUM
HYDROTEST PRESSURE		(atg)	11.7
STORAGE TANK DESIGN TEMPERATURE (MAX/MIN)		°C	210/ 0
HEATER DESIGN TEMPERATURE (MAX/MIN)		°C	260/ 0
HYDROTEST TEMPERATURE (MAX/MIN)		°C	AMBIENT/ 17
RADIOGRAPHY			FULL
CORROSION ALLOWANCE	SHELLS/ HEADS	mm	3.2
	RF PADS/ NOZZLES/ FLANGES	mm	1.6
OXYGEN CONTENT AT OUTLET		(cc/lit)	0.005 (7 PPB)
STORAGE TANK CAPACITY (BETWEEN NL & LLL FOR 10 min. CAPACITY)		(cu.m)	150
NO OF TRAYS			350 △6
NO OF SPRAY NOZZLES			60
WEIGHTS	DRY	(kgs)	80420
	OPERATING	(kgs)	262900
	FLOODED	(kgs)	401090
INSPECTION			AS PER APPROVED QP
PWHT			REQUIRED

△6 CG (ON REF. 00 AXIS) FROM ST.TANK CENTERLINE

EMPTY	954mm ABOVE
OPERATING	72mm BELOW
FLOODED	731mm ABOVE

CG IS LOCATED EXACTLY ON Z AXIS.

OPERATING PARAMETERS

OPERATING PRESSURE (HMD)	(ata)	8.1384
OPERATING TEMPERATURE (HMD)	°C	170.3
OPERATING PRESSURE (DMD)	(ata)	7.2675
OPERATING TEMPERATURE (DMD)	°C	165.7

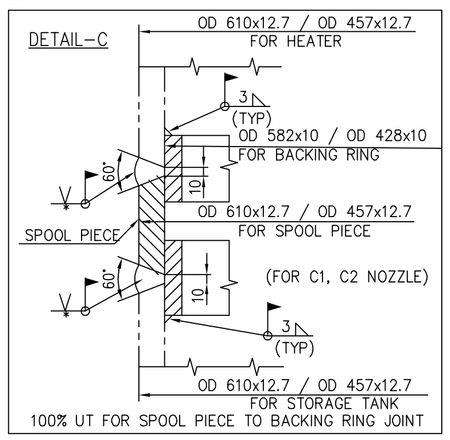
MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL
SHELL (ST.TANK & HEATER)	SA516 Gr.70
DISHED ENDS	SA516 Gr.70
PIPE FOR NOZZLE	SA106 GR.B****
TRAYS	SA240 TP430
COVERS FOR MAN HOLES	SA105
TRAY REMOVAL OPENING	SA106 Gr.B
SPRAY VALVE	SS TP316
VENT ORIFICE PLATE	SA240 TP304L
INTERNAL BOLTING	SS304
BOLTS & NUTS	SA193 B7/ SA194 2H
GASKETS	NON ASBESTOS MSW WITH GRAPHITE FILLER

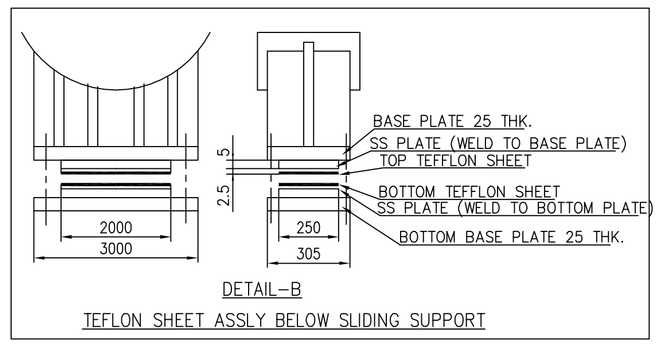
△6 **** SA240 TP304L FOR H2 NOZZLE (ROLLED PIPE)

LIST OF NOZZLE CONNECTIONS

REF.	DESCRIPTION	NPS	OD x THK/ CONN. PIPE THK.	QTY	END CONN.	REMARKS	REF.	
H1	STEAM INLET	16	406.4 x 12.7/	2	BW		H1	△6
H2	CONDENSATE INLET	16	406.4 x 12.0/	1	BW		H2	△6
H3	SAFETY RELIEF VALVE CONN.	8	219.1 x 12.7	2	FLG CL.300 RF		H3	
H4	VENT CONN.	2	COUPLING CL.6000	4	SW	REFER NOTE-12	H4	
H5	TRAY REMOVAL OPENING	20	508.0 x 12.7	1	FLG CL.300 RF		H5	
H6	FLASH TANK VENT CONN.	6	168.3 x 10.97/	1	BW		H6	△6
H7	HPH-5 DRAIN CONN.	8	219.1 x 12.7/	1	BW	WITH DISPERSER	H7	△6
H8	HPH VENT CONN.	1	33.4 x 6.35/	2	BW		H8	
								△6
H10	SPARE CONN.	1	COUPLING CL.6000	1	SW		H10	
H11	HPH-6 DRAIN CONN.	6	168.3 x 10.97/	1	BW	WITH DISPERSER	H11	
S1	FEED WATER OUTLET CONN.	16	406.4 x 12.7/	2	BW	WITH VORTEX BREAKER	S1	△6
S2	OVER FLOW CONN	6	168.3 x 10.97/	1	BW		S2	
S3	INITIAL HEATING STEAM CONN.	10	273.1 x 12.7/	1	BW		S3	
S4	DRAIN	4	114.3 x 11.13/	1	BW		S4	
S5	VENTILATOR	6	168.3 x 10.97	2	FLG CL.300 RF	REFER NOTE-10	S5	
S6	MAN HOLE	20	508.0 x 12.7	2	FLG CL.300 RF		S6	
S7	STAND PIPE CONN.	2	COUPLING CL.6000	4	SW		S7	
S8	INITIAL FILLING CONN.	4	114.3 x 11.13/	1	BW		S8	
S9	SAMPLING CONN.	1	COUPLING CL.6000	1	SW		S9	
S10	BFP RECIRCULATION CONN.	4	114.3 x 11.13/	3	BW	WITH DISPERSER	S10	
S11	BFP LEAK-OFF CONN.	2	60.3 x 8.74/	3	BW	WITH DISPERSER	S11	
S12	SPARE CONN.	10	273.1 x 12.7	1	FLG CL.300 RF		S12	
S13	SPARE CONN.	12	323.9 x 12.7	1	FLG CL.300 RF		S13	
S14	VENT CONN.	2	COUPLING CL.6000	2	SW	REFER NOTE-12	S14	
S16	SPARE CONN.	6	168.3 x 10.97	2	BW		S16	
S17	SPARE CONN.	1	COUPLING CL.6000	1	SW		S17	
C1	EQUALISER	18	457.0 x 12.7	2	BW		C1	
C2	DOWN COMMER	24	610.0 x 12.7	2	BW		C2	
C3	PRESSURE GAUGE CONN.	3/4	COUPLING CL.6000	1	SW		C3	△6
C4	THERMOMETER CONN.	M33X2	COUPLING	1	SCREWED		C4	△6
C5	PRESSURE TRANSMITTER CONN.	3/4	COUPLING CL.6000	2	SW		C5	△6
C6	TEMPERATURE ELEMENT CONN.	M33X2	COUPLING	1	SCREWED		C6	△6



100% UT FOR SPOOL PIECE TO BACKING RING JOINT



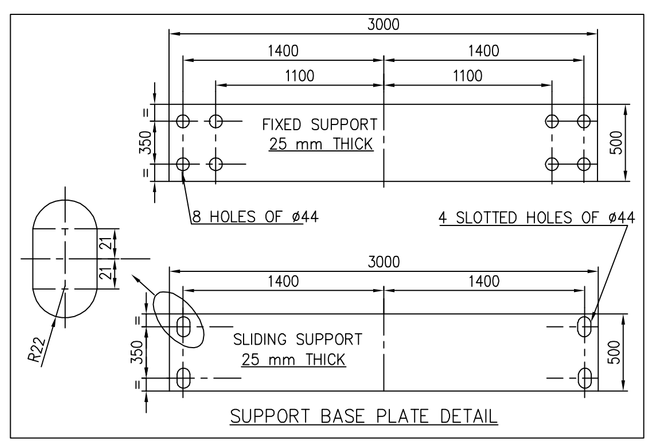
DETAIL-B

TEFLON SHEET ASSLY BELOW SLIDING SUPPORT

LIST OF FITTINGS & VALVES

REF.	DESCRIPTION	QTY	REMARKS
F1	MERCURY IN STEEL DIAL THERMOMETER	1	200° C
F2	PRESSURE GAUGE Kg/sq.cm (g)	1	-1 TO +10
F3	VENT ORIFICE PLATE	4	
F4	THERMOWELL	2	
V1	STAND PIPE ISOLATION VALVE	4	NPS 2 CL.800 SW
V2	SAMPLING VALVE	1	NPS 1 CL.800 SW
V3	SAFETY RELIEF VALVE (SET PR 8.5 atg REL CAP. 60 T/hr)	2	***
			△6
V5	VENT & DRAIN VALVES FOR STAND PIPE	4	NPS 1/2 CL.800 NPT
V6	VENT VALVE	6	NPS 2 CL.300 RF △6
V7	PRESSURE GAUGE & TRANSMITTER ISOLATION VALVES	3	NPS 3/4 CL.800 SW △6

*** NPS 8 CL.300/ NPS 10 CL.150 RF



SUPPORT BASE PLATE DETAIL

NOTES:-

1, HYDRO TEST BLANKING PLATE OF NOZZLES SHALL BE CUT AT SITE AND EDGE PREPARED AS PER DET-A FOR CONNECTING PIPING AT SITE.

2, SPOOL PIECES CONSTRUCTED OF SA516/70 WILL BE SUPPLIED TO AID IN PROPER FIT UP OF DOWN COMMERS AND EQUALIZERS. TWO BACKING RINGS WILL BE SUPPLIED WITH EACH SPOOL PIECE (REFER DET-C).

△6 3, PAINTING
EXTERNAL: AS PER BECHTEL SPEC. 10090/10091-PS-GP-BEF-0001.
INTERNAL: HEATER- NIL
STORAGE TANK - STEAM WASHABLE PAINT

4, SHIPPING
HEATER: DESPATCHED IN ONE ASSEMBLY.
STORAGE TANK: DESPATCHED IN THREE SECTIONS.

5, FOUNDATION BOLTS
M42X300 FOUNDATION BOLTS 16 NO'S WITH FASTENERS WILL BE SUPPLIED.

6, DESIGN CODE ASME SEC VIII DIV 1, 2010, ADD. 2011, HEI 9TH EDN. 2011 & PART 4.4 OF NACE RP0590-96 (FOR MANUFACTURING)

7, COUNTER FLANGES ALONG WITH BOLTS NUTS AND GASKETS WILL BE SUPPLIED FOR FLANGED CONNECTIONS.

8, MOVEMENT OF SLIDING SUPPORT FROM COLD TO OPERATING CONDITION IS= ±21.44 (MAX).

9, ⚑ INDICATES SITE WELDING.

10, VENTILATOR CONN. (NOZZLE S5) IS A SPARE CONN. PROVIDED WITH BLIND FLANGE, WHICH CAN BE OPENED FOR VENTILATION INSIDE THE STORAGE TANK DURING MAINTAINANCE OPERATION.

11, HEATER SUPPORTS ON STORAGE TANKE ARE DESPATCHED LOOSE FOR FINAL WELDING AT SITE.

12, ORIFICE ASSLY. AS PER DET-D SHALL BE WELDED TO COUPLING (H4, S14) AT SITE.

13, FOR DETAILS OF STANDPIPE REFER DRG. 2-163-19-11655.

14, NOZZLE S1 (FEED WATER OUTLET CONN.) PROVIDED WITH VORTEX BREAKER. NOZZLE PROJECTION INSIDE STORAGE TANK IS 150mm.

△6

CONSULTANT: BECHTEL	BECHTEL FREDERICK, MARYLAND, USA
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER: Reliance Industries Limited	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091-6239977-T000-M-M61-BHL-B02-H009
RIL DRG. NO. (HAZIRA):	10090-6239976-T000-M-M61-BHL-B02-H009

BHEL BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A RATH		05.09.13	
CHD.	UMESH MENON		05.09.13	N.A
APPD.	TSN BHARGAV		05.09.13	

DEPT: HEE	GRADE OF TOL.DIM. C/M/F	SCALE NTS	WEIGHT (KG) NA	REF. TO ASSY DRG. NA	ITEM NO. N.A	NO.OF ITEMS N.A
CODE 405						

TITLE: GA OF SPRAY CUM TRAY DEAERATOR

CARD CODE

BHEL DRAWING NO. 1-163-10-11431 REV. 01

SHEET No. 1 NO OF SHEETS 1

REV.	DATE	ALTERED	CHECKED	APPD	ZONE	REVISED IN-LINE FROM COMMENTS FROM CONSULTANT & PE&SD.
01	29.12.13					

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

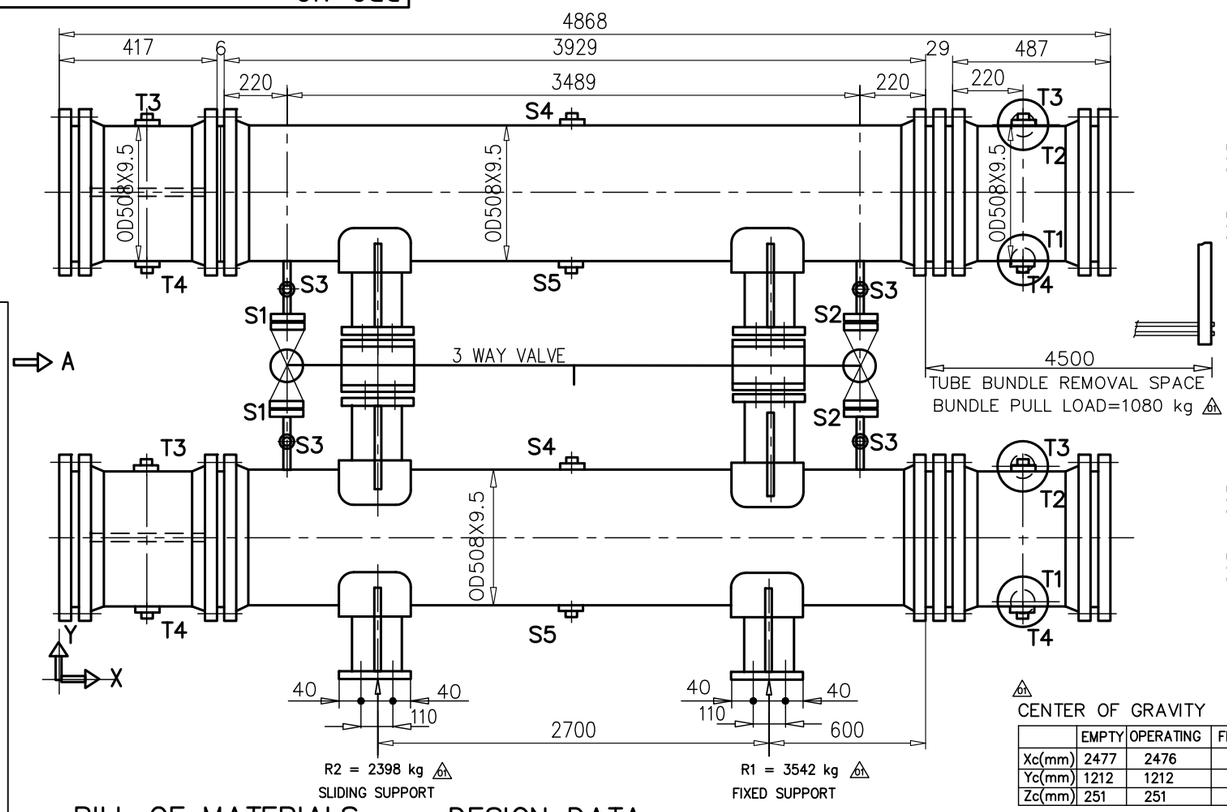
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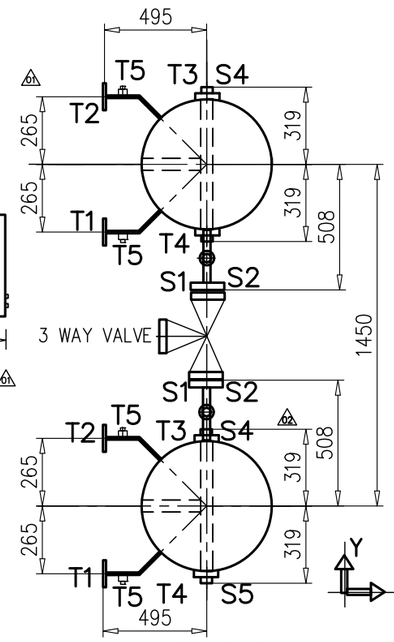
(ALL DIMENSIONS ARE IN mm)

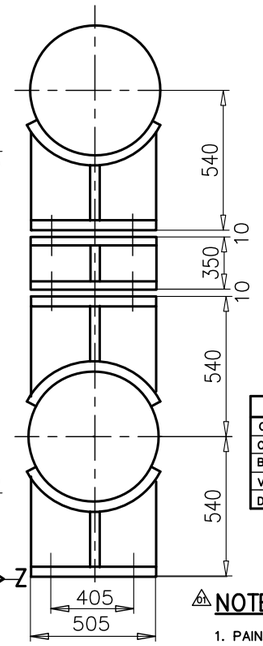
DRG. NO. 3-165-01-20579

SH. 1 OF 1

DESIGN CODE: ASME SEC VIII DIV I 2010 EDITION ADDENDA-2011 & TEMA'C'2007







DESIGN DATA

DESCRIPTION	
HEAT DUTY kW	336.72
OIL QTY. m^3/hr	46
WATER QTY. m^3/hr	90
OIL SIDE TEMP.(INLET/OUTLET) °C	62/47
WATER SIDE TEMP.(IN/OUTLET) °C	38/41

TUBE SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES
WATER INLET	T1	4"	ASME Cl.300 WNRF 01
WATER OUTLET	T2	4"	ASME Cl.300 WNRF 01
VENT	T3	3/4"	ASME 6000 NPT COUPLING
DRAIN	T4	3/4"	ASME 6000 NPT COUPLING
SPARE CONN.	T5	3/4"	ASME 6000 NPT COUPLING

SHELL SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES	
OIL INLET	S1	4"	ASME Cl.150 SORF	WITH 3-WAY CHANGE OVER VALVE
OIL OUTLET	S2	4"	ASME Cl.150 SORF	
BY PASS	S3	3/4"	ASME 6000 NPT COUPLING	
VENT	S4	3/4"	ASME 6000 NPT COUPLING	
DRAIN	S5	3/4"	ASME 6000 NPT COUPLING	

01 NOTE:-

1. PAINTING (OUTSIDE): a) PRIMER: 4-6 MILS OF EPOXY ZINC RICH.
   b) FINISH PAINT: 3-5 MILS OF POLYURETHANE.

01 CENTER OF GRAVITY

	EMPTY	OPERATING	FLOODED
Xc(mm)	2477	2476	2473
Yc(mm)	1212	1212	1212
Zc(mm)	251	251	251

02 SUPPORT REACTIONS

AT FIXED SUPPORT	R1	3542 kg
AT MOVABLE SUPPORT	R2	2398 kg

02 NOZZLE FORCES AND MOMENTS

		S1,S2	T1,T2	UNIT
RESULTANT RADIAL FORCE	F_{RRF}	9074	10007	kgf
RESULTANT CIRCUMFERENTIAL MOMENT	M_{RCM}	579	579	kgf-m

01 DRAWING CATEGORY: FOR INFORMATION ONLY

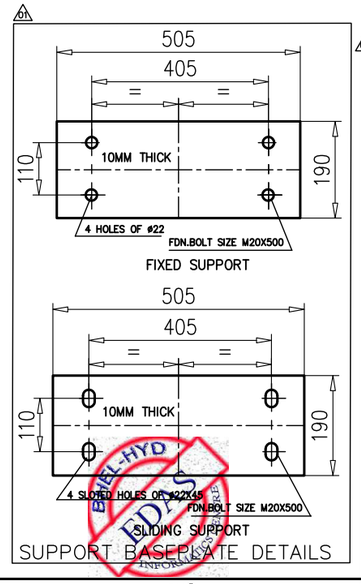
BILL OF MATERIALS

		DESCRIPTION	MATERIALS
SHELL SIDE		SHELL	SA672GR.B60 CL22
		GIRTH FLANGES	SA266 Gr.2
		NOZZLE PIPES	SA 106/B
		NOZZLE FLANGES	SA 105
		SADDLES	SA516/70
TUBE SIDE		TUBES	SA249 TP 304
		TUBE SHEETS	SA516/70
		BAFFLES	IS2062 Gr.B
		TIE RODS	IS 1570/15C8
CHANNEL SIDE		SHELL	SA672GR.B60 CL22
		END COVER	SA 516/70
		GIRTH FLANGES	SA266 Gr.2
		NOZZLE PIPES	SA 106/B
		NOZZLE FLANGES	SA 105
GASKETS	FIX SIDE	SHELL	NON CAF 9
		CHANNEL	NON CAF 9
	FLT SIDE	SHELL	BUNA N
		CHANNEL	BUNA N
		STUDS & NUTS	SA 193-B7/194-2H
		SERVICE	LUBE OIL

DESIGN DATA

DESCRIPTION	SHELLSIDE	TUBE SIDE
DESIGN PRESSURE Kg/sq.cm (g)	13.5	10
MAWP Kg/sq.cm (g)	13.5	10 01
TEST PRESSURE Kg/sq.cm (g)	17.55	13
DESIGN TEMP. °C	100	100
CORROSION ALLOW. mm	1.6	1.6
STRESS RELIEVING	NO	NO
RADIOGRAPHY	SPOT	SPOT
NO. OF PASSES	1	4
MEDIUM	OIL	WATER
INSPECTION	AS PER QA PLAN	
SURFACE AREA / COOLER sq.m	85	
NO. OF TUBES PER COOLER	436	
TUBE LENGTH mm	4000	
TUBE SIZE ODxThk	5/8"x1.24THK.	
PITCH/TYPE mm	19.05 /△	
NO. OF BAFFLES PER COOLER	23	
BAFFLE PITCH mm	151	
EMPTY WEIGHT Kg (BOTH COOLERS)	5170	
WORKING WEIGHT Kg ,,	5940	
FLOODED WEIGHT Kg ,,	6050	
TUBE BUNDLE WEIGHT kg ,,	2160 02	

01



01 P&ID REF.NO.1-317-01-08662, TAG NO.: TGOC-01 02

CONSULTANT: BECHTEL	BECHTEL FREDERICK, MARYLAND, USA
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER: Reliance Industries Limited	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091-6239977-T000-M-M59-BHL-B02-H001
RIL DRG. NO. (HAZIRA):	10090-6239976-T000-M-M59-BHL-B02-H001

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	S.S.R		07.09.13	NA
CHD.	A.C.S		08.09.13	
APPD.	A.C.S		08.09.13	

REV.	DATE	ALTERED	CHD/APPD
02	23.01.14		

ZONE

1. ALL NOZZLE PROJECTION DIM. ADDED
2. P&ID REF.NO. AND TAG NO. ADDED
3. NOZZLE FORCES AND MOMENTS ADDED

REV.	DATE	ALTERED	CHD/APPD
01	21.10.13		

ZONE

1. TITLE BLOCK CHANGED
2. SUPPORT BASEPLATE DETAILS & SUPPORT REACTIONS ADDED
3. MAWP ADDED
4. C.G & BUNDLE PULL LOAD ADDED.
5. FOUNDATION BOLD SIZES ADDED.
6. NOZZLE ORIENTATION CHANGED.
7. T1,T2 NOZZLE FLANGES RATING CHANGED FROM Cl.150 TO Cl.300 AND SORF TO WNRF.

DEPT.	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	C/M/F	N.T.S	5170	-	-	-
CODE 405						

TITLE
TWIN OIL COOLER
(TYPE-AEW)

CARD CODE

DRAWING NO. 3-165-01-20579 REV. 02

SHT. No 1 NO. OF SHT. 1

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

FOR REFERENCE USE

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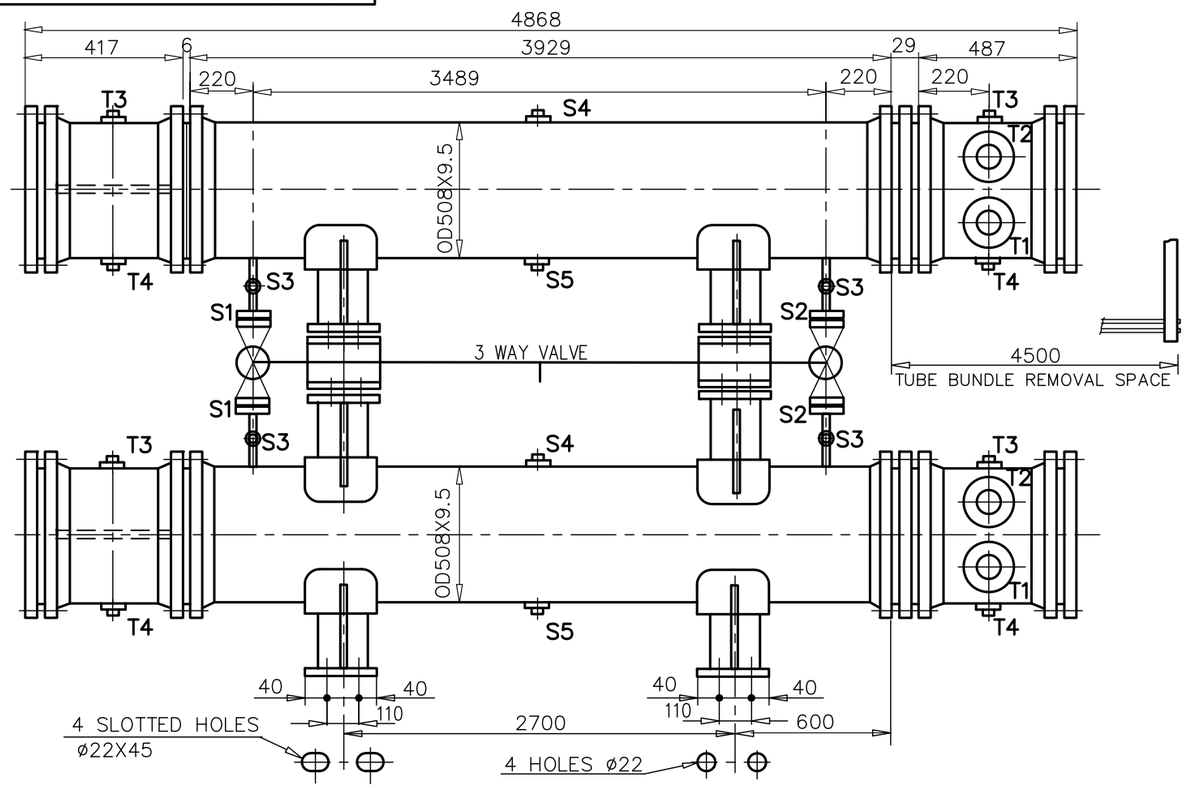
FIRST ANGLE PROJECTION

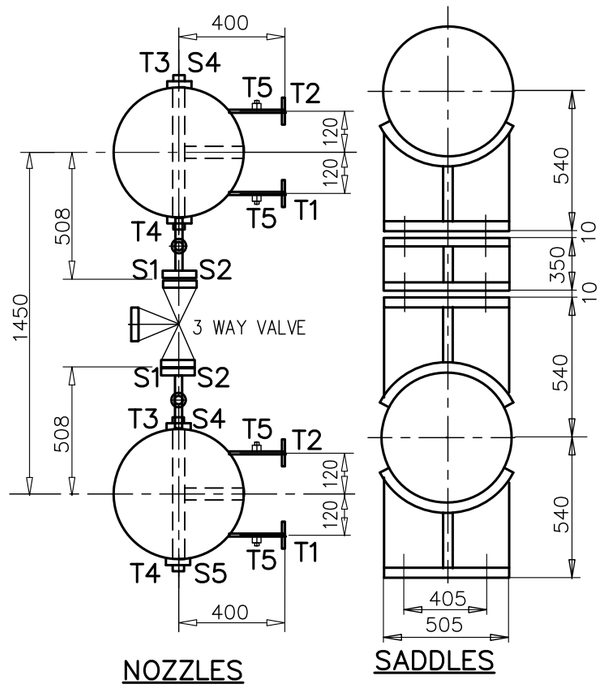
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3-165-01-20579

SH. 1 OF 1

DESIGN CODE: ASME SEC VIII DIV I 2010 EDITION ADDENDA–2011 & TEMA'C'2007





NOZZLES

SADDLES

DESIGN DATA

DESCRIPTION	
HEAT DUTY kW	336.72
OIL QTY. m^3/hr	46
WATER QTY. m^3/hr	90
OIL SIDE TEMP.(INLET/OUTLET) °C	62/47
WATER SIDE TEMP.(IN/OUTLET) °C	38/41

TUBE SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES
WATER INLET	T1	4"	ASME Cl.150 SORF
WATER OUTLET	T2	4"	ASME Cl.150 SORF
VENT	T3	3/4"	ASME 6000 NPT COUPLING
DRAIN	T4	3/4"	ASME 6000 NPT COUPLING
SPARE CONN.	T5	3/4"	ASME 6000 NPT COUPLING

SHELL SIDE NOZZLES

LOCATION	MARK	SIZE	SERIES	
OIL INLET	S1	4"	ASME Cl.150 SORF	WITH 3-WAY CHANGE OVER VALVE
OIL OUTLET	S2	4"	ASME Cl.150 SORF	
BY PASS	S3	3/4"	ASME 6000 NPT COUPLING	
VENT	S4	3/4"	ASME 6000 NPT COUPLING	
DRAIN	S5	3/4"	ASME 6000 NPT COUPLING	

BILL OF MATERIALS

	DESCRIPTION		MATERIALS
SHELL SIDE	SHELL		SA672GR.B60 CL22
	GIRTH FLANGES		SA266 Gr.2
	NOZZLE PIPES		SA 106/B
	NOZZLE FLANGES		SA 105
	SADDLES		SA516/70
TUBE SIDE	TUBES		SA249 TP 304
	TUBE SHEETS		SA516/70
	BAFFLES		IS2062 Gr.B
	TIE RODS		IS 1570/15C8
CHANNEL SIDE	SHELL		SA672GR.B60 CL22
	END COVER		SA 516/70
	GIRTH FLANGES		SA266 Gr.2
	NOZZLE PIPES		SA 106/B
	NOZZLE FLANGES		SA 105
GASKETS	FIX SIDE	SHELL	NON CAF 9
		CHANNEL	NON CAF 9
	FLT SIDE	SHELL	BUNA N
		CHANNEL	BUNA N
	STUDS & NUTS		SA 193–B7/194–2H

DESIGN DATA

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/sq.cm (g)	13.5	10
TEST PRESSURE Kg/sq.cm (g)	17.55	13
DESIGN TEMP. °C	100	100
CORROSION ALLOW. mm	1.6	1.6
STRESS RELIEVING	NO	NO
RADIOGRAPHY	SPOT	SPOT
NO. OF PASSES	1	4
MEDIUM	OIL	WATER
INSPECTION	AS PER QA PLAN	
SURFACE AREA / COOLER sq.m	85	
NO. OF TUBES PER COOLER	436	
TUBE LENGTH mm	4000	
TUBE SIZE ODxThk	5/8"x1.24THK.	
PITCH/TYPE mm	19.05 /	
NO. OF BAFFLES PER COOLER	23 △	
BAFFLE PITCH mm	151	
EMPTY WEIGHT Kg (BOTH COOLERS)	5150	
WORKING WEIGHT Kg ,,	5920	
FLOODED WEIGHT Kg ,,	6030	
SERVICE	LUBE OIL	

NOTE:–

1. PAINTING (OUTSIDE): PRIMER–2 COATS OF EPOXY BASED ZINC CHROMATE PRIMER.
   : FINISH PAINT–1 COAT OF EPOXY BASED FINISH PAINT (GREY COLOUR).

DRAWING CATEGORY: FOR INFORMATION ONLY

CONSULTANT: BECHTEL

CUSTOMER: Reliance Industries Limited

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 7X90MW RIL–HAZIRA, DAHEZ
RELIANCE UTILITIES AND POWER PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	S.S.R		07.09.13	NA
CHD.	A.C.S		08.09.13	
APPD.	A.C.S		08.09.13	

RESTRICTED USE

DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
HEE	GR. C/M/F	N.T.S	5150	–	–	–
CODE 405						

TITLE: TWIN OIL COOLER (TYPE–AEW)

CARD CODE

DRAWING NO. 3–165–01–20579 REV. 00

SHT. No 1 NO. OF SHT. 1

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE		

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

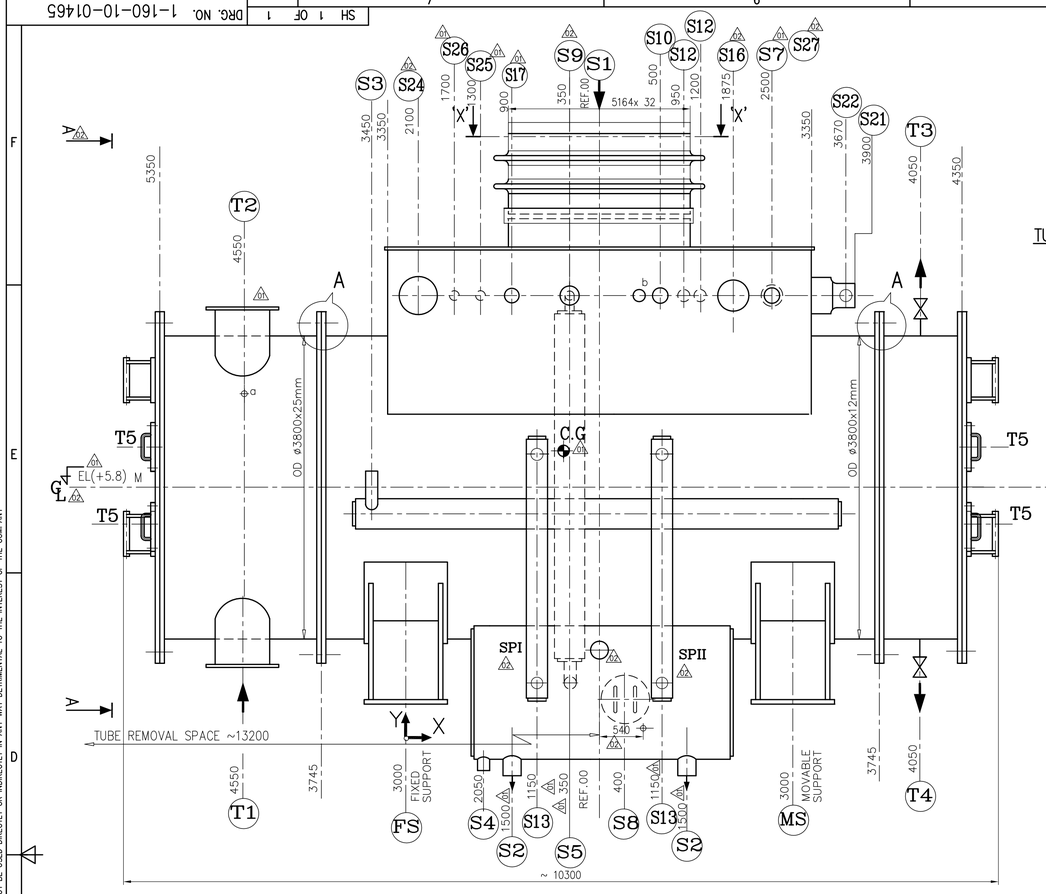
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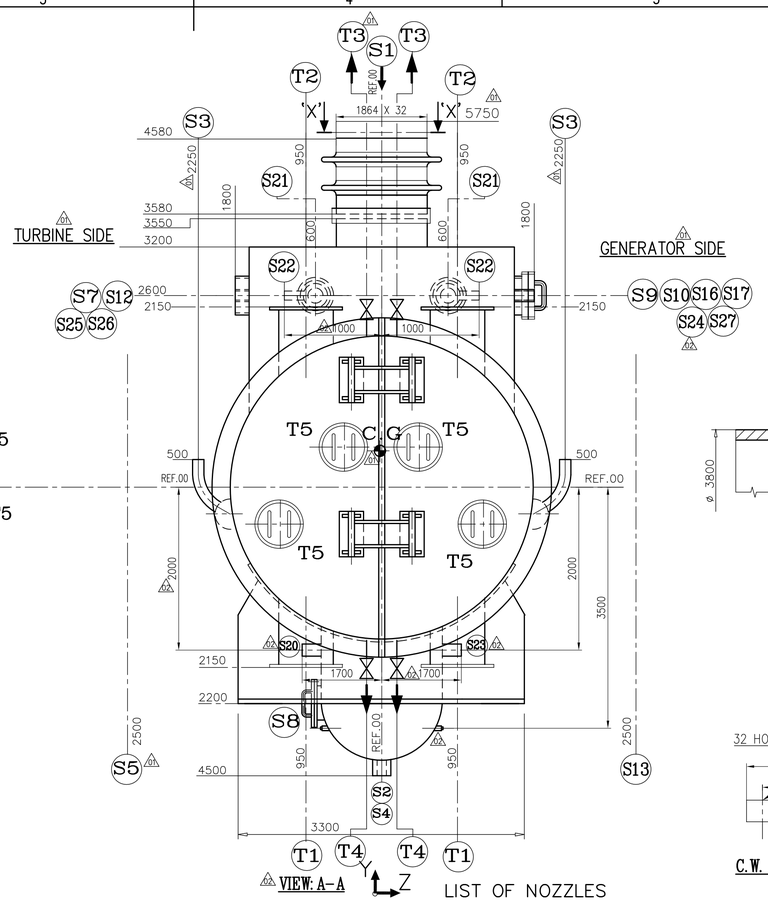
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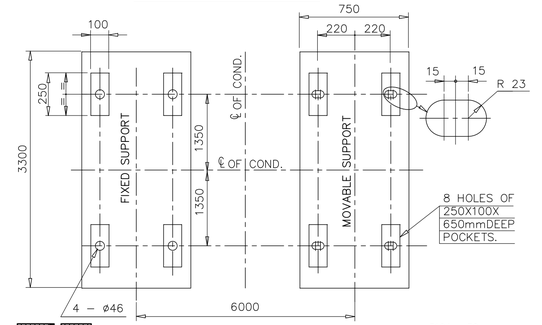
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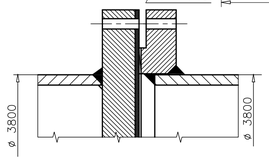
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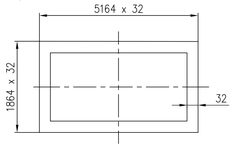


FOUNDATION DETAIL

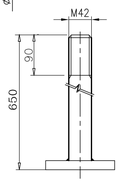




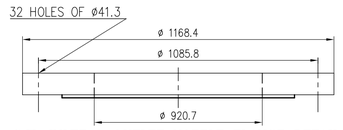
DETAIL – A



EXHAUST DETAIL (S1)
SECTION 'X X'



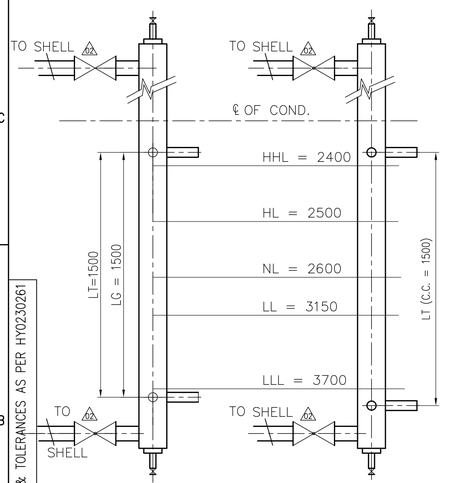
FOUNDATION BOLT DETAIL



C.W. INLET & OUTLET NOZZLE FLANGE DETAIL

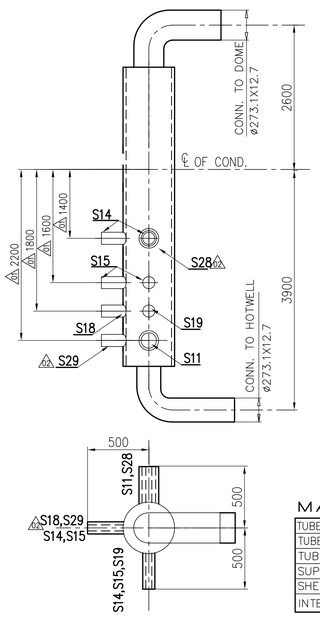
NOZZLE FORCES, MOMENTS AND THERMAL MOVEMENTS

NOZZLE REF	MOMENTS Kg–M	FORCES Kgs	THERMAL MOVEMENTS X mm	Y mm	Z mm
T1	7730	2900	–1.6	+0.1	±1.0
T2	7730	2900	–1.6	+4.4	±1.0
S2	2600	970	+3.0	–2.3	±0.3
S3	900	350	–0.5	+2.7	±2.2
S7	1350	500	+5.5	+2.6	–1.8
S9	700	260	+2.7	+2.6	+1.8
S10	700	260	+3.5	+2.6	+1.8
S17	700	260	+2.1	+2.6	+1.8
S21	2600	970	+10.0	+4.0	±1.0



(SPI)STAND PIPE–I

(SPII)STAND PIPE–II



SURGE PIPE

DESIGN DATA

DESIGN CODE: H E I / B H E L			
DESCRIPTION		SHELL SIDE	TUBE SIDE
TYPE			2 PASS DIVIDED
DESIGN PRESSURE	Kg/sq.CM (g)	1.1 & FULL VC.	5.0
DESIGN TEMPERATURE	°C	100	65
TEST PRESSURE	Kg/sq.CM (g)	HY.FILL	6.9
TEST TEMPERATURE	°C	AMBIENT	AMBIENT
TOTAL SURFACE AREA	sq.M	4232	
TUBE SIZE (OD X THICK)		ø 22x22 BWG (AVG) / ø22x20 BWG	
NO. OF TUBES		8300	
PRESSURE DROP ON C.W. SIDE	M.W.C.	7.0	
HOTWELL CAPACITY (NL TO LLL)	MINUTES	5 MINUTE	
EMPTY WIEGHT		120000 Kgs.	
WORKING WIEGHT		180000 Kgs	
FLOODED WIEGHT		230000 Kgs	
INSPECTION		BHEL/CUSTOMER (AS PER APPD.QAP)	

LIST OF INSTRUMENTS CONNECTIONS

REF.	DESCRIPTION	SIZE	QTY	LOCATION
a	TEMPERATURE GAUGE CONN.	M 33X2	9	HOTWELL, STEAM INLET, C.W.INLET & OUTLET.
b	COMPOUND PRESSURE GAUGE CONN.	1/2"(SW)VALVE	9	ON SHELL
c	LEVEL GAUGE L = 1500	1"ANSI300 RF	2	ON STAND PIPE
d	LEVEL SWITCH CONNECTION	–	–	–
e	LEVEL CONTROLLER/TRANSMETER CONN.	2"ANSI 300 RF	8	ON STAND PIPE
f	WATER EXPANSION RELIEF VALVE	3/4" / 1" S.W	2	ON C.W. INLET

MATERIALS

TUBES – CONDENSING ZONE	SA249 TP316
TUBES – AIR COOLING ZONE	SA249 TP316
TUBE PLATE	SA516 Gr70 WITH SS CLADDING
SUPPORT PLATE	CS:IS 2062 OR EQUVT.
SHELL & OTHER PARTS	CS: SA516 Gr70 OR EQUVT.
INTERNAL BOLTS & NUTS	SA 193 B7, SA194 2H

C.G CENTER OF GRAVITY

	EMPTY	OPERATING	FLOODED
XC	–370	–665	–440
YC	395	–230	–465
ZC	–25	–15	–10

LIST OF NOZZLES

REF.	DESCRIPTION	SIZE	QTY	REMARKS
	TUBE SIDE NOZZLES			
T1	COOLING WATER INLET	36" – 150 SORF	2	FLANGED
T2	COOLING WATER OUTLET	36" – 150 SORF	2	FLANGED
T3	WATER BOX VENT	ø60.3 X 5.54	2	S.W.
T4	WATER BOX DRAIN	ø60.3 X 5.54	4	S.W.
T5	WATER BOX INSPECTION HOLE	18" ANSI 150 FLRF	8	FLANGED
	SHELL SIDE NOZZLES			
S1	EXHAUST STEAM INLET	AS PER SEC.X–X	1	FLANGED
S2	CONDENSATE OUTLET (WITH VORTEX PLATE)	ø323.9X12.7	2	B.W.
S3	AIR SUCTION	ø168.3X7.11	2	B.W.
S4	HOT WELL DRAIN	ø60.3 X 5.54	1	B.W.
S5	EXPANSION SURGE.	ø508 X 12.7	1	–
S6	–	–	–	–
S7	GLAND STEAM LEAKAGE CONN.	ø323.9X 12.7	1	B.W.
S8	HOTWELL INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S9	CONDENSATE RECIRCULATION	ø168.3 X 7.11	1	B.W.
S10	CONN. FOR MAKE UP WATER.	ø88.9 X 5.49	1	B.W.
S11	DRAIN FROM STEAM INLET (PIPING TO TURBINE)	ø219.1 X 12.7	2	B.W.
S12	CONDENSATE PUMP DEAERATION	ø33.4 X 4.55	2	B.W.
S13	STAND PIPE	ø114.3 X 6.02	2	--
S14	INTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S15	AFTER CONDENSER DRAINS.	ø60.3 X 5.54	2	B.W. *
S16	DOME INSPECTION HOLE	18"ANSI 150 SORF	1	FLANGED
S17	VACCUM BREAKER CONNECTION	ø114.3 X8.56	1	B.W.
S18	G S C DRAINS	ø60.3 X 5.54	1	B.W. *
S19	DRAIN FROM EJECTOR AIR HEADER	ø33.4 X 4.55	1	B.W. *
S20	DRAIN FROM DRAIN COOLER	ø273.1 X 12.7	1	B.W.
S21	HP STEAM DUMP NOZZLE	ø323.9 x 6.35	2	B.W.
S22	WATER CONN. TO DUMP NOZZLE	ø88.9 X 5.49	2	B.W.
S23	HPFLASH TANK DRAIN	ø273.1 X 12.7	1	B.W.
S24	HPFLASH TANK VENT	ø910 X 9.53	1	B.W.
S25	LP HEATER–1 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S26	LP HEATER–2 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.
S27	LP HEATER–3 VENT CONNECTION.	ø48.3 X 5.08	1	B.W.

NOTES:–

1. ALL COUNTER FLANGES, FASTNERS AND PACKINGS ARE UNDER B.H.E.L. SCOPE OF SUPPLY.
2. TUBES ARE PROVIDED WITH SELF DRAINING.
3. ✱ CONNS. MOUNTED ON EXPANSION SURGE PIPE–S5.
4. PAINTING: –
   a). STEAM SPACE: 2 COATS OF STEAM WASHABLE PAINT
   b). EXTERNAL SURFACES: 2 COATS OF REDOXIDE ZINC PHOSPHATE PRIMER
   c). WATER SPACE: 2 COATS OF COAL TAR EPOXY.
5. TUBES,DOME ASSLY,HOTWELL,TOPCONNECTING PIECE, BELLOW,STAND PIPES & SURGE PIPES WILL BE SUPPLIED LOOSE TO SITE, FOR ERECTION & ASSLY. BY ERECTION AGENCY.

– Ref.P&ID and Equipment tag No: TGC–01(CONDENSER)

S28	LP HEATER–2 ALTERNATE DRAIN	ø273.1 X 12.7	1	B.W.	*
S29	LP HEATER–3 ALTERNATE DRAIN	ø219.1 X 12.7	1	B.W.	*

CONSULTANT: BECHTEL	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER: Reliance Industries Limited	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091–6239977–T000–M–M61–BHL–B02–H001
RIL DRG. NO. (HAZIRA):	10090–6239976–T000–M–M61–BHL–B02–H001

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN	DATE	NO.OF VAR.
DRN.	SUDHAKAR	SUDHAKAR	04.09.13	N.A
CHD.	M VENKAT		04.09.13	
APPD.	M VENKAT		04.09.13	

REV.	DATE	ALTERED	CHECKED	APPD
02	25.01.14	VSN	MV	MV
01	17.10.13	VSN	MV	MV

02 DRAWING REVISED AS PER T&C ENGG.& PE&SD COMMENTS AND CUSTOMER COMMENTS AND SHOWN AS REV.△

01 DRAWING REVISED AS PER T&C ENGG.& PE&SD COMMENTS AND CUSTOMER COMMENTS AND SHOWN AS REV.△

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE	g/m/f	NTS	NA	NA	N.A	N.A
CODE 405						

TITLE: SURFACE CONDENSER

CARD CODE

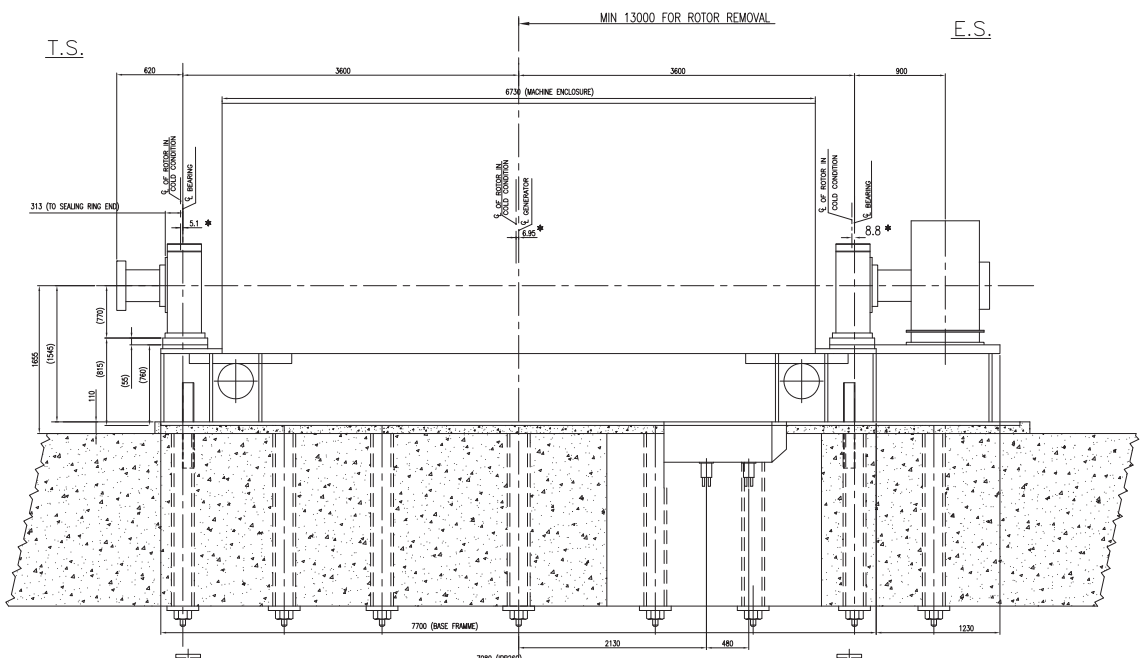
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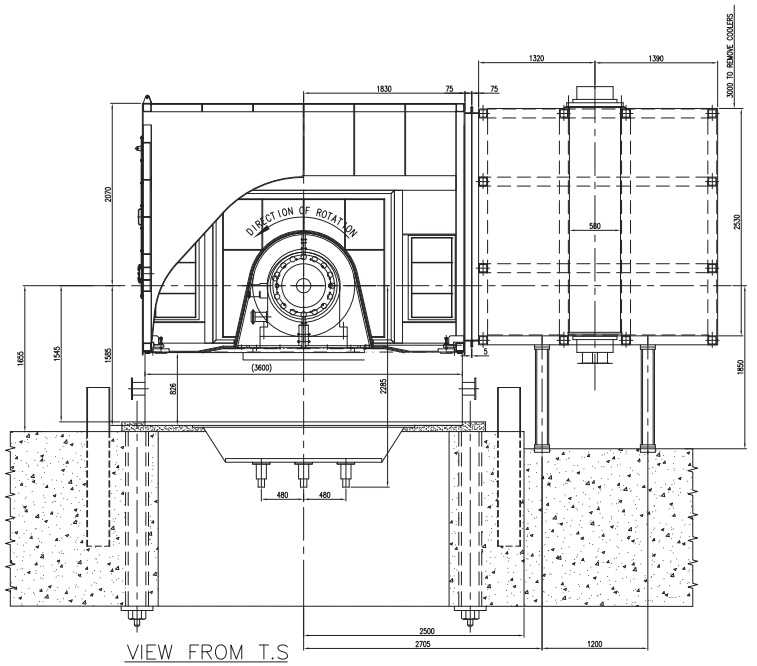
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SHT. X OF X
DRG. NO. 0-139-12-31420
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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY02302261
SIGN AND DATE
REF. DWG. NO.
MEMO NO.

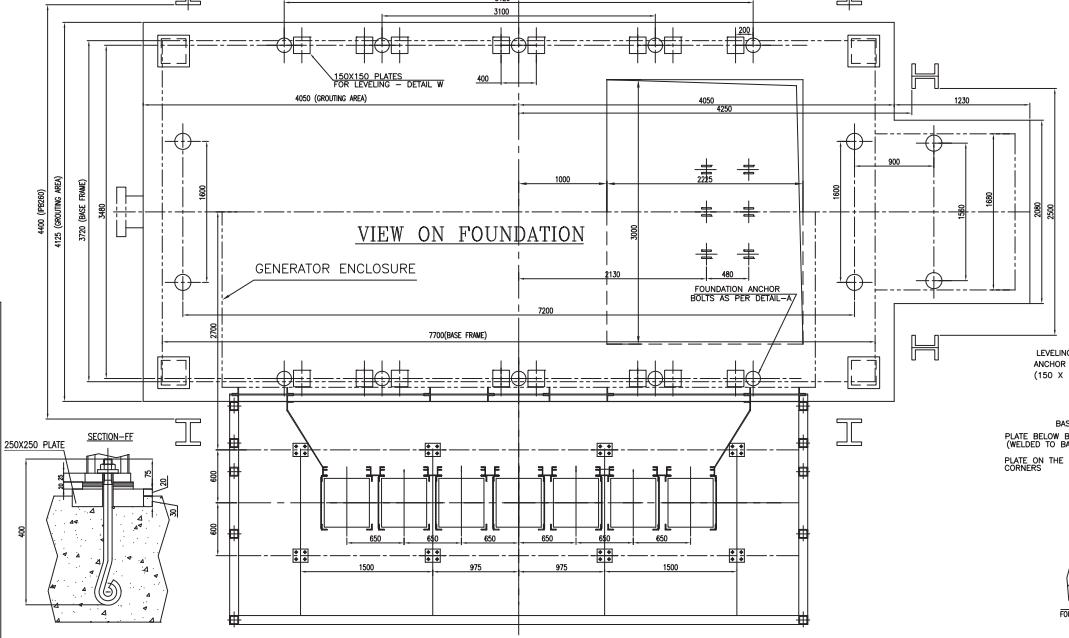
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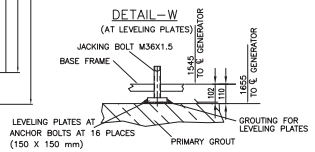


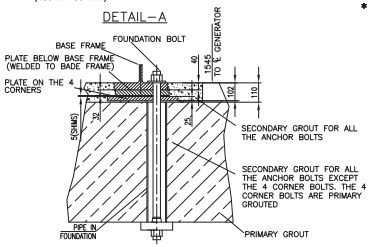
E.S.



VIEW FROM T.S







WEIGHT IN TONNES

1. GENERATOR STATOR	:	167.0
2. GENERATOR ROTOR	:	35.6
3. BEARINGS	:	5.0
4. ACCESSORIES	:	8.0
5. EXCITER	:	3.0
6. MAX. TRANSPORT WEIGHT	:	218.6
7. MAX. ERECTION WEIGHT	:	218.6
8. TOTAL WEIGHT	:	225.0

TECHNICAL DATA

01. TYPE	:	TARI 930–36P
02. RATING	:	125 MVA
03. VOLTAGE	:	11 KV
04. FREQUENCY	:	50 Hz
05. RATED POWER FACTOR	:	0.8 LAG
06. CURRENT	:	6561 A
07. OPERATING SPEED	:	3000 RPM
08. MASS MOMENT OF INERTIA OF ROTOR ($GD^2/4$)	:	3265 $Kg.m^2$
09. CRITICAL SPEED	:	1170 , 3650 RPM
10. QTY. OF LUBRICATING OIL PER GEN. BEARING.	:	110 LT/MIN.
11. PRESSURE OF LUBE OIL	:	1.8 BAR
12. QTY. OF JACKING OIL PER BRG.	:	10 LT/MIN
13. PRESSURE OF JACKING OIL	:	123 BAR
14. DIRECTION OF ROTATION	:	ANTI–CLOCKWISE WHEN VIEWED FROM TURBINE END

* IN THE GENERATOR PACKAGE, THE GEN.FRONT BEARING,GENERATOR STATOR AND GEN. REAR BEARING ARE TO BE SHIFTED TOWARDS E.S. BY 5.1, 6.95 AND 8.8 mm RESPECTIVELY WITH REFERENCE TO ROTOR CENTRE LINES TO TAKE CARE OF TURBINE AND GENERATOR ROTOR THERMAL EXPANSIONS.

REVISION REASON: IFI/ IFA/ IFD/ IFC/ CANC	REV.	DATE	ALTERED CHD/APPD	ZONE

CONSULTANT: BHEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
STG PACKAGE (3 X 90.3 MW STGs), CCPP DAHEJ MANUFACTURING DIVISION (DMD)

CUSTOMER: RELIANCE INDUSTRIES LIMITED
COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER DAHEJ:
RIL DRG. NUMBER HAZIRA: XXXXXXXXXXXXXX

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN	DATE	NO.OF VAR.
DRN.	SHAUKAT		24.10.13	
CHD.	K.C.PANDA		24.10.13	N.A.
APPD.	U.SRIDHAR		24.10.13	

DEPT. DWG. CODE	UNTOL. DIMS. ON	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
	y/w/f	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: LAYOUT OF GENERATOR

CARD CODE: N.A.

BHEL DRAWING NO. 0-139-12-31420 REV. 00

SHT. No 1 NO. OF SHT. 1

Oct Thu 24 15:19 2013
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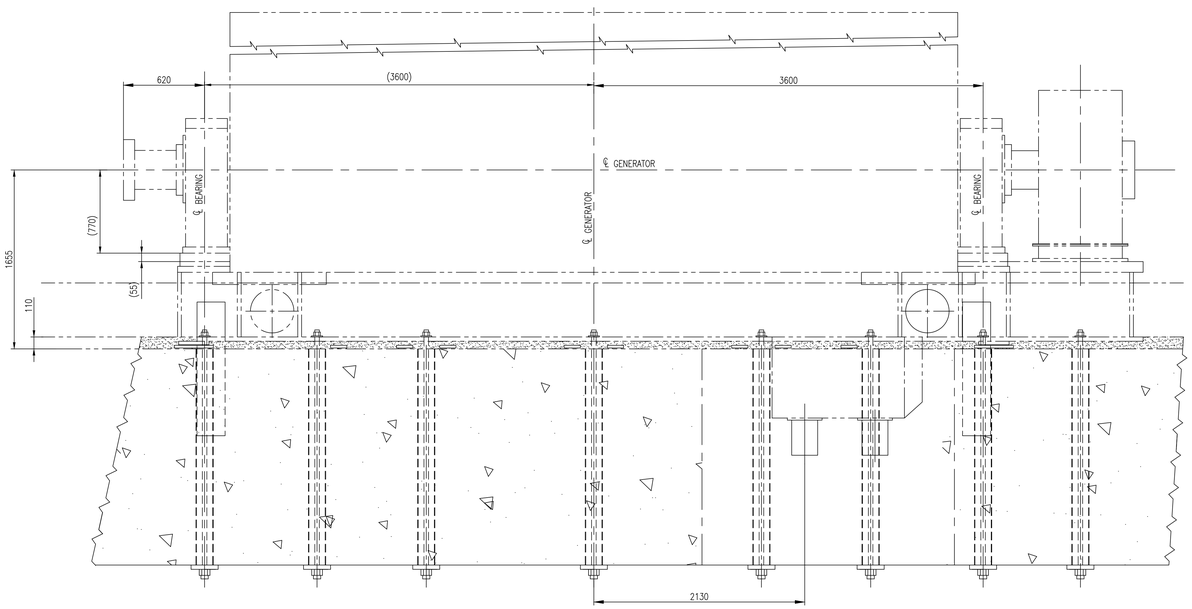
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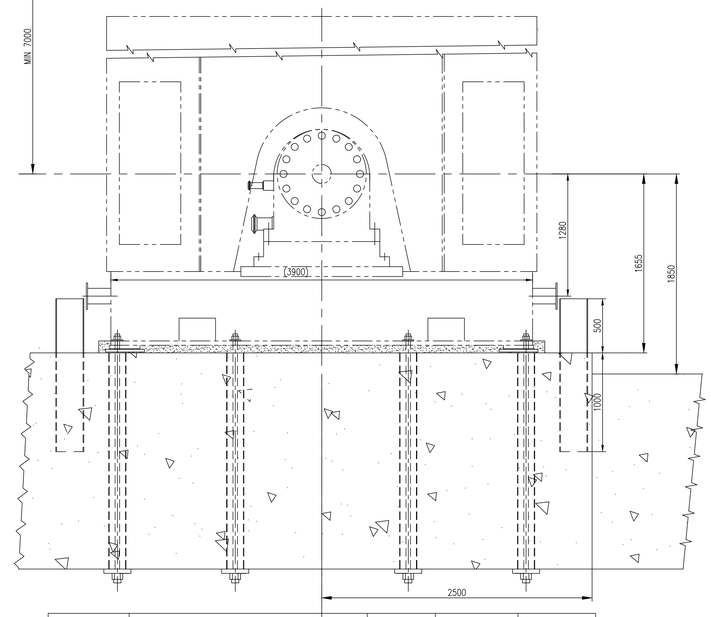
SECTION–KK

MIN 13000 FOR ROTOR REMOVAL

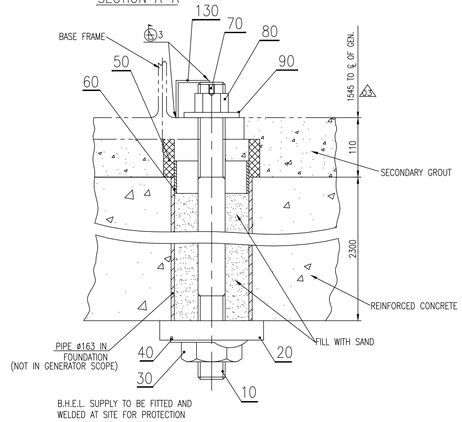
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VIEW FROM T.S

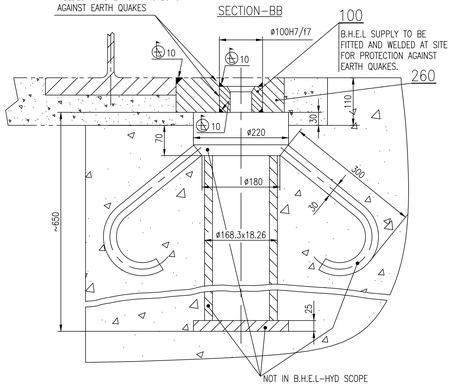


SECTION A–A

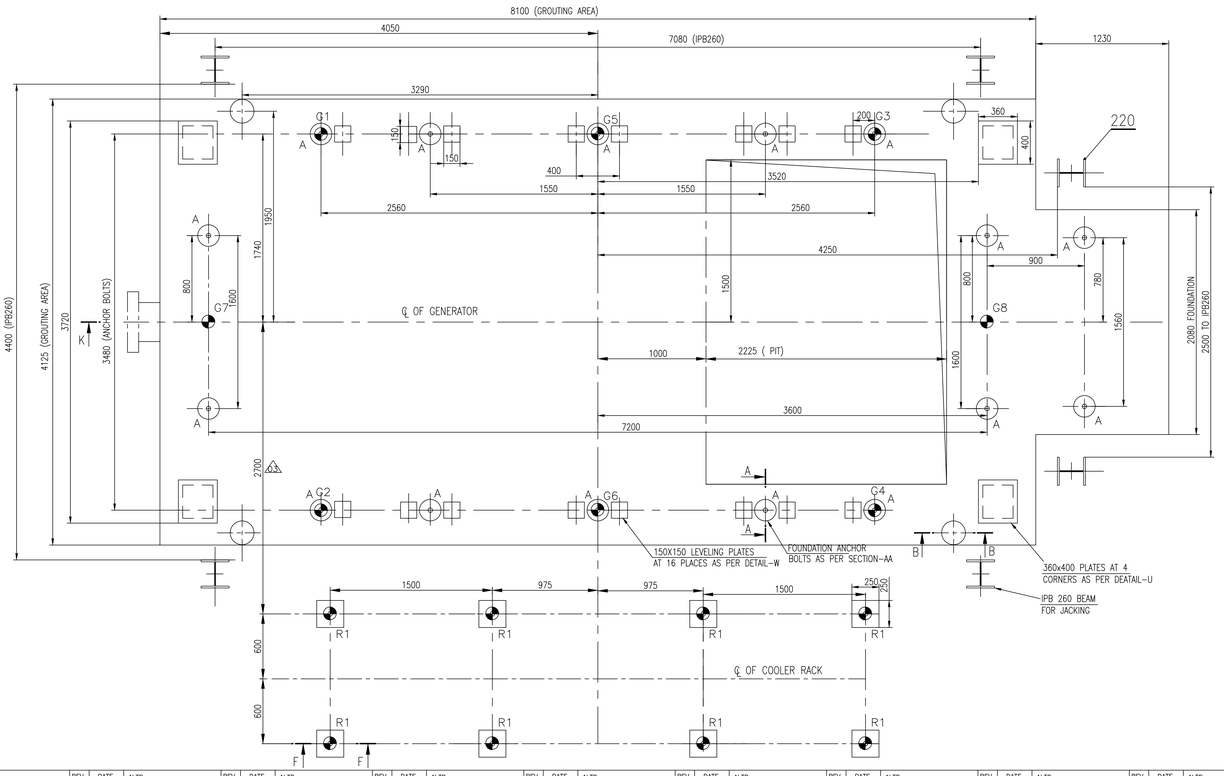


B.H.E.L. SUPPLY TO BE FITTED AND WELDED AT SITE FOR PROTECTION AGAINST EARTH QUAKES

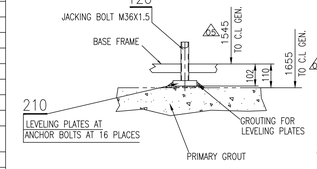
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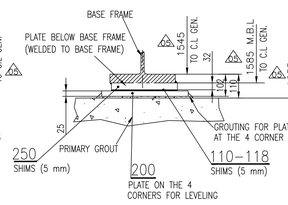
DETAIL ON FOUNDATION



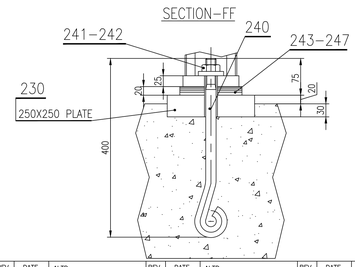
DETAIL–W
(LEVELING PLATES)



DETAIL–U
(4 CORNER ANCHOR BOLTS)



SECTION–FF



POS. NO	DESCRIPTION	QTY	EMBEDMENT	REMARKS
10	FOUNDATION BOLT–M42X3..2875 (01)	16	NO	BHEL–HYD
20	SUPPORT PLATE––STRL ST(WLDG QL	16	NO	BHEL–HYD
30	HEX.NUT–M42X3	16	NO	BHEL–HYD
40	TAB WASHER––CRCSSHT:1.6MM. Dia.=50	16	NO	BHEL–HYD
50	FOAM RUBBER RING: ID=152; OD=220	16	NO	BHEL–HYD
60	COVER–CRCSSHT:1.0mm	16	NO	BHEL–HYD
70	BOLT–M12X320	1	NO	BHEL–HYD
80	HEX. NUT; M42X3	16	NO	BHEL–HYD
90	WASHER Dia=50	16	NO	BHEL–HYD
100	SIESMIC ARRESTOR PIN	4	NO	BHEL–HYD
110–118	SHIMS AT CORNERS	4 SETS	NO	BHEL–HYD
120	JACKING BOLTS M36X1.5	10	NO	BHEL–HYD
130	LOCKING STRIP	16	NO	BHEL–HYD
200	BOTTOM CORNER PLATES	4	NO	BHEL–HYD
210	LEVELING PLATES	16	NO	BHEL–HYD
220	I–BEAM FOR JACKING/MOVEMENT	6	YES	CIVIL CONTRACOR
230	PLATES FOR COOELR 250X250	8	YES	BHEL–HYD
240	BOLTS FOR COOLERS M24	8	YES	BHEL–HYD
241	NUT M24	8	NO	BHEL–HYD
242	WASHER FOR M24	8	NO	BHEL–HYD
243–247	SHIMS	8 SETS	NO	BHEL–HYD
250	TOP CORNER PLATES	4	NO	BHEL–HYD
260	SIESMIC ARRESTOR BLOCK	4	NO	BHEL–HYD

⚠3 VERTICAL LOCATION OF G1 TO G8 IS 1545 MM BELOW THE GENERATOR AXIS.

FOUNDATION LOAD DATA IN KN

LOAD POINT	STATIC LOAD ⚠6A	ROTATING LOAD ⚠6B	SHORT CIRCUIT LOAD	OPERATING TORQUE	FORCE DUE TO UNABALCE (HORIZ. & VERTICAL) ⚠7	DYNAMIC LOADS IN FAILURE (HORIZONTAL & VERTICAL) ⚠8	SYSMIC LOAD (FY) ⚠9	SYSMIC LOAD (FX) ⚠9	SYSMIC LOAD (FZ) ⚠9
G1	–210		±405	–46			±13	±26	±26
G2	–210		±405	46			±13	±26	±26
G3	–210		±405	–46			±13	±26	±26
G4	–210		±405	46			±13	±26	±26
G5	–210		±202.5	–23			±13	±26	±26
G6	–210		±202.5	23			±13	±26	±26
G7	–230	–155			±32	±192	±24	±47	±47
G8	–240	–155			±32	±192	±24	±47	±47
R1	–20						±1.2	±2.4	±2.4 ⚠3
	⚠6A	⚠6B			⚠7		⚠9	⚠9	⚠9

REMARKS:

01. FOUNDATION PRE LOADING: 150 kN.
OR
BOLT STRETCHING: $1.2^{+0.3}_{-0.0}$mm.
OR
TIGHTENING TORQUE FOR M42 ANCHOR BOLTS IS 1800 N–m

02. W.P.S No. WE006.

03. POS. NO. 250 BE PLACED ON POS. NO. 200 AFTER COLOUR MATCHING WITH SURFACE PLATE ON BOTH SIDES. GENERATOR STATOR/PACKAGE IS PLACED ON THESE 4 CORNER PLATES. SHIMS SHALL BE PLACED AS PER ALIGNMENT REQUIREMENT. THE PLATES (POS.NO. 250) ARE WELDED TO BASE FRAME I–BEAM AFTER COMPLETING SPRING BACK CHECK

** ALL THE FOUNDATION DETAILS OF GENERATOR SHALL BE KEPT BY THIS AMOUNT W.R.T. TURBINE FLANGE TO TAKE CARE OF THE THERMAL EAPANSION. INITALLY WHEN GENERATOR IS PLACED ON FOUNDATION AT SITE, THERE EXISTS A GAP OF 8.5MM BETWEEN COUPLNG FLANGES. THE GENERATOR STATOR IS FIXED AT THIS POSIITON AND THE GENERATOR ROTOR IS PULLED TOWARDS TURBINE AND COUPLING BOLTS ARE FIXED. WHILE RUNNING CONDITION DUE TO TURBINE SHAFT EXPANSION ON TO GENERATOR ROTOR THE GENERATOR ROTOR IS PUSHED BACK TO ITS ORIGINAL POSIITON.

WEIGHT IN TON

01. GENERATOR STATOR : 145 ⚠4
02. GENERATOR ROTOR : 31.5 ⚠4
03. GENERATOR BEARING : 7.5 ⚠4
04. ACCESSORIES : 8
05. EXCITER : 3.0
06. MAX TRANSPORT WEIGHT: 187 (TRANSPORT FRAME NOT INCLUDED.)
07. MAX ERECTION WEIGHT : 187 ⚠4

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: TARI 930–36P, RIL, HAZIRA

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	ARUN KUMAR		05.09.13
CHD.	SHAUKAT		05.09.13
APPD.	K C PANDA		05.09.13

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
EME			NA	NA	NA
CODE 425	N.A	NA			

TITLE: FOUNDATION DETAILS

DRAWING NO. 0–137–01–31037 REV. 06

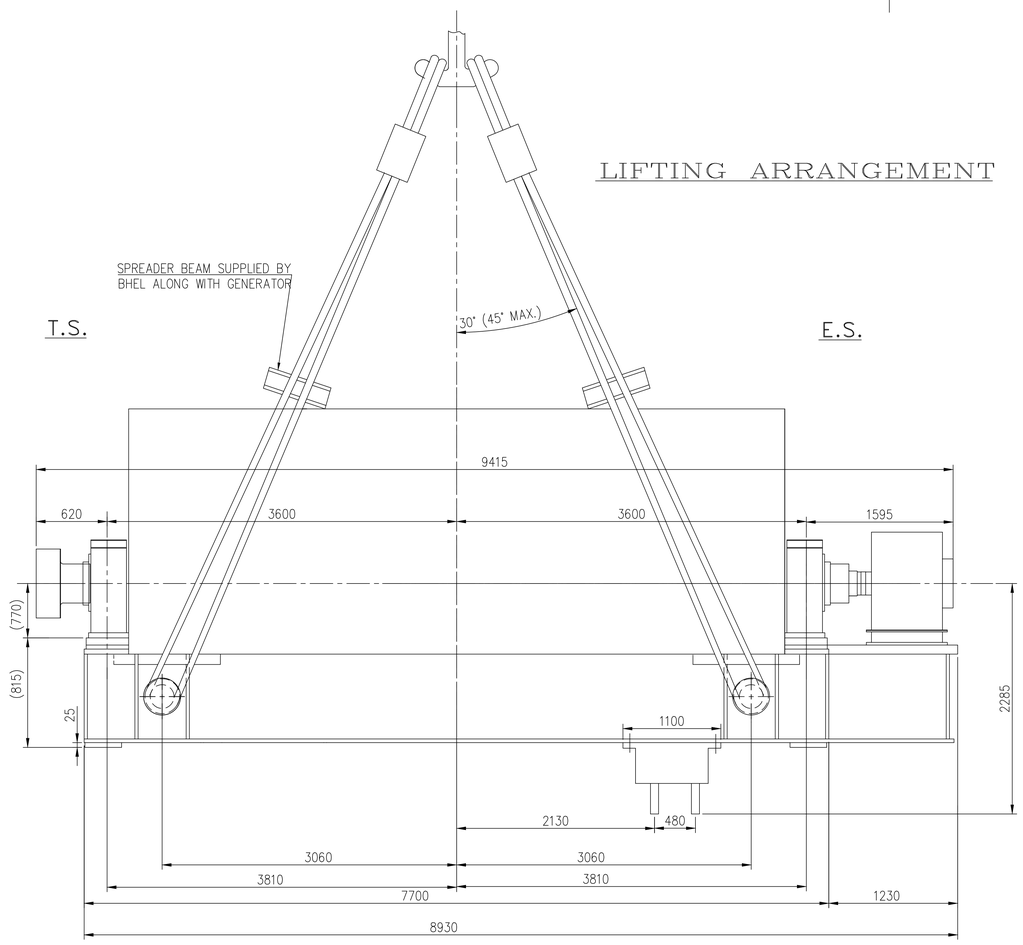
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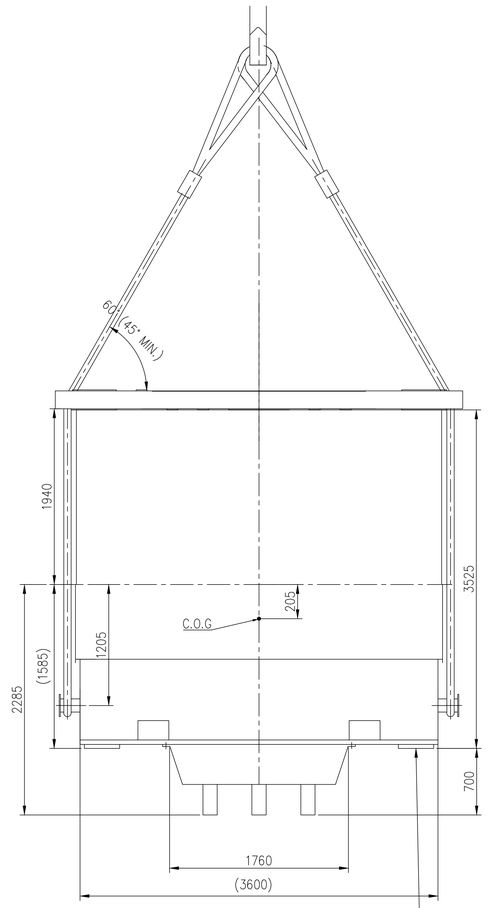
REV.	DATE	ALTD	CHD	APPD.	ZONE
06	28.11.13	FOUNDATION LOAD AND TOTAL LOAD MODIFIED.			
05	27.11.13	COOLER SYSMIC LOAD ADDED. DETAIL U & W MODIFIED.			
04	19.10.13	SYSMIC LOAD ADDED.			
03	15.10.13	SECTION AA REVISED AND COOLER DUCT SUPPORTING STRUCTURE LOCATION SHOWN.			
02	07.09.13	FOUNDATION LOAD MODIFIED.			
01	06.09.13	FOUNDATION LOAD TABLE ADDED.			J17

SOIL AND DATE | REF. DRG. NO. | COMPUTER FILE NAME : | INVENTORY NO

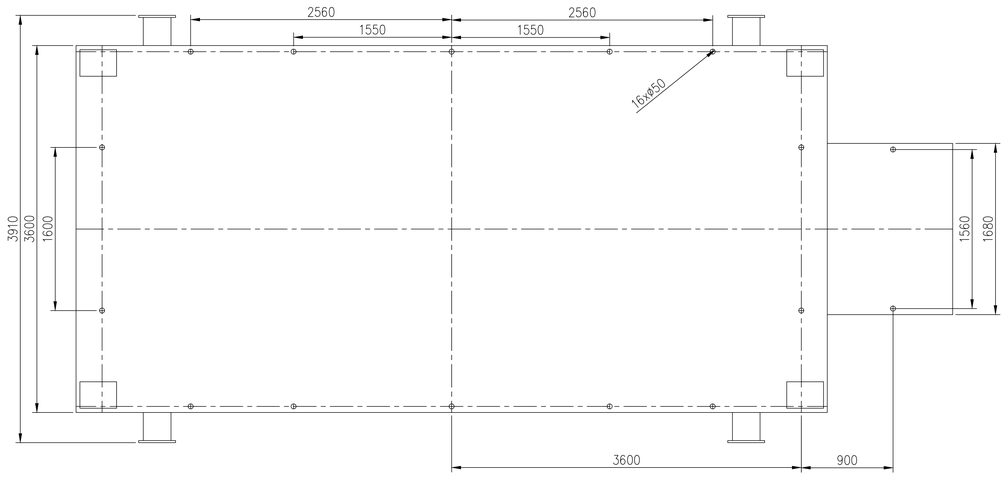
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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

LIFTING ARRANGEMENT





AT THE FOUR CORNERS, 4 NOS MACHINED PLATE WELDED.
IT SHOULD BE PROTECTED WHILE TRANSPORTATION.



WEIGHT IN TONNES

GENERATOR PACKAGE (WITHOUT TRANSPORT FRAME) : 187 TON

********** OUTPUT TERMINAL IS PROJECTED DOWNWARD BY 700MM FROM BOTTOM OF THE GENERATOR. IT SHOULD BE PROTECTED WHILE TRANSPORTATION.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: TARI 930-36P, RIL, HAZIRA,7X90 MW

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	SHAUKAT		28.11.13	
CHD.	K C PANDA		28.11.13	
APPD.	U.SRIDHAR		28.11.13	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
EME		N.T.S	N.A	NA	NA	NA
CODE 425						

TITLE: GENERATOR TRANSPORTATION DETAILS

CARD CODE

DRAWING NO. 1-139-12-31403 REV. 00

SHEET No. 01 NO OF SHEETS 02

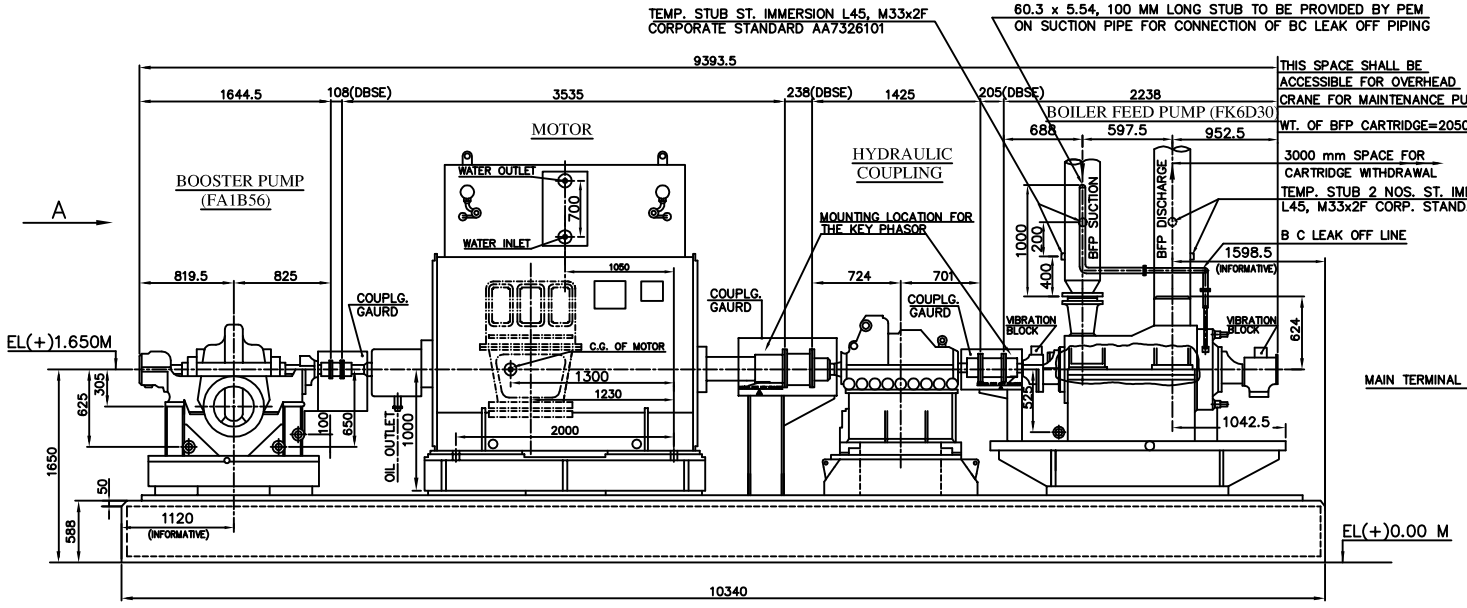
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

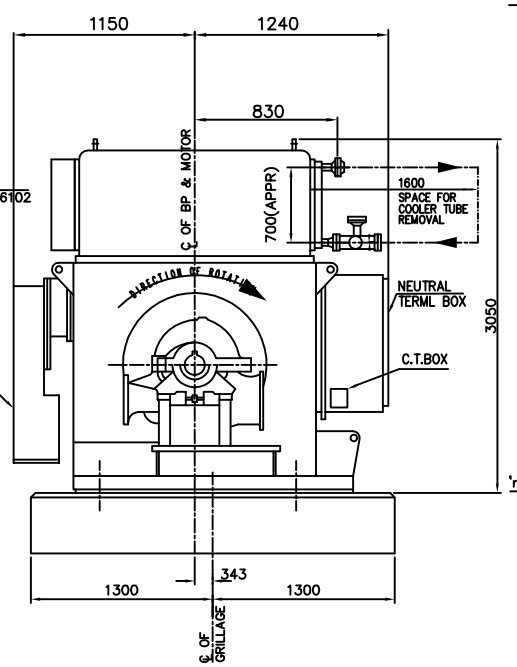
DRG. NO. 1 180 005 7626

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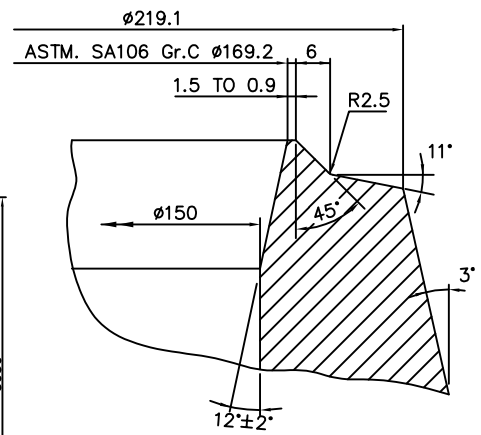
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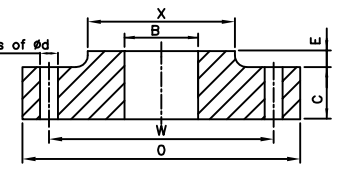
ELEVATION (WITHOUT COOLERS)



VIEW–A



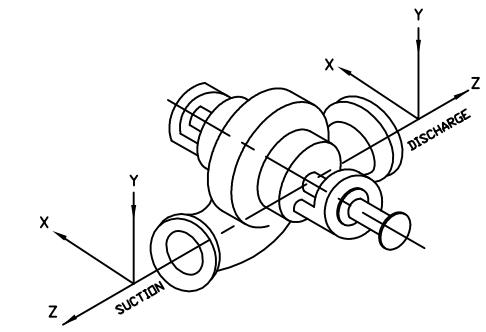
B.F.P. DISCHARGE BRANCH WELD END DETAIL



COUNTER FLANGE DETAILS

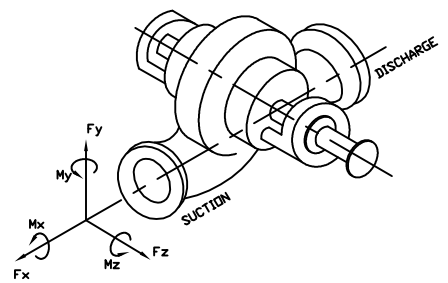
COUNTER FLANGE DIMENSIONS

DESCRIPTION	O	W	X	B	C	E	d	n
BFP SUCTION	360	310	278	221	32	3	27	12
B.P.SUCTION	505	460	430	359.2	24	4	22	16
B.P.DISCHARGE	405	355	320	275	23	3	26	12



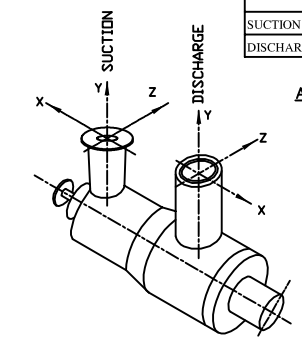
MOVEMENT	SUCTION BRANCH (mm)	DIS. BRANCH (mm)
X	0.67	0.67
Y	0.21	0.21
Z	0.815	0.889

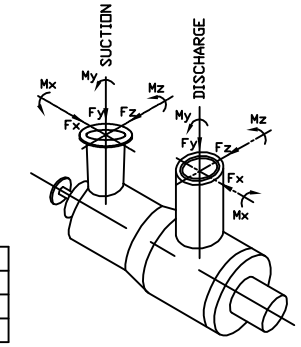
THERMAL MOVEMENTS OF BP BRANCHES



	NOZZLE SIZE	MOMENT Mx Kgm	MOMENT My Kgm	MOMENT Mz Kgm	FORCE Fx Kg	FORCE Fy Kg	FORCE Fz Kg
SUCTION	14"	±130	±130	±178	±342	±342	±342
DISCHARGE	10"	±130	±130	±185	±342	±342	±342

ALLOWABLE FORCES & MOMENTS ON BP NOZZLES



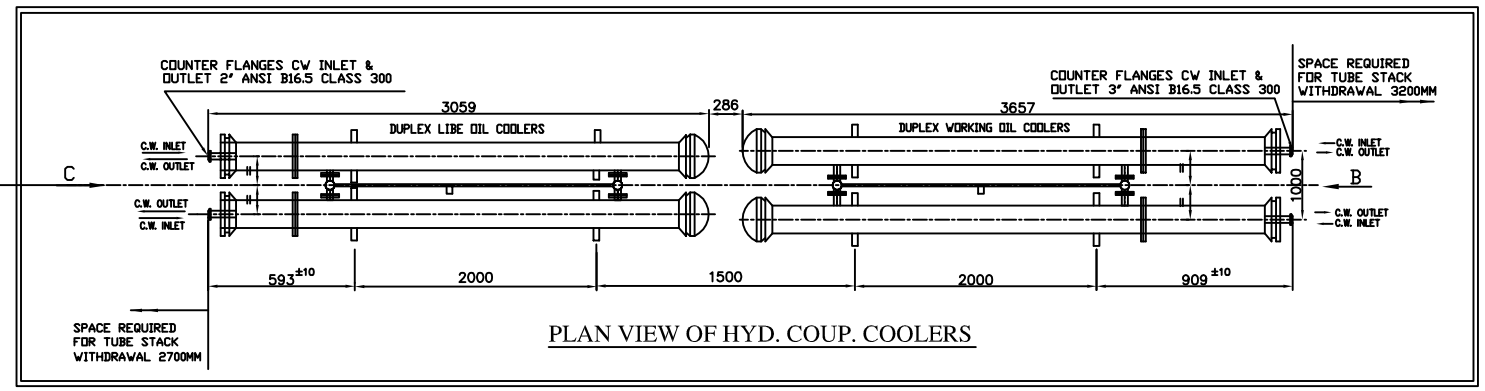


MOVEMENT	SUCTION BRANCH (mm)	DIS. BRANCH (mm)
X	0	0.739
Y	0.19	0.19
Z	0	0

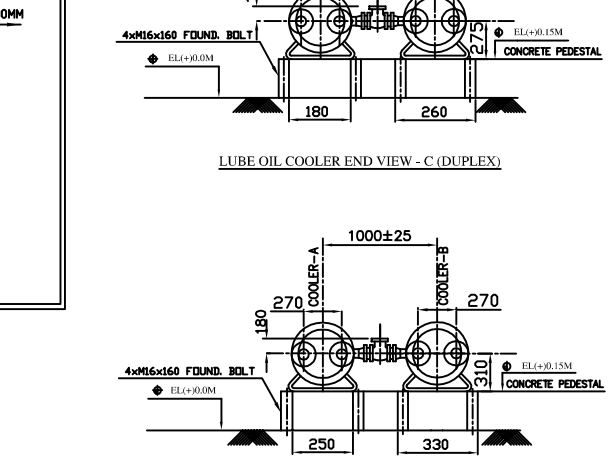
THERMAL MOVEMENTS OF BFP BRANCHES

	NOZZLE SIZE	MOMENT Mx Kgm	MOMENT My Kgm	MOMENT Mz Kgm	FORCE Fx Kg	FORCE Fy Kg	FORCE Fz Kg
SUCTION	8"	±444	±493	±444	±357	±446	±357
DISCHARGE	6"	±448	±551	±448	±266	±333	±266

ALLOWABLE FORCES & MOMENTS ON BFP NOZZLES

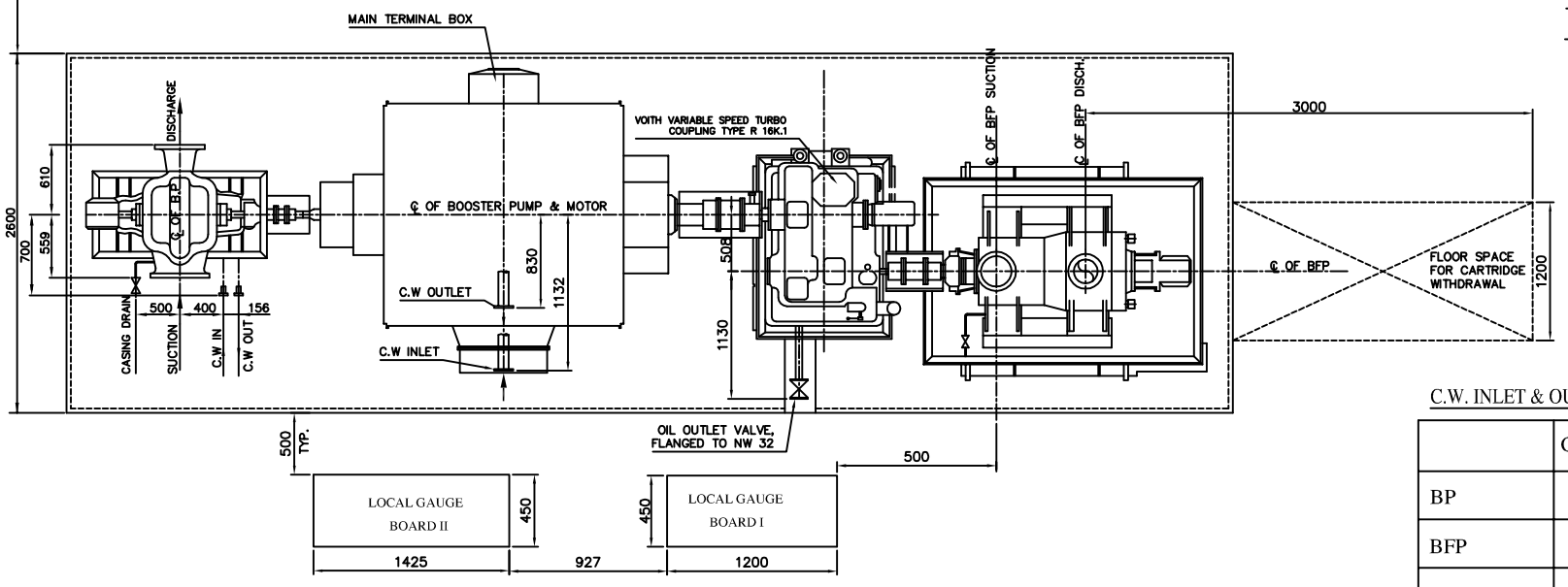


PLAN VIEW OF HYD. COUP. COOLERS



LUBE OIL COOLER END VIEW - C (DUPLEX)

WORKING OIL COOLER END VIEW - B (DUPLEX)



PLAN OF BFP SET

NOTE :

1. FOR MOTOR DETAILS, REFER MOTOR DRG FURNISHED BY BHEL BHOPAL.
2. FOR FOUNDATION DETAILS, EQUIPMENT WEIGHTS AND CENTRE OF GRAVITIES, REFER DRG.NO. HY–DG–1–18000–57627
3. DBSE DENOTES DISTANCE BETWEEN SHAFT END'S
4. ALL ELAVATIONS ARE EXPRESSED IN METERS
5. LOCATION OF LGBs IS SHOWN FOR REFERENCE ONLY & HEIGHT OF LGBs SHALL BE APPROXIMATELY 1.8 M.
6. THIS DRG IS ISSUED FOR LAYOUT PURPOSE ONLY. i.e. FOR THE PURPOSE OF DIMENSIONS, LOCATION OF TERMINAL POINTS, WEIGHTS OF EQUIPMENTS AND FOUNDATION LOADS. THIS DRAWING SHALL NOT BE REFERRED FOR INTERNAL AND EXTERNAL CONSTRUCTION DETAILS OF THE EQUIPMENT.
7. ELEVATION METERS

C.W. INLET & OUTLET FLANGE DIMENSIONS

	C.W. INLET	C.W.OUTLET
BP	SORF FLANGE NB 1" CL 150	SORF FLANGE NB 1" CL 150
BFP	SORF FLANGE NB 2" CL 150	SORF FLANGE NB 3" CL 150
MOTOR	SORF FLANGE NB 4" CL 150	SORF FLANGE NB 4" CL 150

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, USA
BECHTEL DRG. NO.	
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091–M43–CAT000–BHL–P003
RIL DRG. NO. (HAZIRA):	10090–M43–CAT000–BHL–P003

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	B.H.NAIK	S.D/–	17.10.13
CHD.	D.K.GUPTA		17.10.13
APPD.	B.RAJKUMAR		17.10.13

NO.OF VAR. NA

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
PUMPS ENGG.	NTS	NA	NA	NA	NA
CODE 410					

TITLE: GENERAL ARRANGEMENT OF BFP SET

DRAWING NO. HY–DG–1–18000–57626 REV. 00

SHEET NO. 01 NO OF SHEETS 01

REV.	DATE	ALTERED	CHECKED	APPD.	ZONE

INVENTORY NO | SIGN. AND DATE | REF. DRG. NO.

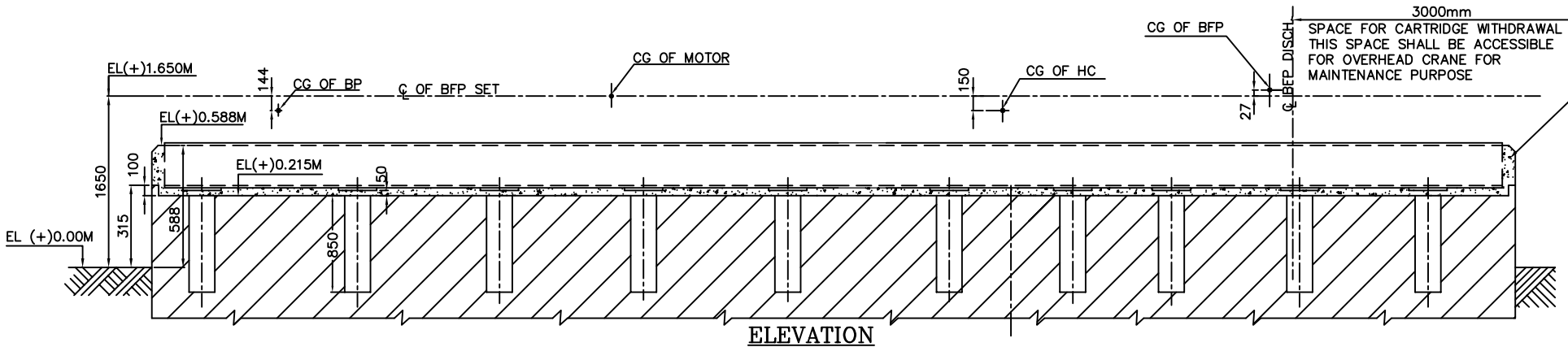
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

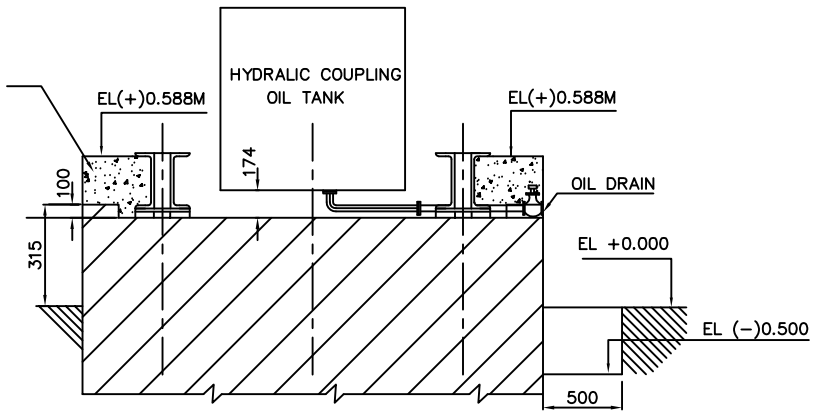
DRG. NO. 1 180 005 7627

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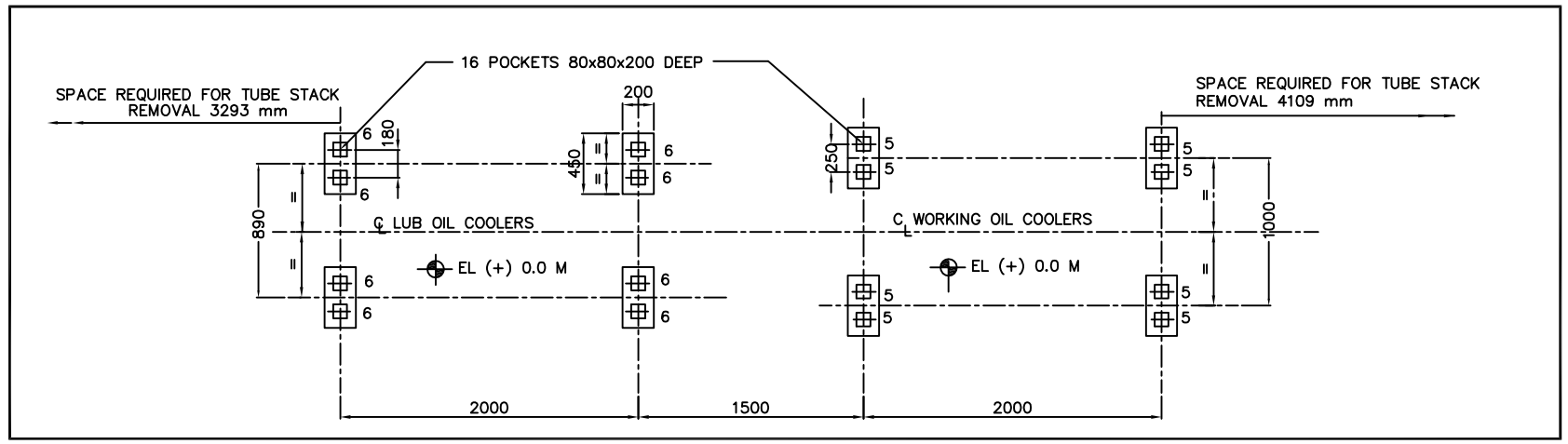
COMPUTER FILE NAME : FP11800057627-00



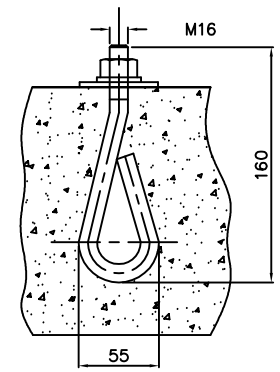
ELEVATION



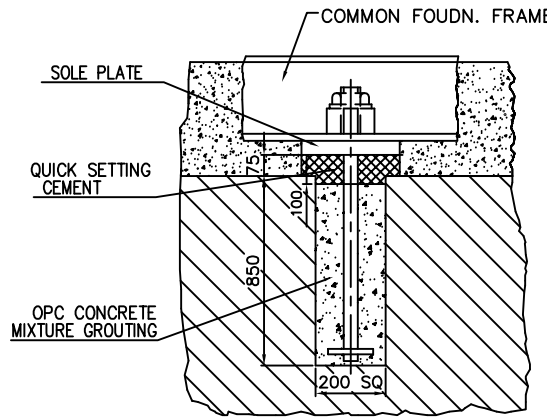
VIEW ON A–A



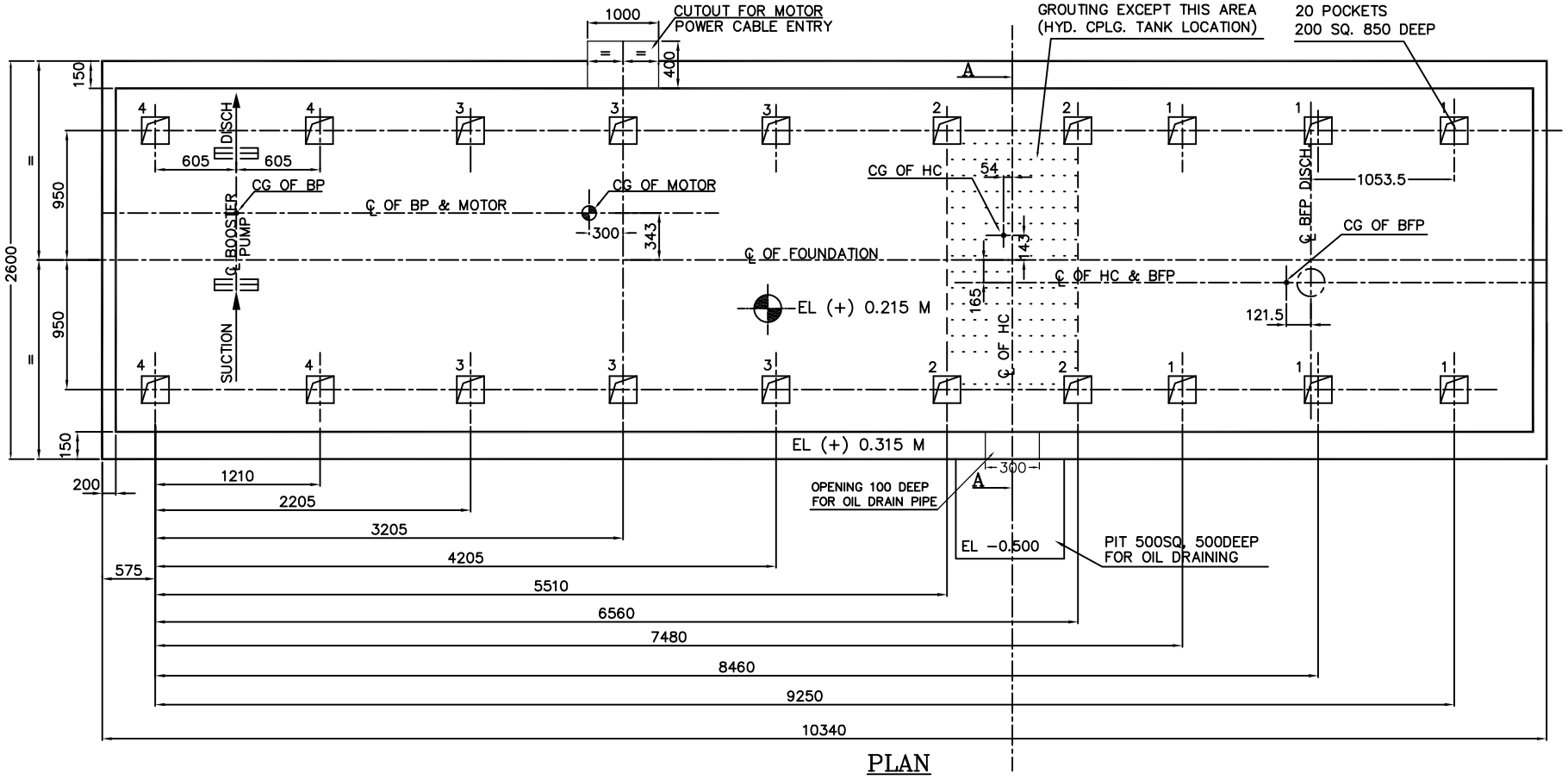
TYPICAL FOUNDATION DETAILS OF
HYD. COUPLING COOLERS AT 0.0 M



FOUND. BOLT DETAILS OF
L.O. & W.O. COOLERS



FOUNDATION BOLT ARRANGEMENT
FOR BFP SET



PLAN

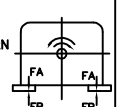
No.OF POCKETS	FOUNDATION POCKET No.	DESCRIPTION OF THE EQUIPMENT	WT. OF THE EQPMT.(KG)	ROTOR ECC. VERTICAL (MICRONS)	SPEED (rpm)	ROTOR WT. (Kg.)	GD^2 (Kg. m^2)	TOTAL DYNAMIC LOAD VERT. (Kgs.)	LOADING ON EACH POCKET STATIC (KG)	LOADING ON EACH POCKET DYNAMIC(KG)
20	1,2,3,4	COM.FOU.FRAME	8752	–	–	–	–	–	481	–
6	1	B.F.P.	5770	50	5100	298	6.12	833	1486	530
4	2	HYD. COUPLING	3000	200/50	–	540 (INPUT) 221 (OUTPUT)	97 (INPUT) 1.24 (OUTPUT)	1667/785 LOW SPEED SHAFT/ HIGH SPEED SHAFT	1090	1900
6	3	MOTOR	15000	200	1485	3250	520	✡✡ SEE MOTOR LOADING DETAILS	3232	6606
4	4	BOOSTER PUMP	2190	–	1485	135	4.9	441	1085	368
8	5	WOR.OIL COOLER	2120	–	–	–	–	–	292	–
8	6	LUB OIL COOLER	1350	–	–	–	–	–	186	–

LEGEND

- CAST FOUNDATION
- SECONDARY GROUTING (QUICK SETTING CEMENT)
- SECONDARY GROUTING (OPC CONCRETE)
- BLIND POCKET/OPENING
- THROUGH OPENING
- ELEVATION (METRES)

✡✡ LOADING ON FOUNDATION (BFP MOTOR)

MAX. FORCE CALCULATED FROM THE MAX.
IMPULSE TORQUE ---------- FM = 207 kN
FORCE EXERTED BY THE WEIGHT ON EACH SIDE – FG = 59 kN
FOUNDATION LOAD ON EACH SIDE
COMPRESSION ------ FA = FM+FG = 266 kN
TENSILE FORCE – – – – – – – – FB = FM–FG = 148 kN
THE FORCE OCCUR ALTERNATIVELY INDEPENDENT OF THE DIRECTION OF ROTATION.



THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, USA
BECHTEL DRG. NO.	
PROJECT:	STG PACKAGE (4X93.1 MW STGS), CCPP HAZIRA MANUFACTURING DIVISION (HMD) STG PACKAGE (3X90.3 MW STGS), CCPP DAHEJ MANUFACTURING DIVISION (DMD)
CUSTOMER:	RELIANCE INDUSTRIES LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RIL DRG. NO. (DAHEJ):	10091-M43-CAT000-BHL-P010
RIL DRG. NO. (HAZIRA):	10090-M43-CAT000-BHL-P010

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	B.H.NAIK	S.D/-	17.10.13	NA
CHD.	D.K.GUPTA		17.10.13	
APPD.	RAJ KUMAR		17.10.13	

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
PUMPS ENGG.	NTS	NA	NA	NA	NA
CODE 410					

TITLE: FOUNDATION DETAILS OF BOILER FEED PUMP SET

DRAWING NO. HY-DG-1-18000-57627 REV. 00

SHEET NO. 01 NO OF SHEETS 01

REV.	DATE	ALTERED	CHECKED	APPD.	ZONE

INVENTORY NO

List of Main Assemblies for HNK 90/3.2-3(RUPPL Project)
Project: 7x90MW

S.No	Assembly	Size in MM			Weight (Kgs)
		Length	Width	Height	
1.	Outer Casing Upper Part	4865	5600	3500	34162
2.	Outer Casing Lower Part	4700	3060	1400	23335
3.	Inner Casing Assembly	1784	1740	1600	8960
4.	Guide Blade Carrier-1	490	1780	1735	3500
5.	Guide Blade Carrier-2	540	1780	1735	3400
6.	Guide Blade Carrier-3	620	1980	1935	4500
7.	Guide Blade Carrier-4	520	2200	2185	6900
9.	Exhaust hood Upper Part	2050	5800	2500	11980
10.	Exhaust Hood Lower Part	2230	6140	2700	20731
11.	Rear Bearing Housing Assembly	1405	1400	900	1928
12.	Front Bearing Housing Assembly	1690	2610	950	15791
13.	Rotor Assembly	8650	Dia 2230	----	34000
14.	Upper Part of Outer Casing & Exhaust Hood (Bolted Condition)	6915	5800	3500	55000
15.	Lower Part of Outer Casing & Exhaust Hood (Bolted Condition).	6930	6140	2700	53000

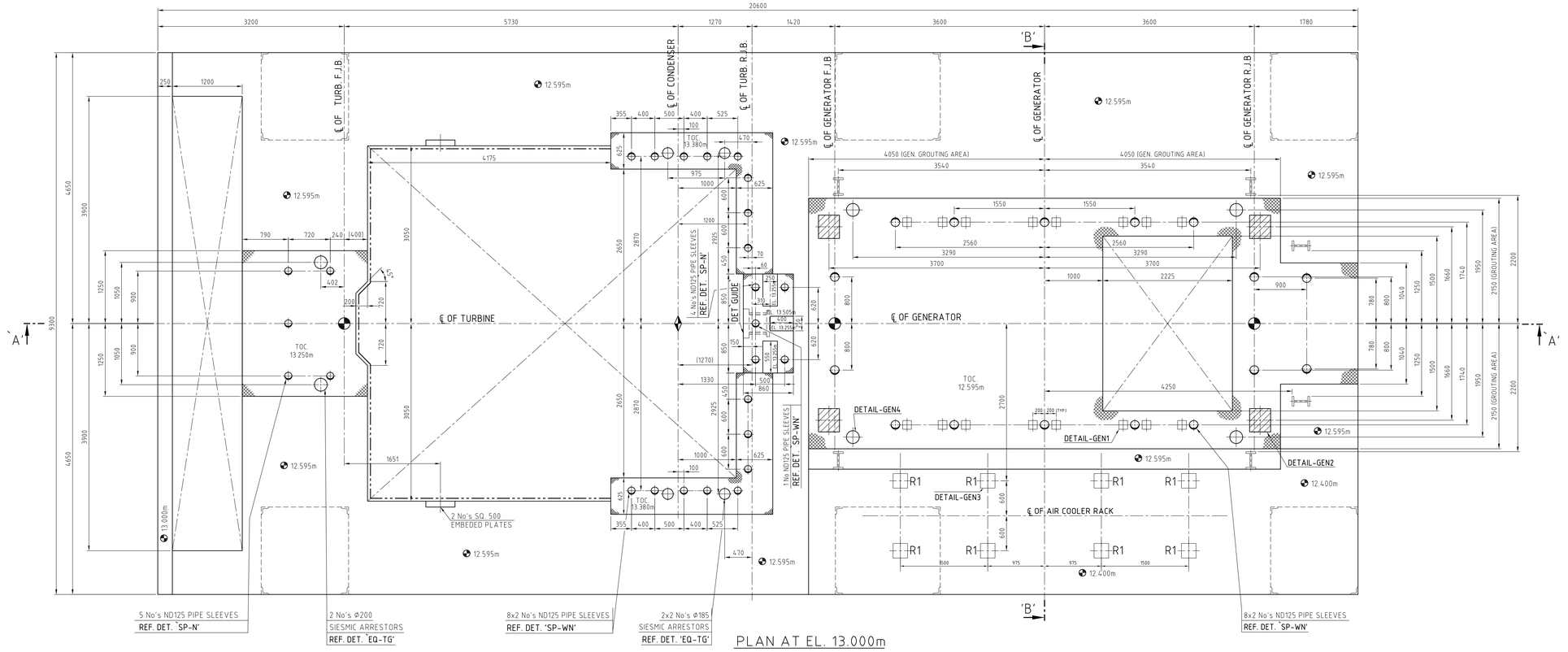
NOTE:

FOR LAY DOWN SPACE REQUIREMENTS FOR MAINTENACE PURPOSE, THE FOLLOWING SL.NOS ARE TO BE CONSIDERED: **3 TO 7, 11 TO 14.**

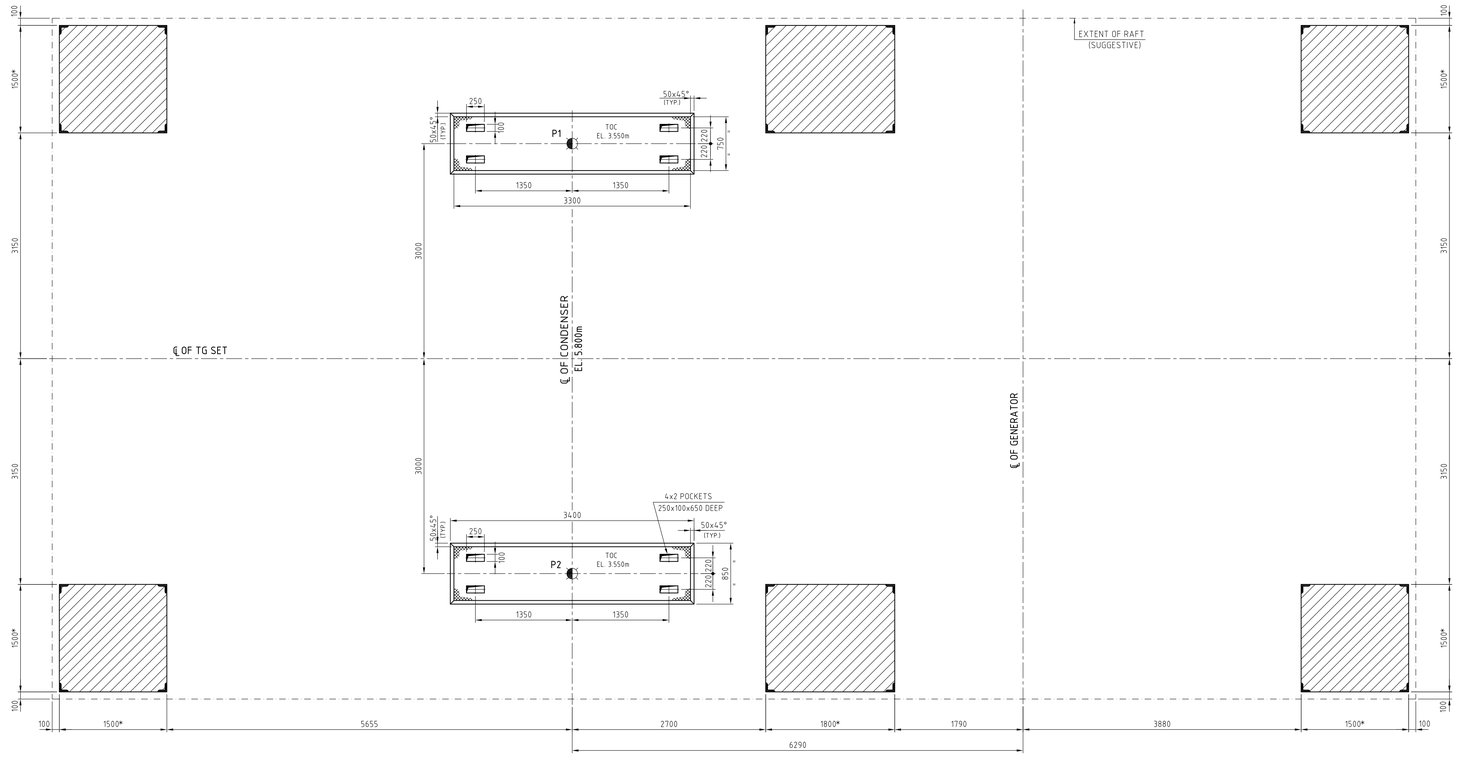
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635 SH. 01 OF 05



PLAN AT EL. 13.000m



PLAN AT 0.000m

LEGEND:

- GROUTING
- THRU. HOLES
- LOAD POINT
- OPENING
- ELEVATION
- TOC TOP OF CONCRETE

NOTES:

1. ALLOWABLE TOLERANCE IN HORIZONTAL AND VERTICAL DIRECTION :
   a) FOUNDATION DIMENSIONS ±10mm
   b) LOCATION OF EMBEDDED ANCHOR BOLTS ±5mm
   c) LOCATION OF SLEEVES FOR PIPING AND THROUGH HOLES FOR ANCHOR BOLTS ±10mm
2. SOUND CONCRETE MATERIAL IS EXPECTED BELOW EQUIPMENT BASEPLATES PERMITTING COMPLETE ADHERENCE OF SECONDARY GROUT CEMENT.
3. IF FIX POINTS ARE EMBEDDED IN A WRONG LOCATION THERE IS NO POSSIBILITY OF ADJUSTMENT OR CORRECTION ON MACHINE PARTS.
4. ALL EMBEDDED STEEL SECTIONS (FLATS & ANGLES) TO BE EMBEDDED MATCHING WITH CONCRETE SURFACE.
5. ALL THE COLUMN DIMENSIONS AND DECK THICKNESS ARE ONLY INFORMATIVE. CIVIL DESIGNER TO DECIDE THE DIMENSIONS.
6. ALL DIMENSIONS ARE IN "mm" AND ELEVATION ARE IN METRES.
7. * DIMENSIONS TO BE DECIDED BY CIVIL DESIGNER.
8. ALL ELEVATIONS CORRESPOND TO FINISHED CONCRETE LEVELS.
9. TG DECK AREA SHALL BE COVERED BY GRATING AFTER COMPLETION OF PIPING CABLING & ERECTION ETC. TOP OF GRATING SHALL BE AT EL. 13.000m. GRATING AND CORRESPONDING SUPPORTS NOT IN B.H.E.L. SCOPE.

STATUS : FINAL

OWNER: Reliance Industries Limited — RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL — BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE	NO.OF YAR.
DRN.	J.C.S/C.BALAJI	15.10.2013	
CHD.	G.N.P.A.V.A.PRASAD	15.10.2013	N.A.
APPD.	M.A.HAMEED	15.10.2013	

DEPT.	UNTOL. DIMS. OR	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
TEEP	±1%	1:30	-N.A.-	-N.A.-	-N.A.-	-N.A.-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO. —

CARD CODE N.A.

SHT. No 01 NO. OF SHT. 05

REV. | DATE | ALTERED | CHD/APPD | ZONE

JCS

AVAILABILITY NO | COA AND DATE | PART ORG. NO. | COMPUTER FILE NAME

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

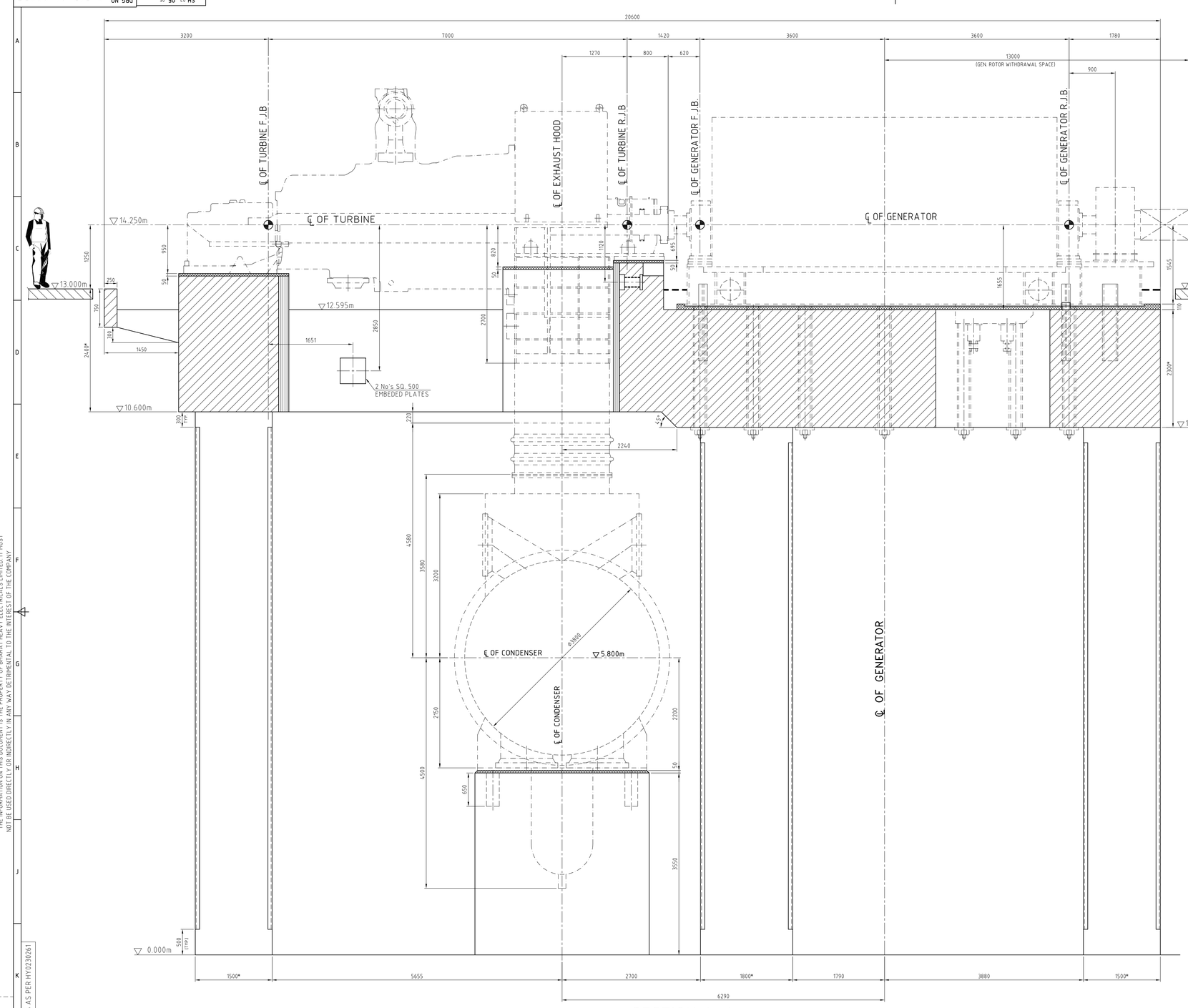
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Oct Thu 17 13:52 2013
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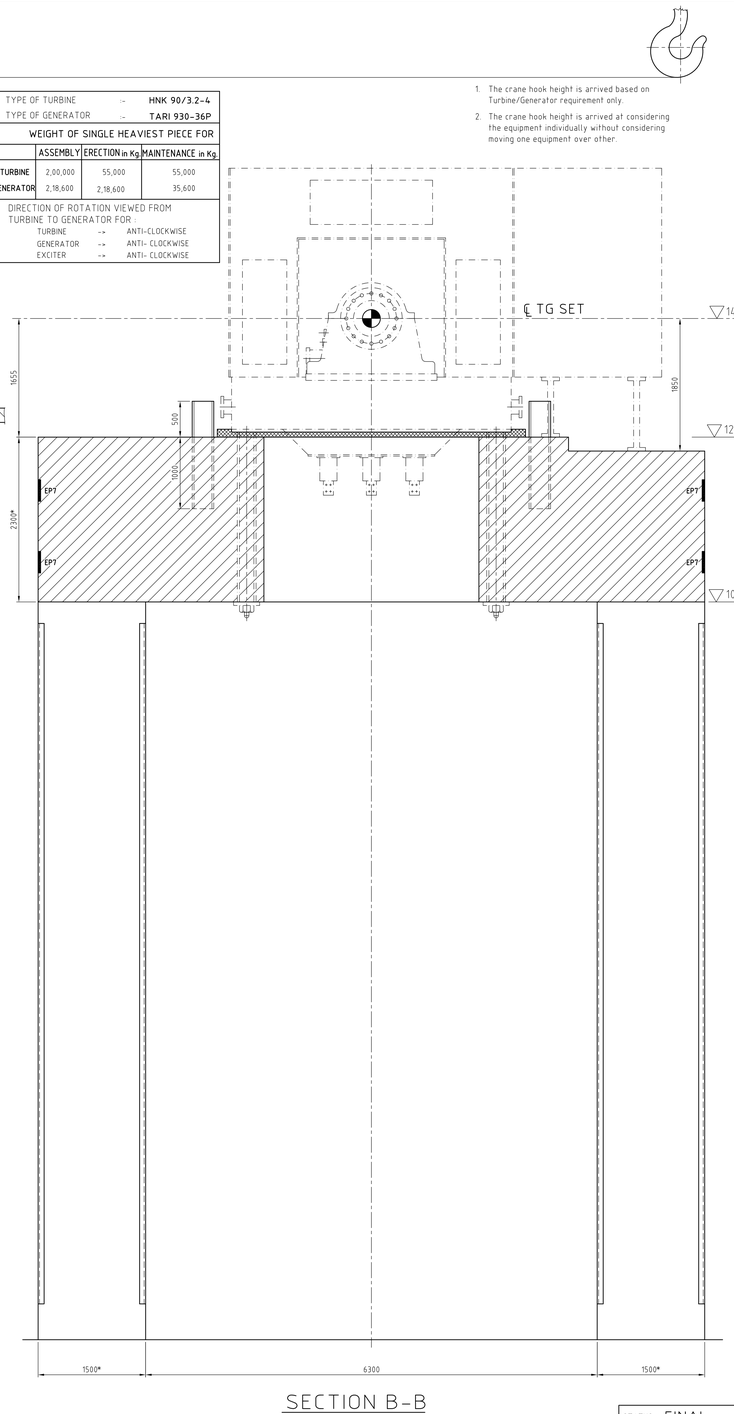
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635 SH. 02 OF 05



SECTION A-A



SECTION B-B

TYPE OF TURBINE	--	HNK 90/3.2-4
TYPE OF GENERATOR	--	TARI 930-36P

WEIGHT OF SINGLE HEAVIEST PIECE FOR

	ASSEMBLY	ERECTION in Kg	MAINTENANCE in Kg
TURBINE	2,00,000	55,000	55,000
GENERATOR	2,18,600	2,18,600	35,600

DIRECTION OF ROTATION VIEWED FROM TURBINE TO GENERATOR FOR :

TURBINE	->	ANTI-CLOCKWISE
GENERATOR	->	ANTI- CLOCKWISE
EXCITER	->	ANTI- CLOCKWISE

1. The crane hook height is arrived based on Turbine/Generator requirement only.
2. The crane hook height is arrived at considering the equipment individually without considering moving one equipment over other.

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY023061

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REV.	DATE	ALTERED	CHD/APPD

STATUS : FINAL

OWNER: Reliance Industries Limited — RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL — BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE	NO.OF VAR.
DRN	J.C.S/C.BALA	15.10.2013	-N.A.-
CHD	G.N.P.A.V.S	15.10.2013	
APPD	M.A.H.K	15.10.2013	

DEPT.	UNTOL DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
TCEP	GR	1:30	-N.A.-	-N.A.-	-N.A.-	-N.A.-
CODE 475						

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO.

SHT. No 02 NO. OF SHT. 05

INVENTORY NO — SIGN AND DATE — REF. DRG. NO. — COMPUTER FILE NAME

Oct Thu 17 13:52 2013

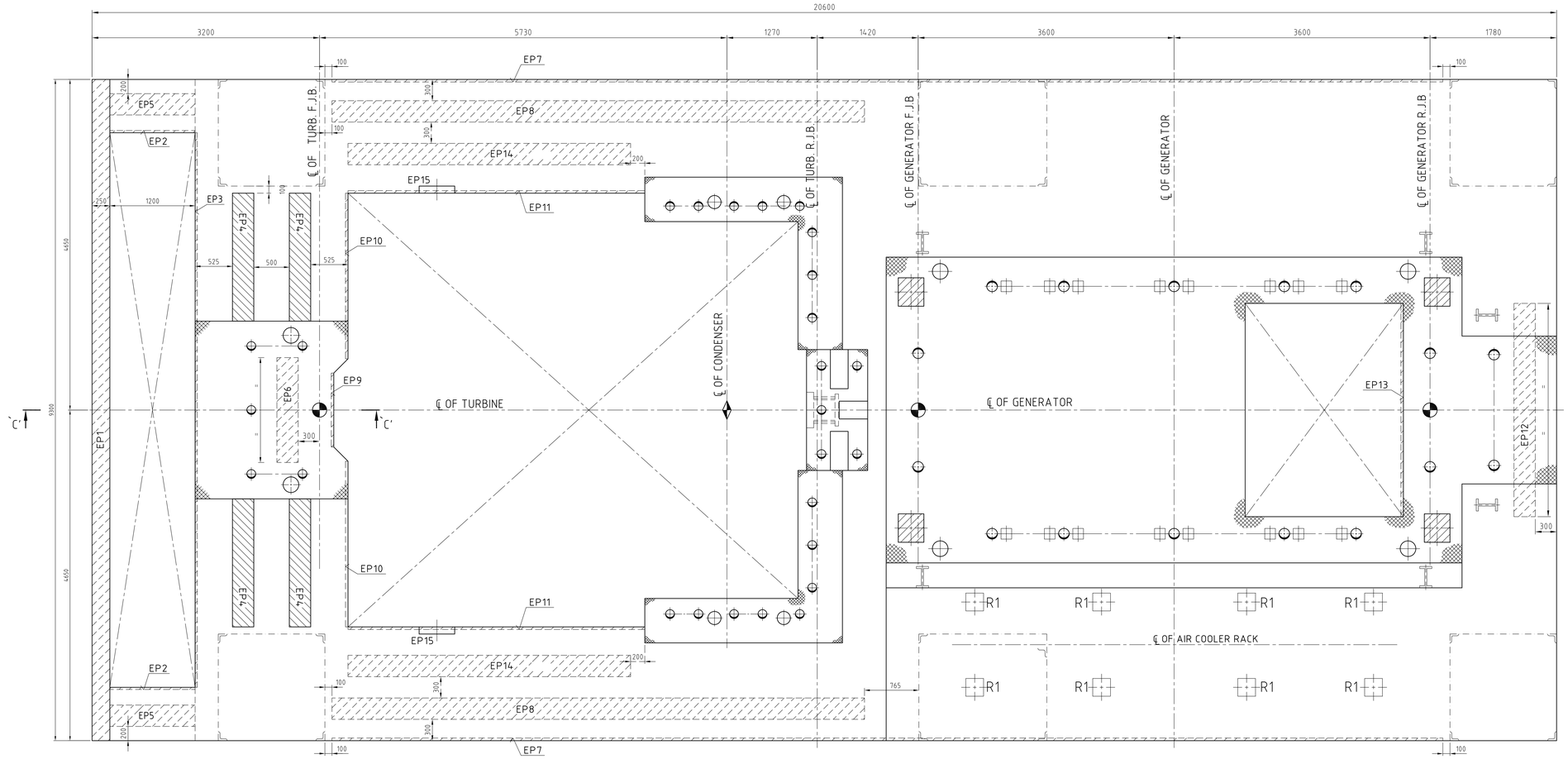
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FIRST ANGLE PROJECTION

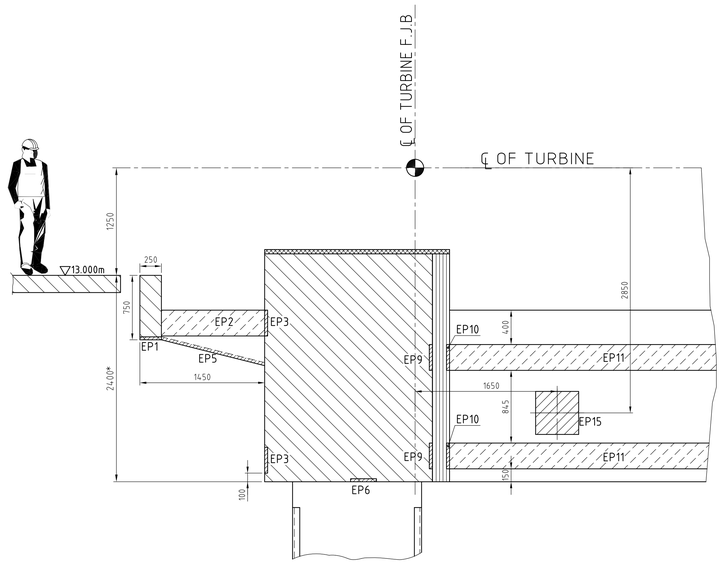
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635 SH. 03 OF 05



LOCATION OF EMBEDED PLATES

(NOT IN B.H.E.L SCOPE OF SUPPLY)



SECTION C-C

EMBEDED PLATE DETAILS

PLATE	SIZE	LOAD (IN Kg/M)	LOCATION	Q.TY.
EP1	PL. 12x250x9300	1000	BOTTOM OF DECK	1
EP2	PL. 12x300x1200	2000	℄ OF PLATE EL. 12.445m	2
EP3	PL. 12x300x7800	2000	TURBINE FRONT CUTOUT	2
EP4	PL. 12x300x1800	2000	TOP OF DECK	4
EP5	PL. 12x300x1200	2000	BOTTOM OF CANTILEVER	2
EP6	PL. 12x300x1475	2000	BOTTOM OF DECK	1
EP7	PL. 12x300x15625	2000	℄ OF PLATE EL. 10.850m/11.850m	4
EP8	PL. 12x300x7490	1000	BOTTOM OF DECK	2
EP9	PL. 12x300x1040	500	TURBINE CUTOUT	2
EP10	PL. 12x300x2330	500	TURBINE CUTOUT	4
EP11	PL. 12x300x4175	500	TURBINE CUTOUT	4
EP12	PL. 12x300x3000	1000	BOTTOM OF DECK	1
EP13	PL. 12x300x3000	1000	GENERATOR CUTOUT	1
EP14	PL. 12x300x3975	1000	BOTTOM OF DECK	1
EP15	PL. 12x500x500	3000	TURBINE CUTOUT	1

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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

SCALE AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

REVISION NO.	REV.	DATE	ALTERED	CHD/APPD	ZONE

STATUS : FINAL

OWNER: RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE
DRN	J.C.S/C.BALAJI	15.10.2013
CHD	G.N.P.A.V.PRASAD	15.10.2013
APPD	M.A.HAMEED	15.10.2013

NO.OF VAR. -N.A.-

DEPT: TCEP | CODE: 215 | UNITOL. DIMS. GR: COARSE | SCALE: 1:30 | WEIGHT (KG): -N.A.- | REF. TO ASSY. DRG.: -N.A.- | ITEM NO.: -N.A.- | NO.OF ITEMS: -N.A.-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO.: 0-313-01-08635

CUSTOMER DRAWING NO.:

REV: 00

SHT. No: 03 | NO. OF SHT.: 05

Oct Thu 17 12:26 2013

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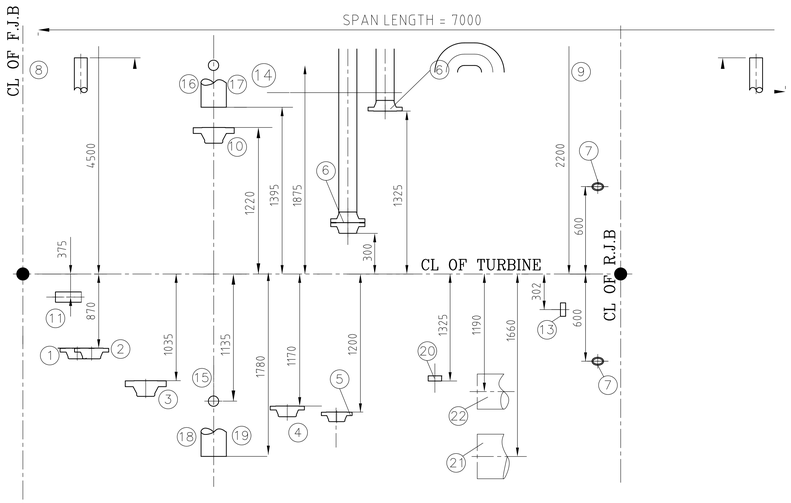
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

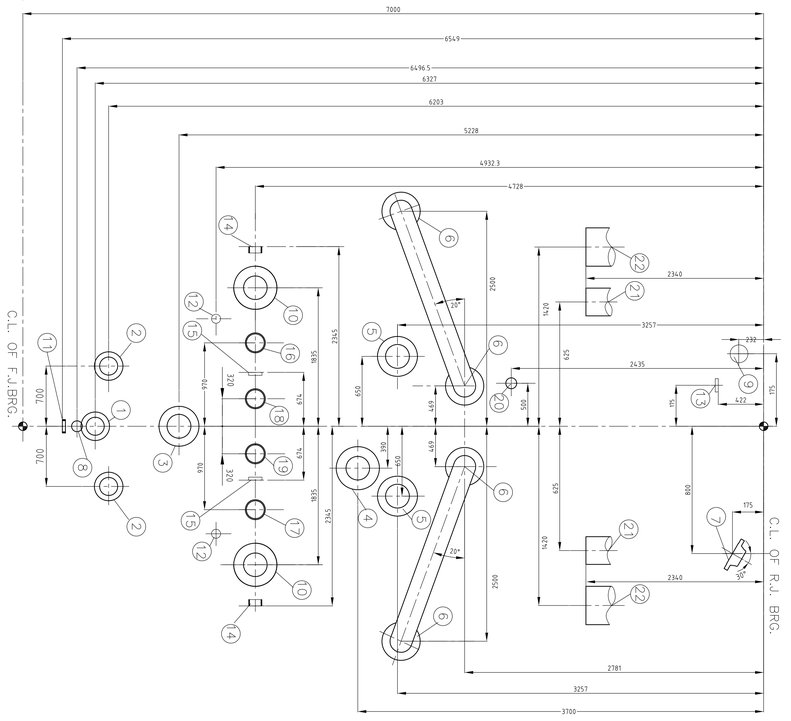
DRG. NO. 0-313-01-08635 SH. 04 OF 05

CASING STEAM AND DRAIN FLANGE CONNECTIONS

ELEVATION

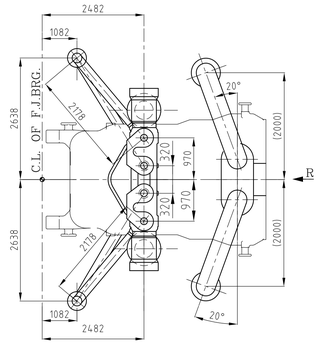


PLAN

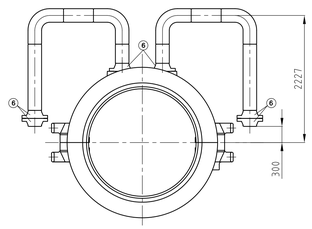


GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

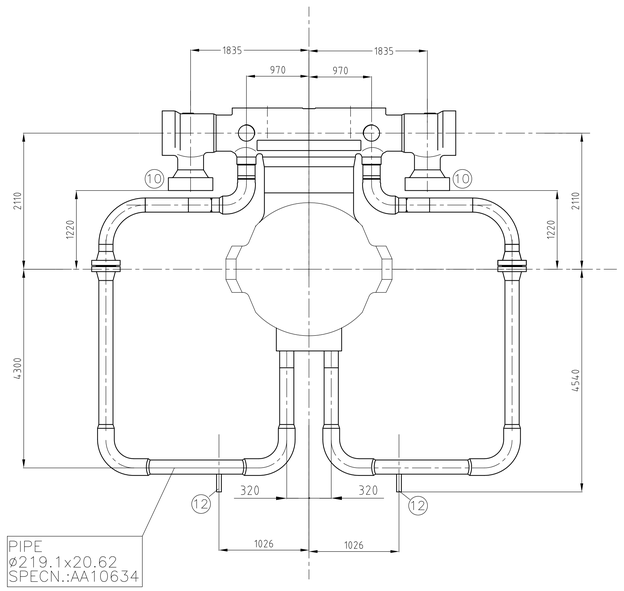
TOP VIEW OF INLET INTER CONNECTING PIPING



PARTIAL VIEW–R



INLET INTER CONNECTING PIPING AS VIEWED FROM TURBINE FRONT



SL. NO.	DESCRIPTION	QTY	TYPE OF FLANGE	REMARKS
1.	Front Steam Gland Connection	1	8" #300 WNRF,SCH=40(SA105)	1.1ata./313°C
2.	Balance Piston Leak off–1	2	8" #300 WNRF,SCH=40(SA105)	9.1ata./322°C
3.	Uncontrolled Extraction to HPH2	1	8"#600 WNRJ,SCH=40(SA105)	34.2ata./348°C
4.	Uncontrolled Extraction to HPH1	1	10" #300 WNRF,SCH=30(SA105)	18.9ata./273°C
5.	Uncontrolled Extn. to Deaerator	2	10"#300 WNRF,SCH=30(SA105)	9.1ata./192°C
6.	Uncontrolled Extraction to LPH3	2	14"#150,SCH=30(SA106)	4.5ata./147°C
7.	Rear Steam Gland Inlet	2	3"#300 WNRF SCH.40(SA105)	—
8.	Steam Vent (front)	1	PIPE ø88.9x5.49(SA335 P11)	—
9.	Steam Vent (rear)	1	PIPE ø48.3x5.08(CS)	—
10.	Main Steam Connection**	2	10"#2500 WNRF. With weld ring Gasket(SA182 F91)	120ata/529°C
11.	Drain connection(Front gland)	1	G1/2" Dilo union (SA335 P11)	—
12.	Drain connection (Inn. piping)	2	NIPPLET Dia. 60.3x11 BW ends (SA182 F91)	—
13.	Drain connection (rear gland)	1	G 1/4" Dilo Union (CS)	—
14.	Drain connection(Stop valve)	2	G1" Dilo Union (SA182 F321))	—
15.	Main Steam Inlet(U ring) Drain	2	NIPPLET dia. 22x5 BW ends (SA182 F11)	—
16.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
17.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
18.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
19.	Steam Inlet	1	PIPE DIA 219.1X20.62 (SA335 P91)	120ata/529°C
20.	DRAIN Connection.	1	1",#300, WNRF, SCH. 40(SA105)	10.85ata./253°C
21.	Uncontrolled Extraction to LPH–2	2	PIPE DIA 457.2X6.35 (SA106)	1.5ata/111°C
22.	Uncontrolled Extraction to LPH–1	2	PIPE DIA 609.4X6.35 (SA106)	0.5ata./83°C

**MAIN STEAM INLET FLANGE SCHEDULE TO BE DECIDED AND INFORMED TO PE GROUP

NOTES:

1) POSITIONS SHOWN IN THIS DRAWING ARE FOR MATING FLANGES OF TURBINE CASING FLANGES ISSUED BY BHEL.

STATUS : FINAL

OWNER: Reliance Industries Limited — RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL — BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	DATE	NO.OF VAR.
DRN.	J.C.S/C.BALA.J	16.9.2013	-
CHD.	G.N.P.A.W.A.R.A	16.9.2013	N.A.
APPD.	M.A.HAMEED	16.9.2013	

DEPT. TEEP | CODE: 4.15 | UNTOL. DIMS. OR CLASS. | SCALE 1:30 | WEIGHT (KG) -N.A.- | REF. TO ASSY. DRG. -N.A.- | ITEM NO. -N.A.- | NO.OF ITEMS -N.A.-

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO.

SHT. No 04 NO. OF SHT. 05

REV.	DATE	ALTERED	CHD/APPD	ZONE

JCS

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REVISION NO. — SIGN AND DATE — REF. DRG. NO. — COMPUTER FILE NAME

Oct Thu 17 12:26 2013

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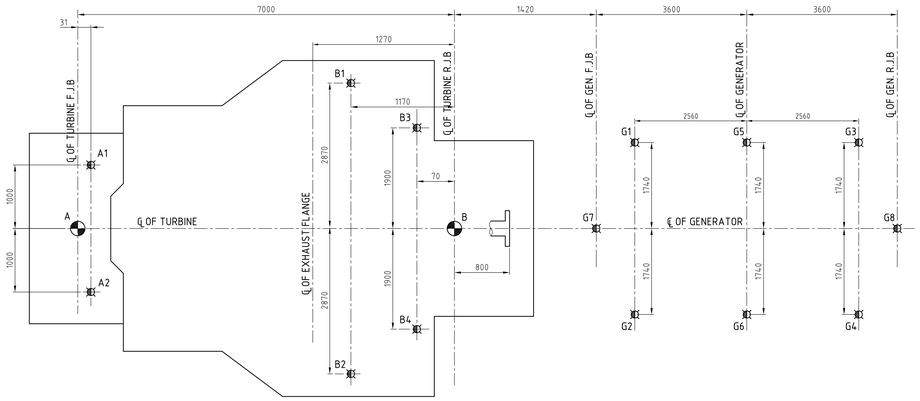
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FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-313-01-08635

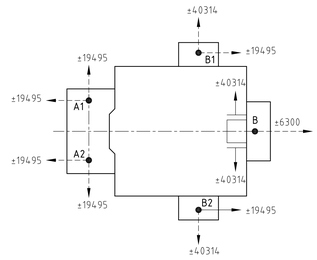
SH. 05 OF 05



HORIZONTAL FRICTIONAL FORCES IN kgf

A	Working point of forces	: 790 mm
B1	Working point of forces	: 695 mm
B1, B2	Working point of forces	: 820 mm

below turbine axis



——— COLD TO HOT
- - - - - HOT TO COLD

THE FORCES ALTERNATE IN DIRECTION

FORCES ON FOUNDATION IN kgf

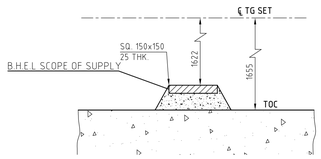
	LOAD POINT / LOAD CONDITION	STATIC LOAD WITHOUT ROTATING WEIGHT	ROTATING WEIGHT	OPERATING WEIGHT OF CONDENSER/VACUUM PULL	SHORT CIRCUIT LOAD *	LOAD DUE TO OPERATING TORQUE	OPERATING UNBALANCE DYN. LOAD (ROTATING) **	FAILURE MODE LOAD ** (Turbine - Blade breakage Generator - End-Ring Breakage)	PIPING FORCE
		1	2	3	4	5	6	7	8
TURBINE	A	-	16300	-	-	-	3260	19560	-
	A1	30828	-	8130	-	7706	-	-	∓5000
	A2	30828	-	8130	-	-7706	-	-	∓5000
	B	-	19924	-	-	-	3985	23910	-
	B1	25530	-	18885	-	1343	-	-	∓5000
	B2	25530	-	18885	-	-1343	-	-	∓5000
	B3	25530	-	18885	-	2028	-	-	-
	B4	25530	-	18885	-	-2028	-	-	-
GENERATOR	G1	23000	-	-	∓40500	4600	-	-	-
	G2	23000	-	-	∓40500	-4600	-	-	-
	G3	23000	-	-	∓40500	4600	-	-	-
	G4	23000	-	-	∓40500	-4600	-	-	-
	G5	23000	-	-	∓20250	2300	-	-	-
	G6	23000	-	-	∓20250	-2300	-	-	-
	G7	25500	17800	-	-	-	∓3600	∓21600	-
	G8	28500	17800	-	-	-	∓3600	∓21600	-
	R1	2000	-	-	-	-	-	-	-
CONDENSER OPERATION		-	-	-	-	-	-	-	-
	P1	115000	-	-	-	-	-	-	-
	P2	115000	-	-	-	-	-	-	-

** At each supporting point acting in radial direction over 360 deg.

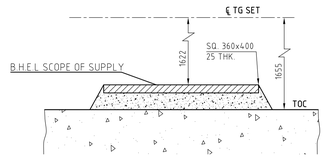
* Loads on either side of TG axis act in opposite directions and the direction changes at 50 cycles/sec.

NOTE :- DOWNWARD FORCES ARE POSITIVE

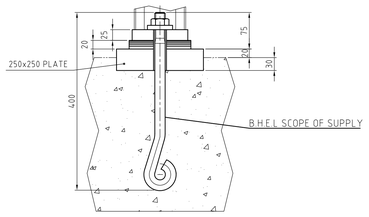
DETAIL-GEN1



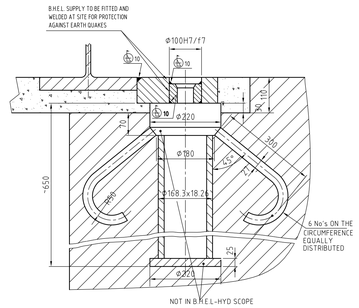
DETAIL-GEN2



DETAIL-GEN3



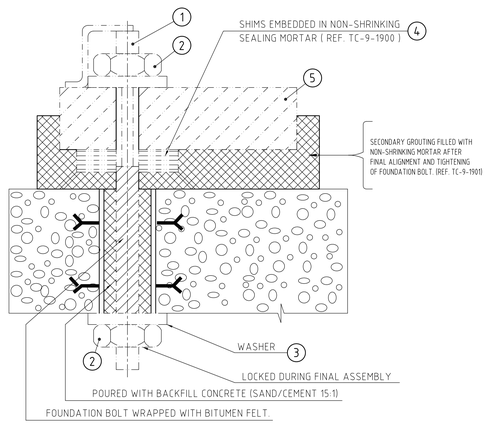
DETAIL-GEN4



MATERIAL - CARBON STEEL

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

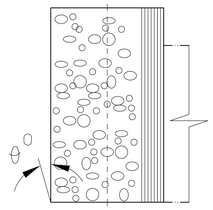
DETAIL `SP-N'



POS (1) TO (5) IN B.H.E.L SCOPE OF SUPPLY

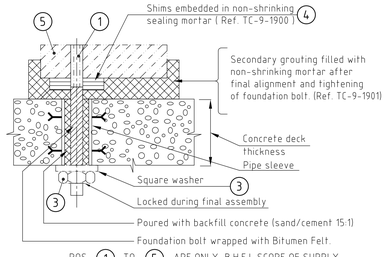
(REFER NOTE 14)

DETAIL `PED'



THE THICKNESS OF THE CONCRETE MEMBER MUST BE SUFFICEINT TO ENSURE THAT THE ANGULAR DEFLECTION DOES NOT EXCEED : 0.0115 DEG. WITH THE HORIZONTAL FORCES SPECIFIED.

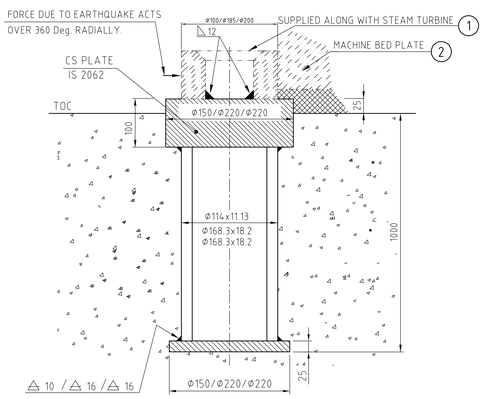
DETAIL `SP-WN'
FOUNDATION BOLT ASSEMBLY



POS (1) TO (5) ARE ONLY B.H.E.L SCOPE OF SUPPLY

(REFER NOTE 14)

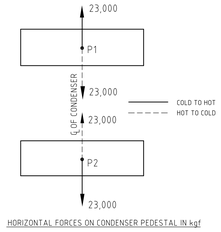
DETAIL `EQ-TG'



POS (1) & (2) IN B.H.E.L SCOPE OF SUPPLY

Speeds in rpm

EQUIPMENT	RATED SPEED	CRITICAL SPEEDS		
		FIRST	SECOND	THIRD
TURBINE	3000	1050 TO 1420	CRITICALLY DAMPED	4870
GENERATOR	3000	1170	3650	-



HORIZONTAL FORCES ON CONDENSER PEDESTAL IN kgf

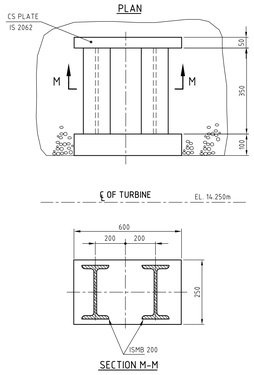
NOTES :-

1. All dimensions are in mm and elevations are in metres.
2. This foundation drawing is only intended as basis for preparing the layout for foundation (by the customer). All civil structural dimensions are tentative and same shall be decided by the civil engineer concerned. The foundation design calculations shall consider all the static and dynamic loads acting simultaneously.
3. Suitable earth quake coefficient applicable for the project site should be adopted for seismic design of foundation as per IS 1893.
4. The foundation block should be designed so that natural frequencies of foundation are sufficiently away from the frequencies of machines. The design shall be as per DIN 4024 standard and IS.2974 part III.
5. Design of the foundation shall consider the allowable limits of vibration behaviour of machines (Group - T) as per VDI 2056.
6. Bearing failure loads are less than failure load condition loads specified in col. 7 of the "Forces on Foundation " table.
7. It is recommended that at all corners of the foundation columns, embedded iron angles of size 100 x 100 x 8 mm shall be provided to support pipes, instruments etc.
8. Dynamic loads in axial direction are negligible.
9. Magnitude of unbalanced forces can be taken in vertical and horizontal directions as equal.
10. Max. live load on top of the deck is :1000 kg./sq.m
11. Foundation block must not be joined to any other structure to avoid vibration transmission.
12. Portions shown thus ▨ in top deck are filled with secondary grouting. The concrete surface in these areas is to be ensured free from dust, grease and oil. Any wooden plugs present in these areas are to be removed. The packing plates below the machine sole plates shall be embedded into a 20 mm thick layer of special grout (local to plates) and are to be levelled horizontally. later, total secondary grouting may be completed.
13. For grouting instructions ref. TC-9-1901 (4 sheets). And for grouting cement specification ref. TC-9-1900.
14. All embedded plates, angles, sleeves, pipes, ducts and any other structurals are NOT part of B.H.E.L. scope of supply unless otherwise specified.

DETAIL `GUIDE'

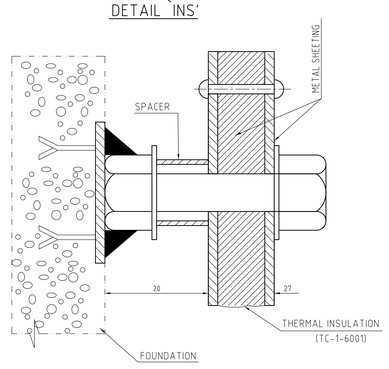
(FOR EXHAUST HOOD GUIDE SUPPORT)

(REFER NOTE 14)



SECTION M-M

DETAIL `INS'



THERMAL INSULATION SHIELD IS NOT IN BHEL SCOPE
CIVIL FOUNDATION SHALL BE DESIGNED FOR CUTOUT
FACE TEMPERATURE OF 70°

THERMAL INSULATION SHIELD FOR CIVIL FOUNDATION

(REFER NOTE 14)

STATUS : FINAL

OWNER: RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL)

CONSULTANT: BECHTEL POWER CORPORATION, USA

COAL-BASED CAPTIVE POWER PLANT

PROJECT: 3x90.3 MW STG Set at Dahej
4x93.1 MW STG Set at Hazira

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME		DATE	NO.OF VAR.
DRN.	J.C.S/C.BALAJI		15.10.2013	
CHD.	G.N.PRAVEEN		15.10.2013	- N.A. -
APPD.	M.A.HAQUE		15.10.2013	

DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
ICEP	GRADE	N.T.S	- N.A. -	- N.A. -	- N.A. -	- N.A. -
CODE 415						

TITLE: MACHINERY ARRANGEMENT AND FOUNDATION

CARD CODE: N.A.

BHEL DRAWING NO. 0-313-01-08635 REV. 00

CUSTOMER DRAWING NO.

SHT. No 05 NO. OF SHT. 05

REV.	DATE	ALTERED	CHD/APPD	ZONE
00	15.10.2013	FIRST ISSUED		

JCS

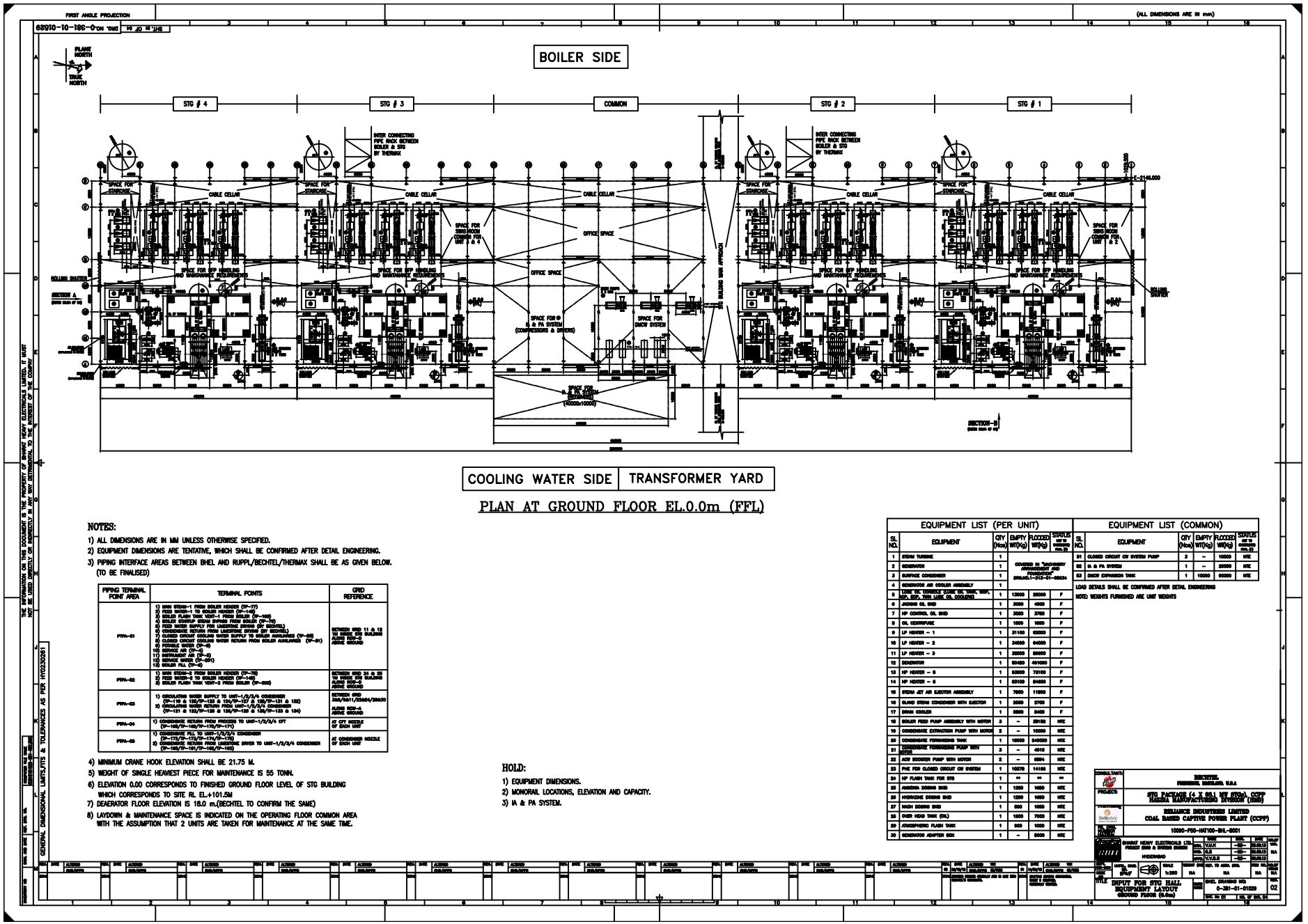
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REVISION NO | SIGN AND DATE | REF. DRG. NO. | COMPUTER FILE NAME

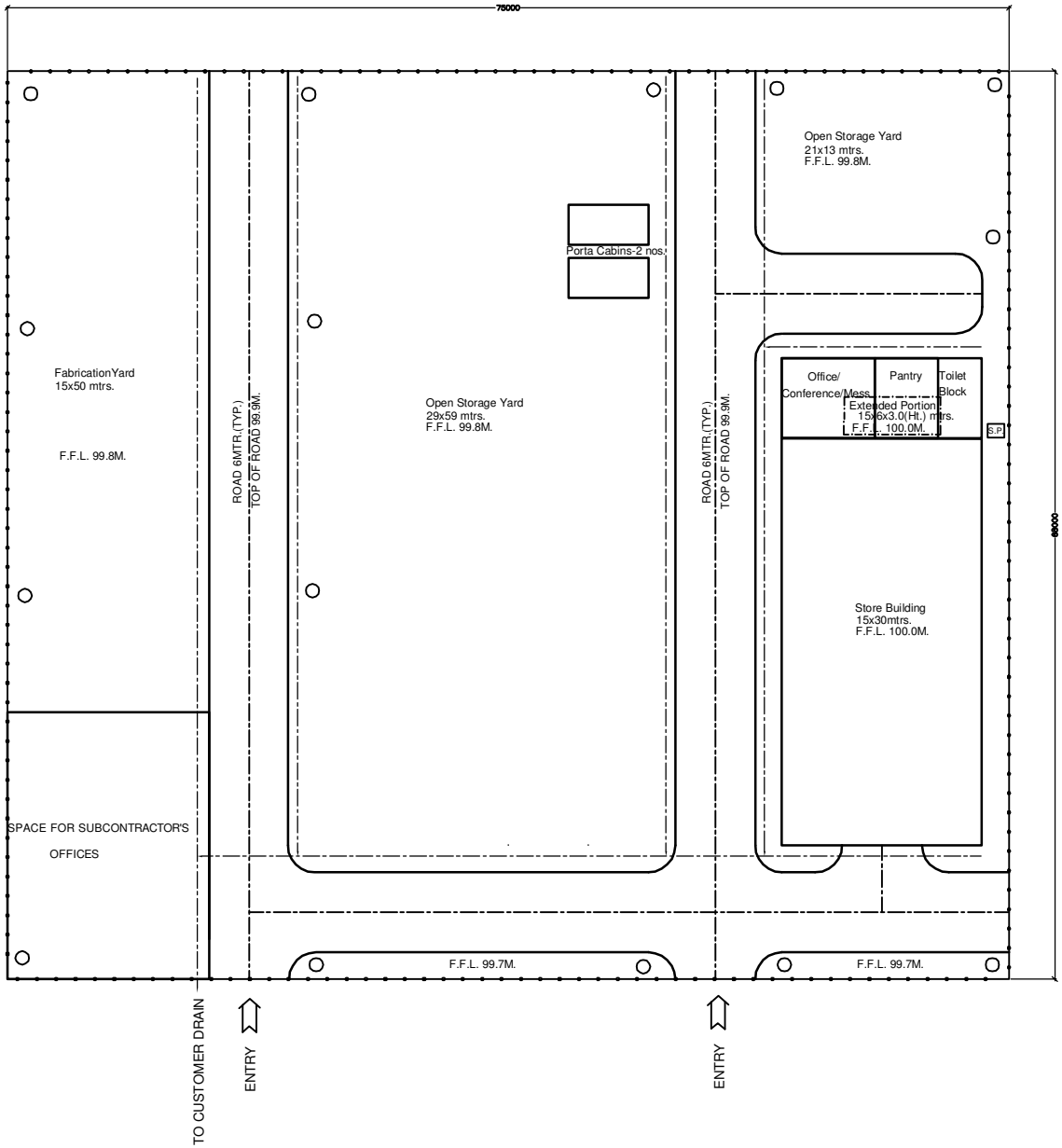
Oct Thu 17 12:27 2013

Printed by : CHEKKA BALAJI-FME3025 / 6031358 on 17-10-13 13:40:25

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BOILER SIDE
STG # 4
STG # 3
COMMON
STG # 2
STG # 1
COOLING WATER SIDE
TRANSFORMER YARD
PLAN AT GROUND FLOOR EL.0.0m (FFL)
NOTES:
1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2) EQUIPMENT DIMENSIONS ARE TENTATIVE, WHICH SHALL BE CONFIRMED AFTER DETAIL ENGINEERING.
3) PIPING INTERFACE AREAS BETWEEN BHEL AND RUPPL/BECHTEL/THERMAX SHALL BE AS GIVEN BELOW. (TO BE FINALISED)
PIPING TERMINAL POINT AREA
TERMINAL POINTS
GRID REFERENCE
PIPA-01
PIPA-02
PIPA-03
PIPA-04
PIPA-05
4) MINIMUM CRANE HOOK ELEVATION SHALL BE 21.75 M.
5) WEIGHT OF SINGLE HEAVIEST PIECE FOR MAINTENANCE IS 55 TONN.
6) ELEVATION 0.00 CORRESPONDS TO FINISHED GROUND FLOOR LEVEL OF STG BUILDING WHICH CORRESPONDS TO SITE RL EL.+101.5M
7) DEAERATOR FLOOR ELEVATION IS 18.0 m.(BECHTEL TO CONFIRM THE SAME)
8) LAYDOWN & MAINTENANCE SPACE IS INDICATED ON THE OPERATING FLOOR COMMON AREA WITH THE ASSUMPTION THAT 2 UNITS ARE TAKEN FOR MAINTENANCE AT THE SAME TIME.
HOLD:
1) EQUIPMENT DIMENSIONS.
2) MONORAIL LOCATIONS, ELEVATION AND CAPACITY.
3) IA & PA SYSTEM.
EQUIPMENT LIST (PER UNIT)
SL. NO.
EQUIPMENT
QTY (Nos)
EMPTY WT(Kg)
FLOODED WT(Kg)
STATUS
1 STEAM TURBINE
2 GENERATOR
3 SURFACE CONDENSER
4 GENERATOR AIR COOLER ASSEMBLY
5 LUBE OIL STORAGE TANK
6 JACKING OIL SKID
7 HP CONTROL OIL SKID
8 OIL CENTRIFUGE
9 LP HEATER – 1
10 LP HEATER – 2
11 LP HEATER – 3
12 DEAERATOR
13 HP HEATER – 5
14 HP HEATER – 6
15 STEAM JET AIR EJECTOR ASSEMBLY
16 GLAND STEAM CONDENSER WITH EJECTOR
17 DRAIN COOLER
18 BOILER FEED PUMP ASSEMBLY WITH MOTOR
19 CONDENSATE EXTRACTION PUMP WITH MOTOR
20 CONDENSATE FORWARDING TANK
21 CONDENSATE FORWARDING PUMP WITH MOTOR
22 ACW BOOSTER PUMP WITH MOTOR
23 PHE FOR CLOSED CIRCUIT CW SYSTEM
24 HP FLASH TANK FOR STG
25 AMMONIA DOSING SKID
26 HYDRAZINE DOSING SKID
27 MACH DOSING SKID
28 OVER HEAD TANK (OHL)
29 ATMOSPHERIC FLASH TANK
30 GENERATOR ADAPTER BOX
EQUIPMENT LIST (COMMON)
SL. NO.
EQUIPMENT
QTY (Nos)
EMPTY WT(Kg)
FLOODED WT(Kg)
STATUS
01 CLOSED CIRCUIT CW SYSTEM PUMP
02 IA & PA SYSTEM
03 DMCW EXPANSION TANK
LOAD DETAILS SHALL BE CONFIRMED AFTER DETAIL ENGINEERING
NOTE: WEIGHTS FURNISHED ARE UNIT WEIGHTS
BECHTEL
RELIANCE INDUSTRIES LIMITED
COAL BASED CAPTIVE POWER PLANT (CCPP)
10080-P00-HKT00-BHL-0001
BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD
INPUT FOR STG HALL EQUIPMENT LAYOUT GROUND FLOOR (0.0m)
0-351-01-01529
02
68910-10-186-0
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER IS10237:2081
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ANNEXURE - 44



PROPOSED PLAN FOR SITE DEVELOPMENT WORKS AT RUPPL,DMD,DAHEJ SITE

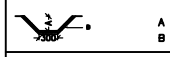
ROAD 6MTR.(TYP.)

BHEL SITE AREA 68 x 75m

LEGEND:

- ELECTRICAL LIGHTING POLES
- BARBED WIRE FENCING, 1.8M. HIGH
- STORM WATER DRAIN, SLOPE 1:250
- S.P — SOAK PIT

CROSS-SECTIONAL DETAIL OF DRAINS:



A – VARIES FROM 300MM TO 600MM
B – 75MM THICK COMPACTED P.C.C.(1:4:8)

CROSS-SECTIONAL DETAIL OF ROADS:



X – 75MM THICK COMPACTED WBM
Y – 75MM THICK COMPACTED WBM
Z – 230MM THICK COMPACTED BOULDER SOLING

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. THE LAYOUT IS TENTATIVE. ORIENTATION AND SIZING MAY BE CHANGED BASED ON THE EXACT LOCATION OF THE AREA PROVIDED BY RUPPL FOR BHEL SITE OFFICE, STORAGE & FABRICATION YARDS, ETC.
3. FINISH GROUND LEVEL : 99.7 M.

TENTATIVE DETAIL OF STORE BUILDING(1 NOS. 15X30M.):

1. PRE FABRICATED STEEL STRUCTURE WITH PRECOATED SHEET ROOF & WALL CLADDING
2. FLOORING OF STORE SHED WILL BE 150 MM THICK M–20 CONCRETE.

TENTATIVE DETAIL OF OTHER INFRASTRUCTURE:

1. G.I. BARBED WIRE FENCING: 300.0M. Ht. – 1.8m.
2. DETAILS OF ROAD: TWO LAYERS OF WBM(TOTAL COMPACTED THICKNESS–150MM) OVER 230MM THICK BOULDER FILLING. TOTAL ROAD LENGTH – 80M. LEVEL 200MM ABOVE FINISH GROUND LEVEL
3. OPEN STORAGE/FABRICATION YARD: 200MM THICK COMPACTED HARD MURUM.
4. BHEL OFFICE– PORTA CABIN – 20X10' – 2 NOS.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230251

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DRG. NO. 1-331142-03361 SHT 1 OF 1

| | | |

Site development, Pantry, toilet block & meeting rooms for 3X90.3 MW STG Packages for CCPP Project at RIL,Dahej,

Tender No: HY/PE&SD/E&C-SUBCON/RIL-HMD/DMD/E&C-MECH./004

Bill of Quantities for 4X90.3 MW STG Packages for CCPP Project at RIL, Dahej

Item. No.	Item Description	Unit	Quantity	Remarks
2.1	**Sub grade preparation**: Cutting & disposal of grass, vegitations, bushes, trees (girth less 300mm), levelling, watering and consolidation (90% of proctor density) by means of 10-12 mt capacity power/vibro roller for sub base preparation. this will include average cutting & filling up to ± 250mm thick, grading the area with proper slope for draining out the rain water with all T&P, labours, materials, dewatering (if required) etc. complete. for development of Open Storage Yard.	SQ M	**5100**	
2.2	**Earthwork in excavation** in all types of soil including ash which can be excavated by any means including setting out, levelling, dewatering (but excluding special type of dewatering viz. well point method), shoring & strutting (wherever required), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 500 m, spreading/levelling of disposed materials etc all complete up to2.5 m depths below ground level, all complete as per spec and directions of the Engr.	CU M	**225**	
2.3	**Back filling upto any depth** below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 250 mm thickness using/with selected materials from compulsorily excavated soil available within a lead upto 500m and compacted as specified including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following.each layer compacted so as to achieve at least 90% maximum dry density as per is-2720 (Part-VII)	CU M	**90**	
2.4	**Providing & filling of 200 mm compacted thick granular hard murum in layers** (thickness of each layer should not exceed 100mm) for preparing hard surface for storage of materials during monsoon period in the specified area as shown in indecative drawing/sketch "as monsoon yard", watering and compaction with 8-10 Ton power/vibro roller complete. rate shall include transportation, royalty, dewatering (both ground water as well as rain water) and keep the area dry till completion of all the works, labours, materials and required T&Ps etc. complete as per standard specification and instructed by BHEL engineer.	CU M	**470**	
2.5	**Disposal of surplus earth & debris** beyond battery limit upto 1 Km lead including transportatin, loading and unloading , dumping, stacking, levelling and dressing etc.complete as per specifications and drawings.	CU. M.	**135**	
2.6	**Providing and laying Stone Soling 230 mm** compacted thickness with 150 -200 mm thick boulder size and filling of voids with hand broken metal of size 40-60 mm, spreading & packing murrum , rolling and compaction including watering, with 8 - 10 MT capacity road roller.	CU M	**90**	
2.7	**Providing 150 mm compacted thick water bound macadam (WBM) in two layers** of each 75 mm, with 40mm to 60mm metal (stone aggregate) including supplying and spreading gravel/murrum over the soling/consolidated base, compacting the same with power roller including necessary labour, watering, materings etc. complete, all as per relevant specifications and directions of BHEL engineer (rate shall be inclusive of all labour, materials etc., complete).	SQ M	**350**	
2.8	**Concrete of grade M7.5** (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume) as filling course at any depth below finished floor level, under and around foundations/floors, mass fill etc.	CU M	**55**	
2.9	**Providing & laying reinforced cement concrete of M20 grade** under floors, paving,plinth protection, lintels columns, beams, etc. at any depth below floor level and also at any height above floor level as per design, drawing & as per specifications & directions of BHEL engineer.	CU M	**35**	
2.10	**Providing and fixing of Reinforcement steel** including cutting, bending and binding of reinforcement using Tor steel (Fe-500) at all elevations, as per drawing and specification and as directed by BHEL engineer including cost of all materials, labour and MS binding wire of 18/20 gauge etc. all complete.	MT	**3.0**	
2.11	**Providing Brick Work in CM 1:6 (1 cement & 6 coarse sand)** using OPC/PPC/PSC of grade 43/53 with locally available burnt clay bricks (Min strength 50 kg/cm^2) as per drawing and specification for drains, culverts and wherever required, including cost of all materials, labour, scaffolding, at all elevations and levels, curing, raking out joints etc. all complete and as directed by BHEL engineer .	CU M	**51**	
2.12	**Providing and plastering with cement mortar 1:6 (12mm thick)** over both internal and external faces of brickwork and concrete surfaces etc. of all heights including preparing the surface, raking joints, cutting grooves at joints of brick work & concrete, rounding corners, curing, cost of all materials, labour, scaffolding etc., all complete as per drawings & Spec.	SQ M	**435**	
2.13	**Supplying & fixing in position of RCC hume pipe** of NP2 wherever drain crosses the roads including aligning, levelling etc. complete as per the direction of engineer. including P.C.C. & collar joints, encasement with concrete 1:3:6, (encasing shall be paid extra under respective items of concrete), all complete as per spec & direction of the Engineer..			

Item. No.	Item Description	Unit	Quantity	Remarks
a)	300mm dia	RM	**30**	
2.14	**Providing and fixing barbed wire fencing** around open storage yard as per BHEL drawing. posts shall be spaced at 3m c/c and struts at 30m centres and at all turnings with foundations, supplying and fixing gi barbed wires, 10 horizontal lines, two diagonals between posts by means of GI staples as per standard practice. the barbed wire shall conform to IS:278 and be made of two strands of galvanised twisted 2.5mm dia (12.5 gauge) steel wire with four point bars. rate quoted shall be inclusive of excavation, disposal of surplus earth, concrete (1:3:6), form work and all materials, cost of posts, barbed wires, transporting, fixing in position etc. including cost of all labour and two coats of enamel paint of approved shade with a shop coat of primer in all structural steel members etc all complete as per drgs & instructions of the engr. (Fabrication & erection of Structural steel posts shall be paid under relevant items of this SOQ)	RM	**330**	
2.15	**Providing & filling in soak pit** with brick bats 40-80mm including sand packing etc. complete, as per standard specification and instructed by BHEL engineer.	CU M	**3**	
2.16	**Providing and laying DPC (damp proof course)** 50mm thick in 1:2:4 cement concret layer using OPC grade 43/53and with 6mm down aggregate, including formwork, bitumen felt using cement with water proofing compound etc. complete	SQ M	**16**	
2.17	**Providing and fixing of best quality country wood doors** comprising of frame 95 x 70mm and 38/40mm thick flush shutters of solid core type using commercial ply including hold fasts, wind appliances, handles, tower bolts, aldrops, mortise of reputed make like Link/and applying two coats of synthetic enamel paint of approved shade & color over a coat of primer complete with all materials and as directed by BHEL engineer.	SQ M	**11**	
2.18	**Providing and fixing 24 mm thick best quality PVC doors** of sintex make or approved equivalent for toilets including pvc frame of size 48mm x 40mm, all fittings, fixtures, frames, hold fast, tower bolts, aldrops etc., all complete with all materials, as per specifications and instruction of BHEL engineer.	SQ M	**4**	
2.19	**Suppling, manufacturing and fixing in position of steel windows** including frames & iron barred (guard bar of square section @ 100 mm c/c) and glazed with 4mm plain glass as per standard specifications & relevant IS code and instructions of BHEL engineer. The cost shall be inclusive of all accessories fittings, latch, hold fasts, painting with two coats of synthetic enamel paint of approved colour and shade over one coat of red oxide primer etc. all complete as per spec and directions of the .	SQ M	**15**	
2.20	**Providing and fixing of IPS flooring 40mm thick** using opc grade 43/53 with cement concrete 1:2:4 (using 12 mm down aggregates) as per standard practice in panels of size Eacht exceeding 2.0 x 2.0 sq.m by providing, fixing glass strips.including curing & cleaning.	SQ M	**450**	
2.21	**Supplying and fixing of white glazed tiles flooring** of required sizes (8.0mm thick of size 300mm x 300mm) laid over the bed of cm - 1:4 (1 cement & 4 coarse sand) using OPC/PPC/PSC of grade 43/53 for pantry room, toilet and wherever required etc. including pereparation of base, laying underbed, finishing and rounding corners and junctions, curing etc. all complete as per drawings and specifications.	SQ M	**90**	
2.22	**Supplying and fixing of white glazed tiles in DADO** of required sizes laid over the bed of cm - 1:4 (1 cement & 4 coarse sand) using OPC/PPC/PSC of grade 43/53 for pantry room, toilet and wherever required etc. including pereparation of base, laying underbed, finishing and rounding corners and junctions, curing etc. all complete as per drawings and specifications.	SQ M	**38**	
2.23	**Providing & applying washable distemper of** two coats over one coat primer on newly plastered surface of reputed make like ASIAN/Shalimar/Nerolac make to given an even shade including preparation of surface like cleaning and brushing of walls and as per manufacturer's recommendations including cost of paint, primer, scaffolding etc., at all elevations, complete as per drgs & spec.	SQ M	**430**	
2.24	**Providing and fixing over head hydraulic door closer** (heavy duty) of approved brand and size on necessary doors as directed by BHEL engineer.	Each.	**2**	
2.25	**Providing and fixing white glazed vitreous wash basin** of 55 cm x 40 cm size of approved reputed make like Hindustan/Parryware/Cera etc., including cold water piller tap, brackets, stop cock, chromium plated bottle trap and necessary pipe connections including upvc waste pipe and trap upto the out side face of the wall, making good the damaged surface, testing etc. complete. as per drgs & spec and as directed by BHEL engineer.	Each	**4**	
2.23	**Providing and fixing european type white glazed vitreous W.C.pan of approved reputed make like Hindustan/Parryware/Cera etc.,** with UPVC seat and lid with chromium plated brass hinges and rubber buffers including UPVC vent pipe (approx. 2m. ht. with cowl)) on the outside face of wall, 10 litre PVC low level flushing cistern with all fittings, pipe and stop cock, brackets for fixing cistern, 32 mm dia. UPVC flush pipe with fittings and clamps, 20 mm dia. UPVC overflow pipe, float valves, cutting and making good to the walls and floors, testing etc., all complete. as per spec & directions of the BHEL Engineer.	Each	**2**	

Item. No.	Item Description	Unit	Quantity	Remarks
2.27	**Providing and fixing in position of white glazed earthenware flat back/corner type lipped front urinals** of 430mm x 260mm x 350mm / 340x460x265 mm of approved make and quality with flushing cistern,GI flush pipe and spreaders with brass unions, GI clamps, cutting of walls and making good of all damages and finishing to match the existing work etc. complete. rate quoted shall include cost of all materials and labour for carrying, laying & fixing and all other incidental charges etc. complete.	Each	**2**	
2.28	**Providing and fixing in position of high class belgium or approved equivalent make of bevelled edge mirror** of size 450mm x 550mm x 6mm with 16 mm dia & 550mm length nickel plated towel rod mounted on 6 mm thick plywood or plastic folder sheet, including cost of all materials, labour for fixing the wooden plugs with cp brass screws and washers etc. all complete. as per spec & directions of the BHEL Engineer..	Each	**4**	
2.29	Providing and fixing in position of **15 mm dia concussion push button type brass/ gun metal self closing tap of reputed make like Jaguar/ Parryware/ Hindustan** including nacessary socket, testing etc., all complete for urinals as per spec & direction of BHEL engineer.	Each	**4**	
2.30	Providing and fixing in position of **15 mm dia nominal size wash down type chromium plated brass bib cocks** of approved reputed make like Parryware/ Cera/ Hindustan, all complete all complete as per spec & directions of the BHEL Engineer...	Each	**2**	
2.31	Providing and fixing in position of **25 mm dia gate valve of approved make** including all nacessary fitting & fixture etc. all complete as per standard specification.	Each	**2**	
2.32	Providing and fixing in position of **15 mm dia nominal size screw down type chromium plates brass stop cocks** of approved reputed make and quality like Jaguar/ Parryware/ Hindustan including cost of jointing materials, sockets, union nut, testing, labours for carrying and fixing etc. complete as per spec & directions of the BHEL Engineer.	Each	**5**	
2.33	Providing and fixing in position of **100mm x 50mm HCl "Nahani" trap** with HCl gratings, bends, connecting pieces of CI pipe upto outside face of the wall. making good the damaged surface, testing etc complete as per drgs & specifications	Each	**4**	
2.34	Providing and fixing in position of **150mm salt glazed stone ware gully trap** with HCl gratings and CI cover of size 300x300 mm of approved make (weight Each less than 2 kg) and quality as per drgs & specifications.	Each	**2**	
2.35	Providing and laying with required **grading & leveling in trenches medium grade (type) galvanised iron (GI) pipe** having embossed ISI mark on it, of required diameter with screwed, sockets, joints, necessary galvanised iron fittings such as sockets, back nuts, elbows, bends, tees, reducers, enlargers, plugs, clamps etc. including all necessary excavation, back filling, fixing with clamps, testing etc. complete. (prior approval of sample and brand by BHEL engineer is necessary before use.)			
a)	25mm dia	RM	**50**	
b)	15mm dia	RM	**20**	
2.36	Providing at working site, carrying and lowering into trenches, laying to proper alignment, level and grade, jointing with cm (1:1) and testing of joints etc. of the following size of salt **glazed stoneware pipe** inclusive of all necessary specials tarred hemp yarn and all jointing materials complete as per standard specifications including all necessary excavation, backfilling, disposal of surplus earth ,lead and lift as per site conditions. rate shall include cost of all materials, labour charges and incidental charges etc. complete.			
a)	100mm dia stoneware pipeline including all specials complete.	RM	**10**	
2.37	Providing and fixing in position of **PVC overhead water tank** of sintex/ Polycon/ Duracon approved make of following litre capacity with lid & provision for overflow arrangement valves, inlet and outlet etc., all complete as per drgs & spec and as directed by BHEL engineer.			
a)	500 litre capacity	Each	**2**	
2.38	Construction of 230mm thick burnt **clay / fly ash lime brick chamber** (using OPC/PPC/PSC of grade 43/53) of the following dimensions (inner dimension) with 20mm thick internal & external cement plaster of mix cm 1:5 (1 cement & 5 coarse sand) , neat cement finish, top CI – cover and connectors for sewer lines. rate shall be inclusive of all necessary excavation & filling, PCC-100 mm thick of 1:3:6 for bedding on 100mm thick oversizer soling with 80 mm metal etc., all complete as per drgs & spec and as directed by BHEL engineer.			
a)	600x450x450 with C.I cover	Each	**2**	
2.39	Providing and fixing **chromium plated towel rod 16 mm dia.** and 75cm. in length including all accessories complete. (prior approval of sample and brand by BHEL engineer is necessary before use).	Each.	**1**	
2.40	Providing & fixing of **liquid soap dispenser** at all wash basin location.	Each.	**4**	
2.41	Providing & fixing in position of **CI vent pipe of dia. 100mm** (approx. ht. 3m) in septic tank. rate to include all necessary fitting & fixture, labour etc.	RM	**6**	

Item. No.	Item Description	Unit	Quantity	Remarks
2.42	Providing, fixing and removing **plyboard formwork** at any depth and elevation for all structures(foundations, footings, base of columns, beams, slabs, mass concrete, trenches,walls etc.) as per the specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer-in-charge	SQ M	**250**	
2.43	Providing and fixing of 1 Each. 18"x24" size **stainless steel sink** with all fittings like drain pipe, stop valve etc.rate to include all necessary fitting & fixture, labour etc.as approved & directed by BHEL engineer.	Each.	**1**	
2.44	**Providing and fixing 18mm thick best quality single piece granite slab** of required shape and colour for fixing ss sink for kitchen counter of pantry block cut out for sink shall be made as per the dimension.cost inclusive of making opening, polishing cut peices/drop/facia and required finishing all complete as per drgs & spec..	SQ M	**4**	
2.45	Providing ang making **edge moulding and nosing to 18mm thick granite stone slab**, counters,vanities and wherever required.including polishing to edge to give high gloss finish etc . complete as per design approved by BHEL engineer.	RM	**4**	
2.46	**Supplying, fabricating and erecting all categories of Structural Steelwork,** using approved quality electrodes of 6013 or low hydrogen 7018 for plate thickness above 20 mm, with pre-heating, packing and delivering at the stores or at site including cost of steel, necessary bolts, nuts & washers with a shop coat of approved Inorganic Red oxide primer of 45-50 micron DFT after cleaning with wire brush, including erecting to all required elevations, necessary welding after erection, all complete as per drawings and specification.	MT	**2.5**	
2.47	Two or more coats of **synthetic enamel paint Asian/Berger/ICI/Nerolac or** approved make made from synthetic resins and drying oil with rutile titanium dioxide and other selected pigments to give smooth, hard, durable & glossy finish to wooden and Steel surfaces complete.(For Measurement of steel works cosisting of angle, channel, beams, flats etc., 18 sq. m of surface area will be taken as equivant to 1 MT)	SQM	**18**	
2.48	**Roofing / side cladding work** including all labour, material, equipment, transportation, handling, scaffolding, laps, hooks, washers, corner pieces etc. at any level as per specification, drawings and as directed by engineer - in - charge.			
a)	**Designing, providing and fixing galvanised MS sheet** measurement of profile sheeting shall be of the plan area of roof covered by MS trough metal decking span upto 1800mm	SQ M	**116**	
2.49	**Supplying & installing power distribution board** complete with: common board for all sheds. 1) Incoming MCB TPH 100 amps. - 1 No. 2) Outgoing MCB TPH 32 amps. -3Nohs. 3) RCCB DP 25/20 amps. - 2Nos. 4) outgoing MCB SP 6 amps - 6Nos. all RCCBS, MCBS shall be MDS/INDO KOPP make. distribution boards shall be SIEMENS / MDS / INDO KOPP make with internal busbars, internal wiring, 2 nos. earthing terminals, earth connections, including glands, lugs.	Set	**2**	
2.50	**Supplying & fixing wall mounting type lighting panels**, each with : . (1) Incoming MCB TPN -32 amps - 1No.. (2) RCCB DP 32 amps - 2Nos (3) MCB SP 6amps - 30 Nos. all RCCBS, MCBS shall be MDS/INDO KOPP make. lighting panel shall be SIEMENS / MDS / INDO KOPP make with internal busbars, 2 nos. earthing terminals, earth connections, including glands, lugs & wiring from main DB	Set	**3**	
2.51	**Providing and installing wiring using 2.5 sq.mm copper conductor through PVC conduit** of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by BHEL engineer in PVC conduit of required size.the make of the wire shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**36**	
2.52	**Providing and installing wiring for using 4.0 sq.mm** copper conductor through PVC conduit of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by bhel engineer in pvc conduit of required size. the make of the wire shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**3**	
2.53	**Providing and installing wiring for using 6.0 sq.mm** copper conductor through PVC conduit of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by BHEL engineer in PVC conduit of required size. the make of the wire shall be only fromKEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**3**	
2.54	**Providing and installing wiring for using 16.0 sq.mm** copper conductor through PVC conduit of required size with accessories and fixtures .wiring shall be concealed type for whrerver required as per instructed by BHEL engineer in PVC conduit of required size. the make of the wire shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	Per point	**4**	

Item. No.	Item Description	Unit	Quantity	Remarks
2.55	**Poviding and installation of plug point of 5A socke**t (ANCHOR or equv.) outlet including wiring termination.	Each	**3**	
2.56	**Poviding and installation of plug point of 15A socket** (ANCHOR or equv.) outlet including wiring termination. this includes tube light fittings.	Each	**5**	
2.57	**Providing and fixing ordinary tubelight** with frame 1x40 w with electronic choke of standard manufacturer like PHILLIPS/BAJAJ or equivalent as approved by BHEL. this includes tube light fittings etc. complete.	Each.	**40**	
2.58	**Providing and fixing exhaust fans 12" diameter** with frame of standard manufacturer like cromptan greeves or equivalent as approved by BHEL.	N0.	**8**	
2.59	**Providing and fixing ceiling fan 48" diameter** of approved company such as Cromptan Greeves or any other standard manufacturer as directed by BHEL. this includes tube light fittings etc. complete.	Each	**2**	
2.60	Providing and fixing **calling bells (**with indicator light)	Each	**1**	
2.61	Providing **earthing pits with 2 " dia** , 2 m long GI pipes with flange & GI wires with charcoal, salt and as per the standard practice for electrical connection rate shall be inclusive of all materials, labours, etc complete.	Each	**2**	
2.62	**Supply of cables 3 -1/2 corex 35 sqmm aluminium armoured PVC insulated cable** (three and half core) confirming to is 1554 (Part-I) the make of the cable shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	RM	**400**	
2.63	Installation of cables **3 -1/2 corex 35 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I) including laying of cable below ground , excavation of trench of 600 mm depth in all kind of soil, termination of cables cores with crimp type lugs, providing sand layer below/ above the cable, brick laying both side /above the above the cable and back filling etc. cables are to be laid from main distribution board to 415 volt AC distribution board of store bldg, porta cabins, street light pillar distribution board and industrial power point.	RM	**400**	
2.64	Supplying, **installation & commissioning of sodium vapour lamp street light fitting** 150 watt SSG-2315 IH of crompton or similar philips make, complete with one piece canopy, integral controlgear comprising of copper wound choke , ignitor , hpf capacitor, hpsv lamp and suitable for directly slipping over light mounting bracket made out of 40 mm OD pipe and suitable for lamps, control gear box cabling & termination of items supplied (to be mounted on 9 mtr pole - item no. 2.65).	Each	**20**	
2.65	**Supply and erecting steel tubular swaged poles**, 9 mtr long made of sheet steel having ultimate tensile strength 42 kg f/sq.mm confirming to bis :2713 (Part-II) complete with 300x300x6 mm thick m. s. base plate for welding at site and size as per configuration given in bis for 410 sp-28 (113 kg- pole weight) with 1.5 mtr. deep exacavation, concreting in 1:4:8 ratio size 45 cms x 45 cms x 150 cms and pole plinth in 1:3:6 cement concreting having 300 mm height and 300 mm dia .including double earthing of pole with suitable arrangement, duly painted with two coats of red oxide paint and one coat of aluminium paint to be applied after erection; the length of pole below ground to be painted with two coats of black bituminus paint. the pole shall be complete with JB, fuse and minor fabrication as below : i) Drilling 20 mm dia hole at about 2.5 mtr from ground level for wire leads from junction box to light fixture . ii) Drilling 15mm dia holes at about 0.7 and at 2.5 mtr froom ground level and welding 12 mm nuts for using a 12 mm G.I bolt for fastening earth conducters. iii) welding requiored holes for fixing pole cap of street light bracket. iv) welding diametrally 10 mm M.S. round 30 mm below pole top edge for clipping wire leads .	Each set	**20**	
2.66	**Supply of cables 2 core x 10 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I). the make of the cable shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	M	**400**	
2.67	Installation of cables **2 core x 10 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I) including laying of cable below ground , excavation of trench of 600 mm depth in all kind of soil, termination of cables cores with crimp type luggs, providing sand layer below/ above the cable, brick laying both side /above the above the cable and back filling etc complete. cables are to be laid from 415 volt AC power feeder pillar board to lighting poles & pole to pole .	M	**400**	

Item. No.	Item Description	Unit	Quantity	Remarks
2.68	Supply of **415 volt AC , 3 phase /four wire power feeder pillar board** , board shall be comprises of three number and one number aluminium bus bar for phase & neutral respectively. bus bar rating shall be 200 amps and shall be mounted on epoxy insulator of 1.1 KV grade, each bus bar shall have drilled hole for connecting incoming / out going cables, provision for earthing the panel enclosure. panel enclosure shall be made of sheet metal thichnness Not less than 1.6 mm and suitable for out door installation, hinged door with locking arragement , base frame , should have slopped canopy, duly painted with first coat with primer and two coats of synthetic enamel paint (interior with white paint and exterior with smoke grey as per is), suitable stool made out of ms structure of 1.2 meter high for mounting of panel with anchoring arragement at foundation .	Each	**1**	
2.69	Supply & installing **3 phase metering and power distribution board** complete with : (1) Incoming SFU TPN 400 amps- 1No, (2) Outgoing SFU TPN 200 amps -1Nos. (3) Outgoing SFU TPN 100 amps -3Nos. (4) Outgoing SFU TPN 32 amps -2Nos. 3 phase electronic energy meter - BHEL /L & T / GEC make. ammeter, voltmeter and selector switches for both - AE and KAYCEE make. phase indication lamps, HRC fuses for I/C and O/G feeders, cable glands, power terminals for cables termination, cable lugs and provision for doubly earthing the panel enclosure. panel enclosure shall be made of sheet metal thichknness not less than 1.6 mm and suitable for out door installation, modular construction, hinged door with locking arrangement, base frame, should have slopped caEachpy, duly painted with first coat of primer and two coats of synthetic enamel paint (interior with white paint and exterior with light grey as per shade 5, IS 630) internal power distribution to devices shall be with al busbars or copper flexible single core pvc cables of 1.1 kv grade, control wiring with 1.5 sqmm, suitable stool made out of ms structure of 1.2 meter high for mounting of panel with anchoring arragement at foundation, suitable for bottom entry of cables.	Each	**1**	
2.70	**Supply of cables 3 -1/2 corex 185 sqmm aluminium armoured PVC insulated cable** (three and half core) confirming to is 1554 (Part -I) the make of the cable shall be only from KEI / POLY CAB/HAVELLS/ FINOLEX/L & T.	RM	**200**	
2.71	**Installation of cables 3 -1/2 corex 185 sqmm aluminium armoured PVC insulated cable** confirming to is 1554 (Part -I) including laying of cable below ground , excavation of trench of 600 mm depth in all kind of soil, termination of cables cores with crimp type lugs, providing sand layer below/ above the cable, brick laying both side /above the above the cable and back filling etc. cables are to be laid from transformer sub station to 415 volt AC distribution board.	RM	**200**	
2.72	**Supply and installation suitable electrical pump** for minimum head of 10m (but Eacht less than 2 H.P.) of reputed manufacturer like SUGUNA/ CRI/ KIRLOSKAR/ SHAKTI/SHARP/ CROMPTON including all accessories, starter, D.B., etc. and to be connected to over head tank from water storage tank below G.L. guarranty/warranty card to be submmitted to BHEL. suction, discharge GI pipes shall be paid seperatly under relevant items.	Each	**1**	
2.73	**Industrial power recepticale 63A IPS 65, TPNE socket** with on/off interlock with MCB	Each	**6**	

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VOLUME - IB
SPECIAL CONDITIONS OF CONTRACT (SCC)

(Document No PESD:E&C:SCC)

BHARAT HEAVY ELECTRICALS LIMITED

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1.0	**INTENT OF THE SPECIFICATION**
1.1	The intent of this erection specification is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / price shall deem to be inclusive of all such contingencies.
1.2	The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship and not conforming to drawings / documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
1.3	It is not the intent of this specification to specify herein all the details of erection and commissioning. However, the system shall conform in all respects to high standards of quality and workmanship for performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
1.4	The omission of specific reference to any fabrication / erection or other method, equipment or material necessary for proper and efficient working of the plant shall not relieve the tenderer of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication / erection shall have to be rectified by the vendor free of cost. Inspection by BHEL/Customer does not relieve vendor of his responsibility of executing quality erection.
1.5	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

1.6	Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.
1.7	Following shall be the minimum responsibility of contractor and have to be provided within finally accepted rates / prices:
1.7.1	Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated IMTEs (Inspection, measuring and testing equipment) as specified and otherwise required for the work, consumables for erection, testing and commissioning including material handling
1.7.2	Achieving Proper out-turn / Turn-over as per BHEL plan and commitment.
1.7.3	Completion of work as per BHEL Schedule
1.7.4	Good quality and accurate workmanship for proper performance of the equipment
1.7.5	Repair and rectification
1.7.6	Preservation / Re-conservation of all components during storage / erection / commissioning till handing over.

2.0	**GENERAL SERVICES TO BE RENDERED BY THE BIDDER**
2.1	Services for construction, fabrication, equipment erection testing as well as trial run & commissioning of various equipment and accessories under the contract shall include but not be limited to the following:
2.2	Issuing materials from store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant/equipment is officially taken over by the owner / BHEL after complete erection any successful trial run & commissioning.
2.3	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
2.4	Trial run and commissioning of individual equipment / sub-systems to the satisfaction of Owner/BHEL.
2.5	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to the rendered under this specification.
2.6	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
2.7	Supply of all consumables, eg welding electrodes, cleaning agents, diesel oil, lubricant etc as well as materials required for temporary supports, scaffolding etc as necessary for such erection work, unless specified other wise.
2.8	Providing support services for the contractor's erection staff eg construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under the Contractor's custody etc. as required.
2.9	Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with BHEL, Submission of monthly progress reports and any such document as and when desired by BHEL/owner, taking approval of all statutory authorities i.e Boiler Inspector, Factory Inspector, Inspector of Explosives etc , as applicable for respective portions of work fall under the jurisdiction of such statutes of laws.
2.10	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.

3.0	**GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)**
3.1	Except where otherwise specified, the plant/equipment shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary, to enable BHEL to identify all of the plant/equipment in the same detail as would be possible had there been a Standard Specification.
3.2	Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
3.3	In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements which are more stringent shall govern.
3.4	Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

4.0	**OBLIGATIONS OF CONTRACTOR**
4.1	**CONSUMABLES & OTHER ITEMS**
4.1.1	The contractor shall provide within finally accepted price / rates, all consumables (excepting those indicated in BHEL scope) like welding electrodes (including alloy steel and stainless steel), filler wires, TIG filler wires (over & above as supplied by the unit along with the plant materials, which will be given free of cost to bidder), gases (inert, welding, cutting), soldering material, dye penetrants, radiography films, etc. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, packers, shims, wooden planks, scaffolding materials hardware items etc required for temporary works such as supports, scaffoldings are to be arranged by the contractor. Sealing compounds, gaskets, gland packing, wooden/concrete sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by the contractor.
4.1.2	All the shims, gaskets and packing, which go finally as part of plant equipment, shall be supplied by BHEL free of cost.
4.1.3	It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non-availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
4.1.4	**TIG Filler wire for Boiler and Filler wires for Electrodes for P91/T91 piping:** These shall be supplied by BHEL free of cost as supplied by BHEL Manufacturing Units as part of regular supply. Required quantity as arrived at by calculation / standards will only be supplied. It would be the contractors' responsibility to account for the consumption of these filler wires. Additional consumption beyond standard / calculated quantity will be at cost recovery basis only unless and otherwise accounted for. Surplus quantity of TIG filler wire, if any, shall be properly stored and returned to BHEL stores.
4.1.5	It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc before procurement of welding electrodes. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No electrode without a valid test certificate will to be used.

4.1.6	BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make / purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required and records maintained.
4.1.7	Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.
4.1.8	In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time. Postponement of such recovery is normally not permitted. The decision of BHEL Engineer in this regard shall be final and binding on the Contractor.
4.1.9	All lubricants and chemicals required for pre-commissioning, commissioning, testing, preservation and lubricants for trial runs of the equipment shall be supplied by BHEL / BHEL's client. All services including labour and T&P will be provided by the contractor for handling, filling, emptying, refilling etc. The consumption of lubricants / chemicals shall be properly accounted for. Surplus material if any shall be properly stacked/tagged and returned to BHEL/ CUSTOMER stores at no extra cost to BHEL. BHEL reserves the right to recover costs for wastage by the contractor.
4.1.10	Transportation of oil drums, from stores, filling of oil for flushing, first filling, subsequent changeover if any, topping/making up till the unit is fully commissioned and handed over to customer is included in scope of this contract. The contractor shall have to return all the empty drums to BHEL / BHEL's client store at no extra cost. Any loss / damage to above drums shall be to contractor's account.
4.1.11	All charges on account of Octroi, terminal or sales tax and other duties on materials obtained from any source for carrying out the works in the scope of the contractor shall be borne by the contractor.
4.2	**TOOLS AND PLANTS / MEASURING AND MONITORING EQUIPMENT (MMEs)**
4.2.1	**T&Ps and MMEs to be provided by Contractor**
4.2.1.1	All T&Ps and MMEs are to be provided by the Contractor. Contractor has to make his own arrangement at his cost for completing the formalities (including arrangement of Road permits, if any) if required with Sales Tax/VAT authorities, for bringing their materials, plants and equipments at site for the execution of work under this contract.

4.2.1.2	All suitable cranes, lifting and transport equipments for material handling at stores/yard/siding of BHEL/Customer are included in scope.
4.2.1.3	All T&Ps to be deployed by the contractor shall have the approval of BHEL Engineer with regard to brand, quality and specification.
4.2.1.4	Indicative list of Major T&Ps in the scope of Contractor are given in the Technical Conditions of Contract. Bidders to note that these are only indicative and as such all other T&P necessary for timely and satisfactory completion of work in scope shall be mobilized by Contractor
4.2.1.5	Timely deployment of adequate T&Ps is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned programme and to achieve the milestones.
4.2.1.6	Contractor shall maintain and operate his tools and plants in such a way that breakdowns are avoided. In the event of breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.
4.2.1.7	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement at the risk and cost of the contractor. Decision of BHEL shall be final and binding on the contractor
4.2.1.8	The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.
4.2.1.9	Use of welding generators/ rectifiers only shall be permitted for welding. Use of welding transformers will be subject to specific approval of BHEL engineer.
4.2.1.10	The contractor at his cost shall carry out periodical testing of his construction equipments. Test certificates shall be furnished to BHEL.
4.2.1.11	Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required. Fitness certificate / Test Certificates of T&P shall have to be submitted before it is put in use. Identification for such T&Ps will be done as per BHEL Engineer's advice. BHEL reserves the right to permit only new slings up to 20 mm and lifting tackles up to 3 MT capacities.

4.2.1.12	Contractor shall ensure deployment of reliable and calibrated MMEs (Inspection measuring and Monitoring equipment). The MMEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each MME shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
4.2.1.13	Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MME so that work does not suffer when the particular instrument is sent for calibration. If any MMEs not found fit for use, BHEL shall have the right to stop the use of such item. It will be necessary for the contractor to deploy proper item. Any readings taken by the defective instrument will be recalled and repeat the readings taken by that instrument with a proper one. In case he fails to do so, BHEL may deploy MMEs and retake the readings at contractor's cost.
4.2.1.14	BHEL shall have lien on all T&P, MMEs and other equipment of the contractor brought to the site for the purpose of erection, testing and commissioning. BHEL shall continue to hold the lien on all such items throughout the period of contract / extended period. The contractor and / or his sub-contractors, without the prior written approval of the Engineer, shall remove no material brought to the site.
4.2.1.15	The month wise T&P deployment plan to execute the work is to be submitted as per relevant format as per the instruction of BHEL. It shall be the contractor's responsibility to deploy the required T&P, for timely and successful completion of the job, to any extent.
4.2.1.16	The area and infrastructure development of the area to be carried out by the customer. However in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases backfilling of approaches where ever necessary, consolidation of ground and arrangement of sleepers / sand bag filling etc for safe operation / movement of equipment including cranes / trailers etc shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.

5.0	**RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF LABOUR, SUPERVISORY STAFF, ETC.**
5.1	Refer relevant clauses of General Conditions of Contract (GCC) also in this regard
5.2	The contractor shall deploy all the necessary skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him.
5.3	Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.
5.4	It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.
5.5	Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangement including construction of septic tank. These installations shall be maintained in hygienic condition at all times.
5.6	The Contractor in the event of engaging 10 or more workmen, shall obtain Independent license under the Contract labour (Regulation and Abolition) Act 1970 from the concerned authorities based on Form-V issued by the Principal Employer/Customer. In order to issue Form-V by Customer, Contractor shall fulfill all Statutory requirements like Insurance Policy, PF Code/PF Account number etc as per the requirement of BHEL/Customer
5.7	Contractor shall deduct the necessary amount towards Provident Fund and contribute equal amount as per Government of India laws. This amount will be deposited regularly to the provident Fund Commissioner. BHEL/Customer may insist for submission of the account code duly certified by PF Commissioner
5.8	Contractor may also be required to comply with provisions of ESI Act in vogue if applicable and submit evidence to BHEL.
5.9	BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL / Customer.

5.10	Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.
5.11	The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.
5.12	The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.
5.13	It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.
5.14	The actual deployment will of Labour and Engineer/supervision staff shall be so as to satisfy the erection and commissioning targets set by BHEL. If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost. The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor
5.15	Contractor shall not deploy women labour at night.

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6.0	**MATERIAL HANDLING, STORAGE AND PRESERVATION ETC**
6.1	**MATERIAL HANDLING AND STORAGE**
6.1.1	All the equipments/materials furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. **While drawing/lifting material from BHEL / customer stores, the contractor shall ensure that the balance / other materials are stacked back immediately. No claim is admissible on this account**
6.1.2	While BHEL will endeavor to store / stack / identify materials properly in their open / close / semi closed / tarpaulins covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection. They should take the delivery of the same, following the procedure indicated by BHEL, and transport the material safely to pre-assembly yard / erection site in time, according to program.
6.1.3	The contractor shall take delivery of components, equipment / consumables from storage area after getting the approval of BHEL Engineer on standard indent forms.
6.1.4	The contractor shall identify and deploy necessary Engineers / supervisors / workmen for the above work in sufficient number as may be needed by BHEL, for areas covering their scope.
6.1.5	All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes / slings etc. shall be used for unloading / handling. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the stores shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.
6.1.6	Contractor shall ensure that while lifting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. Slings / shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the equipment against any damage. Dragging of piping / valves should be avoided. In case of any damage the cost shall be covered from the contractor.
6.1.7	Approach road conditions from the stores / yards to the erection site may not be equipped and ideal for smooth transportation of the equipment. Contractor may have to be adequately prepared to transport the materials under the above

	circumstances without any extra cost. . The contractor may familiar himself with soil conditions at site.
6.1.8	Contractor shall be responsible for examining all the plant and materials issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc before they are moved out of the stores / storage area. The contractor shall be solely responsible for any shortages or damages in transit, handling, storage and erection of the equipment once received by him. As the erection work will be spread in different areas / locations of the project, contractor has to arrange sufficient number of watch / ward personal to avoid any pilferage of material
6.1.9	The contractor shall maintain an accurate and exhaustive record-detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
6.1.10	All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof / fire retardant covering material wherever applicable and shall be blocked up on raised level above ground. All covering materials including blocks and sleeper shall be arranged by the contractor at his cost.
6.1.11	If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor at the contractors risk and cost.
6.1.12	The contractor shall be responsible for making suitable indoor storage facilities to store all equipment (drawn by the contractor from BHEL / customer stores), which require indoor storage till the time of their installation. The Engineer will direct the contractor in this regard, which item in his opinion will require indoor storage, and the contractor shall comply with Engineer's decision.
6.1.13	The contractor shall ensure that all surplus / damaged / scrap / unused material, packing wood/ containers/ special transporting frames etc are returned to BHEL at a place in project area identified by the Engineer. The contractor will maintain an account for all items received and returned to BHEL. Any shortage in returning such items shall be chargeable to the contractor except allowable wastage for packing wood only.
6.1.14	The contractor shall hand over all parts / materials remaining extra over the normal requirement with proper identification tags to the stores as directed by the concerned BHEL engineer.
6.1.15	The contractor shall ensure that all the packing materials and protective devices installed on equipment during transit and storage are removed before installation.

6.1.16	It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus/unusable packing and other materials shall be removed and deposited at location(s) specified by BHEL within the project premises. If required weighing of the same within the project premises will have to be carried out.
6.2	**PRESERVATION OF COMPONENTS**
6.2.1	Plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.
6.2.1.1	Items stored outdoors shall be stacked up at least six inches (6") off the ground. Items should not be stored in a low lying area where water logging is a possibility. Contractor should have sufficient numbers of wooden / concrete / steel sleepers for the job.
6.2.1.2	Motors, valves, electrical equipment, control equipment and instruments, and special or precision items requiring special care, etc shall be stored indoors. Motor windings shall be kept dry by use of external heat or space heaters.
6.2.1.3	Bearings and other wearing surfaces of plant materials shall be protected against corrosion and kept clean and should be regularly monitored.
6.2.1.4	Insulation materials shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.
6.2.2	It shall be the responsibility of the contractor to apply preservatives / touch up paints (primer) on equipment handled and erected by him till such time of final painting. It shall be contractor's responsibility to arrange for required paints (primer), thinners, labour, scaffolding materials, cleaning materials like wire brush, emery sheets, etc, cleaning of surface and provide one coat of preservatives / paints (primer) from time to time as decided by BHEL engineer. The accepted rate shall include this work also. It is to be noted that such painting may have to be done as and when required till such time the final painting is carried out.
6.2.3	The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts then and there for their protection.
6.2.4	Any failure on the part of contractor to carry out works according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

7.0	**DRAWINGS AND DOCUMENTS**
7.1	The detailed drawings, specifications available with BHEL engineers will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place.
7.2	Necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan, which shall be returned to BHEL Engineer at site after completion of work. Contractor shall ensure safe storage and quick retrieval of these documents.
7.3	The contractor shall maintain a record of all drawings and documents available with him in a register as per format given by BHEL Engineer. Contractor shall ensure use of pertinent drawings / data / documents and removal of obsolete ones from work place and returning to BHEL.
7.4	The data furnished in various annexure enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work. The contractors quoted rates shall be inclusive of the above factor
7.5	Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.
7.6	Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimension / details, without specific approval of BHEL.

8.0	**INSPECTION AND QUALITY**
8.1	**Inspection, Quality Assurance, Quality Control**
8.1.1	Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.
8.1.2	The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.
8.1.3	A daily log book should be maintained by every supervisor/engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centering / leveling readings and inspection details of various equipments etc. High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions. Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions. **Record of heat treatments performed shall be maintained as prescribed by BHEL**
8.1.4	The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically furnished for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately
8.1.5	All the welders shall carry identity cards as per the proforma prescribed by BHEL/Customer/Consultant. Only welders duly authorized by BHEL/customer/consultant shall be engaged on the work.

8.1.6	Contractor shall provide all the Measuring Monitoring Equipments (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/gauges/tools for the work under this specification, is final and binding on the contractor. BHEL may give an indicative list of MMEs required for this work and to be made available by the contractor. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.
8.1.7	It is the responsibility of the contractor to prove the accuracy of the testing/measuring/calibrating equipments brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
8.1.8	Any re-laying or re-termination of cables/re-erection of instruments/ recalibration of instruments etc. required due to contractor's mistake or design requirement and found at any stage inspection, shall be carried out by the contractor at no extra cost.
8.1.9	Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipments). The MMEs shall have test / calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment / instrument is sent for calibration. Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall ie repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.
8.1.10	Re-work necessitated on account of use of invalid MMEs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
8.1.11	In the courses of erection, it may become necessary to carry repeated checks

	of the work with instruments recently calibrated, re-calibrated. BHEL may counter/ finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter/final measurements.
8.1.12	Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards.
8.2	**Stage Inspection By FES/QA Engineers**
8.2.1	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipments under erection and commissioning at various stages shall also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc along with proper access for such stage inspections free of cost.
8.2.2	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per Section 13, and provided such modifications have not arisen for reasons attributable to the contractor.
8.3	**Statutory Inspection of Work**
8.3.1	The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work related statutory inspections, though not limited to, are as under: 1) Inspectorate of Steam Boilers and Smoke Nuisance 2) Electrical Inspector 3) Factory Inspector, Labour Commissioner, PF Commissioner and other authoritiy connected to this project work The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for the pressure parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned

	authority.
8.3.2	Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR, for which he should register himself with CIB of state concerned. contractor also should be aware of the latest IBR regulations and Electricity Act, including the amendments thereof.
8.3.3	Contractor shall comply with 'Qualification Tests for welders engaged in welding of Boilers and Steam Pipes under Construction, Erection and Fabrication at Site in India and in repairing Boilers and steam pipes by welding' in line with Chapter XIII of Indian Boiler Regulations-1950, for testing his welders / men / workers, including all associated fees, procedures, required instruments and equipments and their calibration there of. It shall be contractor's responsibility to obtain approval of Statutory Authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities, at his cost.
8.3.4	The following fees shall be excluded from scope of Contractor: 1. Registration Fee as per Regulation 385 of Chapter IX of Indian Boiler Regulations-1950 2. Fees for inspection of Boiler at the site of Construction as per Regulation 395 A, sl no 4 of Chapter IX of Indian Boiler Regulations-1950 However all other fees like visit fees charged by the Boiler Inspector and other arrangements for his visit or visits till satisfactory completion of work, shall be included in scope of Contractor
8.4	The basic philosophy of the Quality Management System is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product/ procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers/vendors of various products/services contributing in the work are also considered as part of the quality management system. .as such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.

8.5	**Field Quality Assurance**
8.5.1	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

9.0	**OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME** : Quality of work to customer's satisfaction and fulfillment of system requirements are the essence of ISO 9001 certification. Contractor shall organise/ plan/ perform all their activities to meet with the applicable requirements of these standards.
9.1	**HSE (Health, safety & Environment):** Contractor will comply with HSE (Health, safety & Environment) requirements of BHEL. HSE requirements in brief, are given below :-
9.1.1	Contractor will nominate one of their qualified and experienced employees as Safety Officer, who will be responsible for all HSE related issues of contractors work area. Safety Officer will have authority to stop any activity, in case he observes that the activity is not being carried out in safe manner. He will conduct surprise inspection as well as periodic inspection/drill (at least once in a month) and submit such reports to BHEL. He will conduct periodic meetings with supervisors of different working groups and explain HSE issues and use of PPEs to them. Reports of such meetings will be submitted to BHEL. Contractor will develop suitable work procedures based upon HSE guidelines and OCPs and implement it. Such work procedures will consist of Area of work, T&P Details, Work Procedure, PPE requirements etc. Contractor should highlight the requirement of safety to staff and labour through daily tool box meeting before start of the days job
9.1.2	The contractor shall ensure that proper job specific health check-up is done by medical professional for their employees during initial mobilization and thereafter if there is any change of job.
9.1.3	Following personnel protective equipments (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured :-
	- HELMET
	- SAFETY GOGGLES & WELDING FACE SHIELDS
	- SAFETY BELTS AND PROTECTIVE NET FOR WORKING AT HEIGHT
	- SAFETY SHOES
	- EAR PLUG
	- ANY OTHER SAFETY EQUIPMENT REQUIRED FOR SAFE COMPLETION OF THE WORK
9.1.4	Providing appropriate First Aid facilities for prompt treatment of injuries and illness at work place. Arranging training to contractor workmen/ employees for giving first aid.

9.1.5	Arranging ambulance in case of any emergency situation .
9.1.6	Identification of nearest hospital and health check-up of workmen/employees
9.1.7	Providing filtered drinking water at work place in cool container.
9.1.8	Providing Canteen, Rest Room, Washing facilities to the contracted employees as per provisions of Contract Labour Regulation Act 1970 (Chapter V).
9.1.9	Providing appropriate fire fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
9.1.10	Identification of nearest fire station and display contact telephone nos. / person's name around work places for cases of emergencies .
9.1.11	Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.
9.1.12	Fulfilling safety requirements at all power tapping points.
9.1.13	Red & White caution tape of proper width(1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavation area etc.
9.1.14	Providing contractors company logo on cloths /uniform/ proper identity cards with photographs, for correct identification of people working at project site .
9.1.15	High/ Low pressure welders to be identified with separate colour clothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
9.1.16	Displaying safe handling procedures for all chemicals such as lube oil, acid, alkali, sealing compounds etc , at work place .
9.1.17	All scaffolding/ platforms should be made from materials of appropriate quality/grade so that these are safe for use. It should be certified/declared safe for use by an experienced contractor person, before any scaffolding/platform is used.
9.1.18	All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test/calibration certificates bearing endorsement from competent authority of BHEL.
9.1.19	Ensure that the regulatory requirement of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
9.1.20	Safety slogan, Safety/ Caution boards , wherever required to be displayed in consultation with BHEL.
9.1.21	Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty

	ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained. Ensure proper cleanliness of work place, housekeeping and waste management (including proper waste disposal) on daily basis.
9.1.22	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
9.1.23	The contractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.
9.1.24	The Contractor is required to provide proper safety net systems where ever the hazard of fall from height is present as per instruction of BHEL Engineer. The safety nets shall be fire resistant, duly tested and shall be of ISI Mark and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.
9.1.25	All applicable OCPs (Operational control procedures) will be followed by contractor as per BHEL instructions. This will be done as part of normal scope of work. List of such OCPs is given below . In case any other OCP is found to be applicable during the execution of work at site, then contractor will follow this as well, within quoted rate. These OCPs (applicable ones) will be made available to contractor during work execution at site. However for reference purpose, these are kept with Safety Officer of BHEL,HYDERABAD or available in downloadable format in the website, which may be refereed by contractor, if they so desire.
	■ OCP for safe handling of chemicals
	■ OCP for Electrical safety
	■ OCP for energy conservation
	■ OCP for safe welding and gas cutting operation
	■ OCP for fire safety
	■ OCP for safety in use of hand tools
	■ OCP for first aid
	■ OCP for food safety at canteen
	■ OCP for safety in use of cranes
	■ OCP for storage and handing of gas cylinders
	■ OCP for manual arc welding
	■ OCP for safe use of helmets
	■ OCP for good house keeping

	■	OCP for working at height
	■	OCP for safe excavation
	■	OCP for safe filling of Hydrogen in cylinder
	■	OCP for illumination
	■	OCP for handling and erection of heavy metals
	■	OCP for safe acid cleaning
	■	OCP for safe alkali boil out
	■	OCP for safe oil flushing
	■	OCP for steam blowing
	■	OCP for safe working in confined area
	■	OCP for safe operation of passenger lift, material hoists & cages
	■	OCP for Vehicle maintenance
	■	OCP for safe radiography
	■	OCP for waste disposal
	■	OCP for working at night
	■	OCP for blasting
	■	OCP for DG Set
	■	OCP for handling & storage of mineral wool
	■	OCP for drilling, reaming and grinding(machining) etc.
	■	OCP for hydraulic test
	■	OCP for spray insulation
	■	OCP for trial run of rotary equipment
	■	OCP for stress relieving
	■	OCP for material preservation
	■	OCP for cable laying/tray work
	■	OCP for electrical maintenance
	■	OCP for transformer charging
	■	OCP for safe handling of battery system
	■	OCP for computer operation
	■	OCP for storage in open yard
	■	OCP for sanitary maintenance
	■	OCP for batching
	■	OCP for piling rig operation
	■	OCP for gas distribution test
	■	OCP for cleaning of hotwell / deaerator
	■	OCP for electro-resistance heating
	■	OCP for compressor operation

	■ OCP for O&M of control of AC plant & system
	■ OCP for air compressor
	■ OCP for passivation
	■ OCP for Safe EDTA Cleaning
	■ OCP for Safe Chemical cleaning of Pre boiler system
	■ OCP for Safe Boiler Light up
	■ OCP for Safe Rolling and Synchronisation
	■ OCP for Safe Loading of Unit
9.2	SAFETY AND CLEANLINESS : The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per discretion of BHEL or its authorised officials (Site Construction Manager) to prevent loss of human lives, injuries, to personnel engaged and damage to property. Before commencing the work, the contractor shall submit a "Safety Plan" to the above authorised BHEL official and obtain approval on the same. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, materials and environment during execution of the work. This will also include an organization structure, role and responsibilities of the concerned key personnel, the safety practices that will be followed, PPEs deployed, plan for handling critical activities and emergencies.
9.3	If the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorised BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor.
9.4	During the course of construction, alternation or repairs, scrap with protruding nail, sharp edge etc and all other debris shall be kept clean from working areas, passage, ways and stairs in and around site.
9.5	Combustible scrap and debris shall be removed at regular intervals during the course of execution. Safe means shall be provided to facilitate such removal. The combustible scrap should be stored in safe place away from the plant materials to avoid fire accidents. The area shall be chosen in consultation with the Engineer and to be cordoned off.
9.6	Rigging equipment for materials handling shall be inspected prior to use in each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment will be removed from service.
9.7	Rigging equipment shall not be loaded in excess of its recommended safe working load. Rigging equipment, when not in use, shall be removed from the

	original work area so as not to present a hazard to employees.
9.8	Contractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The BHEL Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the contractor shall strictly adhere to such instructions. The BHEL Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.
9.9	Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the contractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The contractor shall be responsible for obtaining the same.
9.10	Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
9.11	When cylinders are transported by powered vehicle they shall be secured in a vertical position.
9.12	All workmen of the contractor working on construction area shall wear safety shoes, hand gloves, safety helmets and safety belt as applicable. The contractor shall provide to its workforce and ensure the use of following personnel protective equipment as found necessary and as directed by BHEL.
9.12.1	Safety Helmets conforming to IS-2965 : 1984
9.12.2	Safety Belts conforming to IS-3521:1983
9.12.3	Safety Shoes conforming to IS-1989 : 1978
9.12.4	Eye and face protection devices conforming to IS – 8620 : 1977 & IS – 8950 : 1978.
9.12.5	Hand and body protection devices conforming to IS – 2575 : 1975 and IS – 6994 : 1973, IS – 8907 : 1970 & 8619 : 1977

9.13	The contractor shall insure his workmen against all accidents and the policy shall be presented to BHEL Engineer on demand. Other wise, BHEL will arrange the same and the expenditure towards this will be debited to the contractor. In case of a fatal or disabling injury accident to any person at construction site due to lapses by the contractor, the victim and/or his/her dependants shall be compensated by the contractor as per statutory requirements. However, if considered necessary BHEL shall have the right to impose appropriate financial penalty on contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependence before imposing any such penalty. Appropriate enquiry shall be held by BHEL giving opportunity to the contractor for presenting his case. Above safety conditions are not exhaustive but gives an idea for the contractor and contractor shall adhere to all safety precaution given by the Engineer at site.
9.14	The contractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations during night hours at the work spot as well as at the pre-assembly area.
9.15	The contractor shall be responsible for provision of all the safety notices and safety equipment as enjoined on him by the application of relevant statutory regulation / provisions and/or as called upon by BHEL from time to time. He shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instruction that may endanger safety of men, equipment and material.
9.16	The contractor shall provide temporary fencing wherever required as a safety measure against accident and damage to properties. Suitable caution notices shall be displayed where access to any part is found to be unsafe and hazardous.
9.17	Contractor shall ensure safety of all the workmen, material and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by BHEL without exception.
9.18	It will be the responsibility of the contractor to ensure safe lifting of the equipment, taking due precaution to avoid any accident and damage to other equipment and personnel. All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the contractor. Defective equipment shall be removed from service. Any equipment shall not be loaded in

	excess of its recommended safe working load.
9.19	The contractor shall provide necessary first aid facilities for all his employees, representatives and workmen at site and BHEL shall have no obligation in this regard. The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time. The contractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.
9.20	All the contractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Contractor should nominate his supervisor to coordinate and implement the safety measures.
9.21	Contractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders. All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed. Non-compliance of the above requirement under fire protection shall in no way relieve the contractor of any of his responsibility and liabilities to fire accident occurring either to his materials or equipment or those of others.
9.22	The contractor shall at his cost, remove from vicinity of work at least once each day all combustible waste, scrap, panting materials, rubbish, unused or other materials and deposit them in places specified by BHEL to keep the work site clear and tidy. Use of undercoated canvas paper, corrugated paper, fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.
9.23	The contractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
9.24	All portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works.
9.25	In case of any delay in completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such

	delay from the payments due to the contractor, after notifying the contractor suitably.
9.26	Valve protection caps shall be kept in place and secured.
9.27	The contractor shall be responsible for the safe storage and handling of his radio-active sources as per BARC rules and regulations.
9.28	Tarpaulin being inflammable should not be used (instead, only non infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.
9.29	If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
9.30	If the contractor succeeds in carrying out its job in time with out any fatal or disabling injury accident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the contractor suitably for the performance.
9.31	The contractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
9.32	The contractor shall use only properly insulated and armored cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the contractor. All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
9.33	The contractor shall arrange adequate number of persons specifically for clearing any debris and for house keeping of the erection area including restacking of components in the erection areas.
9.34	In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover the cost of such damages from the contractor after holding an appropriate enquiry.

9.35	The contractor shall submit report of all accidents, fires and property damage etc to the Engineer immediately after such occurrence, but in any case not later then 24 hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. In addition periodic reports on safety shall also be submitted by the contractor to BHEL from time to time as prescribed by the Engineer.
9.36	Before commencing the work, the contractor shall appoint/nominate a responsible person to supervise implementation of all safety measures and liaison with his counterpart of BHEL.
9.37	Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper then ¼ horizontal and 1 vertical.
9.38	Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the out side and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it form saver, from swaying, from the building or structure.
9.39	Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above.
9.40	Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.
9.41	Wherever there are open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.

9.42	Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least ¼" for each additional foot of length.
9.43	A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.
9.44	All personnel of the Contactor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal worker shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
9.45	Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
9.46	All trenches, four feet or more in depth, shall at all times be supplied with at least one ladder for each 30 m in length or fraction thereof. The ladder shall be extended from bottom of the trench to at least 90 cm above the surface of the ground. Sides of the trenches which are 1.50 m or more in depth shall be stepped back to give suitable slope or securely held by timer bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
9.47	The Contactor shall take all measures at the sites of the work to protect all persons from accidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding at law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the Contractor be paid to compromise any claim by any such person should such claim proceeding be filed against BHEL, the Contractor hereby agrees to indemnify BHEL against the same.
9.48	Before any demolition work is commenced and also during the process of the work the following shall be ensured:
9.48.1	All roads and open areas adjacent to the work site shall either be closed or suitably protected.

9.48.2	No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
9.48.3	All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.
9.49	All necessary personnel safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed in the Site and maintained in a condition suitable for immediate use and the Contactor should take adequate steps to ensure proper use of equipment by those concerned.
9.49.1	Workers employed on mixing asphalted materials, cement and lime mortars shall be provided with protective foot wear and protective goggles.
9.49.2	Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles.
9.49.3	Those engaged in welding works shall be provided with welder's protective eyesight lids.
9.49.4	Stone breakers shall be provided with protective goggles and protective clothing and seated sufficient to safe intervals.
9.49.5	Where workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.
9.49.6	The Contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precautions should be taken.
9.49.6.1	No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
9.49.6.2	Suitably face masks should be supplied for use by the workers where paints are applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

9.49.6.3	Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
9.50	When the work is being done near any place where there is risk of drowning all necessary equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
9.51	Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe guards. Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers employed on electrical installations which are already energized, insulting mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.
9.52	All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near the places of work.
9.53	The contractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc as applicable, to enable. inspection Agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.
9.54	The Contractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard. BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the contractor shall adhere to such instructions. BHEL may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.
9.55	All safety precautions shall be taken for welding and cutting operations as per IS-818. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

9.56	These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent, place at work spot. The persons responsible for compliance of the safety code shall be named therein by the Contractor.
9.57	To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangement made by the contract shall be open to inspection by the Engineer of the Engineer's Representative.
9.58	Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the contractor. Such cleanings has to be done by contractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by contractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost alongwith BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the contractor.
9.59	Notwithstanding the above clauses there is nothing to exit the Contractor from the operations of any other Act or Rule in force in area of work in this respect. Provided always that all safety measures apart from those specifically provided in this agreement which are brought to the notice of the Contractor from time to time by the Engineer shall be complied by the Contractor. Provided further that all consequences, damages, or losses arising by reason of any safety code shall be met with by the Contractor.
9.60	**NON COMPLIANCE:-** NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER **for every instance of violation noticed**:

SN	Violation of Safety Norms	Fine (in Rs)
01	Not Wearing Safety Helmet	50/-
02.	Not wearing Safety Belt	100/-
03.	Grinding Without Goggles	50/-
04.	Not using 24 V Supply For Internal Work	500/-
05.	Electrical Plugs Not used for hand Machine	100/-
06.	Not Slinging property	200/-
07.	Using Damaged Sling	200/-
08.	Lifting Cylinders Without Cage	500/-

	09.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
	10.	Not Removing Small Scrap From Platforms	200/-
	11.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	200/-
	12.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
	13.	Improper Earthing Of Electrical T&P	500/-
	14.	Accident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
	15.	Fatal Accident/Accidents Resulting in total loss in Earning Capacity	1,00,000/- per victim

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be utilized for giving award to the employees who could avoid accident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

9.61 **CITATION:**-If safety record of the contractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion of the job

9.62 **MEMORANDUM OF UNDERSTANDING**

After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below:

Memorandum of Understanding

- BHEL PESD, HYDERABAD is committed to Health, Safety and Environment Policy (EHS Policy).
- M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number ID1111103.
- M/s _____ shall ensure that safe work practices not limited to the above are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and

	supervisors for compliance. ➢ BHEL PESD, HYDERABAD will be carrying out EHS audits twice a year and M/s _____ shall ensure to close any non-conformity observed/reported within fifteen days. Signed by authorized representative of M/s ---------- Name : Place & Date:

10.0	**RA Bill Payments**
10.1	The contractor shall submit his monthly RA bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month.
10.2	Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract
10.3	Release of payment in each running bill including PVC Bills will be restricted to 95% of the value of work admitted as per stages of progressive pro rata payments.
10.4	The 5% thus remaining shall be treated as 'Retention Amount' and shall be released as per terms specified in the General Conditions of Contract.
10.5	The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc and other dues in the meanwhile.
10.6	BHEL shall release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, Contractor to furnish details pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker, as per prescribed formats: Note: BHEL may also choose to release payment by other alternative modes as applicable
10.7	Paying Authority shall be the Construction Manager of the Site. Any change in the paying Authority shall be intimated to the Contactor accordingly.

<table>
<tr><td>11.0</td><td>Performance Monitoring</td></tr>
<tr><td>11.1</td><td>Performance of the contractor is monitored through various reports/reviews and shall be jointly evaluated every quarter as per prescribed formats. Based on the net weighted score obtained, Contractors shall be rated ‘Good’ or ‘Satisfactory’ or ‘Unsatisfactory’</td></tr>
<tr><td>11.2</td><td>Annual performance (Financial Year wise) and Over all Performance (for the Contract) shall be based on the averages of Quarterly net weighted scores.</td></tr>
<tr><td>11.3</td><td>In case Annual/Quarterly performance is found ‘Unsatisfactory’, BHEL reserves the right to put on hold such Contractors as given below:
<table>
<tr><td>Sl No</td><td>Performance status</td><td>Type of suspension</td></tr>
<tr><td>1</td><td>‘Unsatisfactory’ in the Annual performance in the last Financial Year (if the agency is executing only one job in the Region)</td><td>Hold for a period of six months for similar Work</td></tr>
<tr><td>2</td><td>‘Unsatisfactory’ in the Annual performance in the last Financial Year or in the ‘Overall’ Performances, for 2 or more Works/Contracts being executed by the Contractor in the Region</td><td>Hold for a period of six months for similar Works for which performance is ‘Unsatisfactory’.</td></tr>
</table>
Note: If there is any conflict between the “Overall” performance and the latest “Annual” performance, then the ‘Overall’ performance shall prevail. However, BHEL reserves the right on the decision of ‘Hold’, in case of consistent ‘Annual’ improvement notwithstanding the vendors ‘Overall’ performance being unsatisfactory.</td></tr>
</table>

12.0	**Suspension of Business dealings**
12.1	BHEL reserves the right to take action against contractors who fail to perform or indulge in malpractices, by suspending business dealings with them.
12.2	Suspension could be in the form of 'Hold', 'De-listing' or 'Banning' a contractor.
12.3	A bidder may be put on HOLD for a period of 6 months, for future tenders for specific works on the basis of one or more of the following reasons: a) Bidder does not honour his own offer or any of its conditions within the validity period. b) Bidder fails to respond against three consecutive enquires of BHEL. c) After placement of order, Bidder fails to execute a contract. d) Bidder fails to settle sundry debt account, for which he is legitimately liable, within one year of its occurrence. e) Bidder's performance rating falls below 60% in specific category (more fully described in chapter 'Performance Monitoring') f) Bidder works are under strike/ lockout for a long period.
12.4	A Bidder may be de-listed from the list of registered Bidders of the region for a period of 1 year on the basis of one or more of the following reasons:- a) Bidder tampers with tendering procedure affecting ordering process or commits any misconduct which is contrary to business ethics. b) Bidder has substituted, damaged, failed to return, short returned or unauthorizedly disposed off materials/ documents/ drawings/ tools etc of BHEL. c) Bidder no longer has the technical staff, equipment, financial resources etc. required to execute the orders/ contracts.
12.5	A Bidder can be banned from doing any business with all Units of BHEL for a period of 3 years on the basis of one or more of the following reasons: a) Bidder is found to be responsible for submitting fake/ false/ forged documents, certificates, or information prejudicial to BHEL's interest. b) In spite of warnings, the Bidder persistently violates or circumvents the provisions of labour laws/ regulations/ rules and other statutory requirements. c) Bidder is found to be involved in cartel formation

	d) The Bidder has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage etc which are contrary to business ethics. e) The Bidder is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings. f) The Bidder is declared bankrupt, insolvent, has wound up or been dissolved; i.e ceases to exist for all practical purposes. g) Bidder is found to have obtained Official Company information/ documentation by questionable means. h) Communication is received from the administrative Ministry of BHEL to ban the Bidder from business dealings.
12.6	Contracts already entered with a contractor before the date of issue of order of 'HOLD' or 'DE-LISTING' shall not be affected.
12.7	All existing contracts with a 'BANNED' contractor shall normally be short closed
12.8	Once the order for suspension is passed, existing offers/new offers of the contractor shall not be entertained
12.9	The above guidelines are not exhaustive but enunciate broad principles governing action against contractors

DOCUMENT NO: PESD: E&C: GCC, REV 00, 11TH MAR. 2014

VOLUME – I C
General Conditions of Contract

BHARAT HEAVY ELECTRICALS LIMITED

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CHAPTER -1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

i) The General Conditions of Contract form part of the Tender specifications. **All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof.** The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages

ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., he shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the tenderer in his offer. Non compliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.

iii) Integrity pact (IP) shall be applicable for all tenders / contracts if indicated in NIT. This integrity pact shall be issued as part of the Tender documents and shall be returned by the bidder along with Techno-commercial bid duly filled, signed and stamped by the authorized signatory who signs the bid. Only those vendors / bidders who have entered into such an IP with BHEL shall be considered qualified to participate in the bidding. Entering into this pact shall be a preliminary qualification.

1.2. SUBMISSION OF TENDERS

1.2.1 The tenderers must submit their tenders to Officer inviting tender as per instructions in the NIT

1.2.2 Tenders submitted by post shall be sent by 'REGISTERED POST ACKNOWLEDGEMENT DUE / by COURIER' and shall be posted with due allowance for any postal/courier delays. BHEL takes no responsibility for delay, loss or non-receipt of tenders sent by post/courier. **The tenders received after the specified time of their submission are treated as 'Late Tenders' and shall not be considered under any circumstances.** Offers received by Fax/Email/Internet shall be considered as per terms of NIT.

1.2.3 Tenders shall be opened by authorised Officer of BHEL at his office at the time and date as specified in the NIT, in the presence of such of those tenderers or their authorised representatives who may be present

1.2.4 Tenderers whose bids are found techno commercially qualified shall be informed the date and time of opening of the Price Bids and such Tenderers may depute their representatives to witness the opening of the price bids. BHEL's decision in this regard shall be final and binding.

1.2.5 Before submission of Offer, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labor, means of transport and access to Site, accommodation, etc. No claim will be entertained later on the grounds of lack of knowledge of any of these conditions.

1.3. LANGUAGE

1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. For the purpose of the tenders, the metric system of units shall be used.

1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and over-writing is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4 **PRICE DISCREPANCY:**

1.4.1 **Conventional (Manual) Price Bid opening** : In the case of price bid opening without resorting to Reverse Auction, if there are differences between the rates given by the tenderer in words and figures or in amount worked out by him, the following procedure for evaluation and award shall be followed:

i) When there is a difference between the rates in figures and in words, the rates which corresponds to the amounts worked out by the contractor, shall be taken as correct

ii) When the amount of an item is not worked out by the contractor or it does not correspond with the rate written either in figure or in words, then the rate quoted by the contractor in words shall be taken as correct

iii) When the rate quoted by the contractor in figures and words tallies but the amount is not worked out correctly, the rate quoted by the contractor shall be taken as correct and not the amount.

iv) In case of lumpsum price, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

v) In case of omission in quoting any rate for one or more items, the evaluation shall be done considering the highest quoted rate obtained against the respective items by other tenderers for the subject tender. If the tenderer becomes L-1, the notional rates for the omission items shall be the lowest rates quoted for the respective items by the other tenderers against the respective omission items for the subject job and the 'Total quoted price (loaded for omissions)' shall be arrived at. However the overall price remaining the same as quoted originally, the rates for all the items in the 'Total quoted price (loaded for omissions)' shall be reduced item wise in proportion to the ratio of 'Original' total price and the 'Total quoted price (loaded for omissions)''.

1.4.2 **Reverse Auction**: In case of Reverse Auction, the successful bidder shall undertake to execute the work as per overall price offered by him during the Reverse Auction process. In case of omission of rates, the procedure shall be as per 'Guidelines for Reverse Auction' enclosed.

1.5. **QUALIFICATION OF TENDERERS**

i) Only tenderers who have previous experience in the work of the nature and description detailed in the Notice Inviting Tender and/or tender specification are expected to quote for this work duly detailing their experience along with offer.

ii) Offers from tenderers who do not have proven and established experience in the field shall not be considered.

iii) Offers from tenderers who are under suspension (banned) by any Unit/Region/Division of BHEL shall not be considered.

iv) Offers from tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India shall not be considered.

1.6. EVALUATION OF BIDS

i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer

ii) In case the same qualifying experience is claimed by more than one agency, then the agency who has executed the work as per documentary evidence submitted shall only be qualified. Scope of qualifying work should be totally with the agency who has executed and in case it is only labor+ consumables without T&P, then the responsibility of execution is assigned to the first agency and not to the agency who has executed only as labor supply contractor. Further, BHEL reserves the right to ask for further proofs including submission of TDS certificates for the said job

iii) In case the qualifying experience is claimed by private organizations based on Work Order and completion certificates from another private organization, BHEL reserves the right to ask for further proofs including submission of TDS certificates for the said job.

iv) Assessing Bidder Capacity for executing the current tender shall be as per Notice Inviting Tender

v) Price Bids of shortlisted bidders shall only be opened either through the conventional price bid opening or through electronic Reverse Auction, at the discretion of BHEL

vi) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated in due course after issue of LOI/LOA to successful bidder and receipt of unqualified acceptance from the successful bidder

vii) Bidders are advised to also refer to clause no 2.9.4 regarding evaluation of their performance in ongoing projects for the current tender

1.7. DATA TO BE ENCLOSED

Full information shall be given by the tenderer in respect of the following. Non-submission of this information may lead to rejection of the offer.

i) INCOME TAX PERMANENT ACCOUNT NUMBER

Certified copies of Permanent Account Numbers as allotted by Income Tax Department for the Company/Firm/Individual Partners, etc. shall be furnished along with tender.

ii) ORGANIZATION CHART

The organization chart of the tenderer's organization, including the names, addresses and contact information of the Directors/Partners shall be furnished along with the offer.

iii) An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor

iv) **IN CASE OF INDIVIDUAL TENDERER:**

His / her full name, address and place & nature of business.

v) **IN CASE OF PARTNERSHIP FIRM**

The names of all the partners and their addresses, A copy of the partnership deed/instrument of partnership dully certified by the Notary Public shall be enclosed.

vi) **IN CASE OF COMPANIES:**

a. Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished).
b. Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

1.8 **AUTHORISATION AND ATTESTATION**

Tenders shall be signed by a person duly authorized/empowered to do so. An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor shall be submitted along with the tenders

1.9 **EARNEST MONEY DEPOSIT**

1.9.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

i) EMD shall be furnished along with the offer in full as per the amount indicated in the Special Conditions of Contract / NIT
ii) EMD is to be paid in cash (as permissible under Income Tax Act), Pay order or Demand Draft in favour of 'Bharat Heavy Electricals Limited' and payable at Hyderabad(PESD HQ) issuing the tender.
iii) No other form of EMD remittance shall be acceptable to BHEL
iv) Bidder may opt to deposit "One Time EMD" of Rs. 2.0 lakhs (Rupees Two lakhs only) with BHEL Hyderabad(PESD HQ) issuing the tender, which will enable them to participate in all the future tender enquiries in respect of Erection and Commissioning services issued from the respective office. Interested bidders may clearly send their consent for converting the present EMD into a "One Time EMD" in their offer.
   - Note : The 'One Time EMD' cannot be withdrawn by the tenderers within 3 years from the date of deposit, under any circumstances. The Tenderer who wishes to withdraw after three years will not be allowed to submit 'One Time EMD' again.
v) Bidders who have already deposited such "One Time EMD" of Rs. 2.00 lakh are exempted from submission of EMD for this tender. However a copy of 'One Time EMD' certificate issued by BHEL PESD HQ issuing the tender shall be enclosed along with the offer.

1.9.2 EMD by the bidder will be forfeited as per Tender Documents if

i) After opening the tender, the bidder revokes his tender within the validity period or increases his earlier quoted rates.
ii) The bidder does not commence the work within the period as per LOI/Contract. In case the LOI / contract is silent in this regard then within 15 days after award of contract.

1.9.3 EMD shall not carry any interest.

1.9.4 In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after acceptance of award by successful tenderer.

1.10 SECURITY DEPOSIT

1.10.1 Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work, as per the rates given below:

SN	Contract Value	Security Deposit Amount
1	Up to Rs. 10 lakhs	10% of Contract Value
2	Above Rs. 10 lakhs up to Rs.50 lakhs	1 lakh + 7.5% of the Contract Value exceeding Rs. 10 lakhs.
3	Above Rs. 50 lakhs	Rs 4 lakhs + 5% of the Contract Value exceeding Rs. 50 lakhs.

1.10.2 The security Deposit should be furnished before start of the work by the contractor.

1.10.3 Security Deposit may be furnished in any one of the following forms

i) Cash (as permissible under the Income Tax Act)
ii) Pay Order / Demand Draft in favour of BHEL.
iii) Local cheques of scheduled banks, subject to realization.
iv) Securities available from Post Offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly pledged in favour of BHEL and discharged on the back).
v) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats
vi) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.
vii) Security deposit can also be recovered at the rate of 10% from the running bills. However in such cases at least 50% of the Security Deposit should be deposited in any form as prescribed before start of the work and the balance 50% may be recovered from the running bills.
viii) EMD of the successful bidder can be converted and adjusted against the cash portion of Security Deposit excepting for such bidders who have remitted One Time EMD.

NOTE: Acceptance of Security Deposit against Sl. No. (iv) and (vi) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

1.10.4 The Security Deposit shall not carry any interest.

1.10.5 In case the value of work exceeds / reduces from the awarded / accepted value, the Security Deposit shall be correspondingly enhanced / reduced as given below:

i) The enhanced part of the Security Deposit shall be immediately deposited by the Contractor or adjusted against payments due to the Contractor.
ii) There will be no reduction in Security Deposit value in case of variation in contract value upto the lower limit specified in Quantity variation clause. In case of reduction of contract value beyond the lower limit specified in Quantity Variation clause, then the Security Deposit shall be re adjusted in proportion.
iii) In case of reduction, the reduced Contract value shall be certified by BHEL Construction Manager after ascertaining / freezing of BOQ / Drawings from the Design / Engineering Centre. The reduced Security Deposit value can only be considered after taking into account the adequacy of the

securities held by BHEL to meet the liabilities of the contractor for the contract, and the performance of the contract in general. **In such cases, the revised value of Security Deposit shall be worked out only after execution of not less than the lower limit of the revised scope of work/contract value as per quantity variation clause, and as certified by Construction Manager. This reduction in value of Security Deposit shall not entitle the contractor to any amendment of Contract and shall be operated at the discretion of BHEL**

iv) Contract value for the purpose of operating the reduced/increased value of Security Deposit due to Quantity Variation, shall be exclusive of Price Variation Clause, Over Run Compensation and Extra works done on manday rates.

1.10.6 The validity of Bank Guarantees towards Security Deposit shall be initially upto the completion period as stipulated in the Letter of Intent/Award + 3 months, and the same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL

1.10.7 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.

1.11 RETURN OF SECURITY DEPOSIT

Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL.

1.12 BANK GUARANTEES

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act.

ii) The Bank Guarantees shall be as per prescribed formats.

iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period (subject to a minimum period of six months), as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be liable for issue of any reminders regarding expiry of the Bank Guarantees.

iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by the Construction Manager and submitted to PESD HQ.

v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.

vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.

vii) The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Subcontracting Department of the PESD.

1.13 VALIDITY OF OFFER

The rates in the Tender shall be kept open for acceptance for a minimum period of **SIX MONTHS** from latest due date of offer submission (including extension, if any) . In case BHEL (Bharat Heavy Electricals Ltd) calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

1.14 EXECUTION OF CONTRACT AGREEMENT

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by Bharat Heavy Electricals Limited. The Tenderer shall submit an unqualified acceptance to the Letter of Intent/Award within the period stipulated therein.

The successful tenderer shall be required to execute an agreement in the prescribed form, with BHEL, within a reasonable time after the acceptance of the Letter of Intent/Award, and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by BHEL

1.15 REJECTION OF TENDER AND OTHER CONDITIONS

1.15.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender or any tender and reserves to itself full rights for the following without assigning any reasons whatsoever:-

a. To reject any or all of the tenders.

b. To split up the work amongst two or more tenderers as per NIT

c. To award the work in part if specified in NIT

d. In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.15.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc., are liable to be rejected.

1.15.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold/banning /delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job as per the required schedule in line with clause no. 9.0 of the 'NIT'. The decision of BHEL will be final in this regard.

1.15.4 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character.

1.15.5 BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognise such

power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

1.15.6 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money/Security Deposit/any other money due.

1.15.7 Canvassing in any form in connection with the tenders submitted by the Tenderer shall make his offer liable to rejection.

1.15.8 In case the Proprietor, Partner or Director of the Company/Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting the Tender shall be informed of the fact as per specified format, along with the Offer. Failing to do so, BHEL may, at its sole discretion, reject the tender or cancel the contract and forfeit the Earnest Money/Security Deposit.

1.15.9 The successful tenderer should not sub-contract part or complete work detailed in the tender specification undertaken by him without written permission of BHEL's Construction Manager/Site Incharge. The tenderer is solely responsible to BHEL for the work awarded to him.

1.15.10 The Tender submitted by a techno commercially qualified tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders

1.15.11 Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-I party, then the awarded price i.e contract value shall be worked out after considering the discount so offered.

1.15.12 BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

1.15.13 Additional security deposit (SD) has to be submitted by the successful bidder with value as follows :

a) In case the Final Price of the successful bidder is greater than equal to Rs 100 Crores:

The value of additional SD shall be equal to:
0.30 X { the difference of (95% of BHEL's estimate OR 95% of the party's 'online sealed bid' (in case of RA)/ Paper price bid (in case of conventional paper bid), whichever is higher) and the final offered price of the successful bidder}

b) In case the Final Price of the successful bidder is less than Rs 100 Crores:

The value of additional SD shall be equal to:
0.30 X { the difference of (90% of BHEL's estimate OR 90% of the party's 'online sealed bid' (in case of RA)/ Paper price bid, whichever is higher) and the final offered price of the successful bidder}

This additional SD shall have the same validity as that of the Security Deposit and shall be revalidated /released in the manner as spelt out for the Security Deposit as per relevant clause of GCC.

The BHEL's estimated value shall be disclosed after RA/Paper Bid opening

CHAPTER-2

2.1 **DEFINITION:** The following terms shall have the meaning hereby assigned to them except where the context otherwise requires

i) BHEL shall mean Bharat Heavy Electricals Limited (PESD, Hyderabad), a company registered under Indian Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its Power Sector Regional Offices/PESD HQ or its Authorised Officers or its Site Engineers or other employees authorised to deal with any matters with which these persons are concerned on its behalf.

ii) "EXECUTIVE DIRECTOR" or 'GROUP GENERAL MANAGER' or "GENERAL MANAGER (Incharge)" or "GENERAL MANAGER" shall mean the Officer in Administrative charge of Project Engineering & System Division, Hyderabad.

iii) "COMPETENT AUTHORITY" shall mean Executive Director or Group General Manager or General Manager (Incharge) or General Manager or BHEL Officers who are empowered to act on behalf of the Executive Director or General Manager (Incharge) or General Manager of BHEL.

iv) "ENGINEER" or "ENGINEER IN CHARGE" shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as "Engineer" on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes 'CONSTRUCTION MANAGER' or 'SITE INCHARGE' as well as Officers at Site or at the Headquarters of the PESD.

v) "SITE" shall mean the places or place at which the plants/equipments are to be erected and services are to be performed as per the specification of this Tender.

vi) "CLIENT OF BHEL" or "CUSTOMER" shall mean the project authorities with whom BHEL has entered into a contract for supply of equipments or provision of services.

vii) "CONTRACTOR" shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor's successors, heirs, executors, administrators and permitted assigns.

viii) "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the Agreement of Work Order, the accepted appendices of Rates, Schedules, Quantities if any, General Conditions of Contract, Special Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments mutually agreed upon and the Letter of Intent/Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement.

ix) "GENERAL CONDITIONS OF CONTRACT" shall mean the 'Instructions to Tenderers' and 'General Conditions of Contract' pertaining to the work for which above tenders have been called for.

x) "TENDER SPECIFICATION" or "TENDER" or "TENDER DOCUMENTS" shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical

	Specifications, Appendices, Annexures, Corrigendum, Amendments, Forms, procedures, Site information, etc and drawings/documents pertaining to the work for which the tenderers are required to submit their offers. Individual specification number will be assigned to each Tender Specification.
xi)	"LETTER OF INTENT" shall mean the intimation by a Letter/Fax/email to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.
xii)	"COMPLETION TIME" shall mean the period by 'date/month' specified in the 'Letter of Intent/Award' or date mutually agreed upon for handing over of the intended scope of work, the erected equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.
xiii)	"PLANT" shall mean and connote the entire assembly of the plant and equipments covered by the contract.
xiv)	"EQUIPMENT" shall mean equipment, machineries, materials, structural, electricals and other components of the plant covered by the contract.
xv)	"TESTS" shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.
xvi)	"APPROVED", "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.
xvii)	"WORK or CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipments to the entire satisfaction of BHEL.
xviii)	"SINGULAR AND PLURALS ETC" words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.
xix)	"HEADING" – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.
xx)	"MONTH" shall mean calendar month unless otherwise specified in the Tender.
xxi)	Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty four (24) hours each. A week shall mean continuous period of seven (7) days.
xxii)	"COMMISSIONING" shall mean the synchronization testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is

	ready for taking into service.
xxiii)	"WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.
xxiv)	"TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.
xxv)	'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum mentioned in the LOI/LOA/Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained
xxvi)	"COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tender
xxvii)	"SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor
xxviii)	"TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract
xxix)	"DE MOBILISATION" shall mean the temporary winding up of Site establishment by Contractor leading to suspension of works temporarily for reasons not attributable to the contractor
xxx)	"RE MOBILISATION" shall mean the resumption of work with all resources required for the work after demobilization.

2.2 LAW GOVERNING THE CONTRACT AND COURT JURISDICTION

The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at *Hyderabad for PESD*, Delhi for PSNR, at Kolkata for PSER, at Nagpur for PSWR and at Chennai for PSSR, shall alone have exclusive jurisdiction in regard to all claims in respect of the Contract. No other Civil Court shall have jurisdiction in case of any dispute, under this contract

2.3 ISSUE OF NOTICE

2.3.1 **Service of notice on contractor**

Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same **by Registered Post / Speed Post to** or leaving the same at the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such posting or leaving of the notice shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

2.3.2 **Service of notice on BHEL**

Any notice to be given to BHEL in-charge/Region under the terms of the Contract shall be served by sending the same by **Registered Post / Speed Post** to or leaving the same at BHEL address or changed address as notified in writing by BHEL to the Contractor.

2.4 USE OF LAND

No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.

2.5 **COMMENCEMENT OF WORK**

2.5.1 The contractor shall commence the work as per the time indicated in the Letter of Intent from BHEL and shall proceed with the same with due expedition without delay.

2.5.2 If the contractor fails to start the work within stipulated time as per LOI or as intimated by BHEL, then BHEL at its sole discretion will have the right to cancel the contract. The Earnest Money and/or Security Deposit with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

2.5.3 All the work shall be carried out under the direction and to the satisfaction of BHEL.

2.6 **MEASUREMENT OF WORK AND MODE OF PAYMENT:**

2.6.1 All payments due to the contractors shall be made by e mode only, unless otherwise found operationally difficult for reasons to be recorded in writing
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2.6.2 For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

2.6.3 These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.

2.6.4 Based on the above quantities, contractor shall prepare the bills in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.

2.6.5 All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.

2.6.6 Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

2.6.7 The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.

2.6.8 The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.

2.6.9 If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.

2.6.10 Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

2.6.11 Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Claim" Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

2.7 **RIGHTS OF BHEL**

BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.

2.7.1 To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons/ BHEL's obligation to its customer.

2.7.2 To terminate the contract or get any part of the work done through other agency or deploy BHEL's own/hired/otherwise arranged resources , at the risk and cost of the contractor after due notice of a period of two weeks by BHEL, in the event of:-

i) Contractor's continued poor progress
ii) Withdrawal from or abandonment of the work before completion of the work
iii) Contractor's inability to progress the work for completion as stipulated in the contract
iv) Poor quality of work
v) Corrupt act of Contractor
vi) Insolvency of the Contractor
vii) Persistent disregard to the instructions of BHEL
viii) Assignment, transfer, sub-letting of contract without BHEL's written permission
ix) Non fulfillment of any contractual obligations
x) In the opinion of BHEL, the contractor is overloaded and is not in a position to execute the job as per required schedule

2.7.3 To meet the expenses including BHEL overheads on the differential cost at 5%, over and above the liquidated damages/penalties arising out of "Risk & Cost" as explained above under Sl.No. 2.7.2. BHEL shall recover the amount from any money due from Contractor, from any money due to the Contractor including Security Deposit or by forfeiting any T&P or material of the contractor under this contract or any other contract of BHEL or by any other means or any combination thereof

2.7.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.

2.7.5 To effect recovery from any amounts due to the contractor under this or any other contract or in

any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfill any of his obligations. BHEL shall levy overheads of 5% on all such payments alongwith the interest as defined elsewhere in the GCC.

2.7.6 While every endeavor will be made by BHEL to this end, they cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.

2.7.7 In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than two months, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de mobilize forthwith and re mobilize at an agreed future date. Cost of such demobilization/remobilization shall be mutually agreed. ORC in such cases shall not be applicable for the period between the period of demobilization and re mobilization. The duration of contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

2.7.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts, etc, due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract in the following cases

a) The balance works (including but not limited to Trial Operation, PG Test, etc) are minor vis a vis the scope of work envisaged as per the contract.
b) There has been no significant work in past 6 months OR no significant work is expected in next 6 months (example in Hydro projects or in projects where work has stopped due to reasons beyond the control of BHEL)
c) The balance works cannot be done within a reasonable period of time as they are dependent on unit shutdown or on other facilities of customer or any other reasons not attributable to the contractor

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work(or estimated value of services to be provided for carrying out milestone/stage payments like Trial Operation/PG Test, etc) as mutually agreed, shall however be reduced from the final contract value.

2.7.9 **LIQUIDATED DAMAGES/PENALTY**

If the contractor fails to maintain the required progress of work which results in delay in the completion of the work as per the contractual completion period, BHEL shall have the right to impose Liquidated Damage/Penalty at the rate of 0. 5% of the contract value, per week of delay or part thereof subject to a maximum of 10% of the contract value. For this purpose, the period of delay shall be the delay attributable to the Contractor for the completion of work as per contract. Contract Value for this purpose, shall be the final executed value exclusive of ORC, Extra Works executed on Man day rate basis, Supplementary/Additional Items and PVC.

2.8 **RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC.**

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

2.8.1 As far as possible, Unskilled Workers shall be engaged from the local areas in which the work is being executed.

2.8.2 The contractor at all times during the continuance of this contract shall, in all his dealings with local labor for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.

2.8.3 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labor (Regulation and Abolition) Act 1970, Payment of Bonus & Gratuity Act and other Acts, Rules and Regulations for labor as may be enacted by the Government during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also give to the local Governing Body, Police and other relevant Authorities all such notices as may be required by the Law.

2.8.4 The contractor shall obtain independent License under the Contract Labor (Regulations and Abolition Act, 1970)as required from the concerned Authorities based on the certificate (Form-V) issued by the Principal Employer/Customer

2.8.5 The contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalties, commission or other charges which may be levied on account of his operations in executing the contract.

2.8.6 While BHEL would pay the inspection fees and Registration fees of Boiler/Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.

2.8.7 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labor Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

2.8.8 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.

2.8.9 The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.

2.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good

the losses or compensate for the same.

2.8.11 All the properties/equipments/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.

2.8.12 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipments/components shall be deemed to be in good condition when received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc, the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor

2.8.13 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract

2.8.14 Any delay in completion of works/or non achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.

2.8.15 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

2.8.16 All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract.

The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices.

Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer

2.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for record purpose, if so called for.

2.8.18 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

2.8.19 Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labor and Tools & Plants being rendered idle due to any reason at any time.

2.8.20 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Client whichever is earlier.

2.8.21 The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly

2.8.22 The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.

2.8.23 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.

2.8.24 The Contractor to note that equipment taken on loan basis from BHEL/ their client may not be insured. The Contractor will take necessary precautions and due care to protect the same while in his custody from any damage/ loss till the same is handed over back to BHEL. In case the damage / loss is due to carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/ replaced immediately and in case of his failure to do so within a reasonable time, BHEL will reserve the right to recover the loss from the contractor.

2.9 **PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION**

2.9.1 A detailed plan/program for completion of the contractual scope of work as per the time schedule given in the contract shall be jointly agreed between BHEL and Contractor, before commencement of work . The above program shall be supported by month wise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis a vis this jointly agreed program. The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc as desired by BHEL.

2.9.2 Monthly progress review between BHEL and Contractor shall be based on the agreed program as above, availability of inputs/fronts etc, and constraints if any, as per prescribed formats. Manpower, T&P and consumable reports as per prescribed formats shall be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.

2.9.3 The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions and (iii) BHEL

2.9.4 Performance of the contractor shall be assessed as per prescribed formats and shall form the basis for 'Annual/Overall Performance Evaluation' of the Contractor. BHEL reserves the right to revise the evaluation formats during the course of execution of the works.

2.10 **TIME OF COMPLETION**

2.10.1 The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers

2.10.2 The entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11

2.11 **EXTENSION OF TIME FOR COMPLETION**

2.11.1 If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.

2.11.2 Based on the monthly reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.

2.11.3 However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.

2.11.4 A joint program shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources (with weightages) to be deployed by the contractor as per specified format. Review of the program and record of shortfall shall be done every month of the 'Time extension' period in the same manner as is done for the regular contract period.

2.11.5 During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program

2.11.6 At the end of total work completion as certified by BHEL Engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/ levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.

2.12 **OVERRUN COMPENSATION**

2.12.1 Over Run Compensation (ORC) is payable by way of rate revisions for periods beyond original contract period subject to the following terms and conditions.

2.12.2 Rates shall be increased by 10% for the first twelve months of one or more extensions beyond original contract period. For the next twelve months of further extensions if any, rates shall be increased as above by 10% over the previous twelve months, and similarly for each subsequent twelve months extension.

2.12.3 The amount of increase payable per month due to rate revisions is subject to a minimum of Rs 1, 00,000/- per month and a maximum of Rs 10, 00,000/- per month.

2.12.4 Should there be any 'Time extension' for reasons attributable only to the contractor, then the work shall be executed by the contractor at the rates applicable for the period the work was planned

2.12.5 Payment of ORC shall be regulated as follows:

i) Contractor is entitled to Over Run Compensation (ORC) only for the portion of backlog attributable to BHEL.

ii) 50% of the compensation as per clause 2.12.3 is allocated for deployment of resources agreed as per the joint program drawn vide 2.11.4. Payment shall however be based on the actual deployment of resources for the month as certified by BHEL, as per weightages assigned therein.

iii) 50% of the compensation as per clause 2.12.3, is allocated for achieving of planned progress agreed as per the joint program drawn vide 2.11.4. Payment shall be on pro rata basis for actual achieved quantities

iv) Total Over Run Compensation shall be limited to 10% of the executed contract value as certified in Final Bill. For this purpose executed contract value excludes PVC, ORC, Supplementary/Additional Items and Extra Works done on man day rate basis

2.12.6 Contractor shall not be entitled for any Over Run Compensation (ORC) for the portion of backlog attributable to the contractor. Such works shall be executed at the rates applicable for the period the work was planned.

2.13 **INTEREST BEARING RECOVERABLE ADVANCES**

2.13.1 Normally no advance is payable to the contractor. However, advance payment in exceptional circumstances shall be interest bearing and secured through an equivalent Bank Guarantee and shall be limited to a maximum of 5% of contract value. This 'Interest Bearing Recoverable Advance' shall be payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance.

2.13.2 In exceptional circumstances, with due justification, Competent Authority of BHEL is empowered to approve proposals for payment of additional interim interest bearing advance against matching Bank Guarantee, for resource augmentation towards expediting work for project implementation.

2.13.3 Bank Guarantee towards 'Interest Bearing Recoverable Advance' shall be at least 110% of the advance so as to enable recovery of not only principle amount but also the interest portion, if so required.

2.13.4 Contractor shall establish the utilization of advance drawn before the release of next installment.

2.13.5 Payment and recovery of Interest Bearing Recoverable advance shall be at the sole discretion of BHEL and shall not be a subject matter of arbitration.

2.13.6 The rate of interest applicable for the above advances shall be the prime lending rate of State Bank of India prevailing at the time of disbursement of the advance + 2%, and such rate will remain fixed till the total advance amount is recovered

2.13.7 Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made progressively from each Running Bill such that the advance amounts paid along with the interest is fully recovered by the time the contractor's billing reaches 80% of contract value.

2.13.8 Recovery rate per month shall be the sum of:

a. 10% of Running Bill amount

b. Simple interest up to the date of RA Bill on the outstanding Principle amount/amounts

2.13.9 Contractor to submit Bank Guarantee as per prescribed formats for each of the advance and shall be valid for at least one year or the recovery duration or the balance contract period which ever is later. In case the recovery of dues does not get completed within the aforesaid BG period, the contractor shall renew the BG or submit fresh BG for the outstanding amount and the remaining recovery period.

2.13.10 BHEL is entitled to make recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement

2.14 **QUANTITY VARIATION**

2.14.1 The quoted rates shall remain firm irrespective of any variations in the individual quantities. No compensation becomes payable in case the variation of the final executed contract value is within the limits of Plus (+) or Minus (-) 15% of awarded contract value

2.14.2 Compensation due to variation of final executed value in excess of the limits defined in clause above, shall be as follows:

i) In case the finally executed contract value reduces below the lower limit of Contract Value due to quantity variation specified above, the contractor will be eligible for compensation @ 15% of the difference between the lower limit of the contract value and the actual executed value.

ii) In case the finally executed contract value increases above the upper limit of Contract Value due to quantity variation specified above, there will be no revision in the rates within the contract period.

2.15 **EXTRA WORKS**

2.15.1 All rectifications/modifications, revamping, and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation/maintenance requirements, mismatching, or due to damages in transit, storage and erection/commissioning, and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

2.15.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

2.15.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/ entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL Engineer does not necessarily mean the acceptance of such works as extra works.

2.15.4 BHEL retains the right to award or not to award any of the major repair/ rework/modification/rectification/fabrication works to the contractor, at their discretion without assigning any reason for the same

2.15.5 After eligibility of extra works is established and finally accepted by BHEL engineer/designer,

payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS: Single composite average labor man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework/ repairs/ rectification/ modification/ fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 60/- per man hour.

2.15.6 The above composite labor man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc will not be applicable due to extra works.

2.15.7 **Extra Works for Civil Packages** shall be regulated as follows

i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re erecting etc due to no fault of Contractor, shall be in the order of the following:
   a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.
   b) As per CPWD-DSR-2007 (or latest edition) with applicable escalation derived from All India Consumer price Index for Whole Sale Commodities, OR, Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed, whichever is less
   c) Item rates are to be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor, plus 15% towards Contractor's overheads and profit.

ii) PVC and ORC will not be applicable for (i) above.

2.16 **SUPPLEMENTARY ITEMS**

2.16.1 **For Non Civil Works**

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

i) Based on percentage breakup/rates indicated for similar/nearby items

ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work

2.16.2 **For Civil Works**

i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:
   a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities
   b) Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.15.7

ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.14

iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor.

iv) PVC and ORC will not be applicable for (i) above.

2.17 PRICE VARIATION COMPENSATION

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, ELECTRODE, CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable

2.17.2 85% component of Contract Value shall be permitted to be adjusted for variation in various relevant indices during execution of work. The remaining 15% shall be treated as fixed component

2.17.3 The basis for calculation of price variation in each category, their component, Base Index, shall be as under:

SL NO.	CATEGORY	BASE INDEX	COMPONENT ('K')				
			CIVIL PACKAGES (See Note A/B/C)			MECHANICAL PACKAGES	LABOUR ORIENTED PACKAGES (See Note D)
			A	**B****	**C**		
i)	LABOUR (ALL CATEGORIES)	'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (Website: labourbureau.nic.in)	**40**	**25**	**30**	**65**	**80**
ii)	HIGH SPEED DIESEL OIL	Name of Commodity : HSD OIL. Type : INDIVIDUAL COMMODITY (**See Note F**)	**5**	**3**	**5**	**5**	**5**
iii)	ELECTRODE	Name of Commodity : ELECTRODES Type: INDIVIDUAL COMMODITY (**See Note F**)				**15**	
iv)	CEMENT	Name of Commodity : CEMENT Type: INDIVIDUAL COMMODITY (**See Note F**)		**20**	**30**		
v)	STRUCTURAL AND REINFORCEMENT STEEL	Name of Commodity : a1. IRON & STEEL Type: GROUP ITEM (**See Note F**)		**25**			
vi)	MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Type: GROUP ITEM (**See Note F**)	**40**	**12**	**20**		

Note: A) Cement & Steel : Free Issue (BHEL Scope)

B) Cement & Steel : In Contractor Scope {: unless otherwise specified in Special Conditions of Contract (SCC) }**

C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)

D) Predominantly 'Labour Oriented' packages include Material Handling & Management, Insulation, Painting, Electrical and CI or a combination thereof, which are separately tendered and awarded

E) For Composite packages (i.e. Civil+Mechanical+Electrical/CI or Civil+Mechanical or Mechanical+Electrical/CI), the components for various categories shall be as per respective packages

F) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website : www.eaindustry.nic.in)

2.17.4 Payment/recovery due to variation in index shall be determined on the basis of the following notional formula without any initial absorption, in respect of the identified components viz LABOUR, HIGH SPEED DIESEL, ELECTRODE, CEMENT, STEEL, MATERIALS

$$P = K \times R \times \frac{(X_N - X_o)}{X_o}$$

Where

P = Amount to be paid/recovered due to variation in the Index for Labor, Electrode, High Speed Diesel Oil, Cement, Steel and Materials

K = Percentage component applicable for Labor, Electrode, High Speed Diesel Oil, Cement, Steel and Materials

R = Value of work done for the billing month (Excluding Taxes and Duties if payable extra)

XN = Revised Index No for Labor, Electrode, High Speed Diesel Oil, Cement, Steel and Materials for the billing month under consideration

Xo = Index no for Labor, Electrode, High Speed Diesel Oil, Cement, Steel and Materials as on the Base date.

2.17.5 **Base date shall be calendar month of the latest date of submission of Tender.**

2.17.6 PVC shall not be payable for the ORC amount, Supplementary/Additional Items, Extra works.

2.17.7 The contractor shall furnish necessary monthly bulletins for the necessary indices from the relevant websites along with his Bills.

2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid/ recovered on getting the final values.

2.17.9 PVC shall be applicable for the entire original contract period plus the extended period. However the Total Quantum of Price Variation amount payable/recoverable shall be regulated as follows:

i) For the portion of backlog attributable to the contractor, the PVC will be based on the average of the indices for the period of the original contract period.

ii) For the period of Force Majeure, the PVC will be limited to the indices applicable at the beginning of the force majeure period.

iii) For the portion of backlog attributable to BHEL, the PVC will be as per the indices applicable for the respective months

iv) The total amount of PVC shall be limited to 20% of executed contract value. Executed contract value for this purpose is exclusive of PVC, ORC, Supplementary/Additional Items, Extra works.

2.18 **INSURANCE**

2.18.1 BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning.

2.18.2 It is the sole responsibility of the contractor to insure his materials, equipments, workmen, etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor.

2.18.3 If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.

2.18.4 The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL or customer. For lodging / processing of insurance claim the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody , matter shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However this will not relieve the contractor of his contractual obligation for the material in his custody.

2.19 **STRIKES & LOCKOUT**

2.19.1 The contractor will be fully responsible for all disputes and other issues connected with his labor. In the event of the contractor's labor resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, BHEL shall have the right to get the work executed through any other agencies and the cost so incurred by BHEL shall be deducted from the Contractor's bills.

2.19.2 For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL

2.20 **FORCE MAJEURE**

The following shall amount to Force Majeure:-

2.20.1 Acts of God, act of any Government, War, Sabotage, Riots, Civil commotion, Police action, Revolution, Flood, Fire, Cyclones, Earth quake and Epidemic and other similar causes over which the contractor has no control.

2.20.2 If the contractor suffers delay in the due execution of the contractual obligation due to delays caused by force majeure as defined above, the agreed time of completion of the job covered by this contract or the obligations of the contractor shall be extended by a period of time equal to period of delay, provided that on the occurrence of any such contingency, the contractor immediately reports to BHEL in writing the causes of delay and the contractor shall not be eligible for any compensation.

2.21 **ARBITRATION & RECONCILIATION**

2.21.1 In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision by the Contractor in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the sole arbitration of the arbitrator appointed by BHEL/In charge PESD.

The award of the Arbitrator shall be binding upon the parties to the dispute
Subject as aforesaid, the provisions of Arbitration and Reconciliation Act 1996 (India) or statutory modifications or re enactments thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion

may determine

2.21.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable :

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred to by either party to the arbitration of one of the arbitrators in the department of public enterprises. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties hereto finally and conclusively.

2.21.3 The cost of arbitration shall be borne equally by the parties.

2.21.4 Work under the contract shall be continued during the arbitration proceedings

2.22 **RETENTION AMOUNT**

2.22.1 Retention Amount shall be 5% of executed contract value and shall be recovered at the rate of 5% from each Running Bill admitted, including PVC Bills. Retention amount shall always be retained in cash and shall not be released against BG under any circumstance.

2.22.2 Refund of Retention Amount shall be as follows.

i) 50% of retention amount along with 'Final Bill'

ii) Balance 50% of retention amount shall be retained towards 'Performance Guarantee for Workmanship' and shall become refundable after expiry of Guarantee period, provided all the defects noticed during the guarantee period have been rectified to the satisfaction of BHEL Site Engineer/BHEL Construction Manager, and after deducting all expenses/other amounts due to BHEL under the contract/other contracts entered into by BHEL with them. Bank Guarantees are not acceptable towards this portion of retention

2.23 **PAYMENTS**

Payments to Contractors are made in any one of the following forms

2.23.1 **Running Account Bills (RA Bills)**

i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).

ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents

iii) Recoveries on account of electricity, water, statutory deductions, etc are made as per terms of contract

iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to re do the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to

be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor.

v) In order to facilitate part payment, BHEL Site Engineer at his discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work

2.23.2 **Final Bill**

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope and upon material reconciliation, along with the following.

i) 'No Claim Certificate' by contractor
ii) Clearance certificates where ever applicable viz Clearance Certificates from Customer, various Statutory Authorities like Labor department, PF Authorities, Commercial Tax Department, etc
iii) Indemnity bond as per prescribed format

BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL

2.24 **PERFORMANCE GUARANTEE FOR WORKMANSHIP**

2.24.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of twelve months from the date of commencement of guarantee period as defined in Special Conditions of Contract, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the Guarantee money.

2.24.2 BHEL shall release the guarantee money subject to the following

i) Contractor has submitted 'Final Bill'
ii) Guarantee period as per contract has expired
iii) Contractor has furnished 'No Claim Certificate' in specified format
iv) BHEL Site Engineer/Construction Manager has furnished the 'No Demand Certificate' in specified format
v) Contractor has carried out the works required to be carried out by him during the period of Guarantee and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Guarantee money refundable.

2.25 **CLOSING OF CONTRACTS**

The Contract shall be considered completed and closed upon completion of all contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a completion certificate as per standard format, based on specific request of Contractor.

2.26 **REVERSE AUCTION**:

BHEL reserves the right to go for Reverse Auction for Price Bid Opening by BHEL appointed service provider, instead of opening the submitted sealed price bid in the conventional way. The Business Rules for Reverse Auction shall be as per BHEL guidelines issued from time to time.

2.27 **SUSPENSION OF BUSINESS DEALINGS**

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in

	line with BHEL guidelines issued from time to time.
2.28	**OTHER ISSUES**
2.28.1	Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 100/- unless otherwise required under relevant statutes.
2.28.2	In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.
2.28.3	Unless otherwise specified in NIT, offers from consortium /JVs shall not be considered.
2.28.4	BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts like providing services for Hot water flushing, Chemical Cleaning, Transportation, etc

REVERSE AUCTION GUIDELINES

ANNEXURE – I to GCC of Tender Notice No.

HY/PE&SD/PUR/RIL HMD and RIL DMD/E.C-MECH/001

Annexure – I

Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit „online sealed bid" in the Reverse Auction. Non-submission of „online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.

4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.

5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

8. Reverse auction will be conducted on scheduled date & time.

9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

Annexure - I

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL"s standard practice.

12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the „Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.

13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.

14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

15. In case BHEL decides to go for reverse auction, the H1 bidder(s) (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

Rev00
11th Mar
2014

VOLUME I - D
FORMS & PROCEDURES

(Doc.No. HY/BHEL/PESD/RUPPL-HMD/DMD/F&P/001)

BHARAT HEAVY ELECTRICALS LIMITED

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: will be released later

Form No: F-01 (Rev 00)

OFFER FORWARDING LETTER / TENDER SUBMISSION LETTER

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

Offer Reference No:……. Date:……

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub: Submission of Offer against Tender Specification No: ……

I/We hereby offer to carry out the work detailed in the Tender Specification issued by Bharat Heavy Electricals Limited, Power Sector-……., in accordance with the terms and conditions thereof.

I/We have carefully perused the following listed documents connected with the above work and agree to abide by the same.

1. Amendments/Clarifications/Corrigenda/Errata/etc. issued in respect of the Tender documents by BHEL
2. Notice Inviting Tender (NIT)
3. Price Bid
4. Technical Conditions of Contract
5. Special Conditions of Contract
6. General Conditions of Contract
7. Forms and Procedures

Should our Offer be accepted by BHEL for Award, I/we further agree to furnish 'Security Deposit' for the work as provided for in the Tender Conditions within the stipulated time as may be indicated by BHEL.

I/We further agree to execute all the works referred to in the said Tender documents upon the terms and conditions contained or referred to therein and as detailed in the appendices annexed thereto.

I/We have deposited/depositing herewith the requisite Earnest Money Deposit (EMD) as per details furnished in the Check List.

Authorized Representative of Bidder
Signature:
Name:
Address:

Place:
Date:

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : **Declaration by Authorised Signatory**

Ref : 1) NIT/Tender Specification No: ……..,

2) All other pertinent issues till date

I/We, hereby certify that all the information and data furnished by me with regard to the above Tender Specification are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations and all other pertinent issues till date, and agree to comply with the requirements and Intent of the specification.

I further certify that I am authorised to represent on behalf of my Company/Firm for the above mentioned tender and a valid Power of Attorney to this effect is also enclosed.

Yours faithfully,

(Signature, Date & Seal of Authorized Signatory of the Bidder)

Date:

Enclosed : Power of Attorney

NO DEVIATION CERTIFICATE

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : **No Deviation Certificate**

Ref : 1) NIT/Tender Specification No: ……..,

2) All other pertinent issues till date

We hereby confirm that we have not changed/ modified/materially altered any of the tender documents as downloaded from the website/ issued by BHEL and in case of such observance at any stage, it shall be treated as null and void.

We also hereby confirm that we have neither set any Terms and Conditions and nor have we taken any deviation from the Tender conditions together with other references applicable for the above referred NIT/Tender Specification.

We further confirm our unqualified acceptance to all Terms and Conditions, unqualified compliance to Tender Conditions, Integrity Pact (if applicable) and acceptance to Reverse Auctioning process.

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)

DECLARATION CONFIRMING KNOWLEDGE ABOUT SITE CONDITIONS

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : **Declaration confirming knowledge about Site conditions**

Ref : 1) NIT/Tender Specification No: ……..,

2) All other pertinent issues till date

I/We, _____ hereby declare and confirm that we have visited the Project Site as referred in BHEL Tender Specifications and acquired full knowledge and information about the Site conditions including Wage structure, Industrial Climate, the Law & Order and other conditions prevalent at and around the Site. We further confirm that the above information is true and correct and we shall not raise any claim of any nature due to lack of knowledge of Site conditions.

I/We, hereby offer to carry out work as detailed in above mentioned Tender Specification, in accordance with Terms & Conditions thereof.

Yours faithfully,

(Signature, Date & Seal of Authorized Representative of the Bidder)

Date :

Place:

DECLARATION FOR RELATION IN BHEL

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder failing which the offer of Bidder is liable to be summarily rejected)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : **Declaration for relation in BHEL**
Ref : 1) NIT/Tender Specification No: ……..,

I/We hereby submit the following information pertaining to relation/relatives of Proprieter/Partner(s)/Director(s) employed in BHEL

Tick(√) any one as applicable:

1. The Proprieter, Partner(s), Director(s) of our Company/Firm DO NOT have any relation or relatives employed in BHEL

OR

2. The Proprieter, Partner(s), or Director(s) of our Company/Firm HAVE relation/relatives employed in BHEL and their particulars are as below:

   (i)

   (ii)

Signature of the Authorised Signatory

Note:

1. Attach separate sheet, if necessary.
2. If BHEL Management comes to know at a later date that the information furnished by the Bidder is false, BHEL reserves the right to take suitable against the Bidder/Contractor.

NON DISCLOSURE CERTIFICATE

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

NON DISCLOSURE CERTIFICATE

I/We understand that BHEL PESD is committed to Information Security Management System as per their Information Security Policy.

Hence, I/We M/s…….. who are submitting offer for providing services to BHEL PESD __ against Tender Specification No:_____, hereby undertake to comply with the following in line with Information Security Policy of BHEL PESD.

- To maintain confidentiality of documents & information which shall be used during the execution of the Contract.
- The documents & information shall not be revealed to or shared with third party which shall not be in the business interest of BHEL PESD.

(Signature, date & seal of Authorized Signatory of the bidder)

Date:

BANK ACCOUNT DETAILS FOR E-PAYMENT

(To be given on Letter head of the Company /Firm of Bidder, and **ENDORSED (SIGNED & STAMPED) BY THE BANK** to enable BHEL release payments through Electronic Fund Transfer (EFT/RTGS)

---

1. Beneficiary Name :

2. Beneficiary Account No. :

3. Bank Name & Branch :

4. City/Place :

5. 9 digit MICR Code of Bank Branch :

6. IFSC Code of Bank Branch :

7. Beneficiary E-mail ID (for payment confirmation) :

NOTE: In case Bank endorsed certificate regarding above has already been submitted earlier, Kindly submit photocopy of the same

FORMAT FOR SEEKING CLARIFICATION

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : **Request for Clarification**

Ref : 1) NIT/Tender Specification No: ……..,

2) All other pertinent issues till date

Sl no	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
1				
2				
3				
4				
5				
6				

Yours faithfully,

(Signature, date & seal of Authorized Representative of the Bidder)

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
PE&SD –Hyderabad.
……...
……

CONTRACT AGREEMENT

AGREEMENT NO._____ _____

NAME OF WORK	
NAME OF THE CONTRACTOR WITH FULL ADDRESS	
VALUE OF WORK AWARDED	
LETTER OF INTENT NO.	
TIME ALLOTTED FOR COMPLETING THE WORK (DATE OF COMPLETION)	

_____ _____
SIGNATURE OF CONTRACTOR (SIGNATURE OF BHEL OFFICER)

CONTRACT AGREEMENT

THIS AGREEMENT MADE THIS _____DAY OF_____ between BHARAT HEAVY ELECTRICALS LIMITED (A Government of India Enterprise) a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort New Delhi-110049 (herein after called BHEL) of the ONE PART.

AND

M/S _____
_____ (hereinafter called the `Contractor') of the SECOND PART.

WHEREAS M/s ----------state that they have acquired and possess extensive experience in the field of ----------

And Whereas in response to an Invitation to Tender No. ---------- issued by BHEL for execution of ---------- the contractor submitted their offer No.----------dated ----------And whereas BHEL has accepted the offer of the Contractor on terms and conditions specified in the Letter of Intent No.----------dated ----------read with the references cited therein.

THIS AGREEMENT WITNESSES AND it is hereby agreed by and between the parties as follows:

1. That the contractor shall execute the work of ----------and more particularly described in Tender Specification No ----------including Drawings and Specifications (hereinafter called the said works) in accordance with and subject to terms and conditions contained in these presents, instructions to Tenderers, General Conditions of Contract, Special Conditions, Annexures, Letter of Intent dated ---------- and such other instructions, Drawings, Specifications given to him from time to time by BHEL.

2. The Contractor is required to furnish to BHEL Security deposit in the form of cash/ approved securities/ Bank Guarantee valid upto ---------- for a sum of Rs.---------- towards satisfactory performance and completion of the Contract.

3. The Contractor has furnished a Bank Guarantee bearing no.----------dated ----------for a sum of Rs.----------executed by ---------- in favour of BHEL towards Security Deposit valid upto ---------

OR

The Contractor has furnished to BHEL an initial Security Deposit of Rs.----------in the form of cash / approved Securities/ B.G No.---------- dated ---------- for Rs.----------executed by ---------- in favour of BHEL valid upto ---------- and has agreed for recovery of the balance security deposit by BHEL @ 10% of the value of work done from each running bill till the entire Security Deposit is recovered.

OR

The contractor has furnished to BHEL an initial Security Deposit of Rs.-----(Rs.---------- vide Bank draft No.----------dated ----------and by adjusting EMD of Rs.---------- submitted vide Bank draft No.---------- dt.---------) and has agreed for recovery of balance Security Deposit by BHEL @ 10% of the value of work done from each running bill till the entire security deposit is recovered.

4. The Contractor hereby agrees to extend the validity of the Bank Guarantee for such further period or periods as may be required by BHEL and if the Contractor fails to obtain such extension(s) from the Bank, the Contractor, shall pay forthwith or accept recovery of Rs.---------- from the bills in one installment and the contractor further agrees that failure to extend the validity of the Bank Guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and proper for recovering the said sum of Rs.----------

OR

In case the contractor furnishes the bank guarantee at a later date the contractor hereby agrees to extend the validity of bank guarantee for such further period or periods as may be required by BHEL and if the contractor fails to obtain such extension(s) from the bank, the contractor shall pay forthwith or accept recovery of the amount of bank guarantee given in lieu of security deposit from the bills in one installment and the contractor further agrees that failure to extend the validity of bank guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and proper for recovering the said sum.

5. That in consideration of the payments to be made to the Contractor by BHEL in accordance with this Agreement the Contractor hereby covenants and undertakes with BHEL that they shall execute, construct, complete the works in conformity, in all respects, with the terms and conditions specified in this Agreement and the documents governing the same.

6. That the Contractor shall be deemed to have carefully examined this Agreement and the documents governing the same and also to have satisfied himself as to the nature and character of the Works to be executed by him.

7. That the Contractor shall carry out and complete the execution of the said works to the entire satisfaction of the Engineer or such other officer authorised by BHEL, within the agreed time schedule, the time of completion being the essence of the Contract.

8. That BHEL shall, after proper scrutiny of the bills submitted by the Contractor, pay to him during the progress of the said works such sum as determined by BHEL in accordance with this Agreement.

9. That this Agreement shall be deemed to have come into force from -------- the date on which the letter of intent has been issued to the Contractor.

10. That whenever under this contract or otherwise, any sum of money shall be recoverable from or payable by the Contractor, the same may be deducted in the manner as set out in the General Conditions of Contract or other conditions governing this Agreement.

11. That all charges on account of Octroi, Terminal and other taxes including sales tax or other duties on material obtained for execution of the said works shall be borne and paid by the Contractor.

12. That BHEL shall be entitled to deduct from the Contractor's running bills or otherwise Income Tax under Section 194 (C) of the Income Tax Act, 1961.

13. That BHEL shall be further entitled to recover from the running bills of the Contractor or otherwise such sum as may be determined by BHEL from time to time in respect of

consumables supplied by BHEL, hire charges for tools and plants issued (Where applicable) and any other dues owed by the Contractor.

14. That it is hereby agreed by and between the parties that non- exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents and the liability of the Contractor with respect to compensation payable to BHEL or Contractor's obligations shall remain unaffected.

15. It is clearly understood by and between the parties that in the event of any conflict between the Letter of Intent and other documents governing this Agreement, the provisions in the Letter of Intent shall prevail.

16. The following documents

1. Invitation to Tender No---------- and the documents specified therein.
2. Contractor's Offer No---------- dated----------.
3. _____
4. _____
5. _____
6. Letter of Intent No_____ dated_____.
7. _____

shall also form part of and govern this Agreement.

IN WITNESS HEREOF, the parties hereto have respectively set their signatures in the presence of

WITNESS

1.

2.

(CONTRACTOR)
(to be signed by a person holding a valid Power of Attorney)

WITNESS

1.

2.

(For and on behalf of BHEL)

BANK GUARANTEE FOR SECURITY DEPOSIT

B.G. NO. Date

This deed of Guarantee made this ---------- day of ----------two thousand ----- by <Name and Address of Bank> hereinafter called the "The Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) in favour of M/s Bharat Heavy Electrical Limited (A Govt. of India Undertaking) a company incorporated under the Companies Act, 1956, having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its unit at Bharat Heavy Electricals Limited, PE&SD ,Ramachandrapuram , Hyderabad-502 032 hereinafter called "The Company" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns)

WHEREAS < Contractor's Name and Address> (hereinafter referred to as the Contractor) have entered into a contract arising out of Letter of Intent no. < LOI REF & Date > (hereinafter referred to as "the contract") for < Name of Work > with the company.

AND WHEREAS the contract inter-alia provides that the contractor shall furnish to the company a sum of Rs.---------- (Rupees----------) towards security deposit for due and faithful performance of the contract in the form and manner specified therein.

AND WHEREAS the contractor has approached the Guarantor and in consideration of the arrangement arrived at between the contractor and the Guarantor, the Guarantor has agreed to give the Guarantee as hereinafter mentioned in favour of the company.

The Guarantor do hereby guarantee to the company the due and faithful performance, observance or discharge of the Contract by the contractor and further unconditionally and irrevocably undertake to pay to the Company without demur and merely on a demand, to the extent of Rs.----------(Rupees----------) against any claim by the company on them for any loss, damage, costs, charges and expenses caused to or suffered by the company by reasons of the contractor making any default in the performance, observance or discharge of the terms, conditions, stipulations or undertakings or any of them as contained in the contract.

The decision of the company whether any default has occurred or has been committed by the contractor in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them as contained in the contract and / or as to the extent of loss, damage, costs, charges and expenses caused to or suffered by the company by reason of the contractor making any default in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them shall be conclusive and binding on the Guarantor irrespective of the fact whether the contractor admits or denies the default or questions the correctness of any demand made by the company in any Court, Tribunal or Arbitration proceedings or before any other Authority.

The company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the contract or extend time of performance by the contractor or to postpone for any time and from time to time any of the powers exercisable by it against the contractor and either enforce or forebear from enforcing any of the terms and conditions governing the contract or securities available to the company and the Guarantor shall not be released from its liability under these presents by any exercise by the company of the liberty with reference to the matters aforesaid or by reasons of time being given to the contractor or any other forbearance, act or commission on the part of the company or any indulgence by the company to the contractor or any other matter or thing whatsoever which under the law relating to sureties would, but for this provision have the effect of so releasing the Guarantor from its liability under this guarantee.

The Guarantor further agrees that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the contract and its claim satisfied or discharged and till the company certifies that the terms and conditions of the contract have been fully and properly carried out by the contractor and accordingly discharges this Guarantee, subject however, that the company shall have no claim under this Guarantee after ---------- i.e. (the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time, as the case may be) unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor not withstanding the fact that the same is enforced after the expiry of the said period.

BANK GUARANTEE FOR SECURITY DEPOSIT

The Guarantor undertakes not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing and agrees that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the contractor or the Guarantor shall not discharge the Guarantor's liability hereunder.

It shall not be necessary for the company to proceed against the contractor before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor shall at the time when proceedings are taken against the Guarantor hereunder be outstanding or unrealized.

Notwithstanding anything contained herein before, our liability under the Guarantee is restricted to Rs.---------- (Rupees----------). Our guarantee shall remain inforce until ----------, i.e. (the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time) unless a claim or demand under this guarantee is made against us on or before ---------- we shall be discharged from our liabilities under this Guarantee thereafter.

Any claim or dispute arising under the terms of this documents shall only be enforced or settled in the courts of at Nagpur only.

The Guarantor hereby declares that it has power to execute this guarantee and the executant has full powers to do so on behalf of the Guarantor.

IN WITNESS whereof the ---------- (Bank) has hereunto set and subscribed its hand the day, month and year first, above written.

(Name of the Bank)

Signed for and on behalf of the Bank
(Designation of the Authorized Person Signing the Guarantee)

(Signatory No.----------)

DATED:

SEAL

==========

Notes :

1. The BG shall be executed on non-judicial stamp papers of adequate value procured in the name of the Bank in the State where the Bank is located.

2. The BG is required to be sent by the executing Bank directly to BHEL at the address where tender is submitted / accepted under sealed cover.

BANK GUARANTEE FOR INTEREST BEARING REFUNDABLE ADVANCE

B.G. No. Date

This deed of Guarantee made this _____day of_____two thousand_____by **< Name and Address of Bank>** hereinafter called the "The Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) in favour of M/S Bharat Heavy Electricals Limited a Company incorporated under the Companies Act, 1956, having its registered office at BHEL House, Siri Fort, New Delhi - 110049 through its unit at Bharat Heavy Electricals Limited, PE&SD ,Ramachandrapuram , Hyderabad-502 032, hereinafter called "The Company" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns).

WHEREAS M/s. _____(hereinafter referred to as the Contractor) have entered into a Contract arising out of Letter of Intent no._____dtd_____(hereinafter referred to as "the Contract") for the **< Name of work >** with the Company.

AND WHEREAS the Contract inter-alia provides that the Company will pay to the Contractor interest bearing advance of Rs._____ (Rupees_____ only) on certain terms and conditions specified in the Contract subject to the Contractor furnishing a Bank Guarantee for Rs._____ (Rupees_____ only) in favour of the Company.

AND WHEREAS the Company has agreed to accept a Bank Guarantee from a Bank to cover the said advance.

AND WHEREAS the Contractor has approached the Guarantor and in consideration of the arrangement arrived at between the Contractor and the Guarantor, the Guarantor has agreed to give the Guarantee as hereinafter mentioned in favour of the Company.

NOW THIS DEED WITNESSES AS FOLLOWS:-

(1) In consideration of the Company having agreed to advance a sum of Rs._____ (Rupees_____ only) to the Contractor , the Guarantor do hereby guarantee the due recovery by the Company of the said advance with interest thereon as provided according to the terms and conditions of the Contract. If the said Contractor fails to utilise the said advance for the purpose of the Contract and /or the said advance together with interest as aforesaid is not fully recovered by the Company the Guarantor do hereby unconditionally and irrevocably undertake to pay to the Company without demur and merely on a demand, to the extent of the said sum of Rs._____ (Rupees_____ only) any claim made by the Company on them for the loss or damage caused to or suffered by the Company by reasons of the Company not being able to recover in full the advance with interest as aforesaid.

BANK GUARANTEE FOR INTEREST BEARING REFUNDABLE ADVANCE

---

(2) The decision of the Company whether the Contractor has failed to utilise the said advance or any part thereof for the purpose of the Contract and / or as to the extent of loss or damage caused to or suffered by the Company by reason of the Company not being able to recover in full the said sum of Rs._____ with interest if any shall be final and binding on the Guarantor, irrespective of the fact whether the Contractor admits or denies the default or questions the correctness of any demand made by the Company in any Court Tribunal or Arbitration proceedings or before any other Authority.

(3) The Company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the Contract or extend time of performance by the Contractor or to postpone for any time and from time to time any of the powers exercisable by it against the Contractor and either enforce or forebear from enforcing any of the terms and conditions governing the Contract or securities available to the Company and the Guarantor shall not be released from its liability under these presents by any exercise by the Company of the liberty with reference to the matters aforesaid or by reasons of time being given to the Contractor or any other forbearance, act or commission on the part of the Company or any indulgence by the Company to the Contractor or of any other matter or thing whatsoever which under the law relating to sureties would, but for this provision have the effect of so releasing the Guarantor from its liability under this guarantee.

(4) The Guarantor further agrees that the Guarantee herein contained shall remain in full force and effect during the period till the Company discharges this Guarantee, subject to however, that the Company shall have no claim under this Guarantee after_____ i.e. (the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time, as the case may be) unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor not withstanding the fact that the same is enforced after the expiry of the said period.

(5) The Guarantor undertakes not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing and agrees that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the Contractor or the Guarantor shall not discharge the Guarantor's liability hereunder.

(6) It shall not be necessary for the Company to proceed against the Contractor before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor shall at the time when proceedings are taken against the Guarantor hereunder be outstanding or unrealised.

(7) Notwithstanding anything contained herein before, our liability under the Guarantee is restricted to Rs._____(Rupees_____). Our guarantee shall remain in force until _____, i.e. the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time. Unless a claim or demand under this guarantee is made against us on or before---------, we shall be discharged from our liabilities under this Guarantee thereafter.

BANK GUARANTEE FOR INTEREST BEARING REFUNDABLE ADVANCE

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(8) Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts at Nagpur only.

(9) The Guarantor hereby declares that it has power to execute this Guarantee under its Memorandum and Articles of Association and the executant has full powers to do so on its behalf under the Power of Attorney dated_____ (To be incorporated by the Bank) granted to him by the proper authorities of the Guarantor.

IN WITNESS whereof the _____(Bank) has hereunto set and subscribed its hand the day, month and year first, above written.

(Name of the Bank)

Signed for and on behalf of the Bank
(Designation of the Authorized Person Signing the Guarantee)

(Signatory No.----------)

DATED:

SEAL

==========

Notes :

1. The BG shall be executed on non-judicial stamp papers of adequate value procured in the name of the Bank in the State where the Bank is located.

2. The BG is required to be sent by the executing Bank directly to BHEL at the address where tender is submitted / accepted, under sealed cover.

FORM for EXTENSION OF VALIDITY OF BANK GUARANTEE

1. To be typed on non judicial Stamp Papers of value as applicable in the State of India from where the BG has been issued or the State of India where the BG shall be operated
2. The non judicial stamp papers shall be purchased in the name of the Party on whose behalf the BG is being issued or the BG issuing Bank

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BANK GUARANTEE No:
Date:……...

To

(Write Designation and Address of Officer of BHEL inviting the Tender)

Dear Sir

Sub : Validity of Bank Guarantee No:…….. Dated …….. for …….. Rs ……. in favour of yourself, expiry date ……., on account of M/s ……. in respect of Contract Number……., (herein after called the Original bank Guarantee)

At the request of M/s……., we ……... Bank, having its branch Office at ……... and having Head office at ……., do hereby extend our liability under the above mentioned Bank Guarantee number……... dated ……. for a further period of ……...Months/years from ……. to expire on ……...

Except as provided above, all other terms and conditions of the Original Bank Guarantee No …….. Dated……. shall remain unaltered and binding on us.

Kindly treat this extension as an integral part of the original Bank Guarantee to which it would be attached.

Yours faithfully

Signature……..
Name & Designation……...
Power of Attorney/Signing Power No
Seal of Bank

PE&SD

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Name of Site		Contract No.	
		Name of Contractor	
Review for the month of		Brief Scope of work	
Date of Review			

PART- A PHYSICAL REVIEW

Sl.No.	Description of work	Unit of Measurement	Original Plan (QTY Planned for the month as per joint review of previous month)	Last months shortfall (attributable to Contractor)	Total Planned for the month (including previous month backlog attributable to Contractor)	Achieved	Shortfall attributable to (in Qty)		REMARKS
			(a)	(b)	C=(a)+(b)		BHEL	Contractor	
		UOM	Phy.	Phy	Phy	Phy.	Phy.	Phy.	

Use separate sheets if necessary

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PE&SD	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 2 of 4

CONTRACT NO:

CONTRACTOR:

PART – B-1 REVIEW OF DEPLOYMENT OF MAJOR T&Ps

SUPPLIER SCOPE:-

SN.	MAJOR T&P TO BE DEPLOYED AS PER WORK PLANNED FOR THE MONTH	QTY.	DEPLOYMENT STATUS (ACTUAL DEPLOYED)	REMARKS (WORKS EFFECTED DUE TO NON-DEPLOYMENT OF T&Ps

BHEL SCOPE:-

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PE&SD	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 3 of 4

CONTRACT NO:

CONTRACTOR:

PART – B-2 REVIEW OF DEPLOYMENT OF MANPOWER

SUPPLIER SCOPE:-

SNO.	AREA OF WORK	CATEGORY OF LABOUR	NO. OF LABOUR REQUIRED AS PER CATEGORY	DEPLOYED FOR THE PERIOD	REMARKS (WORKS AFFECTED DUE TO NON-AVAILABILITY OF LABOUR)

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PE&SD	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 4 of 4

CONTRACT No.:

Date of Report:

PART C1 : PLAN FOR THE NEXT MONTH (PHYSICAL)

SL NO.	DESCRIPTION OF WORK (Area Wise)	PLANNED MT/ % / QTY (EXCLUDING SHORTFALLS ATTRIBUTABLE TO CONTRACTOR TILL DATE)	T&Ps REQUIRED	MANPOWER REQUIRED	REMARKS

NOTE: USE SEPARATE SHEETS, IF REQUIRED

PART C2: PLAN FOR THE NEXT MONTH (OTHERS)

SL NO.	DESCRIPTION OF WORK (Area Wise)	PLANNED MT/ % / QTY	T&Ps REQUIRED	MANPOWER REQUIRED	REMARKS

NOTE: USE SEPARATE SHEETS, IF REQUIRED

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PE&SD	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 5 of 4

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

QUARTERLY EVALUATION OF OF CONTRACTOR PERFORM ANCE

NOTE: This evaluation should be done **EVERY QUARTER** * by the respective Regions for all Contracts under executions

*: March, June, September & December of every year

A	GENERAL	
1	Reporting Period	Quarter ending : Year :
2	Name of Site	
3	Name of Contractor	
4	Contract Number/LOI Number & Date	
5	Name of Work	
6	Contract Start Date	
	I. As per Conctract	
	II.Actual Date of Start	
7	Completion Status (as on date)	
	I.Physical completion in %age	
	II.Running Bill amount paid in %age of Contract Value	
8	Scheduled Completion Time	
9	Actual Date of Completion	
10	Awarded Contract Value	
11	Final contract Value	

BHEL	Contractor
(Signature with Name, Designation & date)	(Signature with Name, Designation & date)

QUARTERLY EVALUATION OF CONTRACTOR PERFORM ANCE

		MAX SCORE	SCORE OBTAINED
1.0 QUALITY			
1.1	Amenability to Quality System	5	
1.2	Adherence to Quality Standards	5	
1.3	Preventing recurrence of Defects/Complaints	5	
1.4	Finishing and aesthetics	5	
1.5	Housekeeping	5	
1.6	Rating of Quality Officer for Quality Control of Job	5	
2.0 DELIVERY			
2.1	Achievements vis a vis Requirements/Commitments	5	
2.2	Timely Depoyment of Manpower	5	
2.3	Timely Depoyment of T&Ps and MMEs	5	
2.4	Timely arrangement of Consumables	5	
3.0 MANPOWER			
3.1	Experience and Job knowledge of Supervisory personnel	5	
3.2	Aptitude of supervisory Personnel (w.r.t. Attitude, Initiative, Leadership, Cooperativeness, etc.)	5	
3.3	Adequacy of Manpower (Work Force) deployed	5	
3.4	Competence of Manpower (Work Force) deployed	5	
4.0 T&P, IMTEs &CONSUMABLES			
4.1	Adequacy of T&P & MMEs as per Site requirement	5	
4.2	Condition of T&P & MMEs	5	
4.3	Ensuring Fitness & Calibration of T&P & MMEs	5	
4.4	Adequacy of Consumables as per Site requirement	5	
5.0 SITE INFRASTRUCTURE AND SERVICE			
5.1	Site Organization vis a vis Commitment	5	
5.2	Readiness to rectify Defects	5	
5.3	Providing support Documents and Records	5	
5.4	Speed of responce	5	
5.5	Cooperativeness in Delivering and Implementing Improvement Measures	5	
5.6	Approachability of Top Management during critical requirements and its cooperation	5	

BHEL
(Signature with Name, Designation & date)

Contractor
(Signature with Name, Designation & date)

QUARTERLY EVALUATION OF CONTRACTOR PERFORMANCE

6.0	**SITE FINANCE**		
6.1	Regularity in Payment to Staff and Workers	5	
6.2	Financing Site Operation	5	
7.0	**HSE (Health Safety & Environment) & SA (Social Accountability)**		
7.1	Health & Safety Awareness among Employess	5	
7.2	Rating of Safety Supervisor on HSE Aspects		
7.2.1	Experience and Job knowledge of Safety Supervisor	5	
7.2.2	Rating of safety Supervisor for controlling Safety at Site	5	
7.3	Quality &Usage of Safety gadgets		
7.3.1	Personal Protective Equipments (PPE)	5	
7.3.2	Use of Safety Equipments & Safety in Equipments (Safety Net, Toeguard, Proper earthing,Fire-fighting Equipments etc.)	5	
7.4	Use of Safety Posters	5	
7.5	Compliance to Social Accountablity Norms	5	
7.6	Rating based on feed back of HSE & SA Audits	5	
8.0	**OTHERS**		
8.1	Concern for Employees Welfare and Health (like First Aid)	5	
8.2	Compliance to Statutory Requirements, State and Local Laws/Regulations	5	
8.3	Tendency of taking undue advantage by interpreting Contract Clauses in their favour (Score 5 for no tendency)	5	
8.4	Understanding of Contract (Scope & Contract Clauses)	5	
8.5	Planning of Work Activities(Monthly/Weekly/Daily)	5	
8.6	Submission of Monthly/Weekly/daily Report	5	

BHEL
(Signature with Name, Designation & date)

Contractor
(Signature with Name, Designation & date)

QUARTERLY EVALUATION OF CONTRACTOR PERFORM ANCE

Sl No	Category	Max Score	Score obtained	Weightage factor	Weighted Score
1	Quality	30		0.4	
2	Delivery	20		0.75	
3	Manpower	20		0.6	
4	T&Ps, MMEs & Consumables	20		0.75	
5	Site Infrastructure & Service	30		0.4	
6	Site Finance	10		1.1	
7	HSE & SA	40		0.35	
8	Others	30		0.3	
9	**Total Weighted Score**				
10	Any detail which Construction Manager wants to share with Management				
11	**Less** Score for Accidents attributable to Contractor during the Reporting Period (Major at@3 Minor@1)				
a	Major Accidents-----Fatal,Permanent Disability, Major Damage to Equipment.				(-)
b	Minor Accidents ----- All others				(-)
12	**Net Weighted Score (OUT OF 100):**				

Overall Performance Evaluation : **Good / Satsfactory / Unsatisfactory**

Net Weighted Score

80% and Above - Good
Between 60% To 80% -Satisfactory
60% and Below -Unsatisfactory

Dated: **Section Head/ Site Engineer**

Specific Recommendation of Construction Manager:

Construction Manager

FOR SUB CONTRACT DEPT.

Dated **Head (S/C)**

GM/PROJECTS

Note:This summary evaluation sheet is to be sent to Contractor after every Evalution

BHEL	**ANNUAL EVALUATION OF CONTRACTOR PERFORMANCE** **(EVALUATED FINANCIAL YEAR WISE AT HQ)**	**Page 1 of 1**

1. **Contract No.:**
2. **Contractor:**
3. **Name of Site :**
4. **Reporting Period (Financial Year):**

Sl No	QUARTER	Net Weighted score
1	Quarter-I	
2	Quarter-II	
3	Quarter-III	
4	Quarter-IV	
5	Total for the 4 Quarters	
6	Average for the Year (Financial Year)	
7	**Annual Evaluation of Contractor Performance** (based on net weighted score)	➢ **80% and above : Good** ➢ **Between 60% to 80% : Satisfactory** ➢ **60% and below : Unsatisfactory**

Comments if any:

Head/Subcontracts

Date: **General Manager/Projects**

BHEL	**OVERALL PERFORMANCE OF CONTRACTOR FOR THE CONTRACT** **(EVALUATED CONTRACT WISE AT HQ)**	**Page 1 of 1**

1. **Contract No.:**
2. **Contractor:**
3. **Name of Site :**
4. **Reporting period (From : To :)**

Sl No	FINANCIAL YEAR	QUARTER	Net Weighted score
1		Quarter-I	
		Quarter-II	
		Quarter-III	
		Quarter-IV	
2		Quarter-I	
		Quarter-II	
		Quarter-III	
		Quarter-IV	
3		Quarter-I	
		Quarter-II	
		Quarter-III	
		Quarter-IV	
4		Quarter-I	
		Quarter-II	
		Quarter-III	
		Quarter-IV	
5		Total for all the quarters	
6		Average for the all the Quarters (Contract Period)	
7		**Overall Performance for the Contract** **(based on net weighted score)**	➢ **80% and above : Good** ➢ **Between 60% to 80%: Satisfactory** ➢ **60% and below : Unsatisfactory**

Comments if any:

Head/Subcontracts

Date:

General Manager/Projects

MILESTONE COMPLETION CERTIFICATE
(issued by BHEL on the specific request of Contractor)

Ref :
Date:

To,

(Name & address of Contractor)

Dear Sir,

References
1. Contract No:
2. Job Description:

This is to hereby confirm that the following Milestone Activity has been achieved in respect of the Contract /Job under reference

Sl No	Milestone Activity	Remarks

This certificate is issued as per your request vide letter no …….. without any prejudice to the rights of BHEL in line with the terms and conditions of the above referred Contract

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Construction Manager/Head (Subcontracts)

CONTRACT COMPLETION CERTIFICATE
(Issued by BHEL/HQ on the specific request of Contractor)

Ref :
Date:

To Whom so ever it may concern

1	DESCRIPTION OF WORK	
2	NAME AND ADDRESS OF THE CONTRACTOR	
3	CONTRACT NO	
4	CONTRACT VALUE	
5	LETTER OF INTENT NO & DATE	
6	CONTRACT PERIOD//CONTRACT DURATION	
7	FINAL EXECUTED VALUE	
8	PERFORMANCE	GOOD SATISFACTORY UNSATISFACTORY

This certificate is issued as per your request vide letter no ……..
without any prejudice to the rights of BHEL to use this certificate for evaluation of your offers for future tenders

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Head (Subcontracts)

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

This Indemnity Bond executed by <name of company> having their Registered Office at <xxxxxxxxxxx> in favour of M/s Bharat Heavy Electricals Limited, a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort, Asiad, New Delhi - 110049 through its Unit at Bharat Heavy Electricals Limited, PE&SD ,Ramachandrapuram , Hyderabad-502 032.

And whereas the Company has entered into a Contract with M/s xxxxxxxxx, the executants of this Deed (hereinafter referred to as the Contractor) as its contractor in respect of the work of "xxxxxxxxxxxxxxxxxxxxxxxxxx".

AND WHEREAS under the provisions of GCC further stipulates that the Contractor shall indemnify the Company against all claims of whatever nature arising during the course of execution of Contract including defects liability period of <xx Months > i.e till <xx xx xxxx>

Now this deed witness that in case the Company is made liable by any Authority including Court to pay any claim or compensation etc. in respect of all labourers or other matters at any stage under or relating to the Contract with the Contractor , the Contractor hereby covenants and agrees with the Company that they shall indemnify and reimburse the Company to the extent of such payments and for any fee, including litigation charges, lawyers' fees, etc, penalty or damages claimed against the Company by reason of the Contractor falling to comply with Central/States Laws, Rules etc, or his failure to comply with Contract (including all expenses and charges incurred by the Company).

The Contractor further indemnifies the Company for the amount which the Company may be liable to pay by way of penalty for not making deductions from the Bills of the Contractor towards such amount and depositing the same in the Government Treasury.

The Contractor further agree that the Company shall be entitled to with hold and adjust the Security Deposit and/or with hold and adjust payment of Bills of Contractor

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

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pertaining to this Contract against any payment which the Company has made or is required to make for which the Contractor is liable under the Contract and that such amount can be withheld, adjusted by the Company till satisfactory and final settlement of all pending matters and the Contractor hereby gives his consent for the same.

The Contractor further agrees that the terms of indemnity shall survive the termination or completion of this contract.

The contractor further agrees that the liability of the contractor shall be extended on actual basis notwithstanding the limitations of liability clause, in respect of :

1. breach of terms of contract by the contractor
2. breach of laws by the contractor
3. breach of Intellectual property rights by the contractor
4. breach of confidentiality by the contractor

Nothing contained in this deed, shall be construed as absolving or limiting the liability of the Contractor under said Contract between the Company and the Contractor. That this Indemnity Bond is irrevocable and the condition of the bond is that the Contractor shall duly and punctually comply with the terms and the conditions of this deed and contractual provisions to the satisfaction of the Company.

In witness where of M/s xxxxxxxxxxxx these presents on the day, month and year first, above written at xxxxxxxx by the hand of its signatory Mr. xxxxxxxxxx.

Signed for and on behalf of
M/s xxxxxxxxxxxxxx

Witness:
1
2

CONSORTIUM AGREEMENT

(To be executed on Rs. 50/- Non – Judicial Stamp Paper)

THIS AGREEMENT is made and executed on this _____ day of _____, by and between (1) M/s _____ , (The First Party, i.e, the Bidder) a company incorporated under the Company's Act 1956, having its registered office at _____(herein after called the "Bidder", which expression shall include its' successors, administrators, executors and permitted assigns) and (2) M/s _____, (The Second Party, i.e, the associates (Guarantor)), a company incorporated under the Company's Act 1956, having its registered office at _____ (herein after called the " Guarantor", which expression shall include its' successors, administrators, executors and permitted assigns).

WHEAEAS the Owner, Bharat Heavy Electricals Ltd, a Government of India Undertaking, proposes to issue / issued an NIT (herein after referred to as the said NIT) inviting bids from the individual Bidders for undertaking the work of _____, at _____ (herein after referred to as the said works).

WHEREAS the said NIT enables submission of a bid by a Consortium subject to fulfillment of the stipulations specified in the said NIT.

AND WHEREAS M/s _____ (The First Party, i.e, the Bidder) will submit its proposal in response to the aforesaid invitation to bid by the Owner for _____ as detailed in the Bid doc. no. < TENDER REF-------->

AND WHEREAS M/s _____ (The First Party, i.e the Bidder) is willing to execute the said work under the complete supervision of M/s_____ (The Second Party, the Guarantor) and this tie-up agreement is being entered into with M/s _____ (The Second Party, the Guarantor) , who has guaranteed the first party entire technical support and supervision for executing said works (_____).

WHEREAS the First Party and the Second Party are contractors engaged in the business of carrying out various items of works. WHEREAS the two parties have agreed to constitute themselves into a consortium for the purpose of carrying out the said works by the First Party under the support and supervision of second party, and that the consortium will be continued till the completion of the works in all respects.

WHEREAS the parties have agreed to certain terms and conditions in this regard:

CONSORTIUM AGREEMENT

NOW THEREFORE THIS AGREEMENT WITNESSETH AS FOLLOWS :

1. First and Second parties hereby constitute themselves into a Consortium for the purpose of bidding and undertaking the said works by the first party under the support and supervision of second party pursuant to the said NIT as hereinafter stated.

2. The First Party will be the Prime bidder (Lead Partner) and will be responsible for the entire works and Second Party shall be Back-up Guarantor.

3. The First Party shall undertake the entire scope of work detailed in the NIT namely _____
_____

4. The Second Party shall undertake/guarantee to provide technical support and supervision to first party to carry out entire scope of work.

5. The parties hereby declare and confirm that each of them will fulfill the required minimum qualifying requirements as prescribed in the said NIT.

6. It is also agreed between the parties hereto that all of them shall be individually and severally responsible for the completion of the said works as per the schedule. Further, if the Employer/Owner sustains any loss or damage on account of any breach of the Contracts, we the, Consortium partners individually and severally undertake to promptly indemnify and pay such losses / damages caused to the Employer/Owner on its written demand without any demur, reservation, contest or protest in any manner whatsoever.

7. The parties hereby agree and undertake that they shall provide adequate finances, suitable Tools, Plants, Tractors, Trailers, other transportation equipment, other Tools & Plants, Measuring & Monitoring Equipments (MMEs), Men and Machinery etc. for the proper and effective execution of the works to be undertaken by them as specified here-in-above.

8. It is agreed interse between the parties hereto that all the consequences liabilities etc., arising out of any default in the due execution of the said works shall be borne by the party in default, that is by party in whose area of works default has occurred, provided however, so far as M/s Bharat Heavy Electricals Limited is concerned, all the parties shall be liable jointly and severally.

IN WITNESS HEREOF the parties above named have signed this agreement on the day month and year first above written at _____(Place) .

CONSORTIUM AGREEMENT

WITNESS For

1. NAME (FIRST PARTY)
2. OFFICIAL ADDRESS

WITNESS For

1. NAME (SECOND PARTY)
2. OFFICIAL ADDRESS

[The successful bidder shall have to execute the " JOINT DEED OF UNDERTAKING " in the format to be made available by BHEL at the time of awarding].

REFUND OF SECURITY DEPOSIT

To,

The Construction Manager
BHEL Site Office

Dear Sir,

Sub : **Refund of Security Deposit**
Ref : Contract No: ……..,
Work:……...

I/We have submitted Final Bill in respect of the above Contract/Work vide our letter no:……. dated ……... . In line with Tender conditions (GCC clause no 1.11), kindly arrange to release/refund the Security Deposit along with Final Bill payments.

The details of Security Deposit are as below:

1. Cash Portion :
2. BG Portion :

Thanking You

Date: _____ Authorised representative of Contractor

==========

To be filled up by BHEL

1. Security Deposit to be refunded:
    a. Cash Portion:
    b. BG Portion :
2. Less
    a. Amount spent by BHEL on behalf of Contractor:
    b. Payments made by BHEL on behalf of Contractor:
    c. Other recoveries for Services etc
    d. Any other recoveries
    e. Total of 'a' to 'd':
3. Net Amount to be released (1-2) :
4. Certified that
    a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
    b. Contract Guarantee period of …….. Months commenced wef :_____
    c. All objections raised so far have been settled
    d. A note for refund of Security Deposit has been made in the Measurement Book

Signature of BHEL Engineer

Construction Manager

Date:----------

REFUND OF GUARANTEE MONEY

BHARAT HEAVY ELECTRICALS LIMITED
PE&SD,HYDERABAD.

Ref No: Date:

1. Name and Address of Contractor :
2. Contract Agreement/LOI No :
3. Date of Contract Agreement/LOI :
4. Name of the Work undertaken :
5. Date of commencement of the Work :
6. Date of Completion of the Work :
7. Period of Maintenance (Guarantee Period) :
8. Date on which the Final Bill was paid :
9. Last date of making good the defect during Maintenance Period :
10. Expenditure incurred by BHEL during Maintenance Period, if any, recoverable :
11. Date on which Guarantee Money refund: falls due as per Contract
12. Amount of Guarantee Money to be refunded:
13. Less Amounts recoverable (with details)
    a. Amount spent by BHEL on maintenance :
    b. Payments made by BHEL on behalf of Contractor:
    c. Court dues/penalties/compensation :
    d. Other recoveries for Services, etc :
    e. Total of 'a' to 'd' :
14. Net Amount recommended for release (12-13) :

Signature of BHEL Engineer

Date: _____

REFUND OF GUARANTEE MONEY

BHARAT HEAVY ELECTRICALS LIMITED
PE&SD,HYDERABAD.

CERTIFICATE TO BE FURNISHED BY THE CONTRACTOR

I/We have no claim or demand outstanding against BHEL_____, for the work done or for labour or material supplied or any other account arising out of or connected with the Contract Agreement/LOI (No_____ dated _____) and the payment of this bill shall be in full and final settlement of all my/our claims and demands including the 'Deposits' of the Contract Agreement/LOI referred to.

Signature of Contractor

Date:

CERTIFICATE TO BE FURNISHED BY SENIOR ENGINEER/CONSTRUCTION MANAGER

1. Certified that
    a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
    b. Maintenance period (Contract Guarantee period) is over and the Contractor has carried out the works required to be carried out by him during the period of maintenance (Guarantee) to our satisfaction, and all expenses incurred by the Company on carrying out such works have been included for adjustment
    c. All objections raised so far have been settled
    d. A note for refund of Guarantee Amount has been made in the Measurement Book and Contract Agreement/Work Order

Signature of BHEL Engineer

Construction Manager

Date:----------

FOR USE IN ACCOUNTS DEPARTMENT

Passed for Rs_____ (Rupees _____ only)

Accountant Accounts Officer

ACKNOWLEDGE BY THE CONTRACTOR

Received Rs _____ in full and final settlement of my/our claim

Signature of Contractor

Date:

POWER OF ATTORNEY for SUBMISSION OF TENDER/SIGNING CONTRACT AGREEMENT

(To be typed on non judicial Stamp Papers of appropriate value as applicable and Notarised)

KNOW ALL MEN BY THESE PRESENTS, that I/We do hereby make, nominate, constitute and appoint Mr …….. , whose signature given below herewith to be true and lawful Attorney of M/s…… hereinafter called 'Company', for submitting Tender/entering into Contract and inter alia, sign, execute all papers and to do necessary lawful acts on behalf of Company with Bharat Heavy Electricals Limited, PE&SD, Ramachandrapuram , Hyderabad-502 032 in connection with ……
……
……. vide Tender Specification No : _____, dated _____.

And the Company do hereby agree to ratify and confirm all acts, deeds, things or proceedings as may be lawfully done by the said attorney and by or on behalf of the company and in the name of the company, by virtue of the powers conferred herein and the same shall be binding on the company and shall have full force and effect.

IN WITNESS WHEREOF the common seal of the company has been hereunto affixed in the manner hereinafter appearing on the document.

Dated at _____, this _____ day of _____

Director/CMD/Partner/Proprietor

Signature of Mr……(Attorney)

Attested by: Director/CMD/Partner/Proprietor

Witness

Notary Public

ANALYSIS OF UNIT RATES QUOTED

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

Offer Reference No:…….. Date:…….

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : Analysis of Unit Rates Quoted
Ref : Tender Specification No: ……

Analysis of Unit Rates quoted by us in respect of above Tender is as detailed

SN	DESCRIPTION	% OF QUOTED RATE	REMARKS
01	SITE FACILITIES VIZ., ELECTRICITY, WATER OTHER INFRASTRUCTURE.		
02	SALARY AND WAGES + RETRENCHMENT BENEFITS		
03	CONSUMABLES		
04	T&P DEPRECIATION & MAINTENANCE		
05	ESTABLISHMENT & ADMINISTRATIVE EXPENSES		
06	OVERHEADS		
07	PROFIT		
	TOTAL	100%	

Yours faithfully,

(Signature, Date & Seal of Authorized Representative of the Bidder)

Form WAM 6

BHARAT HEAVY ELECTRICALS LIMITED

DIVISION.....

Running Account Bill

(Para 4.31.1 of Works Accounts Manual)

Name of the Contractor: Departmental Bill no: Date:

Name of the Work: Division: Sub-Division:

Sanctioned Estimate: Date of written order to commence the work :

Code No: Date of commencement of the Work:

Contract Agreement No : Dated: Due date of completion as per Agreement:

1. ACCOUNT OF WORK EXECUTED

On account payment for work not previously previously measured**			Item No of	Description of Work	Quantity as per agree-ment	Quantity executed up to date	Rate	Unit	Payment on the basis of actual measure-ment up to date	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill	Remarks
Total As per Running Account bill	since last running account bill	Total up to date										
Rs.	Rs.	Rs.					Rs.	P.	Rs.	P.	Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12	13

* *1. Whenever payment is made on 'on account' basis without actual measurements the amount in whole rupees should be entered in columns 1 to 3 only and not in columns 7 to 12.

2. whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total up to date in column 4 may become nil.

Form WAM 6 (contd…)

1	2	3	4	5	6	7	8	9	10	11	12	13

Total value of work done up to date	(A) …
Deduct value of work shown on the last Running Account Bill	(B) …
Net value of work done since last	(C) …

Rupees (in words) ……..only.

II.MEMORANDUM OF PAYMENTS

		Rs. P.	I Rs. P.	II Rs. P.
1. Total value of work actually measured as per Account No. I. Column 10	(A)	……		……..
2. Total up to date 'on account' payment for work covered by approximate Or plan measurements as per Account No. I, Column 3	(B)	……		……..
3. Total up to date secured advances on security of materials as per column 8 Of the enclosed Account (Form WAM 10)	(C)	……		……..
4. Total up to date payments [(A) + (B) + (C)]	(D)	……		……..
5. Total amount of payments already made as per Entry (D) of last Running Account Bill No…….. Dated……..forwarded to the Accounts Office on ……..	(E)			
6. Balance [(D)-(E)]		……..……		
7. Payments now to be made:				
a) by cash/cheque			……	
b) by deduction for value of materials supplied				
c) by BHEL vide Annexure A attached			……	
d) by deduction for hire of tools and plant vide Annexure B attached			……	
e) by deduction for other charges vide Annexure C Attached			……	
f)by deduction on account of security deposit			……	
h) by deduction on account of Income Tax			……	……

Note: Amounts relating to items 4 to 6 above should be entered in column II and those relating to item 7 in column I. The amount shown against item 6 and the total of item 7 should agree with each other.

III.CERTIFICATE OF THE ENGINEER IN CHARGE **Form WAM 6 (contd…)**

1. The measurements on which the entries in column 7 to 12 of Part I of this Bill (Account of work executed) are based were made by……..and are recorded at pages……...of
(Name and Designation)
Measurement Book No ……..
2. Certified that the methods of measurement are correct and the work has been carried out in accordance with the terms and conditions, schedules, specifications and drawings etc, forming part of the contract agreement, subject to deviations included in the deviation statement (Annexure D).
3. Certified that in addition to and quite apart from the quantities of work actually executed as shown in column 10 of Part I, some work has actually been done in connection with several items and the value of the such work is, in no case, less than 'on account' payments as per column 3 of Part I, made or proposed to be made, for the convenience of the contractor in anticipation of, and subject to the results of, detailed measurement which will be made as soon as possible.

Signature of Contractor — Signature of Engineer in charge
Date: — Designation:
Date:

IV. CERTIFICATE OF THE SENIOR ENGINEER

1. Certified that measurements have been check measured to the prescribed extent by ……... ……..at site and also by the undersigned and the relevant entries have been intialled in the Measurement book. (vide pages……)
(Name and Designation)
2. Certified that all the measurements recorded in the measurement book have been correctly billed for
3. Certified that all recoberable amounts in respect of materials tools and plant etc, and other charges have been correctly made vide Annexures A to C attached.

Certified for payment * of Rs……..(Rupees……..only)
To be paid in cash/by cheque in the presence of ……..

ALLOCATION

The expenditure is chargeable as under and to be included in the accounts for…….20……

Ledger Head	Debit (Gross amount) Rs. P.	Credit (Deductions) Rs. P.
_____	_____	_____
Total	_____	_____
	_____	_____

* Here specify the net amount payable.

Signature of Senior Engineer
Date:

Form WAM 6 (contd…)

V. ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Accounts Bill No ……Dated……...
Entered in Journal Book vide entry No……..Dated……..
Passed for……Rs……
Less Deductions……...Rs……..
Net Amount Payable……..Rs……....
(Rupees……..only)
Payable to Shri/M/s……by cheque/cash
Entered in Contractor's Ledger No……Page……...

ALLOCATION

Estimate No: Code no:
Name of the Work:

Ledger Head	Debit (Gross amount) Rs. P.	Credit (Deductions) Rs. P.
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _
	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _
Total	_ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _

Assistant Accountant Account Officer
Date: Date: Date:

VI. Received Rs……(Rupees……only) as per Memorandum of Payments on account of this work.

Signature of witness
Address :

Date:

Revenue Stamp
Signature of Contractor
Date:

VII. ENTRIES TO BE MADE BY TREASURY SECTION

Cash Book entry No. and date:

Amount paid Rs……..

Amount unpaid Rs……..

Total Rs……..

Signature of Cashier
Date:

Form WAM 6 (contd…)

ANNEXURE A

Statement showing details of materials issued to the contractor Shri/M/s……

In respect of Contract Agreement No ……...Dated……

Sl. No.	Stores issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued to the contractor	Quantity issued	Quantity actually incorp-rated in the work	Whether recover-able from the contrac-tor or supplied free	If recoverable from the contractor				REMARKS
							Rate at which recover-able	Amount recover-able	Amount recover-ed up to previous bill	Balance now recover-ed	
							Rs. P.	Rs. P.	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12
			Total								

Signature of contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

Form WAM 6 (contd…)

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri/M/s……

In respect of Contract Agreement No ……...Dated……

Sl. No	Description of tools and plant issued	Period for which Issued	Rate at which recovery Is to be Made Rs. P.	Amount recover-able Rs. P.	Amount recovered upto previous bill Rs. P.	Balance now recovered Rs. P.	Remarks
1	2	3	4	5	6	7	8
		Total					

Signature of contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

Form WAM 6 (contd…)

ANNEXURE C

Statement showing details of other recoveries to be made from the contractor Shri/M/s……

In respect of Contract Agreement No ……..Dated……

Sl. No	Particulars	Unit	Quantity	Rate	Amount recover-able	Amount recovered upto pre-vious bill	Amount now recovered	Remarks
				Rs. P.	Rs. P.	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9
1.	Water Charges							
2.	Electricity charges							
3.	Seignorage charges							
4.	Medical charges							
5.	Cost of empty gunny bags and Empty containers not returned							
6.								
7.								
8.								
9.								
10.								
	Total							

Signature of contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

Form WAM 6 (contd…)

ANNEXURE D

Name of the Contractor: Contract Agreement No:
Name of the Work: Date:

Sl. No.	Description of item	Unit	Quantity as per Agreement	Quantity as executed	Quantity further anticipated	Total quantity anticipated on completion	Rate as per agreement Rs. P.
1	2	3	4	5	6	7	8

Rate as executed Rs. P.	Amount as per agreement Rs. P.	Amount as executed Rs. P.	Amount further anticipated Rs. P.	Total amount anticipated on completion Rs. P.	Difference Excess Rs. P.	Difference savings Rs. P.	Reason for the deviation with authority, if any
9	10	11	12	13	14	15	16

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE G

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulers and answers to be recorded)	
Name of the work :	
Name of the Contractor :	
Date of commencement of the work:	
Contract agreement/work ordered no. and date:	
Reference to supplementary agreement no,if any :	
Whether adminstrative approval and techanical sanction has been accorded by the cmpetent authority ? If so ,citc reference	
Whether sanction of the competent authority and financial concurrencr of the Accounts Departnment for award of the work has been accorded ? If so,cite reference.	
Wheter the work has been completed in time ? If not ,wheter penalty has been levied or sanction of the competent authority for extension of time granted and communicated to the Accounts Department with reasons for grant of extension? (Due and actual date of completion of the work and reference to letter no. and date granting the extension of time should be given)	
(a) Wheter the rates allowed in the bill have been checked with the contract agreement ? (b) Wheter the rates for extra/supplemental items have been approved by the competent authority and the sanction communicated to the accounts Department together wiht rate analysis? If so,cite reference.	
Wheter deviations have been approved by the competent authority? If yes, give reference to the approval; if not, give reasons.	
Whether the rates of recovery of stores issued to the contractor which are not provided for in the Contract Agreement have been settled in counsultation with Finance?	
Whether discrepancies pointed out by the Accounts Department in the store statement have been reconciled and accepted by the Accounts Department?	

ANNEXURE G

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulers and answers to be recorded)	
Whether materials issued to the contractor in excess of the theoretical requirements have been returned to the Stores Department and the no. and date of such retuened stores vouchers have been shown in stores statement? If not ,whether the cost of such excess material has been recovered at the prescribed rate? Whethre consumption statements in respect of materials chargeabale to the work have been attached to the bill?	
Whether consumption of materials shown has been technicaly checked by Senior Engineer?	
Whether materials isshued and used in the work is not less then that required for consumption in work accroding to our specification? If comsumption is less, whether necessary recovery has been made in the bill?	
Whether mesurments have been checked by the Engineer and Sr. Engineer to the extent required and certificates of check recorded in the mesurments books?	
Whether contractor has signed the bill and the mesurments books without reservations? If not; whether resones have been intimated to the Accounts Department?	
Whethet arithmatical calculations have been checked and certificate recorded in the mesurment books by a person other than the one who calculated initially	
Whether any work was done at the risk and cost of the contractor and whether such cost has been recovered from him? Give particulers.	
Whether all advance payments on running Accounts have been recovered?	
Whether tall the recovries due to services given to the contractor like rent of accommodation, water charges, electricity charges etc. have been recovered and wheather payments made by the company on behalf of the contractor have been adjusted?	
Whether the files containing abstracts from mesurments books/ standared mesurment books have been completed/ updated?	
Whether hire charges of tools and plant have been recovered and the statement of hire charges with full details attached?	

ANNEXURE G

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulers and answers to be recorded)	
Whether the certificate of workmanship and completion of work according to specifications, drawings etc. is recorded by Engineer/ Sr. Engineer and whether recoveries have been made for defective works, if any?	
Whether all corrections in the bill/measurement books etc. have been neatly made and attasted and there are no overwriting?	
Whether final measurments have been taken as soon as possibal after completion of work and the cretificate of complition issued? If not, whether resons for delay have been recorded and communicated to Accounts?	
In respect of Quintites reduced in the final bill as compare to the running payment, whether adequate reasons have been recorded and communicated to Accounts	
Whether the Expeinditure has been classified correctly according to heads of Account recorded in the sanctioned estimate?	
Whether the work has been completed within the estimated cost? If not, what is the percentage of excess over thw sanctioned estimate/ addministrative approval? In case the excess is beyond the competency of Sr. Engineer, what action has been taken for the obtaining the approval of the authority complent to sanction the excess?	
(a) If the contractor has furnished bank guarantee in lieu of cash sequrity deposit towards proper exicuation of works and guarantee against defectsduring the maintenance period, whether the period of currency of the bank guarantee cover the entire maintenance period? (b) If not, whether sequrity deposite has been proposed to be recovred from the final bill?	
Whether all the previous audit objections raised on running Account bills have been settled? If so, cite refrence.	
Signature of Engineer in Charge	Signature of Engineer in Charge
Date:	Date:

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION……..
……And Final bill
(Para 4.3.2 Of Works Accounts Manual)

Name of Contractor		Departmental Bill no		Date	
Name of the Work		Division		Division	
Sanctioned Estimate		Date of written order to commence the work			
Contract Agreement/work Order No		Date of commencement of work			
		Due date of completion as per agreement			
		Date of actual completion of the work			

I. ACCOUNT OF WORK EXECUTED

On Account payment for the work not previously measured **												
Total as per last running account bill Rs.	Since last running account bill Rs	Total up to date Rs	Item No of the agreement/ work order	Description of work	Quantity as per agreement	Quantity executed up to date	Rate Rs. P	Unit	Payment on the basis of actual measurement up to date Rs P	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill Rs P	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13

1	2	3	4	5	6	7	8	9	10	11	12	13

Total Value of Work Done up to date	(A)	
Deduct Value of work shown on the last running account bill	(B)	
Net value of work done since last running account bill	(C)	

Rupees (In Words).....Only

II MEMORANDUM OF PAYMENT

		Rs.	P
1	Total Value of work actually measured as per Account no I coloumn 10 (A)		
	Deduct amount of paym,ents already made as per last running account bill No ……. Dated…….		
2	Forwarded to the Accounts Office on ……. (B)		
3	Payments now to be made { (A) - (B)} (C)		
4	Deduct ammounts recoverable from the contractor on account of :	Rs	P
	a Material suplied by BHEL vide annexure A attached		
	b Hire of Tools & Plants vide Annexure B attached		
	c Other charges vide Annexure C attached		
	d Income Tax		
	Total deduction		
5	Balance		
6	Refund of 50% of security deposite on completion of work		
7	Net amount to be paid to the Contractor		

III. CERTIFICATE OF THE ENGINEER IN CHARGE

The measurement on which the entries in coulmns 7 to 12 of Part I of this bill (Account of work executed) are based were made by ……..

1 (Name and designation)

2 A statement showing the quantities of stores issued to the contractor (whether free or on recovery basis) and their disposal is attached.

Date:

Signature of Engineer in charge
Designation

IV CERTIFICATE OF THE SENIOR ENGINEER

1 Certified that I have personally inspected the work and that the work has been physically completed on the due date in accordance with the terms and Cretified that the measurements have been check measured to the prescribed extent by …….. ……. (Name & designation). And by the the undersigned at site and relevent entries have been initiated in the measurement book (vide
2 pages…… ….)

3 Certified that the methods of measurement are correct

4 Certified that the measurements have been technically checked with reference to contract drawings, deviations etc

5 Certified that all the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.

6 Certified that all the recoverable amounts in respect of stores, tools and pa\lant, e\water, electricity charges etc, have been correctly made vide Annexures A

7 Certified that the issues of all stores as per statement atytached (whether charged to the contractor or direct to the work) have been technically checked and

Certified for payment of * Rs …… (Rupees…… (Only). To be paid in cash/by cheque in the presence of ……..

ALLOCATION

The expenditure as under and to be included in the accounts for ……..19

Ledger Head	Debit (Gross Amount) Rs. P	Credit (Deduction) Rs. P
……	……	……
Total	……	……

* Here specify the net amount payable

Signature of Senior Engineer
Date

V. ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Account Bill no…… Dated …….
Entered in Journal book vide entry No……Dated……
Passed for……..Rs……..
Less Deductions……..Rs……
(Rupees…….Only)
Payable to Shri/M/s……..... by cheque/cash
Entered in contractors' Ledger no..... Page

Assistant Accountant Accounts officer
Date: Date: Date:

ALLOCATION

Estimate No: Code No

Name of the Work ……

Ledger Head	Debit (Gross Amount) Rs P	Credit (Deduction) Rs
…….	.....	.....
Total	.....	.....

VI. Received Rs……..(Rupees……..Only) in full and final settlement of all moneys due under this contract and I / we have no further claims of this contract.

Signature of Witness
Address

Revenue Stamp
Signature of Contractor
Date:

VII . ENTRIES TO BE MADE BY TREASURY SECTION

Cash book entry no and date :

Amount Paid Rs……
Amount unpaid Rs……..
Total Rs……..

Signature of Cashier
Date:

ANNEXURE A

Part I

Statement showing details of material issued to the contractor Shri/M/s…….. In respect of Contract Agreement/Work Order No…….. Dated …….

Sl No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from contractor						Remarks
							Rate at which recoverable		Amount Recoverable		Amount recoverable upto previous bill		Balance Now recovered		
							Rs	P	Rs	P	Rs	P	Rs	P	
1	2	3	4	5	6	7	8		9		10		11		12

Total ……

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE A

Part II

Statement showing details of material issued to the contractor Shri/M/s…….. in respect of Contract Agreement/Work Order No…….. Dated ……..and not covered by the agreement

Sl No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate Rs P	Amount Recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	Remarks
1	2	3	4	5	6	7	8	9	10	11

Total ……

Add Departmental Charges

Add Sales Tax (wherever applicable) ……..

Total ……..

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE B

Statement showing TOOLS & PLANTS issued to the contractor Shri/M/s…….. in respect of Contract Agreement/Work Order No…….. Dated …….and not covered by the agreement

Sl No	Description of tools & plants issued	Period for which issued	Rate at which Recivery is to be made	Amount recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	Remarks
1	2	3	4	5	6	7	8

Total ……

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE C

showing detail of other recoveries to be made from the contractor Shri/M/s……

ıent/Work Order No……Dated……

Sr.No	Particulars	Unit	Quantity	Rate Rs. P.	Amount recoverable Rs. P	Amount recovered upto previous bill Rs. P.	Amount now recovered Rs. P.	Remarks
1	2	3	4	5	6	7	8	9
1	Water Charges							
2	Electricity Charges							
3	Seignorage Charges							
4	Medical Charges							
5	Cost of empty gunny bags and empty containers not returned							
6								
7								
8								
9								
10								
	Total							

Signature of Contractor
Date

Signature of Engineer Incharge
Date

Signature of Sr. Engineer
Date

ANNEXURE F

Statement showing detail of materials issued to the contractor Shri/M/s……
ct of Contract Agreement/Work Order No……Dated……

Name of work; **FREE OF COST**

Sr.No	Stores issue voucher No.	ription of ma	Unit	Quantity issued	Quantity requried as per data	Quantity consumed in the work	Balance(If any)	Nature of disposal for the balance	Rate chargeable for material not returned Rs.P.	Amount recoverable for material not returned Rs. P	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
				Total							

Signature of Contractor
Date

Signature of Engineer Incharge
Date

Signature of Sr. Engineer
Date

Note:Data statement of therotical consumption should be attached in support of the quantity specified in coloumn 6