T E N D E R S P E C I F I C A T I O N

No. BHE/PW/PUR/FINSE-STG/684

Port clearance at Djibouti / Mele port and cross country Transportation of Cargo to Finchaa Sugar Factory ,Receipt of equipment / material at site, ,Unloading ,Inspection, Verification, reporting shortages / damages, Storage, Up-keeping during storage, Collection of materials from BHEL/client's stores/storage yard; transportation to site; erection, testing & assistance for commissioning, trial operation of Surface Condenser, Steam Turbine, Generator, Piping, Pumps & Auxiliaries including Electrical and Control & Instrumentation equipments / components, application of Thermal Insulation, Final Painting, assistance for PG test etc. and Handing over of 2x12 MW STG set at Finchaa Sugar Factory Expansion Project , Oramia Regional State, Finchaa Valley, Agamsa of Ethiopia.

at

FINCHAA SUGAR FACTORY EXPANSION PROJECT

ORAMIA REGIONAL STATE, FINCHAA VALLEY

AGAMSA, ETHIOPIA

PART I

(TECHNICAL BID SPECIFICATION, NOTICE INVITING TENDER & GCC)

Bharat Heavy Electricals Limited

Power Sector Western Region

345-Kingsway,

Nagpur 440 001

C O N T E N T S

SL. NO.	DESCRIPTION	SECTION/ APPENDIX NO.	NO OF PAGES
	PLAN BY THE CONTRACTOR		
29.	MONTHWISE T&P DEPLOYMENT PLAN BY CONTRACTOR	APPENDIX-IV	1
30.	Planned Man Days	APPENDIX-V	1
31.	DETAILS OF CONCURRENT COMMITMENT	APPENDIX-VI	1
32.	Analysis Of Unit Rate	APPENDIX-VII	1
33.	RATE SCHEDULE (PRICE BID : PART-II)		**@**
	Drawings		**##**

LEGEND:

$: Included in Tender Specifications Part-I. Hosted in BHEL web page (www.bhel.com) as file titled **"NIT+GCC-684".**

@: Issued as separate hard copy booklet 'Tender Specifications Part-II (Price Bid-684)'. Hosted in BHEL web page (www.bhel.com) as file titled **"PRICE BID-684"**

Drawing Nos

1. 2-162-14-00409 Rev 00
2. 2-166-03-00462 Rev 00
3. 1-161-01-00573 Rev 00
4. 3-165-01-00435 Rev 00
5. 1-160-10-01192 Rev 00

} Attached with Tender Specifications Part-I.

Note:

Rest of the tender documents are included in Tender Specifications Part-I. Hosted in BHEL web page (www.bhel.com) as file titled "**TECH BID-684"**

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)
POWER SECTOR - WESTERN REGION
345, KINGS WAY - NAGPUR 440 001

TENDER SPECIFICATION No. BHE/PW/PUR/FINSE-STG/684

ISSUE DETAILS

Name Of The Work : Port clearance at Djibouti / Mele port and cross country Transportation of Cargo to Finchaa Sugar Factory ,Receipt of equipment / material at site, ,Unloading ,Inspection, Verification, reporting shortages / damages, Storage, Up-keeping during storage, Collection of materials from BHEL/client's stores/storage yard; transportation to site; erection, testing & assistance for commissioning, trial operation of Surface Condenser, Steam Turbine, Generator, Piping, Pumps & Auxiliaries including Electrical and Control & Instrumentation equipments / components, application of Thermal Insulation, Final Painting, assistance for PG test etc. and Handing over of 2x12 MW STG set at **FINCHAA SUGAR FACTORY EXPANSION PROJECT , ORAMIA REGIONAL STATE, FINCHAA VALLEY, AGAMSA OF ETHIOPIA.**

EARNEST MONEY DEPOSIT: Please see Special Conditions of Contract.

LAST DATE FOR TENDER SUBMISSION: Please obtain updated information from web page "http://www.bhel.com" → Tender Notifications → View Corrigendums.

THESE TENDER SPECIFICATION DOCUMENTS CONTAINING **PART-I** AND **PART-II** ARE ISSUED TO:

M/s. ……

…….

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

Dy. General Manager (Purchase)
Place: Nagpur
Date:

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR-WESTERN REGION

'Shreemohini' Complex, 5th floor
345-Kingsway Nagpur 440001
Phone: 0712-3048600-604 Fax: 0712-3048 605, 698, 699

PROCEDURE FOR SUBMISSION OF SEALED TENDERS

THE TENDERER MUST SUBMIT THEIR TENDERS AS REQUIRED IN TWO PARTS IN SEPARATE SEALED COVERS PROMINENTLY SUPERSCRIBED AS PART-I TECHNICAL BID AND PART-II PRICE BID AND ALSO INDICATING ON EACH OF THE COVERS THE TENDER SPECIFICATION NUMBER AND DUE DATE AND TIME AS MENTIONED IN THE TENDER NOTICE.

PART-I (TECHNICAL BID) COVER-I

EXCEPTING RATE SCHEDULE, ALL OTHER SCHEDULES, DATA SHEETS AND DETAILS CALLED FOR IN THE SPECIFICATION SHALL BE ENCLOSED IN PART-I "TECHNICAL BID" ONLY.

PART-II (PRICE BID) COVER-II

ALL INDICATIONS OF PRICE SHALL BE GIVEN IN THIS PART-II "PRICE BID". **EMD SHALL NOT BE INCLUDED IN THIS COVER.**

THESE TWO SEPARATE COVERS-I AND II (PART-I AND PART-II) SHALL TOGETHER BE ENCLOSED IN A THIRD ENVELOPE (COVER-III) ALONGWITH REQUISITE EMD AS INDICATED EARLIER AND THIS SEALED COVER SHALL BE SUPERSCRIBED AND SUBMITTED TO ADDL. GEN MANAGER (PURCHASE) AT THE ABOVE MENTIONED ADDRESS ON OR BEFORE THE DUE DATE AS INDICATED.

THE QUALIFIED TENDERER WILL BE INTIMATED SEPARATELY ABOUT THE STATUS OF THEIR OFFER.

TENDERER ARE REQUESTED TO MAKE SPECIFIC NOTE OF THE FOLLOWING CONDITIONS:

- CONTRACTOR SHOULD HAVE ADEQUATE RESOURCES INCLUDING MAJOR T&PS AT HIS DISPOSAL FOR THIS JOB.
- CONTRACTOR SHOULD HAVE SOUND FINANCIAL STABILITY.
- TENDERER SHOULD MEET QUALITY REQUIREMENT REGARDING WORKMANSHIP, DEPLOYMENT OF PERSONNEL, ERECTION TOOLS AND NECESSARY INSPECTION, MEASUREMENT & TESTING INSTRUMENTS.
- ALL INFORMATION AS CALLED FOR IN VARIOUS APPENDICES AND CLAUSES OF TENDER SPECIFICATION SHOULD BE FURNISHED IN COMPLETENESS. PLEASE REFER THE CHECKLIST.
- CLARIFICATION ON TENDER IF ANY, SHALL BE OBTAINED BY THE TENDERER BEFORE SUBMITTING THEIR OFFER.
- OFFERS MUST BE SUBMITTED WITHOUT ANY DEVIATION.
- OFFERS RECEIVED WITH ANY DEVIATION OR WITHOUT RELEVANT INFORMATION AS DESCRIBED ABOVE ARE LIABLE TO BE REJECTED. PRICE BIDS RECEIVED IN THE FORM OTHER THAN SPECIFIED IN PART-II (PRICE BID) ARE LIABLE TO BE REJECTED.
- In case customer approval is required for this package, bidder's offer will be accepted subject to approval of bidder by customer.

SOME SPECIAL CONDITIONS OF THIS TENDER ARE AS BELOW :

1) **Only Indian bidder shall be eligible to participate in this tender.**

2) **The Indian bidder who is submitting the offer should necessarily fulfill the QR (Qualifying Requirement) and other tender conditions. The Indian Bidder will be permitted to have a tie up for execution of limited portions of work with the agencies locally available in Ethiopia, on prior approval of BHEL. However back to back tie up is NOT permitted.**

3) **The Indian bidders shall only be allowed to submit their offers & quoted rates shall be Indian rupees only.**

PROJECT INFORMATION

Finchaa Sugar Factory, Ethiopia on behalf of Government of Federal Democratic Republic of Ethiopia having its principal place of business at Oramia Regional State, Finchaa Valley, Agamsa, Ethiopia intended to expand existing Sugar Factory with designed cane crushing capacity of 500 tons per hour at Finchaa.

M/s Finchaa Sugar Factory have engaged M/s Overseas Infrastructure Alliance (India) Pvt Ltd having its pricipal place of Business at 1205, Surya Kiran Building, 19, Kasturba Gandhi Marg, New Delhi – 110001 as their EPC contractor.

M/s Overseas Infrastructure Alliance (India) Pvt Ltd have awarded job of Design, Manufacture, Supply to Port Djibouti, transport to the site (Finchaa Sugar Factory), Store, Erection of mechanical and electrical equipment, train employers personnel, commissioning, testing and handover Power Generation Plant of capacity 2x12MW STG with associated civil works to Bharat Heavy Electrical Limited having its Head Office at BHEL House, Siri Fort, New Delhi – 110049 (India)

LOCATION & APPROACH

1) Project Name: Finchaa Sugar Factory Expansion Project , 2x12 MW

2) Project Location: Finchaa Sugar Factory, Oramia Regional State, Finchaa Valley, Agamsa ,Ethiopia.

3) Transport facilities:

A) Road : Project site is located in the Wolega zone of Aroma region, about 350 km West of Addis Ababa.

B) Airport : Nearest Airport is Addis Ababa.

C) Sea Port : Port of entry for imported goods by marine transport is 'Port of Djibouti', which is around 1300 km from site.

CLIMATIC CONDITIONS:

1) Maximum ambient Temperature (shade)	:	+34^{o} Centigrade
2) Minimum ambient Temperature(shade)	:	+11^{o} Centigrade
3) Relative Humidity range	:	62% to 96% (average 84%)
4) Rainy season	:	June to October
5) Average rainfall	:	1300 mm
6) Average wind speed	:	3.4km/h.
7) Dust condition	:	Very dusty, contains sugar and splashes of molasses
8) Area classification electrical	:	Hazardous class-I, Division-1A, Refinery Sugar handling

GEOGRAPHICAL CONDITIONS:

1) Height above Mean Sea level	:	1500 m
2) Seismic zone	:	Zone - II.

CHECK LIST

(VIDE PARA 1.3 OF SECTION-I OF GENERAL CONDITIONS OF CONTRACT)

1	NAME OF THE TENDERER WITH ADDRESS		
2	NATURE OF THE FIRM	LIMITED / PARTNERSHIP / PROPRIETARY	
3	EMD DETAILS (Rs. 2.0 LACS BY DD ONLY OR ONE TIME EMD)		
4	VALIDITY OF OFFER (REQUIRED 6 MONTHS FROM DUE DATE)		
5	MOBILIZATION TIME (FROM FAX LOI)		
6	WHETHER NO DEVIATION CERTIFICATE FURNISHED	YES	NO
7	TENDERER HAS VISITED THE PROJECT SITE AND ACQUAINTED WITH THE SITE CONDITIONS	YES	NO
8	DETAILS OF CONCURRENT JOBS ARE FURNISHED (AS PER RELEVANT APPENDIX)	YES	NO
9	HEAD QUARTER'S ORGANISATION IS FURNISHED	YES	NO
10	PROPOSED SITE ORGANISATION IS FURNISHED	YES	NO
11	FINANCIAL STATUS OF THE COMPANY (RELEVANT ANNEXURE OF GCC) IS FURNISHED	YES	NO
12	PROFIT & LOSS ACCOUNT FOR PRECEDING THREE YEARS IS FURNISHED	YES	NO
13	LATEST SOLVENCY CERTIFICATE FROM THE BANKER IS FURNISHED	YES	NO
14	LATEST INCOME TAX CLEARANCE CERTIFICATE OR COPY OF PAN CARD ACCOMPANIED BY 'IT RETURN' COPY IS FURNISHED	YES	NO
15	MANPOWER DEPLOYMENT PLAN (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
16	MONTHWISE DEPLOYMENT PLAN FOR MAJOR T&P (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
17	ANALYSIS OF UNIT RATES QUOTED (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
18	POWER OF ATTORNEY ENCLOSED IN FAVOUR OF PERSON MAKING OFFER.	YES	NO

19	DETAILS OF SIMILAR WORK DONE IN LAST SEVEN YEARS (AS PER RELEVANT APPENDIX) AND SUPPORTING DOUCMENTS FURNISHED.	YES	NO
20	PROGRAMME FOR THE SUBJECT WORK FURNISHED	YES	NO
21	BIDDER HAS FMILIARIZED HIMSELF WITH ALL RELEVANT LOCAL LAWS & CONDITIONS.	YES	NO
22	WHETHER ALL THE PAGES OF THE TENDER DOCUMENTS ARE READ, UNDERSTOOD AND SIGNED	YES	NO
23	WHETHER THE FOLLOWING DETAILS PERTAINING TO YOUR BANK ACCOUNT DULY ENDORSED BY THE BANK HAVE BEEN FURNISHED {TO ENABLE BHEL RELEASE PAYMENTS THROUGH ELECTRONIC FUND TRANSFER (EFT/RTGS) AS SPECIFIED IN SECTION 12 } 1. Name of the Company 2. Name of Bank 3. Name of Bank Branch 4. City/Place 5. Account Number 6. Account type 7. IFSC code of the Bank Branch 8. MICR Code of the Bank Branch	YES	NO

NOTE: STRIKE OFF YES OR NO, AS APPLICABLE

DATE: SIGNATURE OF TENDERER

DECLARATION BY BIDDER

I, ---------- hereby certify that all the information and data furnished by me with regard to this tender specification no. **BHE/PW/PUR/FINSE-STG/684** are true and complete to the best of my knowledge. I have gone through the specification, conditions and stipulations in detail and agree to comply with the requirements and intent of the specification. I further certify that I am duly authorised representative of the under-mentioned bidder and a valid power of attorney to this effect is also enclosed.

Authorised representative's signature

Name and address

Seal of the bidder

Certificate of No Deviation

Tender Specification No. BHE/PW/PUR/FINSE-STG/684

I/we, M/s…...……...

hereby certify that in our offer I/we have neither set any terms and conditions nor there are any deviations taken from the tender conditions, either technical or commercial, and I/we agree to all the terms and conditions mentioned in the tender specification.

Signature of the bidder

Date:

Section-3

OFFER OF BIDDER

AGM (Purchase)
Bharat Heavy Electricals Limited
Power Sector - Western Region
Shreemohini Complex 345, Kingsway
Nagpur- 440 001

Dear Sir,

I/we hereby offer to carry out the work detailed in Tender Specification **No. BHE/PW/PUR/FINSE-STG/684** for 2x12 MW Unit#1&2 issued by Bharat Heavy Electricals Limited, Power Sector-Western Region, Nagpur, in accordance with the terms and conditions thereof.

I/we have carefully perused the following documents connected with the above work and agree to abide by the same.

1. Instructions to tenderers
2. General conditions of contract
3. Special conditions of contract
4. Other sections, appendices, schedules and drawings.

I/we have deposited / forwarded herewith the earnest money deposit for a sum of **Rs.2,00,000/- (Rupees two lakhs only)** as stipulated vide Clause no, 1.4 of General Conditions of Contract, details of which is funished in the check list, & which shall be refunded should our offer not be accepted. Should our offer be accepted, I/we further agree to deposit such additional sum which along with the sum of **Rs. 2,00,000/- (Rupees two lakhs only)** mentioned above, shall make up security deposit for the work as provided for in the tender specification within the stipulated time as may be indicated by BHEL, Power Sector-Western Region, Nagpur.

I/we further agree to execute all the works referred to in the said documents upon the terms and conditions contained or referred to therein and as detailed in the appendices annexed thereto.

Place: Signature of Tenderer:
Date: Address:

Witnesses with their Address

	Signature	Name	Address
1.			
2.			

Section- 4

Special Conditions of Contract

4.0 SCOPE OF WORK

The work to be carried out under the scope of these specifications is broadly as under:

AA Port clearance and Local Transportation

BB Material handling at site and Erection, testing and Commissioning

4.0.0.1 DETAIL SCOPE OF WORK

AA Port clearance at Djibouti / Mele port and cross country Transportation of Cargo to Finchaa Sugar Factory

1. a Arranging all permits at Djibouti Port for cross country transportation of cargo.
   b Unloading of cargo from the ship
   c Lashing / securing on trailer,
   d Transportation from Port to Finchaa Sugar Factory
   e Placement of cargo/ Truck / trailer at the designated place,
   f Transportation of empty container to the Shipping Company.

2. Contractor shall have their liason office at Addis Ababa for coordination with various agencies

3. The containers / Break Bulk cargo shall be custom cleared at Djibouti / Mele or any other suitable place in Ethiopia as desired by customs department of Ethiopia and transported to designated sites at Ethiopia. All expenses for custom clearance (except any custom duty) & Container Security Deposits shall be borne by the Transporters.

4. The empty containers shall be returned to the Djibouti port by Contractor after unloading of Cargo at site by BHEL.

5. Use of Shore cranes is permitted without any financial liability to BHEL. The contractor shall be responsible for safe unloading and loading of Heavy Packages. Any damages during these operations if adopted, it will be the sole responsibility of the contractor to make good the losses to the product and any other incidental damages.

6. Contractor should ensure port handling; transportation and delivery of goods at site with utmost care and in a professional manner. Contractor should follow manufacturer's lifting & handling instructions on packages. Contractor will be responsible for any damage due to negligence to follow manufacturer's instructions or due to use of wrong lifting and handling equipments.

7. The shipment is expected to commence from end Sept 09 and may last up to Aug 2010.

8. Endorsements on the relevant documents from relevant authorities are to be obtained by the Contractor. BHEL / BHEL'S Site representatives shall issue receipt at site for material delivered and the same shall be obtained by the Contractor. BHEL Addis Ababa office shall extend all necessary support for the required paper works.

9. Under the contract no custom duty is applicable on these materials.

10. Payment to Ethiopian Shipping lines / Ethiopian Airlines against the items shipped by BHEL and its suppliers. These payments would be done on written instruction of BHEL Site office in Ethiopian Birr by Contractor's Addis Ababa office.

11. This will be the responsibility of Contractor to collect all papers from BHEL Addis Ababa office .BHEL will arrange duty free letter, Bank permit, original or copy B/L with letter from Shipper. Contractor shall be intimated over phone / e-mail about the readiness of papers. After receipt of papers contractor will arrange custom clearance & discharge letter from Ethiopian shipping lines / Ethiopian Airlines. Contractor will make payments for freight, container security, demurrage (if any). BHEL will reimburse for freight & Demurrage .As return of container safely is Contractor's responsibility hence container security amount will not be reimbursed.

4.0.0.2 DETAIL SCOPE OF WORK

BB Receipt of equipment / material at site, ,Unloading ,Inspection, Verification, reporting shortages / damages, Storage, Up-keeping during storage, Collection of materials from BHEL/client's stores/storage yard; transportation to site; erection, testing & assistance for commissioning, trial operation of Surface Condenser, Steam Turbine, Generator, Piping, Pumps & Auxiliaries including Electrical and Control & Instrumentation equipments / components, application of Thermal Insulation, Final Painting, assistance for PG test etc. and Handing over of 2x12 MW STG set at **Finchaa Sugar Factory Expansion Project , Oramia Regional State, Finchaa Valley, Agamsa of Ethiopia**.

4.0.1

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, equipments etc, in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel.

4.0.2

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.

4.0.3
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.

4.0.4
The bidder shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work.

4.0.5
Contractor shall erect all the equipments 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.

4.0.6
All the necessary certificates and licenses required to carryout this work are to be arranged by the contractor expeditiously at his cost.

4.0.7
The work to be carried out under the scope of these specifications covers the complete work of -

AA Port clearance at Djibouti / Mele port and cross country Transportation of Cargo to Finchaa Sugar Factory

BB Receipt of Equipment/Material at site ,Unloading ,Inspection ,Verification, Storage, Up keeping during storage, loading at stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, levelling, cold pulling, adjusting, non-destructive testing, post weld heat treatment, hydraulic test, 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.

4.0.8
The terminal points decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done. Tentative list of terminal points for E&C is given at **para 4.18 of this section**

4.0.9
The indicative schedule of weight of major equipments given at **Appendix –IIB** is meant for providing a general idea to the contractor about the magnitude of the work involved.

4.0.10
During the course of execution of E & C work, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feed back 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. 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. Claims of contractor, if any, for such works will be dealt as per clauses of section-13 of special conditions of contract.

4.0.11
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 applicable taxes if any and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

4.0.12
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.

4.0.13
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.

4.0.14
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.

4.0.15
Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

4.0.16
Contractor shall mobilise sufficient quantity of sleepers for stacking of materials in his custody.

The scope of work under this Tender Specification is further detailed as follows.

4.1 SCOPE OF WORK FOR ERECTION, TESTING & COMMISSIONING OF STG SET

4.1.1 The work to be carried out under the scope of these specifications is broadly as under

1) Receipt of materials / equipments at site, Unloading, inspection, verification, reporting shortages and damages, record keeping, storage, Up keeping during storage.

2) Collection & Loading of materials from BHEL / Customer Stores / Storage Yard.

3) Transportation to pre-assembly area and up to & including site of work.

4) Pre-assembly / assembly, pre-erection checks as per requirement.

5) Erection, Alignment, Testing, Commissioning of equipments / systems with associated auxiliaries and stage inspection by BHEL, OIA, FSF and statutory authorities like Factory Inspector etc. covered under this tender specification. All the necessary tests including supply of testing / measuring equipments & instruments shall be carried out as per requirement under this scope of tender specification.

6) Chipping/ Blue-Matching of civil foundation, grouting of equipments/ auxiliaries / panels with Portland and Non-shrink cement ready-mix grouting cement as per normal engineering practice for similar equipments. Contractor shall arrange all the grout materials of BHEL-approved brand within the quoted price.

7) Pre-assembly, Stage inspection as per requirement of BHEL / Customer and other Statutory Authorities, Erection, Alignment, Heat treatment, Stress relieving, welding, Radiography & other NDT tests, Flushing / Chemical cleaning, Steam blowing of piping including impulse piping.

8) Erection, cold setting and hot setting of piping supports & hangers.

9) Application of thermal insulation & cladding of applicable piping, vessels & equipments as applicable.

10) Fabrication & Erection of foundation frames of electrical equipments / panels and approach platform of valves.

11) Chequered plates and structural steel is in the scope of contractor . This will be used for covering various openings in the TG floor. The contractor has to cut these to required size and fix at appropriate locations including raised supports etc to fill the gaps around the TG set foundation shall be carried by Contractor. No separate payment is envisaged for this activity.

12) Erection of Electrical motorised & control valves

13) Erection, Pre-commissioning & commissioning checks/tests and commissioning including trial run operation of applicable equipments and auxiliaries.

14) Trial operation of TG set, Final painting, providing assistance during PG test of the equipments and handing over of the units to BHEL's Client.

The work shall conform to dimensions and tolerances specified in the various drawings/documents of BHEL which will be provided during various stage of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings/documents or other stipulations due to contractor's fault, 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 and recoveries will be effected from the contractor's bills towards expenditure incurred including departmental overheads of BHEL.

4.1.2 The intent of specification is to provide erection services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient erection and commissioning of the plant shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

4.1.2 The work shall be executed under the conditions, where customer is already having their existing plant in operation. The contractor and his personnel shall co-operate with personnel of customer's & other contractor's, co-ordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

4.1.3 Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL. This will be decided by the BHEL engineer depending upon the technical requirements, availability of materials and fronts. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods adopted in erection of similar sets elsewhere.

4.1.4 All necessary certificates and licenses, permits & clearances required to carry out this work are to be arranged by the contractor expeditiously at his cost.

4.1.5 All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments/ 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 which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

4.1.6 As this plant is an extension of the existing plant, any interconnection, hook-up, required with existing system shall form part of work. Such interconnections, hook-ups may require shut down of running plant and the relevant work have to be completed within such planned shutdowns. This may call for working with enhanced resources and on working days (No works on nights or National Public

Holidays or days of rest without the permission from Customer. Contractor's offer shall cover all such contingencies.

4.1.7 Excepting those specifically shown as BHEL scope, the contractor shall provide all fixtures, concrete block supports, wooden sleepers, steel structures required for jigs & fixtures, temporary supports, anchors for load and guide pulleys etc, required for the work.

4.1.8 The contractor shall take delivery of the components, equipments, chemicals, lubricants, gases etc from the BHEL's/client's stores/ storage area after getting the approval of BHEL engineer on standard indent forms to be specified by BHEL. Complete and detailed account of the equipments erected as well as the progress shall be submitted to the BHEL engineer as directed.

4.1.9 Contractor shall plan and transport equipments, components from storage 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. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by contractor most expeditiously. No claim for extra payment for such work will be entertained.

4.2 COLLECTION & RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

4.2.1
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.

4.2.2
The contractor shall return all parts, materials, and 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.

4.2.3
Transportation of lube oil, 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.

4.3 PREPARATION OF FOUNDATIONS AND GROUTING OF EQUIPMENTS

4.3.1 Building foundations and other necessary civil works for supporting structures, equipments etc Will be provided by BHEL. The dimensional accuracy, axes, elevation, levels etc, with reference to benchmarks of foundations and anchor bolt pits have to be checked and logged. Adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments as per BHEL engineer's instructions, should be done by the contractor as part of the work. Dressing and chipping of foundations to the extent of 25mm for achieving proper levels is within the scope of work.

4.3.2 All minor foundations and anchor points/arrangements required for installing erection equipments and winches etc are in the scope of contractor.

4.3.3 Contractor shall carry out scrapping and blue matching of embedded plates/ packers of rotating equipments. Chipping and the bedding of concrete surfaces, fine dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of this work. Scrapping, chipping and matching shall be done so as to achieve prescribed percentage of contact.

4.3.4 Contractor shall provide the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates/steel sheets at site to meet site requirement. Contractor shall cut and prepare and finish the packers and shims by suitably. Machining of the packers wherever necessary, will be arranged by contractor.

4.3.5

Complete grouting of equipments, including anchor/foundation bolts, beneath base, base hollows etc, as may be applicable, is included in the scope of contractor. Arranging all labour, building materials including cement, ordinary portland as well as quick setting – free flow - non-shrink grouts (e.g. Conbextra GP1 / GP2), form work, shuttering, and any other requirements is in the contractor's scope. Contractor shall obtain approval of BHEL for cement (ordinary as-well-as quick setting) prior to use. Cleaning of foundation surfaces, pocket holes and 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, are within the scope of this specification/work.

4.3.6

The quick-setting-non-shrink-free-flow special grout mix shall be purchased only from the following BHEL approved vendors:

1. M/s Fosroc Chemicals
2. M/s Sika India Pvt Ltd;
3. M/s Pagel Concrete Technologies Pvt Ltd;
4. M/s Pidilite Industries Ltd.

In order to ensure the quality, the major grouting of equipments using any of above grout mixes shall essential be done as per the recommendations of supplier with regard to grout preparation and use of machinery etc under the supervision of the respective supplier. In case supervision services from above suppliers is required then same shall be arranged by contractor at his own cost. However, the contractor shall ensure readiness of equipment for grouting in all respect before such a service is requisitioned and the duration is not prolonged unduly. Contractor shall consult BHEL engineer before deciding upon the vendor for the above.

4.3.7

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.

4.3.8

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 shall be arranged by contractor .

4.3.9

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.

4.4 EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS

4.4.1

Filling of lubricants for steam turbine, Turbo-Generator and other rotating auxiliaries for purpose of oil flushing, **initial fill up** and subsequent topping up during various stages of work shall be arranged by contractor.

4.4.2

All works such as cleaning, levelling, aligning, hot alignment, trial assembly, dismantling of certain equipments/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, grinding, straightening, chamfering, filling, machining, chipping, drilling, reaming,

scraping, lapping, shaping, fitting-up, drilling of holes, making dowel pins, minor rectification of foundation bolts etc. Are incidental to the erection/commissioning and any other work/activity which is necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

4.4.3

Cleaning, servicing, lubrication of actuators, pumps, headers, governing system, ESV, Control valves and other valves, tanks, vessels etc. During erection and commissioning stages is in the scope of work. However, gaskets / packing's / lubricants for replacement is in the scope of contractor.

4.4.4

All equipment shall be preserved and protected periodically before and after erection as per advice of BHEL engineer. The journals of steam turbine rotors, generator rotor, motors and other rotating machines shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.

4.4.5

Trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment.

4.4.6

After initial trial of rotating equipments, control and power cabling for motors and other equipments / instrumentation may have to be disconnected for checking alignment and resetting / realignment / hot alignment. Contractor will have to provide services for disconnection and reconnection of control and power cables.

4.4.7

All racks or assembled units like governing rack, seal oil unit, gas unit, seal oil valve rack, etc supplied from manufacturing units will be tested by contractor at site. This may require transportation, filling of oil, water etc in these racks for carrying out testing of these racks. Defects noticed during testing of these racks will have to be rectified by the contractor free of charges. Further, any pipeline / flanges / fittings not found assembled properly, the same have to be rectified / corrected by the contractor free of charges.

4.5 PIPING INSTALLATION

4.5.1

The work on piping systems (Air, Water, Oil, Steam etc.) will include fabrication, laying, edge preparation, fixing & welding of the elbows/fittings/ valves etc On the line, fixing & adjustment of supports/angles shock absorbers and carrying out all other activities/work to complete the erection and also carrying out all pre-commissioning/commissioning operations mentioned in the specification as per BHEL engineers instructions and/or as per approved drawings/documents.

4.5.2

Fittings like bends tees, elbows, reducers, flanges etc, will be supplied as loose items which shall be matched with the corresponding piping. Bends of tube size up to OD 150mm will have to be fabricated at site at no extra cost.

4.5.3

All pipes & tubes shall be sent from units in commercially available lengths. Certain adjustments in length may be necessary while erecting pipelines. The contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges both for High Pressure & Low Pressure (IBR & Non-IBR) pipes and adopting specified heat treatment procedure at no extra cost.

4.5.4

Minor adjustments like removal of ovality in pipes and opening and closing of the bends of pipe by process of heat or correction of any other method approved by BHEL engineer to suit the layout, with specified heat treatment procedure, are in the scope of work.

4.5.5

Flame cutting of piping, where required shall be done as per BHEL engineers instructions.

4.5.6

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

4.5.7

Connection (either flanged/bolted or welded) of piping to the terminal points/equipments etc Is in the scope of work even though such terminal point/equipment may not form part of this work. All NDE including radiography of joints so made, post-weld-heat-treatment if any, is also within the scope of work/specification. Terminal points works of various piping schemes with customer lines and other contractor's lines. The terminal points work is inclusive of cutting of existing lines, edge preparation, welding/blanking and hook up work.

4.5.8

Erection, Welding & UT/radiography test of BHEL supplied flow nozzles in customer terminal / tapping points is the part of scope of works. Same will be carried out as per BHEL engineer's instruction at site and shall be binding on Contractor.

4.5.9

Drilling, welding of stubs for drains, vents, instrument tapping points, Welding of attachments for supports etc is part of the work. No additional payment is envisaged for this work .

4.5.10

Erection and installation of Motorised valves & Control Valves shall be treated as part of piping work. No separate rate on this account will be payable.

4.6 CONDENSER INSTALLATION

4.6.1

The Surface type condenser weighing about **15 MT** will be despatched in assembled condition along with tubes. However the other parts like hot well, level instruments Stand & surge pipes, Collar/sleeve pipe, top connecting piece, Stainless steel bellows, foundation parts, air extraction pipes, etc will be sent loose. The assembled condenser is to be handled at site including unloading from the trailer, transportation to site of work, Lifting, positioning & placement on foundation in TG hall by contractor using his own required capacity crane/ suitable arrangement. Assembly and welding of other loose parts like hot-well, collar/sleeve, SS bellows, Stand/Surge pipes, top connecting pipe to turbine exhaust hood counter flange shall be carried out at site. Welding of top connecting pipe to counter flange of turbine exhaust hood will be carried out after final alignment and levelling of turbine, & as per the sequential welding procedure.

4.6.2

It will require cleaning of water side surface, opening of manhole/water box covers & retighten the same after replacement of packing/gaskets, carry out hydraulic test & water fill test on steam side and water side space. All above shall be carried by contractor including attending the leakages (if any) as part of work under this tender specification.

4.6.3

All water side surfaces of water chambers shall be painted only after completion of work and water fill test/ hydro test. Welding & Interfacing of Condenser cooling water connection from customer terminal point will be decided by BHEL Engineer at site and shall be binding on contractor.

4.6.4

For surface preparation, the water boxes etc., may have to be sand/shot blasted to remove all traces of shop coat of primer. The specified primer & protective paint as specified (quality and final dry film thickness) in erection documents shall be applied. Primer and paint shall be provided by the contractor.

4.6.5

Work of painting of condenser surfaces in various area and at various stages of work are specified elsewhere in these specifications.

4.7 Generator Installation

4.7.1 Generator along with Rotor, Stator, bearings and brush-less exciter weighing about 31 MT will be dispatched from BHEL Manufacturing Unit in assembled condition. Contractor shall have to carry out further works like unloading, local transportation up to foundation, handling, Lifting, positioning & placement of the generator on foundation in TG hall and further erection, testing & commissioning activities. Other associated items of generator like Air coolers, Line & Neutral side terminal Boxes, Base plates, NGR & Cubicles, AVR panel & other Control/Relay & metering panels and synchronising panels will be supplied loose separately.

4.8 Steam Turbine Installation

4.8.1

Steam Turbine along with Casing, Rotor, Bearings, Base frame (permanent) and connected bearing lube oil pipe drain/supply header total weighing **37 MT** will be dispatched in assembled condition, but EOT crane in Power House building is only of 30 MT capacity. In order to make use of EOT crane for lifting of Steam Turbine, contractor may have to dismantle the upper outer casing of assembled turbine. The stud bolts and nuts are to be removed and tightened back by using Bolt Heating machine. Contractor shall carry out this job by using his own T&P (Bolt heating machine shall be provided by BHEL) and fabricate suitable temporary fixture/supports by providing required quantity Steel materials like ISMB beam/angles sections to keep steam turbine on this temporary supports/fixture and re-assemble the turbine on permanent base frame after their lifting and placement on foundation. Contractor shall take utmost care to dismantle, fabricate temporary support/fixture and re-assemble the Steam Turbine and all these works shall be the part of scope of erection. Contractor shall have to carry out further works like handling, Lifting, positioning & placement of the Steam Turbine on foundation in TG hall and further erection, testing & commissioning works.

4.8.2

Speed reduction Gear Box weighing 8MT approx shall be supplied separately. , Foundation parts / base plates shall be supplied loose. Contractor has to align the Turbine and Generator with Speed reduction Gear Box.

4.8.3

Turbo-visory instruments like proximitors/probes and other associated items/auxiliaries will be sent loose separately. Contractor shall carry out erection, assembly, providing protective flexible conduit as required for such instruments like proximitors/probes, RTDS etc and testing.

4.9 Other Rotating Machines Installation

4.9.1

All rotating machinery and equipments shall be cleaned, lubricated, checked for their smooth rotation, if necessary, by dismantling and re-fitting before erection. If in the opinion of BHEL engineer, the equipment is to be checked for clearances, tolerances at any stage of the work or during testing, pre-commissioning, facilities for dismantling, cleaning, lubricating and re-fitting shall be provided by the contractor. All rotating machines shaft shall be rotated periodically to avoid bowing of shafts.

4.9.2

Trial run of the drive in un-coupled state and then coupled with equipment has to be done after necessary alignment etc

4.9.3

Forced lube oil systems of motors and/or rotating equipments form the part of work under this specification

4.9.4

Performance of hydro test of oil coolers and Air coolers of rotating machines, if any, is included in the scope of work.

4.9.5

During charging of system if any leakage is found in HP/LP Heaters, Drain Cooler, Oil cooler, Air cooler, same shall be attended by contractor. BHEL will provide necessary gaskets etc.

4.9.6

Certain rotating machinery after, initial runs and commissioning of the equipment, may have to be hot aligned.

4.9.7

Protective lubricant coats/fill provided on the critical area of equipments have to removed at appropriate stage and regular lubricants, after removal/cleaning of protective coat/fill, as per specifications should be filled/applied. Cleaning/flushing agents/oils will be provided by BHEL.

4.9.8

After initial trial of rotating equipments, control and power cabling for motors and other equipments/instrumentation may have to be disconnected for checking alignment and re-setting / re-alignment / hot-alignment. Contractor will have to arrange labour for disconnecting control and power cabling as per BHEL engineer's instructions and clearance and reconnect the control and power cabling after re-alignment, quoted tonnage rate shall be inclusive of the above.

4.9.9

Even though rotating machines may be grouted to foundation using non-shrink grout mix, blue matching of packer plates/shims with foundation/between packers/equipment base should be done wherever instructed by BHEL engineer.

4.9.10

Vital clearances of shop assembled rotating machines should be checked at site and adjusted if required.

4.10 EOT Crane and Hoists

4.10.1 One number EOT crane of capacity 30MT / 5MT shall be erected, tested and commissioned in Power House Building for handling and maintenance of STG and auxiliaries. The span of the TG hall is 21 meters and the length is 35 meters. EOT package includes main hoist of 30 MT, Aux hoist of 5 MT, gantry rack rails, end carriage, crab, platform, hoisting rope, brakes, motors, helical gear boxes, pendent switches, power cables, limit switches, panels etc. The EOT crane shall cater the need of both STG.

4.10.2 One number Hoist for handling of CW pumps and one number for handling reciprocating compressor each weighing approximately 5 MT, are to be erected, tested and commissioned in CW pump house and Compressor house

respectively. CW pump house and Compressor house is common for both the units.

4.11 Cooling Water system

4.11.1 Cooling water system is common for both the units. It comprises the following-

1 Main cooling water pumps with drive motors for Condenser … 3 sets
2 Main cooling water pumps with drive motors for Bearing cooling … 2 sets
3 Return water sump pump … 2 sets
4 Spray water pumps … 2 sets
5 Cold water tank … 1 No

Above are to be erected, tested and commissioned.

4.11.2 Associated piping for CW system is to be erected and tested as stated under the piping head.

4.12 Condensate system

4.12.1 Condensate system consists of Condensate Extraction pumps with drive motor (2 sets) per unit.

Total 4 CEPs are to be erected, tested and commissioned.

4.12.2 Associated piping for Condensate system is to be erected and tested as stated under the piping head.

4.13 Compressed Air system

4.13.1 Compressed Air system is common for both the units. It comprises the following-

1 Reciprocating Air Compressor 300 NM^3 per hour with drive motors …3 sets
2 Air Driers …2 sets
3 Air receiver capacity 3000 NM^3 …1 No

Above are to be erected, tested and commissioned.

4.13.2 Associated piping for Compressed air system is to be erected and tested as stated under the piping head.

4.14 Air Conditioning and Ventilation system

4.14.1 Air Conditioning and Ventilation system is common for both the units. It comprises the following-

1 Package type air conditioner for Control room of size 6mx21m
2 Pressurised ventilation for switchgear room of size 6mx35m
3 Roof exhausters for STG Hall of size 21mx35m
4 Associated piping / ducting

Above are to be erected, tested and commissioned.

4.15 Fire fighting system

4.15.1 Fire Fighting system is common for both the units. It comprises the following-

1 Fire and smoke detectors for STG hall
2 Extension of fire hydrant in STG hall

Above are to be erected, tested and commissioned.

4.16 Electrical, Control & Instrumentation

4.16.1 Installation of Panels .

A. Electrical control panels, electronic control panels, analyser panels and transmitter racks/enclosure are normally supplied in suit of either one/two/three or loose shipping sections with integral base frame or loose base frame. These panels may have to be installed as stand alone or in group consisting of number of panels in each row, depending upon the plant layout and foundation arrangement. Panels under the scope of this works are Distributed Control Logic system based.

B. The panels shall be transported from stores to the place of installation in vertical position. Care shall be taken such that the switches, lamps, instruments etc mounted on the panel does not get damaged during transit.

C Installation of panel shall include fixing of base frame, levelling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubical interconnection hard wares, bus bar jointing, wiring interconnection, welding and grouting of panels and base frames, mounting of panel canopy wherever supplied as part of panel, drilling of gland plates, sealing of panels/ cable entries. Where the base frame is not supplied as part of panel supply, the contractor shall fabricate the base frame from structural items at site. Special material required for fireproof sealing of the panels shall be supplied by the contractor free of cost. Proper sealing of all the holes and cable entries (even if the cable has been laid by others) in the panel is in the contractor's scope.

D Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc Which shall be a part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc Panels have to be erected at different locations and elevation in STG hall and unit control room etc

E Panel and instruments once erected in position should be properly protected using necessary care to prevent ingress of dust/moisture. This will have to be periodically cleaned and surroundings have to be kept tidy.

F Whenever the panels to be mounted on cable trenches, channel supports have to be provided across the cable trench over which the base frame of panel shall be mounted. For such work, structural steel fabrication & installation rate shall be applicable.

G Normally the panels shall be supplied with meters, relays, electronic modules, contractors, pushbuttons etc mounted and pre-wired. However, if such devices are supplied loose/separately for safety in transit, contractor shall mount the same as part of panel installation work and no extra payment shall be made for this.

H Supplier's instruction manuals, packing slips, door keys etc Received along with the panels will be handed over to BHEL's engineer on opening of the panels.

I Regular cleaning of the panels as per the instruction of BHEL engineer till handing over of the set to customer is to be carried out by the contractor free of cost.

4.16.2 Structural Steel Fabrication And Installation

A Structural steel material like MS angles, channels, beams, flats, plates etc will be supplied in running meter and the same shall be used and fabricate for panel base frame, cable tray supports, canopies for instruments/panels/ drives/JB's/push buttons etc, instrument/junction box frames, impulse pipe/ instrument air pipe supports and instruments etc as part of scope of work. No separate payment will be made for these woks.

B This shall include cutting to size, contouring of ends for connections if required, welding, grinding of excess weld deposits/burrs, drilling of holes for mounting of device/instrument, installation at location, levelling, alignment, providing bracings and painting etc. No gas cut holes will be permitted.

C All the fabricated supports/frames shall be painted as per painting specifications.

D Frame installation at site may involve mounting either on concrete floor by grouting/using anchor fasteners or on steel structure by welding etc All consumables including anchor fasteners shall be arranged by the contractor. Where required, as part of work, concrete floors may have to be chipped out to reinforcement depth for anchoring the frames. Wherever grouting is required, contractor shall arrange all the required material including cement/grout mix, shuttering etc, necessary labour and meet all other requirements as part of work.

E In certain packages, members of frames/rack for mounting of junction boxes/ instruments may be supplied readymade. These have to be assembled prior to installation.

F Gas cutting of tray/impulse pipe support and holes in frame is not permitted. Only hacksaw cutting/ drilled hole shall be permitted.

4.16.3 Laying Of Pipes/Tubes (Impulse Pipe)

A Installation of impulse pipe of CS/AS/SS material shall include cleaning, air flushing, cutting to length from the running meter, edge preparation, cold bending, welding of sockets/ reducers/ tee/ cross/ isolating valves/union nut

and nipples/tail pieces etc, mounting of SS/AS/CS three/five valve manifolds and compression fittings, condensate pot/equalizing vessel, providing supports, clamping, conducting leak test/hydraulic pressure test, painting and other accessories as per instrument hook-up diagram. Piping works shall involve either arc or TIG welding.

High Pressure / IBR certified welders shall be deployed for welding of impulse pipe and contractor shall take approval for welder and welding consumables from BHEL site engineer.

B All fittings and accessories for impulse pipe and air line shall be provided by BHEL. Quoted rate for piping shall include cost of installation of such fittings as no separate rate is envisaged.

4.16.4 Instrument & Service Air Piping (GI Pipe)

Laying of GI pipe for instrument air line shall include air blowing, cutting from the running meter length, threading, installation of elbows/ tee/reducer/ moisture traps/auto drain pot/check valves/isolating valves, supporting clamping, conducting leak test etc Threaded joints of air pipeline shall be made leak proof by using Teflon tapes or sealing compound. Seal welding of threaded joints as decided by BHEL engineer at site shall be carried as per requirement. Contractor shall provide GI clamps for impulse pipe and GI instrument air pipes as scope of work.

4.16.5 Copper Tubing/Pipe/SS Tube

1. Installation of copper tube/SS tube/copper pipe shall include cutting into required length, laying, bending, cleaning, brazing wherever required, fixing of fittings like compression fittings/tees/end connectors/straight connectors/bulk heads/valves etc Supporting, clamping including supply of clamps and hardware, flushing and conducting leak test. Suitable tube cutters, benders and de-burring tools will be used for such jobs. Contractor shall arrange required clamping materials, identification ferrules, tags, U clamps & fasteners for laying of pneumatic tubing, impulse piping as scope of work.

4.16.6 Cable Trays/Cable Ducts

A Cable tray with cover will be supplied in standard lengths along with accessories and hardware viz coupler plate, tray covers and tray clamps etc

B Installation of cable tray/cable duct shall include cutting, laying, jointing, fixing tee/reducers/ bends/clamps, fixing of tray covers, hardware, welding of tray supports as per tray route layout etc

C Fabrication of bends/tee/ reducers from straight length is within the scope of work and rate quoted shall be inclusive of this. All site welds of cable trays shall be painted with approved primer and cold galvanizing paint, which shall be arranged by the contractor.

D In case, structural cable trays, bends, tees, reducers etc, are required to be fabricated from structural steel and installed, unit rate applicable for fabrication and installation of structural steel shall be applicable in such instances.

E Cable trays/duct etc may have to be routed underground in cable trench, over head on structure, along the walls, floors etc For various applications.

4.16.7 **Cable Laying (Control / Instrumentation Shielded Cables / Triad Cable / Plug-In Cables / UTP Cables For Ethernet N/W / Armoured / Un-Armoured, Single / Multi-Core, PVC / HR PVC / FRLS / Teflon / XLP Insulation)**

A Cable laying will include:

1. Cutting to the required length, laying in overhead/underground cable trench/ through pipes/flexible conduits. Cable rollers have to be used as per requirement. The contractor shall prepare the drum schedule in order to minimize the wastage.
2. Dressing/clamping in tray etc
3. Drilling of holes in gland plates in panels and junction boxes for the entry of cable.
4. Cable glanding, splicing, dressing of spliced wire inside the panel and JBs.
5. Providing PVC numerical/alphabetical ferrules. Wherever required ferrules shall be one-piece heat shrinkable type.
6. Termination by using crimp type lugs copper tinned/ aluminium (insulated/ un-insulated).
7. Providing identification cable tags, aluminium at both the ends and at appropriate interval throughout the route length.
8. Continuity checking, insulation resistance checking, high voltage test on HT cables, as applicable.
9. Contractor shall provide required consumables like aluminium tags, ferrules and ferrules as applicable as scope of work under this tender specification.

B Entry to the panels, JB's may be from top, side or bottom. All cable shall be supported and clamped near the panels/ JB

C Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, suitable alternative arrangement as specified by BHEL shall be done. Pre-fab plug-in cables, for such cases, cables may have to be lifted inside the panel either making cut-out in gland plate and providing rubber profile for sharp edge protection or alternatively, provide 4/6" PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.

D Copper tinned lugs of various type (pin, ring, fork, snap-on), PVC cable ties, PVC ferrules, PVC buttons and tapes, cable identification tag of metallic, clamping and dressing material with hardware, PVC sleeves etc Shall be supplied by the contractor within the quoted rate for cable laying. The quality of

material shall be got approved from BHEL engineer prior to their procurement. BHEL shall provide cable gland & cable lugs above 4 sq.mm size.

E All care should be taken to avoid abrasion, tension, twisting, kinking, stretching of cables during installation.

F Cable shielding – all signal cables are supplied with bare shielded copper wire/with breaded wire shield, generally sealed wire is kept isolated at instrument/field device end and continuity is maintained through JB's and getting earth at panel end only. While terminated the sealed wire either in panel or JB's PVC sleeves is to be used to avoid two-point earthing. Supply of PVC sleeves of appropriate colour is in contractor's scope.

G Wherever cable ducts/tray, conduits pass through fire barriers such as walls, floors etc, the openings/ passage shall be sealed using fireproof/ weatherproof sealing compound. Similarly cable entry in panels, MCC/LT/HT breakers, instruments, electrical actuators etc are also required to be sealed. These shall

be done as per the specifications of BHEL. Required consumable shall be provided by contractor as scope of work.

H Normally, cables glands on junction boxes side are received mounted. While terminating the cables as per drawings, the cable glands to be removed and fixed. Wherever cable glands are not received along with junction boxes, no separate payment will be made for fixing the cable glands to the junction boxes including drilling of holes.

I Many of the cables may have to be laid in the cable trenches. For this purpose, the cover of trenches has to be opened for working inside. All safety precautions have to be observed while laying the cables in the trench. After completing the work, the trench has to be cleaned and covers put back into position. The contractor, if required, shall do de-watering of trenches.

J **Terminations**:

The types of cable terminations are as detailed below:

1) Power cable : 11 KV
   1.1 KV
2) Control cable : Manual crimping
   Crimped/soldered plug-in-type
   Screwed type.
3) All console devices / computer peripherals shall be screwed, crimped, soldered plug in type.

The contractor shall arrange for special tools and skilled manpower required for any type of cable termination

K. Cables supplied under this tender scope are Power, Control & Signal cables and meant for BHEL supplied equipments to Junction boxes, Filed Instruments

to Junction boxes, Junction boxes to BHEL supplied panels and inter connection between BHEL panels.

4.16.8 Field Instrumentation

A Various type of primary/secondary/ indicating/ recording instrument for pressure, temperature, flow, level, speed, turbo-supervisory and analytical measurement shall be supplied either loose or mounted along with the equipment. Contractor shall fabricate the instrument stands and arrange the fasteners as required for fixing of Instruments as scope of work.

B Scope of work under calibration, erection// testing/ commissioning shall include calibration, setting, adjustment, supply and fixing of instrument tag plates as specified by BHEL, report making, installation, servicing, minor repairs, putting instrument into service, signal checking from field up to the functional group panels and remote indicating/recording instrument, functional checks, interlock and protection/alarm checks by simulating the field devices, providing assistance for trouble shooting during pre-commissioning/ commissioning and till the unit is handed over to the customer.

C Contractor shall establish calibration laboratory with adequate facilities and they should arrange standard test instruments duly calibrated from the agencies approved by BHEL. Calibration report of the same should be submitted prior to start of calibration of the field instruments/devices.

D It is the responsibility of contractor to make erection, calibration/ testing and commissioning protocols for various equipments/devices installed by them and they should get duly certified by customer/BHEL engineer and should be submitted to BHEL engineer regularly.

E Installation of instrument shall also include drilling of holes and tapping for mounting of instrument and local instrument frames/panels and supply of hardware for mounting of the instrument.

F The instruments/devices such as temperature gauge/switches, pressure gauge/switches, transmitter pressure/flow/ level/DP, level probe/switch etc which are received assembled with mechanical equipments shall be calibrated as per requirement of BHEL engineer at site and shall removal and re-fixing after calibration.

G Installation of thermo-wells and seal welding of the same is not in contractor's scope. Similarly installation of root valves is not in the contractor's scope.

4.16.9 Integrated Testing of Generator Control And Protection Panel & Associated System

Integrated testing/dynamic testing of control and protection system of the above equipments shall involve various activities like relay testing/setting, simulation checks, testing of energy meters, on/off line functional checks on integrated system. This needs highly experienced ENGINEER AND TEST EQUIPMENTS ETC THE SCOPE OF WORK UNDER ***"INTEGRATED TESTING OF CONTROL AND PROTECTION PANEL OF GENERATOR & ASSOCIATED SYSTEM".***

(INTEGRATED TESTING MEANS PROTECTION & SUPERVISORY RELAYS IN STATIC/ DYNAMIC CONDITION, MERTERING INSTRUMENT TESTING, INTREGATED FUNCTIONAL CHECKING OF PROTECTION & CONTROL CIRCUIT IN STATIC/ DYNAMIC CONDITION, GENERATOR OPEN CIRCUIT / SHORT CIRCUIT TESTING, SYNCHRONISATION SCHEME)

4.16.10 Misc. Other Instrument/ Equipment Calibration, Erection, Testing, And Commissioning.

a Contractor shall carry out testing & commissioning of panels, electrically operated valves, pneumatic control valves, pneumatic trip valves, solenoid valves, limit switches, ht/lt motors including drying out, and any other integral devices forming part of various mechanical skids/equipments, & piping etc

b The scope of commissioning of electrically operated actuators for valves, dampers, gates etc, will include meggering, adjustments of mechanical/ electrical or electronic position transmitters, setting of limit/torque switches, cable checking, internal wiring checking, local/remote operation, replacement of limit/torque switches if required.

c The scope of commissioning of devices like solenoid valves, feedback position transmitter, limit switches, air filter regulator, airlock relay, positioner etc which are integral part of pneumatic control valves/ power cylinder/ trip valves etc and electrically operated valve will involve adjustments/servicing, calibration etc as incidental to work, contractor shall remove such devices prior to erection either at site or at store to avoid damage/pilferage and for keeping in safe custody. these shall be installed at appropriate stage as instructed by BHEL

d Certain instrumentation like pressure switches, pressure gauges, dial thermometers, transmitters etc are received in assembled condition as integral part of equipments. dismounting, calibration, and re-erection of such instruments, where required for safe keeping or any other purpose as instructed by engineer, is in the scope of work.

4.16.11 Calibration, Testing & Commissioning

Calibration, testing & commissioning activity as specified in this technical specification and rate schedule against various equipments, devices, systems etc are broadly described hereunder. however, there may be some overlapping between the activities, i.e. erection, calibration and testing, commissioning. the classification of each activity is only a guideline for understanding the volume of work in each activity. the contractor shall have no claim for performing or providing manpower assistance for such overlapping work, which is also within the scope of work.

A **Calibration**

1. Verification of instruments for range, type etc; with respect to instrument schedule, data sheet or system document.
2. Codification of instruments as per system tag numbers
3. Calibration/adjustment of instrument as per system requirement/set values.

4. Providing head correction in case of pressure measuring instruments.
5. Verification of installation of instruments for range, type, tag number as per physical location of process point as per process, instrumentation diagram.
6. Checking and ensuring the proper functioning of instruments.
7. All the recorders shall be made functional with proper chart movement and ink marking.
8. Preparation of calibration certificates and erection commissioning protocols.

B **Erection**

1. Drawing materials from stores, verification, inspection as per shipping list, drawings and documents.
2. Preservation, upkeep, safe custody of the erected equipments till handing over.
3. Verification of installation as per drawing and document for the correctness of cabling, JB's, impulse pipe, various field device, panels, instruments etc
4. Continuity check & IR value of cables.
5. Verification of correction of cable termination with respect to instrument, electrical hook-up diagram, panel interconnection diagram, JB schedule.
6. Checking earthing of the equipments and cable shield wire continuity.
7. Energizing the functional group control panels and field devices.
8. Flushing of impulse pipe before making the instruments process connections through.
9. Any leakage damages to impulse pipe, field device connections, air connections etc shall be fully attended by contractor.

C **Testing & Commissioning**

1. Checking/verification of binary/analogue input and output signal from field and panel and up to recording/indicating instrument/MMI monitors.
2. Adjustment, testing, calibration of pneumatic drive (control valve, trip valve, power cylinder for gate/dampers etc), electrical actuator operated valve/gate/dampers of other functional elements.
3. Checking and operating electrical/pneumatic drive through functional group panel, remote control desk, PMS/MMI, CRT operation and repeatability and smooth operation to be checked.
4. Checking the interlock, protection and alarm for various processes by stimulation of field devices/process changes.
5. Functional check of sub-loop control, sub group control and auto loop and fine-tuning.
6. Adjustment of limit switches/feed back position transmitter checking the LS of actuator for correct position indication and repeatability shall be ensured.

7. Motor IR value measurement, bearing/winding RTD checking, checking the ht load connector, providing assistance for trial run of motor which includes monitoring temperature rise winding/bearing during trial run.

8. Contractor shall prepare calibration/testing report/protocols.

9. During trial run of various systems, the performance of any instrument found erratic, un-satisfactory are required re-adjustment, re-calibration etc. Contractor shall attend to the defects.

10. Observing and checking the performance of the various devices on load/process variation. any deficiencies/defect noticed during the variable load conditions, the same shall be attended promptly.

11. Observe the proper functioning of sub-group/sub-loop control.

12. Check the operation of various control in manual /auto mode for smooth functioning.

13. Clearing of all bad signals arising during commissioning. Any wiring correction or minor modification in control panel wiring noticed during the pre-commissioning, it shall be carried out.

4.16.12 BHEL's Customer will arrange the clearances/approval from Electrical Inspectorates and other Statutory Authorities at site including payment of all fees for the works under this tender specifications. Other assistance/drawings and documents as required to enable the customer to obtain the such clearance/approval shall be provided by contractor as part of scope of work. In case these inspections have to be repeated due to default/fault of the contractor and fees have to be paid again, the contractor has to bear the charges. This supersedes clause 8.13.5 of Section-8 (Special conditions- **Inspection/Quality Assurance/Quality Control/ Statutory Inspection**

4.17 Insulation

Application of wool insulation, sheet metal cladding, welding of studs/hooks/ supports for Equipments, Tanks/vessels and pipings etc. to hold insulation covered under this contract shall include, but not limited to, the following :-

A) Removable type of insulation to be provided for valves, expansion joints, etc As per the drawings or as directed by BHEL engineer.

B) Wool insulation are received at site as bonded and un-bonded mattresses in standard sizes. These are to be dressed/cut to suit work

C) Application of insulation work and sheet metal cladding as given in various drawings/ specifications of BHEL. The documents for further details of insulation of equipments like , SJAE, GSC, Drain Cooler, Flash Tank etc. will be furnished at site.

D) Aluminium / GI sheet cladding by fabrication of aluminium/GI sheets to the sizes and shapes specified in drawings, beading, swaging, bevelling of sheets, crowning the sheets, if necessary, fixing the same to supports, over

wool insulation with screws / retainers as specified in BHEL drawings or as instructed by BHEL engineer.

E) Welding of studs/hooks/supports on equipment and piping to support wool insulation, as per the drawings or as instructed by BHEL engineers.

F) Painting the inner side of aluminium cladding, with anti-corrosive paint as specified. The required paint and thinner & other accessories/ consumables for painting, cleaning the surfaces etc Shall be arranged by the contractor.

G) 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. These gaps will have to be finished as per drawings at a later date by the contractor at no extra cost to BHEL.

H) A log book shall be maintained by the contractor for taking clearance of the location for application of refractory and insulation.

I) **Wastage Allowance For Insulation & Cladding**

Wastage allowance on net issued quantity for refractory & insulation shall be as follows:

i)	Wool mattresses and cladding sheets	2%
ii)	Iron & other retainers/fasteners components	2%

Net issued quantity is the gross quantity issued less the useable quantity returned to BHEL. Acceptance of any material as useable will be at absolute discretion of BHEL engineer.

J) The insulation of Turbine shall be done either by Spray Insulation or by using mineral wool mattresses. Insulation of Turbine is in the scope of contractor. However if the insulation is to be done by spraying method then it is excluded from the scope of contractor. Necessary assistance required for spray insulation is to be extended by contractor.

4.18 Final Painting

4.18.1 Supply

The contractor shall provide all the primer, thinner, finish paint and other consumables like brush, cleaning agents etc required for preservation and Final Painting of mechanical / electrical and piping system and equipments along with associated auxiliaries.

All the exposed metal surfaces shall be painted with paint of type pigmented epoxy resin with modified amine hardener or hydroxyl polyster base with hardener confirming to BS standards or equivalent.

4.18.2 Paint application

Application of primer and final paints is in the scope of the contractor. Required T&P, consumables, manpower, supervision is to be arranged by the contractor. Paint specification / grades, Colour shades, colour coding (colour bands, name of equipments / lines, flow-direction arrow, inscription etc.) for identification and specification of various equipments & pipelines shall be as decided by BHEL/ Customer at site.

Dry film thickness of the primer coat shall not be less than 35 microns.

Two coats for final paint shall be applied with minimum dry film thickness of 70 microns.

Steel work surfaces to be prepared according to International standards for paint preparations.

4.18.3 All exposed metal parts of the equipment including main equipments under the scope of this tender specification, piping, supports, structures, railing, tanks/vessels etc, as applicable shall be painted after thoroughly cleaning the surface from dust, rust, grease, oils, scales, etc, by wire brush, scrapping, etc as required. The above parts shall then be painted with two coats of synthetic enamel paint over the existing shop primer/paint. Also, where the shop primer/paint has peeled off, the affected area shall be cleaned thoroughly by suitable method to obtain clean metal surface and coated with two coats of Primer and two coats of Finish Paint. Similarly, certain components may be supplied without any primer/paint coat from shop. The surface of such items shall be cleaned and painted as specified above. The dry film thickness after final coat should be as per specification. The colour shade etc shall be as instructed by the BHEL engineer in charge. Primer and Finish Paints shall be sourced only from the manufacturers approved by BHEL / Customer.

In order to have consistency in painting system, it is preferable that all the supplies are sourced from one single manufacturer.

The primer shall be compatible with the final paint schedule.

Manufacturer's test certificate for each batch of primer/ paint shall be submitted prior to use. Non-compliance to this requirement will lead to the prohibition from use and rejection of that particular batch of supplies.

4.19 **Welding, Heat-Treatment, Radiography and Other Non-Destructive Testing**

A) Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc Contractor's personnel engaged should have adequate qualification on the above works.

B) The method of welding (viz) arc, TIG or other method will be indicated in the detailed drawing/documents. BHEL engineer will have the option of changing the method of welding as per site requirement.

C) 1) Welding of high pressure joints shall be done by high pressure welders certified by Boiler inspectorate of India or Ethiopia or any other country or as per decision of BHEL / Customer.

2) Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.

D) All the welders (structural and high pressure) shall be tested and approved by BHEL engineer before they are actually engaged on work though they may possess the IBR/other certificate. BHEL reserves the right to reject any welder without assigning any reason.

E) Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.

F) The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this paint will be supplied by the contractor.

G) HP joint fit-ups, should be protected, where required, by use of tapes/protective paint as may be prescribed by BHEL. The contractor shall supply protective paints/tapes etc

H) Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the contractor in accordance with BHEL engineer's instructions. Normally the electric resistance heating method will be adopted. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the contractor shall have to arrange for labour, all heating elements, thermocouples and attachment units, graph sheets, thermal chalks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

J) All the recorded graphs for heat treatment works shall be the property of BHEL and shall be handed over to BHEL site in-charge when demanded.

K) The contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL engineer as required. Interpretation of the BHEL engineer regarding acceptability of the welds shall be final.

L) Heat treatment may be required to be carried out at any time (day and night) to ensure the continuity of the process. The contractor shall make all arrangements including labour required for the work as per direction of BHEL.

M) Radiography work of welds connected with this contract shall be arranged by the contractor including provision of services of technician and necessary equipment and consumables like isotope camera, x-ray/gamma ray films, chemicals etc, and necessary labour required such as riggers, helpers, etc, to assist the technician for carrying out the radiography work and making other arrangements such as providing scaffolding, approaches, platform lighting arrangements, etc, at their cost and the work has to be arranged as per the

instruction of BHEL. It may please be noted that invariably the radiography work will be carried out after the normal working hours and close of other site activities only.

N) Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL engineer. The quantum of radiographic inspection shall be as per provision of IBR/BHEL's erection documents. They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL engineer/boiler inspecting authority.

O) All x-ray/gamma ray films of joints shall be preserved properly and be handed over to BHEL. These shall become the property of BHEL.

P) The field welded joints shall be subject to dye-penetrant / other non-destructive examination as specified in the respective engineering documents/ as instructed by BHEL.

Q) Wherever required, surface preparation, like smooth grinding of welded area, prior to radiography shall be done as specified. 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 contractor shall take all this into account in his offer.

R) **Socket Welding** :

In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The bidder shall take notice of this while quoting as no extra claim on this account will be entertained at a later date. The socket welding on HP parts/ HP piping shall be done by certified / qualified welders as given in para – (C) above. In case the contract provides for payment/ recovery on account of variation in the quantity of butt weld joints elsewhere in the specifications, the socket welds will not be taken into account on either side while computing variation in number of butt weld joints. Modification work, involving socket weld joints will be paid on the basis of extra man-day rate only. Contractor has to adhere to the procedures/specification as indicated in the drawing for socket welding.

S) Welding electrodes have to be stored in enclosures having temperature and humidity control arrangement. This enclosure shall meet BHEL specifications.

T) Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens.

U) The portion of work coming under purview of Boiler inspectorate (e.g. Welding, heat treatment of HP joints) has to be executed as per the latest version of Boiler Regulations and amendments thereof. BHEL will furnish relevent documents for piping & fittings and further approvals of Boiler inspectorate /

Statutory Authorities for pre-assembly & erection and other works shall be taken by contractor.

4.20 Testing, Pre-Commissioning, Commissioning and PG Test

4.20.1 Testing, pre-commissioning, & commissioning will involve, though not limited to these, various testing, trial runs of various equipments erected and systems installed, flushing of the lines by air, oil or steam as the case may be, chemical cleaning of various systems & piping, oil-flushing, steam blowing of the pipe lines, steam rolling, synchronization, trial operation etc, are some of these activities. All the activities for commissioning of the set, as informed by BHEL from time to time shall be completed.

4.20.2 All the above tests may have to be repeated till all the equipments satisfy the requirement/ obligations of BHEL to their client and also the relevant statutory authority.

4.20.3 For the purpose of Chemical Cleaning, Steam blowing, Oil flushing & Hydraulic test of TG piping, contractor shall lay/install necessary temporary piping, valves for conduct of hydraulic test, Oil flushing, Chemical cleaning, steam blowing etc This may involve cutting of some portion of existing piping/valves, placing of rubber wedges/ blanks in the valves and other openings, installation of temporary tanks for chemical mixing, temporary access platforms to mixing tanks etc Where required, bends have to be fabricated at site from running length of pipe. Temporary installation itself has to be tested, tried, and subject to non-destructive examinations as per the instructions of BHEL as part of work.

4.20.4 All materials, equipments necessary for installation of temporary system as above will be supplied by BHEL in random sizes/lengths. However, servicing, fabrication, erection, dismantling of the same after completion of the process, and handing over back to BHEL stores will be the responsibility of the contractor. All temporary dummy/blank flanges, fittings & fixtures and temporary supports required to carry out Steam Blowing, Chemical cleaning, Oil flushing and Hydraulic test will be arranged by contractor.

4.20.5 Fabrication, fit-up, welding, and post-weld-heat treatment if any, of requisite blanks for conduct of hydraulic test is part work. Similarly, removal of blanks, restoration and normalisation of the concerned system/line is to be done as part of work. BHEL will provide the material for blanks free of charge. No separate payment is envisaged for these activities.

4.20.6 Overhauling, cleaning, servicing of tanks, pumps, equipments, valves, during erection and commissioning stages are in the scope of work. Gaskets, packing for replacement will be provided by BHEL.

4.20.7 After chemical cleaning/pickling of lubricating system (including oil piping, oil tank and other fittings) of TG, rotating machines etc, oil flushing for lubricating systems as per instructions of BHEL engineer shall be carried out. Cleaning of oil tank of lubricating oil system before and after oil flushing is in the scope of work.

4.20.8 BHEL will provide oil for flushing, fresh oil for filling & topping, up to trail operation completion. Receipt & handling at store/storage yard and taking the delivery of flushed oil, fresh oil barrels from stores/storage yard for entire operations of flushing, filling & topping up, returning of flushed oil, fresh oil empty/unused/partly used barrels etc. to BHEL Stores after completion of operations shall be the part the scope of work. No separate payment on this account will be made. Similarly, for various pre-commissioning/ commissioning activities / processes mentioned in various clauses, transport of chemicals from BHEL/ customer's stores, charging of chemicals into the system and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of the contractor.

4.20.9 During pre-commissioning/ commissioning, replacing/ changing mechanical/ other seals of equipments, pumps, removal and cleaning/replacing of filters etc is within the scope of work. Items required for replacement/change will be provided by BHEL.

4.20.10 Contractor shall render all assistance for filling of gas in generator gas system. Air tightness test has to be conducted to ensure leak-proof-ness of generator gas cooling system.

4.20.11 In case any defect is noticed during tests, trial runs of TG set & its auxiliaries such as loose components, undue noise or vibration, strain on connected equipment etc, the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and realignment are necessary, the same shall be done as per BHEL engineer's instructions. Claim, if any, for these works from the contractor shall be governed by clauses 13.1 to 13.8.

4.20.12 Contractor shall cut/open work, if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.

I) Similarly, during the course of erection, if certain portion of equipment's erected by the contractor has to be undone for enabling other contractors/agencies of BHEL/customer to carry out their work, contractor shall carry out such jobs expeditiously and promptly and make good the job after completion of work by other contractor's/ agencies of BHEL/customer as per BHEL engineer's/agencies of BHEL/customers instructions. Claims, if any, in this regard shall be governed as per clauses 13.1 to 13.8.

4.20.13 During this period, though BHEL/ client's staff will also be associated in the work, the contractor's responsibility will be to arrange for complete requirement of men and required tools and plants, consumables, scaffolding and approaches etc, till such time the commissioned unit is taken over by BHEL's client.

4.20.14 Commissioning activities will continue till the completion of trial run/PG test for erection works. During this period contractor shall make available the services

of separate dedicated labour-force comprising of suitable skilled and semi/un-skilled hands along with necessary tools and plants, consumables etc

4.20.15 It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning and commissioning period along with BHEL engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.

4.20.16

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

4.20.17

Assistance for PG Test

The contractor shall provide assistance for conducting Performance Guarantee (PG) Test to BHEL as a part of his regular scope of work. This shall include manpower assistance, small T&P, providing access platforms/ scaffolding/ladders, lighting arrangements and other enabling facilities associated with typical PG Test activity.

4.21 General

4.21.1 Steam piping, Extraction piping, Drain line, Oil line, Service air piping, Cooling and Service water lines between the BHEL supplied equipments/ auxiliaries and battery limits of customer is in the scope of this tender specification.

4.21.2 It may be specifically noted that it should not be construed or claimed by the contractor that with the technical specification and "exclusions and/or inclusions" detailed in this tender specification, BHEL has covered the entire scope of work and/or the details thereof to be executed by the contractor.

4.22 General Responsibility of the Contractor

4.22.1 The contractor shall have total responsibility for all equipment and materials in his custody at contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/finished surfaces should be greased and covered.

4.22.2 Preservation & Protection of Components

At all stages of work, equipments/materials in the custody of contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents, excepting the primer & paint, for the above work shall be provided by BHEL. However, steam washable paint, if required, for preservation of condenser parts will be provided by BHEL.

4.22.3 The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.

4.22.4 Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. In case of failure of contractor in compliance of this requirement, BHEL will make suitable arrangement at contractor's risk and cost.

4.22.5 The entire surplus, damaged, unused materials, package materials/ containers, special transporting frames, gunny bags, etc, shall be returned to BHEL stores by the contractor.

4.22.6 The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilisation of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.

4.22.7 For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.

4.23 Common Requirements

4.23.1 All welded joints should be painted with anticorrosive paint immediately after completion of radiography and stress relieving works. Necessary paints and other consumables for the above work are in the scope of the contractor.

4.23.2 Suspensions/supports for tubes/piping, etc, will be supplied in running/ random lengths/ sizes which shall be cut to suitable sizes and adjusted as required.

4.23.3 Spring suspension/constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/locks, cutting of excess thread length of hanger tie-rod etc, have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/instructions, during various stages of erection & testing and after floating of piping/ducting during cold and hot condition will have to be done. This exercise may have to be repeated till satisfactory results are achieved.

4.23.4 Layout of field routed/ small bore piping shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipe lines even after completion of erection.

4.23.5 Welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow metering & measurement devices, and control valves to be provided on TG & its auxiliaries, integral & external pipe lines covered within the scope of this specification, will also be the responsibility of

the contractor and shall be done as per the instructions of BHEL site engineer. The installation of all the above items will be contractor's responsibility even if the :

I. Items are not specifically indicated under the respective product groups as given in the technical specifications.
II. Items are supplied by an agency other than BHEL.

NDE, and post weld heat treatment for above shall be done as per the specifications as part of work.

4.23.6 Entire Electrical, Control & Instrumentation works covered under the tender specification are highly advanced in technology with Logic Controls based. Contractor have provide reputed & experienced staff and required testing equipments.

4.23.7 Fixing and seal welding of thermo-wells & plugs before hydro test/ steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermo-wells after hydro test/steam blowing of lines as part of work.

4.23.8 Actuators/drives of valves, dampers, gates, powered vanes etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.

4.23.9 All electrical motors have to be tested for IR&PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. BHEL will provide the motorized insulation testers.

4.24 BHEL's Customer will arrange the clearances/approval from Electrical Inspectorates and other Statutory Authorities at site including payment of all fees for the works under this tender specifications. Other assistance/drawings and documents as required to enable the customer to obtain the such clearance/approval shall be provided by contractor as part of scope of work. In case these inspections have to be repeated due to default/fault of the contractor and fees have to be paid again, the contractor has to bear the charges. This supersedes clause 8.13.5 of Section-8 (Special conditions- **Inspection/Quality Assurance/Quality Control/ Statutory Inspection)**

4.25 List of Terminal Points

4.25.1 **MECHANICAL**

SNo	PARAMETER	TERMINAL POINT
1.	Steam at 32 bar	Outside Boiler building within 1 m at a height of 10m above ground level.
2.	Extracted steam at 8 bar	Outside Power House building within 1 m at a height of 10m above ground level.

3.	Extracted steam at 2.3 bar	Outside power house building within 1m at a height of 10m above ground level.
4.	Steam at 2.3 bar from PRD	Outside power house building within 1m at a height 10m above ground level.
5.	Condensate from Power House to Boiler	Outside Boiler building within 1m at a height of 10 m above the ground.
6.	Desuperheating water for Power House	Outside Boiler building within 1m at a height of 10 m above the ground level.
7.	**Bearing Cooling water**	
I	To juice extraction plant , process house plant	On bidder's cooling water header outlet lines at a height of 20 m above ground level.
II	To steam generation plant	Outside the boiler hose building within one meter of it, at a height of about 10 m above ground level.
III	Return piping	From sump.
8	Cooling tower make up	
I	DEC turbine cooling tower	From tower basin
II	Bearing cooling water cooling water	From tower basin
9	Gland sealing water to Power Generating plant	Outside power house building within 1 m of it at the height of 10 m above ground level.
10	Water for general usage to power generating plant	Out side the power house building within 1 m of it , at a height of 10m above ground level.
11	Instrument air from Power Generating plant	Out side the power house building & within 1m of it, at a height of 10 m above the ground level.
12	Power air for boiler house	Outside Boiler building within 1m at a height of 10 m above ground level.
13	For power air for other plants	Outside the power house building within 1 m of it , at a height of 10 m above ground level.
14	For air supply to sulpher burners	Out side the power house building within 1 m of it, at a height of 10 m above ground level.
15	Potable water	Out side the power house building within 1 m of it , at a height of 10 m above ground level.

4.25.2 ELECTRICAL :

1. Generated power: At the bus bars of HT (11KV) Generator breaker panels for further hook up/ evacuation by Customer (only two stand alone generator incomer breaker panels are supplied).
2. LT power (normal & emergency) : :

I. At the incomers feeder terminals of LT 415V MCC (common MCC for two STG sets & BOP loads) for interconnection from Customer's PCC/MCC (redundant incomer feeders – 2 nos of 2000Amps (min rating) will be provided at Customer's PCC/PMCC).

II. At the incomers feeder terminals of LT 415V MCC (BOP MCC located at cooling tower pump house)for interconnection from Customer's PCC/MCC (Redundent incomers feeders – 2nos of 2000Amps(min rating) will be provided at purchaser's PCC/PMCC.

3. Earthing system: At the nearest earthing points/risers for hook up to Customer's above & below ground earthing system.
4. DC power supply: No TP with Customer or others packages.
5. AC UPS power Supply: At consumption points for feed from purchaser's AC UPS system.

4.25.2 C & I:

a. Field instrumentation: :
   i. Instrumentation with in BHEL battery limit.
   ii. MS STEAM: with in BHEL piping supply scope.
   iii. IP Steam: with in BHEL Piping supply scope.
   iv. Condensate: At Deaerator inlet.

Section-5
Special Conditions of Contract

5.0 OBLIGATIONS OF THE CONTRACTOR (LABOUR COLONY, TOOLS AND TACKLES, CONSUMABLES, INFRASTRUCTURES, ETC.)

5.1 LABOUR COLONY

5.1.1 Space & Construction

Space as jointly decided with Customer & BHEL will be provided free of charges for construction of labour colony, temporary structures / facilities like temp houses, toilets, etc. Contractor shall construct labour colony including lighting, internal, roads, water distribution ensuring proper hygiene and provide facilities for proper sanitation and drainage. Contractor shall comply with the stipulations of Ethiopian Pollution Control Board while constructing the labour colony.

5.1.2 Electricity

Owner / BHEL will provide Electricity at one point free of charges. The contractor shall augment the electric facilities for use in its labour quarters at its expense and use its best endeavours to control and minimize the electricity provided. Contractor shall make further necessary arrangements like distribution network with necessary poles, conductors, cables, Energy Meter, protection devices, distribution board etc. at his own cost and services as per the requirement and instruction from Owner/BHEL

5.1.3 Potable & drinking Water

Customer / BHEL shall provide potable water free of charge at one point in the form and content as is available .Further distribution of water shall be carried out by contractor at his cost and services fulfilling all the requirements including statutory & safety requirements in this regard as per the instructions from Customer/BHEL.

5.2 TOOLS AND PLANTS

5.2.1 The contractor shall provide all required tools and plants for , transportation, erection, lifting & placement to required foundation / elevation, testing, commissioning for entire Equipments / systems including handling & transportation arrangements for heavier consignment like Surface Condenser, Steam Turbine, Generator, Tanks etc and other auxiliaries , inspection, measuring, testing, calibration instruments required to carry out & complete the erection, testing and commissioning of works covered under this tender specification. Services of 30 MT capacity EOT will be made available in TG hall free of hire charges for erection of TG equipments subject to its availability and accessibility. No claim on account of non-availability of Customer's EOT will be entertained.

5.2.2 All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification.

5.2.3 Timely deployment of adequate quantity of T&P 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.

5.2.4 Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternate arrangements expeditiously so that the progress of work is not hampered.

5.2.5 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 the alternate arrangement at the risk and cost of the contractor.

5.2.6 The T&P to be arranged by the contractor shall be in proper working condition. The operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage/breaking occur to foundation, equipment, material and men. All arrangements for the movement of his T&Ps etc, shall be the contractor's responsibility.

5.2.7 Normally, for welding only the use of welding generators may be permitted. The use of welding transformers/rectifiers will be subject to the approval of BHEL engineer.

5.2.8 The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring instruments (MMDs) and tests. Test/ calibration certificates shall be furnished to BHEL. MMDs shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL.

5.3 CONSUMABLES

5.3.1 The contractor shall provide all consumables, lubricants including TG special consumables like Molykote, Hylomar, Bricosit Stag-B and sealing compound for GI instrument & service air piping etc. as required for carrying out the work covered under these specifications. BHEL will provide only flushing oil and fresh lube oil for TG system

5.3.2 All consumables to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports/ certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

5.3.3 Primer, Paints etc.

The contractor shall provide the Primers, Thinner, Paints etc. for various applications **including Final Painting** as specified in these specifications elsewhere (refer section-4).

5.4 Welding Electrodes, Filler Wires for TIG Welding and Gases

5.4.1 All the required welding electrodes, including Stainless Steel and special electrodes, as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding manufacturer, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc Batch test certificates shall be made available for verification & record.

BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type/brand etc

5.4.2 BHEL will not supply any filler wires for TIG welding. The contractor shall provide all types of filler wires in adequate quantity for TIG welding involved with this work.

5.4.3 All the required gases like argon, oxygen, acetylene etc Shall be arranged by the contractor at his cost.

5.4.4 If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability of consumables from the contractor's side BHEL will make alternate arrangements at the risk and cost of contractor. The expenditure incurred with overheads will be recovered from the contractor.

5.5 Field Office

5.5.1 Customer will provide open space for office & stores. Contractor shall make his own arrangements for further construction of field office, stores to accommodate the contractors necessary equipments, tools room etc. necessary for execution of the work.

5.5.2 On completion of work, all the temporary installations , structures, pipelines, cables, etc shall be dismantled/demolished and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so , the same will be arranged to be removed and expenditure thereof will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.6 Area Lighting

5.6.1 Contractor shall arrange adequate floodlights, hand lamps and area lighting. Provision of distribution lines for lighting from the single point to the required place with proper distribution boards, observing the safety rules laid down by the electrical authorities of the state shall be done by the contractor including all the materials like cables, fuses, switch boards etc

5.7.1 CONSTRUCTION POWER

5.7.1.1
Customer / BHEL will provide construction power at one point near the erection site free of charges. The contractor shall use its best endeavours to control and minimize the electricity provided. Contractor shall deploy and install required energy meter, cables, fuses, distribution boards, switchboards, bus bars, earthing arrangements, protection devices and any other installation as specified by statutory authority/act. Contractor shall also obtain approvals of appropriate authority and pay necessary fees, levies etc towards the clearance of such installations, prior to use.

5.7.1.2
Contractor shall make necessary arrangements for onward distribution of construction power at his own cost and services taking due care of surrounding construction activities like movement of cranes & vehicles, civil work, fabrication/construction/assembly/ erection etc and safety of personnel. It may become necessary to relocate some of the installations to facilitate work by other agencies or by him.

5.7.1.3
It shall be the responsibility of the contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced electrician.

5.7.1.4
While BHEL will make reasonable efforts to ensure continuous electric power supply, interruptions cannot be ruled out. Contractor shall be well equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc to tackle situations arising due to failure of customer supplied power, so as to ensure continuity and completion of critical processes that are underway at the time of power failure or important activities planned in immediate future.

5.7.1.5
Notwithstanding the above ,BHEL shall not be responsible for disruption in supply of electricity . The Contractor shall not claim loss of time due to any such disruptions in the supply of electricity and shall make standby arrangements for any captive generation of electricity that may be required for completion of package facilities in accordance with the programme.

5.7.1.6
BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply.

5.7.2 CONSTRUCTION WATER

5.7.2.1

BHEL / Customer will provide water for construction purpose free of charge at a single point . All arrangements for further distribution beyond this point have to be made by the contractor at his own costs and services.

5.7.2.2
Notwithstanding the above BHEL shall not be responsible for any disruption in the supply of water by the owner.

5.8 RESPONSIBILITIES WITH REGARD TO LABOUR EMPLOYMENT ETC.

Refer clause 2.8 of general conditions of contract in this regard.

5.8.1
Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.

5.8.2
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.

5.8.3
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 lay 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.

5.8.4
Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangements including construction of septic tank. These installations shall be maintained in hygienic condition at all times.

5.8.5
If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability/shortfall in provision of resources from the contractor's side BHEL will make suitable alternate arrangements at the risk and cost of contractor. The expenditure incurred with overheads thereby shall be recovered from the contractor.

5.9 TAXES, DUTIES, LEVIES

5.9.0 TAXES, DUTIES, LEVIES

Refer to Clause 2.8.4 of General Conditions of Contract. Notwithstanding anything contained therein, the following provisions shall be applicable for this contract.

5.9.1

The rate quoted by bidders should be inclusive of all Taxes & Duties and BHEL will not reimburse any amount on account of Taxes & Duties. Wherever tax exemptions/concessions are allowed to the bidder, the

same may be availed by the bidder without attracting any financial implication on BHEL. However, if as per the Ethiopian/ Indian laws, BHEL can avail set off against any tax or duty paid by the bidder, the bidder shall provide necessary documents to BHEL to avail such set off.

All payments to the bidders shall be subject to recovery of all applicable Withholding Tax and / or Tax Deduction at source as per the Ethiopian Laws and /or Indian Law

5.10 SUBMISSION OF PERIODICAL REPORTS

Contractor shall submit periodical reports in respect of following aspects of operation:

1) Consumption of consumables like welding electrodes, gases and paints
2) Consumption of construction power
3) Availability and utilization of BHEL's Tools & Plants
4) Availability and utilization of contractor's tools & plants
5) Daily manpower reports
6) Daily progress reports of activities & incidents
7) Calibration reports
8) Records of wages payment
9) Any other report/record as may be specified by BHEL/client.

BHEL at site will suggest formats for these reports.

5.11 EMPLOYMENT OF WORKERS , WORKING TIME ETC.

5.11.1 It shall be the responsibility of the Contractor to pay salaries and other benefits to its employees/personnnel engaged by it as per the agreement with them, and in keeping in line with the local laws in Fincha. The Contractor shall submit to Construction Manager, BHEL Site, Fincha regularly, the details/statement of wages paid to its workers in India/back home, besides wages paid in Fincha.

5.11.2 All traveling and transportation expenses including air fares etc shall be borne by the Contractor for all his employees. The Contractor shall also bear air fare and other expenses for those employees sent back to their place on account of misconduct, disobedience, improper behaviors, sickness, unsatisfactory work or any other reason whatsoever.

5.11.3 Contractor shall arrange passports for all his staff and labour. BHEL will assist Contractor for issue of visas including multi-entry visas and other permits as per requirement for the job. However, the Contractor shall arrange for attestation of certificates and other documents required for travel arrangements, medical tests as applicable and comply with other formalities. All expenses for all these activities will be borne by the Contractor.

5.11.4 The delay in obtaining the passports and other travel documents or compliance with the various formalities for the deputation of the contractor's personnel shall not absolve the contractor from his obligations under the Contract including completion of the work strictly in accordance with the time schedule.

5.11.5 The Contractor shall in all dealings with persons in his employment have due regard to all recognised festivals, days of rest/weekly off, and religious or other customs in Fincha and shall make special arrangements whenever the exigencies of the construction program demand that work shall proceed during such festivals and days of rest.

5.11.6 The Contractor shall plan and schedule the activities on Site such that they happen strictly during the specified working hours.

5.11.7 **The Contractor shall not otherwise than in accordance with Fincha State Laws import, sell, give, barter, or otherwise dispose of any alcoholic liquor or drugs or any arms or ammunition to any person or persons whatsoever, nor permit or suffer any such importation, sale, gift, barter, or other disposal by his employees.**

5.11.8 The Contractor shall submit a request to BHEL for issue of an identity card to each and every person employed at the Site by him along with passport size photographs and other documents as may be required for the purpose.

5.11.9 No person will be allowed to enter the project premises without an identity card. All identity cards will be surrendered by the Contractor to BHEL in respect of each person on completion of assignment of such person.

5.11.10 The Contractor shall at all times take all requisite precautions and use his best endeavors to prevent any riotous or unlawful behavior by or amongst the labourers and others employed by him for the purpose of or in connection with the Contract and for the preservation of the peace and the protection of the inhabitants and the security of property on or in the neighbourhood of the Site.

5.11.11 The Contractor shall in collaboration with, and to the requirements of, any duly constituted medical or sanitary authority, ensure that suitable arrangements are made on the Site for the maintenance of health, the prevention and overcoming of epidemics, and for adequate first-aid, welfare, and hygiene services.

5.11.12 The Contractor, his partners, foreign workers and employees and their families shall not be involved by any manner in any political activity during their residence in the Employer's country

Section-6

Special Conditions of Contract

6.0 Contractor's Obligation in Regard to Employment of Supervisory Staff and Workmen

6.1 The contractor shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen like high pressure welders 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. Contractor should furnish a tentative deployment plan of his manpower as required vide appendix-vii. Also the actual deployment will be so as to satisfy the erection and commissioning targets set by BHEL.

6.2 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.

6.3 Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.

6.4 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.

6.5 The supervisory staff employed by the contractor shall ensure proper out-turn 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.

6.6 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.

6.7 Industrial Relations and Labour Laws

An industrial relations supervisor shall coordinate for the implementation of local labour laws, maintenance of records as required by contract labour (regulation and abolition) act and also coordinate with the local labour authorities and any other such authorities under whom this work falls.

6.8 Site Organization

The contractor shall provide adequate staffing in the following major areas.

- Planning, Monitoring and Control
- Materials Management
- Condenser & Auxiliaries
- Turbine & auxiliaries
- Generator and auxiliaries
- Pumps & Auxiliaries
- Piping
- Welding and NDT
- Quality Assurance and Control
- Safety
- Industrial relations and welfare

Contractor shall furnish an organisation chart indicating the staffing pattern for the above functions. Contractor shall provide the names and details of engineer/supervisors at the time of mobilization to BHEL as per the proposed organization chart.

Section-7

Special Conditions of Contract

7.0 **Obligations Of BHEL**

7.1 Facilities Provided by BHEL

7.1.1 Space for Field Office

Refer section-5 in this regard.

7.1.2 **Construction Water**

Refer section-5 in this regard.

7.1.3 **Construction Power**

Refer section-5 in this regard.

7.1.4 **Other Materials and Consumables**:

BHEL shall not provide any material/consumables except those specifically mentioned in this tender specification.

7.2 **Test Blanks (Plates & Pipes)**

BHEL will provide only temporary pipes & valves for steam blowing / chemical cleaning & oil flushing. All the temporary plates & dummy/blank flanges required to carry out above test will be arranged by Contractor at his own cost.

7.3 **Filler Wire For TIG Welding**

Refer section-5 in this regard.

7.4 **Equipments – Tools & Plants**

7.4.1 Facility of 30 MT capacity EOT crane inside the TG hall will be extended free of hire charges for erection of TG equipments, subject to its availability and accessibility. No other cranes / equipments will be provided by BHEL for the work under the scope of this tender specification. As such the contractor shall make his own independent arrangement for handling and erection of heavier assemblies like Condenser, Turbine, Generator etc. for the purpose of unloading and handling at store/storage yard, transportation to site of work and for erection, testing & commisioning. No claim of extra payment on account of non-availability of EOT crane shall be entertained at any point of time.

7.4.2 Special tools which are supplied by BHEL manufacturing unit as part of maintenance tools to be handed over to customer under regular DU/DESS numbers in various product groups may be issued to the contractor free of charges for specific activities, at the discretion of BHEL. Contractor shall return them after the completion of the specific activity for which the tools were spared, in good working order.

7.4.3 The contractor must not use these equipments for any purpose other than what they are intended for. Misuse, if any, will result in penalty.

7.4.4 If the above items issued to contractor are found not utilised/not maintained to the satisfaction of BHEL engineer or misused, these will be withdrawn and no replacement will be done for such items.

7.5 Chemicals and Lubricants for Pre-Commissioning and Commissioning

7.5.1 All lubricants and chemicals required for testing, preservation, chemical cleaning / acid cleaning, oil flushing, and the lubricants for trial runs of the equipments will be shall be arranged by contractor. BHEL will provide only oil for flushing and fresh lube oil for of TG Lube oil system free of charges.

SECTION-8 (Rev 01, 24/01/2009)
SPECIAL CONDITIONS OF CONTRACT

8.0 Inspection/Quality Assurance/Quality Control/ Statutory Inspection

8.1 Various inspection/quality control/quality assurance procedures/methods at various stages of erection and commissioning will be as per BHEL/customer quality control procedure/codes and other statutory provisions and as per BHEL engineer's instructions.

8.2 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.

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.

8.3 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.

8.4 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.

8.5 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.

8.6 Contractor shall provide all the measuring monitoring devices (MMDs) required for completion of the work satisfactorily. These MMDs 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. The indicative list of MMDs required for this work and to be made available by the contractor is given in relevant appendix. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.

8.7 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.

8.8

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.

8.9 BHEL, Power Sector – Western Region (PSWR) has already been accredited with ISO 9002 certification and as such this work is subject to various audits to meet ISO 9002 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by the contractor. Contractor shall ensure deployment of reliable and calibrated MMDs (Instrument Measuring and Test Equipment). The MMDS 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 MMDs so that work does not suffer when the particular equipment / instrument is sent for calibration. Also if any MMDs 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 MMD and retake the readings at Contractor's cost.

8.10 Re-work necessitated on account of use of invalid MMDs 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.

8.11 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 MMDs. Contractor shall render all assistance in conduct of such counter/final measurements.

8.12 Vibration indicators / vibration recorders / vibration analysers will be provided by BHEL for checking and analysing vibration levels of rotating equipments with necessary operators. Contractor shall provide necessary labour for carrying out such tests.

8.13 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. Contractor shall provide the services of Quality Assurance Engineer.

8.14 Stage Inspection By FES/QA Engineers

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 for such stage inspections free of cost.

8.15 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.

Statutory Inspection of Work

8.16 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) Factory Inspector, Labour Commissioner, Electrical Inspector 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 BHELl 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.

8.17 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.

8.18 All fees connected with the contractors for testing his welders / men / workers and testing, inspection, calibrating of his instruments and equipments, shall be paid by the contractor. 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.

8.19 Other fees like fees for periodic visits, hydraulic test fees, light up inspection fees etc. shall be borne by the contractor.

8.20 Payment of Registration fees for Boiler is excluded from the scope.

8.21 BHEL shall pay the ground inspection fees of Boiler Inspectorate. All other arrangements for site visits periodically by Boiler Inspector to site, for obtaining Inspection certificate etc, will have to be made by contractor.

8.22 The quality management system of BHEL, Power Sector – Western Region (PSWR) has already been certified and accredited under ISO 9002 standards in this regard. 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.

Field Quality Assurance

8.23 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.

SECTION-9

SPECIAL CONDITIONS OF CONTRACT

Safety, Occupational Health and Environmental Management

BHEL PSWR has been certified for Environmental Management under ISO 14001:1996 standard and Occupational Health & Safety under OHSAS 18001 by DNV. In order to comply with the above standards, it shall be the endeavour of BHEL and all its subcontractors to meet and implement the requirements by following the guidelines issued under Environmental, Occupational Health and Safety Management (EHS) manual a copy of which will be available with the BHEL Site-in-charge.

Contractor shall also enter into a "Memorandum of Understanding" as given in clause 9.9 in case of award of contract.

9.0 Responsibility of the Contractor in Respect of Safety of Men, Equipment, Material and Environment.

9.1 The Contractor shall:

9.1.1

Abide by the Safety Regulations applicable for the Site/Project and in particular as mentioned in the booklet "Safe Work Practices" issued by BHEL. Contractors are also to ensure that their employees and workmen use safety equipments as stipulated in the Factories Act (Latest Revision) during the execution of the work. Failure to use safety equipment as required by BHEL Engineer will be a sufficient reason for issuance of memo, which shall become part of Safety evaluation of the contractor at the end of the Project. Also all site work may be suspended if it is found that the workmen are employing unsafe working practice and all the costs/losses incurred due to suspension of work shall be borne by contractor. A comprehensive list of National Standards from which the contractor can draw references for complying with various requirements under this section is given under 9.10

9.1.2

Hold BHEL harmless and indemnified from and against all claims, cost and charges under Workmen's Compensation Act 1923 and 1933 and any amendment thereof and the contractor shall be solely responsible for the same.

9.1.3

Abide by the Procedure governing entry/exit of the contractor's personnel within the Customer/Client premises. All the contractors employees shall be permitted to enter only on displaying of authorized Photo passes or any other documents as authorized by the Customer/Client.

9.1.4

Be fully responsible for the identity, conduct and integrity of the personnel/workers engaged by them for carrying out the contract work and ensure that none of them are ever engaged in any anti national activity

9.1.5

Prepare a signboard giving the following information and display it near work site:

i) Name of Contractor
ii) Name of Contractor Site-in-charge & Telephone number
iii) Job Description in short
iv) Date of start of job
v) Date of expected completion
vi) Name of BHEL Site-in-charge.

9.1.6
Abide by the rules and regulations existing during the contract period as applicable for the contractors at the Project premises.

9.1.7
Observe the timings of work as advised by BHEL Engineer-in-charge for carrying out the contract work.

9.2 SPECIAL CONDITIONS

9.2.1 Safety

9.2.1.1 Safety Plan

Before commencing the work, contractor shall submit a "safety plan" to the authorized BHEL official. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety to men, equipment, material and environment during execution of the work. The plan shall take care to satisfy all requirements specified hereunder.

The contractor shall submit "safety plan" before start of work. During negotiations, before placing of work order and during execution of the contract, BHEL shall have right to review and suggest modifications in the safety plan. Contractor shall abide by BHEL's decision in this respect.

9.2.1.2
The contractor shall take all necessary safety precautions and arrange for appropriate appliances and/or as per direction of BHEL or it's authorized person to prevent loss of human lives, injuries to men engaged and damage to property and environment.

9.2.1.3
The contractor shall provide to his work force and also ensure the use of Personnel Protection Equipment (PPE) as found necessary and/or as directed and advised by BHEL officials without which permission is liable to be denied.

- Safety helmets conforming to IS 2925/1984 (1990)
- Safety belts conforming to IS 3521/1989
- Safety shoes conforming to IS 1989 part-II /1986(1992)
- Eye and face protection devices conforming to IS 2573/1986(1991), IS 6994 (1973), part-I (1991), IS 8807/1978 (1991), IS 8519/1977(1991).
- Other job specific PPEs of standard ISI make as may be prescribed

9.2.1.4
All tools, tackles, lifting appliances, material handling equipment, scaffolds, cradles, cages, safety nets, ladders, equipment, etc used by the contractor shall be of safe design and construction. These shall be tested and certificate of fitness obtained before putting them to use and from time to time as instructed by authorized BHEL official who shall have the right to ban the use of any item found to be unsafe.

9.2.1.5
All electrical equipment, connections and wiring for construction power, its distribution and use shall conform to the requirements of Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carryout all types of electrical works. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed.

9.2.1.6
The contractor shall not use any hand lamp energized by electric power with supply voltage of more than 24 volts. For work in confined spaces, lighting shall be arranged with power source of not more than 24 volts.

9.2.1.7
The contractor shall adopt all fire safety measures as per relevant Indian Standards

9.2.1.8
Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provisions and/or storage in accordance with the rules and regulations laid down by the relevant government acts, such as petroleum act, explosives act, petroleum and carbides of calcium manual of the chief controller of explosives, Government of India etc. The contractor in all such matters shall also take prior approval of the authorized BHEL official at the site.

9.2.1.9
Proper means of access must be used e.g. ladders, scaffolds, platforms etc. No makeshift access such as oil drums or pallets shall be used. Design of these will be in accordance with relevant standards and certified by competent persons before use.

9.2.1.10
Temporary arrangements made at Site for lifting , platforms, approach access etc should be properly designed and approved before being put to use.

9.2.1.11
All excavations and openings must be securely and adequately fenced/barricaded and warning signs erected when considered necessary as per relevant code of practice.

9.2.1.12
No persons shall remove guardrails, covers or protective devices unless authorized by a responsible supervisor and alternative precautions have been taken

9.2.1.13
Access ways, means of escape and fire exits shall be clearly marked, kept clear and unobstructed at all times

9.2.1.14
Only authorized persons holding relevant license will drive and operate site plant and equipments e.g. cranes, dumpers, excavators, transport vehicles etc

9.2.1.15
Only authorized personnel are allowed to repair, commission electrical equipments.

9.2.1.16
Gas Cylinders shall be handled and stored as per Gas Cylinders Rules and relevant safe working practices

9.2.1.17
All wastes generated at Site shall be segregated and collected in a designated place so as to prevent spillage/contamination/scattering at Site, until the waste is lifted for disposal to designated disposal area as advised by BHEL official.

9.2.1.18
The contractor shall arrange at his cost (wherever not specified) appropriate illumination at all work spots for safe working when natural day light is not adequate for clear visibility.

9.2.1.19
The contractor shall train adequate number of workers/supervisors for administering “FIRST AID”. List of competent first aid administers should be prominently displayed.

9.2.1.20
The contractor shall display at strategic places and in adequate numbers the following in fluorescent markings

- Emergency telephone numbers
- Exit, Walkways
- Safe working load charts for wire ropes, slings, D shackles etc
- Warning signs

9.2.1.21
The contractor shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instructions that may endanger safety of men, equipment, material and environment in his scope of work or other contractors or agencies. Cost of damage, if any, to life and property arising out of such violation of statutory regulations and BHEL instructions shall be borne by the contractor.

9.2.1.22
In case of a fatal or disabling injury/accident to any person at construction sites due to lapses by the contractor, the victim and/or his/her dependents 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 the contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

9.2.1.23
In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover cost of such damages from payments due to the contractor after holding an appropriate enquiry.

9.2.1.24
In case of any delay in the 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 payments due to the contractor after notifying the contractor suitably and giving him opportunity to present his case.

9.2.1.25
If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given a 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 instructions regarding safety issued by the authorized BHEL official, 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 seven days indicating the steps that would be taken by BHEL.

9.2.1.26 **Emergency Response**

BHEL will have an Emergency Response Plan for each Project Site in consultation with the Owner as the case may be, detailing the procedure for mobilization of personnel and equipment, and defining the responsibilities of the personnel indicated, in order to prepare for any emergency that may arise in order to ensure the priorities of

- Safeguard of life
- Protect assets under construction or neighbouring

- Protect environment
- Resumption of normal operations as soon as the emergency condition is called off

All Contractors shall also be part of the Emergency response Plan and the personnel so nominated shall be aware of their duties and responsibilities in an emergency response situation.

9.2.1.27
At least 5% Contractors supervisors and workmen shall undergo training in administering 'First Aid'. The trained persons should represent for all categories of work and for all areas of work. Adequate number of trained persons should be available for each shift. These first aides shall be included in the emergency response team. Contractor employees and workmen are encouraged to participate in first aid training programmes whenever organized by BHEL.

9.2.2 OCCUPATIONAL HEALTH

9.2.2.1
Specific occupational health hazards will be identified through the hazard evaluation processes in consultation with BHEL engineers and the necessary prevention/reduction/elimination methods implemented.

9.2.2.2
All personnel working in an activity with a potential risk to health shall be made aware of all those risks and the actions they must take to reduce/control/eliminate the risk

9.2.2.3
Safety coordinator shall conduct periodic checks to ensure that every group of workers engaged in similar activities are aware of potential risks to health and the actions required to be taken to mitigate the risk

9.2.2.4
In order to protect personnel from associated health hazards, the following main areas will be focused

- Issue of approved Personnel Protective Equipment
- Verification that the PPE are adequate/maintained and worn by all staff involved in operations that are potentially hazardous to their health
- Ensure that the personnel deployed are physically fit for the operation/work concerned
- Provide hygienic and sanitary working conditions

9.2.2.5
Contractor workers employees engaged in noise risk areas shall be issued with hearing protection aids and the use of the same will be enforced. Further, these workers will be educated on the hazards of noise

9.2.2.6
Contractor workers engaged in dust environment shall be issued with necessary dust protection aids and the use of the same shall be enforced

9.2.2.7
Workers engaged in exposure to bright light/rays as in welding or radiation shall be issued with eye protection devices and the use of the same shall be enforced

9.2.2.8
Adequate arrangements shall be made to provide safe drinking water

9.2.2.9
Health monitoring records on at least sample basis for contractor employees & workmen shall be maintained for persons engaged in specified categories of work. These shall include

- Noise induced hearing loss
- Lung Function test
- Ergonomic Test
- Eye Test for Welders, Grinders, Drivers etc

9.2.3.0 HYGIENE and HOUSEKEEPING

9.2.3.1
Good house keeping and proper hygiene is one of the key requirements of Occupational Health Safety and Environment management. Towards this the contractor shall encourage his workers and supervisors to maintain cleanliness in their area of work.

9.2.3.2
The Contractor shall arrange to place waste bins/chutes at convenient locations for the collection of scrap and other wastes. The bins shall be clearly marked and segregated for metal, non-metal, hazardous and non hazardous wastes.

9.2.3.3
BHEL may take up appropriate remedial measures at the cost of the contractors if the contractors fail in good house keeping and if there is an imminent risk of pollution

9.2.4 ENVIRONMENT MANAGEMENT

9.2.4.1
BHEL has a sound environmental management system, which is to be maintained and implemented by all the contractors. The system allows for project specific objectives to be set and developed sensitive to client requirements, applicable environmental legislation and BHEL's own objectives and policy. BHEL engineers will assess and monitor the environmental impact of their work and lay out objectives for their minimization. The contractors shall implement the objectives for continual improvement of environmental performance. BHEL shall regularly audit environmental impacts and their improvements.

9.2.4.2 WASTE MANAGEMENT

9.2.4.3.1
The objective of waste management is to ensure the safe and responsible disposal of waste, ensuring that it is correctly disposed of and being able to audit the process to ensure compliance.

9.2.4.3.2
Chemical wastes if any shall be collected separately and disposed of to BHEL designated refuse yard as per BHEL advice.

9.2.4.3.3
No dangerous chemicals, noxious waste products or materials will be disposed off on or off site without approval obtained through BHEL.

9.2.4.3.4
All disposal of wastes generated during construction shall be in accordance with all relevant legislation.

9.2.4.3.5
Acid and alkali cleaning wastes shall be neutralized to acceptable norms before disposal to the designated area.

9.2.4.3.6
All necessary measures shall be taken to ensure safe collection and disposal of waste oils. In particular to ensure the prevention of their discharge into surface waters, ground waters, coastal waters or drainages

9.3 **SUPERVISION**

9.3.1

Contractor must provide at least one full time on site safety coordinator when the manpower engaged is in excess of 50 for the contract activities in the premises. If the manpower is less than 50, the on site safety coordination responsibilities shall be assumed by any one of the contractor's other supervisory staff; however in both the cases, the contractor must specify in writing the name of such persons to the BHEL Engineer in Charge.

9.3.2

Contractor's safety coordinator or his supervisor responsible for safety as the case may be shall conduct at his work site, and document formal safety inspection and audits at least once in a week. Such documents are to be submitted to BHEL Engineer in Charge for his review and record.

Contractor, supervisor must attend all schedule safety meetings as would be intimated to him by the BHEL Engineer in Charge.

9.3.3

Before starting work under any contract, the contractor must ensure that a job specific safety procedures/field practices as required over and above the safety permit conditions are prepared and followed .He should also ensure that all supervisors and workers involved understand and follow this procedures /field practices.

9.3.4
Contractor must ensure that in his work site appropriate display boards are put displaying signs for site safety, potential hazards and precautions required.

9.4.0 **TRAINING & AWARENESS**

9.4.1

Contractor shall deploy experienced supervisors and other manpower who are well conversant with the safety and environment regulations of the Project. The electricians to be deployed on the job should have wireman license.

9.4.2
All Supervisors & Workmen of the Contractor shall undergo Fire safety training/ demonstration whenever arranged by BHEL with the help of either Customer's Fire and Safety department or outside faculty so as to acquire knowledge of fire prevention and also to be able to make use of appropriate fire extinguishers.

9.4.3
Contractor must familiarize himself from BHEL Engineer in Charge about all known potential fire, explosion or toxic release hazards related to the contract. He in turn will ensure that same information has been passed to the supervisors and workmen

9.4.4
Contractor must ensure that all his supervisors are properly trained and each employee has received and understood from his supervisor necessary training and briefing about the safety requirement. Necessary document as a means to verify that employees have understood the training is to be maintained.

9.4.5
The contractor supervisors shall also give a small safety briefing to all the workmen under his charge before undertaking any new work and specially understand the safety requirements that are mandatory

9.5.0 **REPORTING**

9.5.1
The contractor shall submit report of all accidents, fires and property damage, dangerous occurrences to the authorized BHEL official immediately after such occurrence but in any case not later than twelve hours of the occurrence. Such report shall be furnished in the manner prescribed by BHEL and also to meet statutory requirement.

9.5.2
Any injury sustained by any of the contractor's employees within the Project premises must be reported to BHEL supervisor and FIRST AID should be immediately administered. The Contractor shall be responsible for keeping and maintaining proper records of Accidents to his personnel.

9.5.3
Contractor must arrange to immediately investigate, properly document and report any injury, accident or near miss involving any of his employees and take appropriate follow up action. He must furnish within 12 hours of the incident a written report to BHEL Engineer in charge and the Safety Section.

9.5.4
According to the Factory Act and the Employees state Insurance Act & regulation, any person sustaining any injury within the project premises and absenting himself from work for more than 46 hours, his accident report has to be sent to the respective Government Authorities. Therefore contractor shall inform the owner's representative such matter immediately for their needful action.

9.5.5
In addition, contractor shall submit periodic reports on safety to the authorised BHEL official from time to time as prescribed.

9.5.6
Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with his counterpart of BHEL.

9.6 **AUDIT REVIEW AND INSPECTION**

9.6.1
BHEL shall conduct audit on the contractor performance and compliance with the project specific requirements of the Environment and Occupational Health & Safety Management systems. The programme of audit shall cover all activities under the contract but will focus particularly on high-risk activities. The Construction Manager shall decide the schedule of audit. The audit findings shall be communicated to the contractors and necessary remedial action as advised by BHEL Engineers shall be under taken within the stipulated time.

9.6.2
Inspections shall be carried out regularly by the contractors and by BHEL Engineers on activities, facilities, equipment, documentation, to cover the following aspects.

- Compliance with procedures and systems
- Availability, condition and use of PPE
- Condition of maintenance tools, equipments, facilities
- Availability of fire fighting equipments and its condition
- Use of fire fighting equipments and first aid kit
- Awareness of occupational health hazard
- Awareness of safe working practices
- Presence of quality supervision
- Housekeeping

The Safety coordinator shall visit and inspect work sites daily. All unsafe acts, unsafe conditions that have imminent potential for causing harm/injury/damage will be immediately corrected. He shall maintain a daily logbook giving details of unsafe acts or conditions observed and the corrective action taken and recommendations for preventing recurrence. Adequacy of corrective actions will be verified

The contractor shall take remedial measures as per the findings of each inspection
Besides the above, the contractor shall be required to carry out the following inspections

Sl no	**Equipment**	**Scope of inspection**	**Inspection by**	**Schedule**
1	Hand tools	To identify unsafe/defective tool	User	Daily
2	Power tools	To identify unsafe/defective tool	User	Daily
3	Fire Extinguishers	To check pressure and any defect	User / Safety Coordinator	Daily Every month
4	Lifting equipment/tackles	To check for defects and efficacy of brakes	User Third party	Daily Every Year
5	PPE	To check for defects	User	Daily

9.7 **NON COMPLIANCE**:-

9.7.1
NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND THE BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER **for every instance of violation noticed**:

Sl. No	**Instance of Violation**	**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/-

Sl. No	Instance of Violation	Fine (in Rs)
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/-
	Major Accident or Accidents causing partial loss of earning to the victim	50,000/- per victim
14	Fatal Accident or Accidents causing permanent loss of earning to the victim	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 utilised 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.

9.8

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

9.9 Memorandum of Understanding

After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below:

Memorandum of Understanding

is committed to Health, Safety and Environment Policy (EHS Policy) as given in the booklet titled " Safe Working Practices" issued to all contractors.

M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number _____

M/s _____ shall ensure that safe work practices not limited to the above booklet are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and supervisors for compliance.

BHEL 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:

9.10

Comprehensive list of National Standards for reference and use wherever applicable in the execution of Civil, Erection and Commissioning Contracts.

IS No	YEAR	Amd upto	DESCRIPTION
IS 10204	1982		PORTABLE FIRE EXTINGUISHERS MECHANICAL FOAM TYPE
IS 10245	1994		SPECIFICATION FOR BREATHING APPARATUS
IS 10291	1982		SAFETY CODE FOR DRESS DRIVERS IN CIVIL ENGINEERING WORKS
IS 10658	1983		HIGHER CAPACITY DRY POWDER FIRE EXTINGUISHERS (TROLLEY MOUNTED)
IS 10662	1992		COLOUR TELEVISION
IS 10667	1983		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF FOOT AND LEG
IS 11037	1984		ELECTRONIC FAN REGULATORS
IS 11057	1984		INDUSTRIAL SAFETY NETS
IS 11451	1998		RECOMMENDATION FOR SAFETY AND HEALTH REQUIREMENT RELATING TO OCCUPATION EXPOSURE TO ASBESTOS
IS 1169	1967		PEDESTAL FANS
IS 1179	1967		SPECIFICATION FOR EQUIPMENT FOR EYE AND FACE PROTECTION DURING WELDING
IS 11833	1986		DRY POWDER FIRE EXTINGUISHERS FOR METAL FIRES
IS 11972	1987		CODE OF PRACTICE FOR SAFETY PRECAUTION TO BE TAKEN WHEN ENTERING A SEWARAGE SYSTEM
IS 1287	1986		ELECTRIC TOASTER
IS 13063	1991		STRUCTURAL SAFETY OF BUILDINGS ON SHALLOW FOUNDATIONS ON ROCKS
IS 13385	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE WHEEL MOUNTED WATER TYPE (GAS CARTRIDGES)
IS 13386	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE MECHANICAL FOAM TYPE
IS 13415	1992		CODE OF SAFETY FOR PROTECTIVE BARRIERS IN AND AROUND BUILDINGS
IS 13416	1992		RECOMMENDATIONS FOR PREVENTIVE MEASURES AGAINST HAZARDS AT WORKING PLACE PART 1 TO PART 5
IS 13430	1992		CODE OF PRACTICE FOR SAFETY DURING ADDITIONAL CONSTRUCTION AND ALTERATION TO EXISTING BUILDINGS
IS 13849	1993		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CONSTANT PRESSURE)
IS 1446	1985		CLASSIFICATION OF DANGEROUS GOODS (FIRST REVISION)
IS 1476	1979		REFRIGERATORS
IS 1641	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): GENERAL PRINCIPLES OF FIRE GRADING AND CLASSIFICATION
IS 1642	1989		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS-DETAILS OF CONSTRUCTION
IS 1643	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): EXPOSURE HAZARD
IS 1646	1997		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): ELECTRICAL INSTALLATIONS
IS 1904	1986		CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF FOUNDATIONS IN SOIL
IS 1905	1987		STRUCTURAL SAFETY OF BUILDINGS MASONARY WALLS

IS No	YEAR	Amd upto	DESCRIPTION
IS 2082	1985		ELECTRICAL GEYSERS
IS 2171	1985		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CARTRIDGE)
IS 2309	1989		PRACTICE FOR THE PROTECTION OF BUILDINGS AND ALLIED BUILDINGS AGAINST LIGHTENING
IS 2312	1967		EXHAUST FANS
IS 2361	1994		SPECIFICATION FOR BUILDING GRIPS - FIRST REVISION
IS 2418	1977		TUBULAR FLUORSCENT LAMPS IS 2418 (FT-1)
IS 2750	1964		STEEL SCAFFOLDINGS
IS 2762	1964		SAFE WORKING LOADS IN KGS FOR WIRE ROPE SLINGS
IS 2878	1986		FIRE EXTINGUISHERS CARBON DIOXIDE TYPE (PORTABLE AND TROLLEY MOUNTED)
IS 2925	1984		SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS
IS 3016	1982		CODE OF PRACTICE FOR FIRE PRECAUTIONS IN WELDING AND CUTTING OPERATIONS- FIRST REVISION
IS 3315	1974		DESERT COOLERS
IS 3521	1989		INDUSTRIAL SAFETY BELTS AND HARNESS
IS 368	1983		IMMERSION WATER HEATERS
IS 3696	1991		SAFETY CODE OF SCAFFOLDS AND LADDERS PART 1 TO 2
IS 3737	1996		LEATHER SAFETY BOOTS FOR WORKERS IN HEAVY METAL INDUSTRIES
IS 374	1979		CEILING FANS INCLUDING REGULATORS
IS 3764	1992		EXCAVATION WORK - CODE OF SAFETY
IS 3786	1983		METHOD FOR COMPUTATION OF FREQUENCY AND SEVERITY RATES FOR INDUSTRIAL INJURIES AND CLASSIFICATION OF INDUSTRIAL ACCIDENTS
IS 3935	1966		CODE OF PRACTICE FOR COMPOSITE CONSTRUCTION
IS 4014	1967		CODE OF PRACTICE FOR STEEL TUBULAR SCAFFOLDING
IS 4081	1986		SAFETY CODE FOR BLASTING AND RELATED DRILLING OPERATIONS
IS 4082	1977	1996	STACKING AND STORAGE OF CONSTRUCTION MATERIALS AND COMPONENTS AT SITE
IS 4130	1991		DEMOLITION OF BUILDINGS - CODE OF SAFETY PART 1 TO 2
IS 4138	1977		SAFETY CODE FOR WORKING IN COMPRESSED AIR (FIRST REVISION)
IS 4155	1966		GLOSSARY OF TERMS RELATING TO CHEMICAL AND RADIATION HAZARDS AND HAZARDOUS CHEMICALS
IS 4209	1967		CODE OF SAFETY FOR CHEMICAL LABORATORY
IS 4250	1980		FOOD MIXERS
IS 4262	1967		CODE OF SAFETY FOR SULFURIC ACID
IS 4756	1978		SAFETY CODE FOR TUNNELING WORK
IS 4912	1978		SAFETY REQUIREMENTS FOR FLOOR AND WALL OPENINGS, RAILINGS AND TOE BOARDS
IS 5121	1969		SAFETY CODE FOR PILING AND OTHER DEEP FOUNDATIONS
IS 5182	1969	1982	METHODS FOR MEASUREMENT OF AIR POLLUTION
IS 5184	1969		CODE OF SAFETY FOR HYDROFLUORIC ACID
IS 5216	1982	2000	RECOMMENDATIONS ON SAFETY PROCEDURES AND PRACTICE IN ELECTRICAL WORK PART I AND II

IS No	YEAR	Amd upto	DESCRIPTION
IS 555	1979		TABLE FANS
IS 5557	1995		INDUSTRIAL AND SAFETY LINED RUBBER BOOTS (SECOND REVISION)
IS 5916	1970		SAFETY CODE FOR CONSTRUCTION INVOLVING USE OF HOR BITUMINOUS MATERIALS
IS 5983	1980		SPECIFICATION FOR EYE PROTECTORS - FIRST REVISION
IS 6234	1986		PORTABLE FIRE EXTINGUISHERS WATER TYPE (STORED PRESSURE)
IS 692	1994		CRITERIA FOR SAFETY AND DESIGN OF STRUCTURES SUBJECTED TO UNDERGROUND BLASTS
IS 6994	1973		SPECIFICATION FOR SAFETY GLOVES
IS 7155	1986		CODE OF RECOMMENDED PRACTICE FOR CONVEYOR SAFETY (PART 1 TO 8)
IS 7205	1974		SAFETY CODE FOR ERECTION OF STRUCTURAL STEEL WORK
IS 7293	1974		SAFETY CODE FOR WORKING WITH CONSTRUCTION MACHINERY
IS 7323	1994		GUIDELINES FOR OPERATIONS OF RESERVOIRS
IS 7812	1975		CODE OF SAFETY FOR MERCURY
IS 7969	1975		SAFETY CODE FOR HANDLING AND STORAGE OF BUILDING MATERIALS
IS 8089	1976		CODE OF SAFE PRACTICE FOR LAYOUT OF OUTSIDE FACILITIES IN AN INDUSTRIAL PLANT
IS 8091	1976		CODE OF PRACTICE FOR INDUSTRIAL PLANT LAYOUT
IS 8095	1976		ACCIDENTS PREVENTION TAGS
IS 818	1968	1997	CODE OF PRACTICE FOR SAFETY AND HEALTH REQUIREMENTS IN ELECTRIC AND GAS WELDING, AND CUTTING OPERATIONS
IS 8448	1989		AUTOMATIC LINE VOLTAGE CORRECTOR (STABILISER)
IS 8519	1977		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR BODY PROTECTION
IS 8520	1977		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR EYE, FACE AND EAR PROTECTION
IS 875	1987		STRUCTURAL SAFETY OF BUILDING: LOADING STANDARD PART 1 TO 5
IS 8807	1978		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF ARMS AND HANDS
IS 8978	1985		INSTANTANEOUS WATER HEATERS
IS 8989	1978		SAFETY CODE FOR ERECTION OF CONCRETE FRAMED STRUCTURES
IS 940	1989		PORTABLE FIRE EXTINGUISHERS WATER TYPE (GAS CARTRIDGE)
IS 9457	1980		SAFETY COLOURS AND SIGNS
IS 9679	1980		CODE OF SAFETY FOR WORK ENVIRONMENTAL MONITORING
IS 9706	1997		CODE OF PRACTICE FOR THE CONSTRUCTION OF AERIAL RPEWAYS FOR THE TRANSPORTATION OF MATERIAL
IS 9759	1981		GUIDELINES FOR DEWATERING DURING CONSTRUCTION
IS 9815	1989		SERVO MOTOR OPERATED LINE VOLTAGE CORRECTOR (SERVO STABILISER)
IS 9944	1992		RECOMMENDATIONS ON SAFE WORKING LOAD FOR NATURAL AND MAN-MADE FIBRE ROPE SLINGS
IS 996	1979		SINGLE PHASE ELECTRIC MOTORS

IS No	YEAR	Amd upto	DESCRIPTION
ISO 3873	1977		SAFETY HELMET

SECTION-10

SPECIAL CONDITIONS OF CONTRACT

10.0 DRAWINGS AND DOCUMENTS

10.1
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.

10.2
One set of necessary drawings/documents to carry out the erection work will be furnished to the contractor by BHEL on loan that shall be returned to BHEL after completion of the work. Contractor's personnel shall take care of these documents given to them.

10.3
The data furnished in various sections and appendices and the drawings enclosed with this tender specification describe the equipment to be installed, tested and commissioned under this specification, briefly. However, the changes in the design and in the quantity may be expected to occur as is usual in any such large scale of works.

10.4
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.

10.5
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.

10.6
In case of any conflict between general instructions to tenderness, general conditions of contract contained in sections 1 & 2 respectively and special conditions of contract contained in sections 4 to 15 and appendices, provisions contained in special conditions of con t in sections 4 to 15 and appendices shall prevail.

10.7
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.

10.8
Bank Guarantees to be furnished by the contractor towards Security Deposit and Performance Guarantee (last 5% payment against workmanship warranty/defect liability) shall have a claim period of six months over and above the validity period required for the respective cases. BG for advance payment shall be kept valid for a period of two more months beyond the recovery period of the advance with interest thereof.

Section-11

Special Conditions of Contract

11.1 MOBILIZATION, TIME SCHEDULE, CONTRACT PERIOD AND GRACE PERIOD

11.1.1

Contractor shall mobilize necessary resources within shortest possible time of issue of fax letter of intent to commence the erection work. Such resources shall be progressively augmented to match the schedule of milestones and commissioning.

11.1.2

AA Mobilization for Local Transportation from Port to Site etc.

First consignment is expected to be despatched from India by end Sept 09. Contractor to mobilise its resources to coordinate the formalities to be completed for fulfilling statutory requirements and unloading the consignment at Port of landing and arrange for onward transportation to Site. All necessary lifting equipments and trailer / trucks etc are to be arranged by the contractor.

BB Mobilization for erection, testing, assistance for commissioning etc.

The activities for erection, testing etc. shall be started as per directions of construction manager of BHEL. Contractor shall mobilise further resources (in addition to those required for activities under clause no. 11.1.1) as per requirement to commence the work of erection, testing etc. of TG and auxiliaries and progressively augment the resources to match schedule of the project.

11.1.3

COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

Unloading of first consignment from the first shipment shall be recognised as "start of Contract period"

Erection / placement on its designated foundation / location, of the first major permanent equipment / component/column covered in the scope of these specifications shall be recognized as "start of Erection". Smaller items like packer plates, shims, anchors, inserts etc. will not be considered as start of contract period.

Based on the availability of civil foundations and materials from manufacturing units contractor may have to advance the start of erection after getting clearance from Construction Manager.
The contractor has to subsequently augment his resources in such a manner that following major milestones of erection & commission are achieved on specified schedules:

Sr No	Milestone Description	Schedule Date	
		Unit-1	Unit-2
1	Supply commencement from factory	30-Sep-09	----
2	Site Office opening & mobilisation	10-Oct-09	---
3	Condenser Erection Start	05-Mar-10	20-Apr-10
4	Turbine Erection Start	05-Apr-10	20-May-10
5	Oil Flushing	15-Jul-10	30-Aug-10
6	Barring Gear	25-Jul-10	10-Sep-10
7	Rolling & Synchronisation	05-Aug-10	20-Sep-10
8	Trial Run & Handing over	25-Aug-10	10-Oct-10

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.

11.1.4

START OF CONTRACT PERIOD AND DURATION (for each Unit)

The total contract period for completion of entire work shall be 13 **(Thirteen)** months from the date of start of Contract period.

However the contractor shall have to mobilize his resources earlier than the start of contract period for preparatory work.

The contractor shall reach site and establish his site office and mobilise to commence the work as per directions of BHEL engineer. Mutually agreed programme shall be drawn by the contractor primarily to achieve the schedules as above, taking into account available and anticipated materials inflow, and other inputs. These may have to be further fine tuned with shorter duration programmes as the case may be.

The contractor shall complete all the work in the scope of this contract within the contract period.

11.1.5

GRACE PERIOD

Grace period of **3 (Three) months** beyond the contract period is provided for this contract. However, all milestone events as per actual requirement of project schedule shall have to be achieved by the contractor without taking recourse to the grace period.

11.2 PROGRESS MONITORING, CONTRACT EXTENSION AND OVERRUN

11.2.1 PROGRESS MONITORING

Progress will be reviewed periodically (daily / weekly / monthly) including month end review vis-a-vis the plans drawn as above. The contractor shall submit periodical progress reports, and other reports / information including manpower, consumables etc as desired by BHEL.

11.2.2 ASCERTAINING AND ESTABLISHING THE REASONS FOR SHORTFALL

The onus probandi that the causes leading to extension of the contract period is not due to any reasons attributable to the contractor is on him (the contractor). review of the performance as stated vide clause 11.2.1 above will be made considering the availability of components to be erected and other inputs / constraints over which the contractor has no control. The programme will be reviewed area-wise and the following facts will be recorded in case of shortfall at the end of every month:

11.2.2.1

A) Erection / commissioning programme not achieved owing to non-availability of fronts.

B) Erection / commissioning programme not achieved owing to non-availability of materials.

Erection/commissioning programme not achieved owing to non-availability of tools and plants, manpower and consumables by the contractor or any other reason attributable to the contractor.

11.2.2.2

Erection / commissioning programme not achieved due to any other reasons not attributable to the contractor.

11.3 CONTRACT EXTENSION

11.3.1

If the completion of work as detailed in these specification gets delayed beyond the end of contract period and grace period then depending on the balance work left out, BHEL at its discretion may extend the contract.

11.3.2

A joint programme shall be drawn for the work to be completed during the extended contract period. Review of the program and record of shortfall as describe vide clause 11.2.2 shall be done during the extended period. The over run charges will be paid in proportion to the achievement of the respective month vis-à-vis the plan for the month (for assessing the performance, the agreed plan shall be reduced by shortfall attributable to the BHEL). BHEL may disallow contractor's claim for over run charges, if the monthly programme as mentioned here not made by him.

11.3.3
The part of extension attributable to the contractor, if any, in total contract extension shall be exhausted first i.e. immediately after end of grace period this shall be followed by the extension on account of force majeure conditions, if any, and lastly on account of BHEL.

11.4 OVERRUN COMPENSATION

If the contract is extended beyond the contract and grace period for any reason other than those attributable to the contractor or force majeure conditions, the contractor will be compensated by payment of overrun charges at the rate of **Birr 48,000** (Birr forty thousand only) per month. Overrun compensation will be paid for the extension attributable to BHEL only. **No overrun compensation shall be payable for the extension of contract on account of reasons of delay of erection & commng works attributable to contractor and/or force majeure conditions**. Overrun compensation for eligible period shall be in proportion to the progress achieved against the plan for respective period.

11.5 PRICE VARIATION

11.5.1 For Local Transportation

If there is more than 10% variation in the price of Fuel (HSD), as notified by Ethiopian Government, the contract prices for transportation shall be revised by 6% for every 10% changes in the price of fuel, in the same direction as variation in the fuel prices.

11.5.2 For Erection and Commissioning

Agreed item rates or rate schedule shall remain firm throughout the contract period and extensions thereof. no price variation/adjustment shall be applicable for this contract.

11.6 CONTRACT VARIATIONS

11.6.1 VARIATION IN WEIGHT /QUANTITY

Quantity & weight of various equipments and items of work covered under the tender specification are likely to vary. For any upward or downward variation in quantities as well as weight in respect of TG & auxiliaries under item Sl. no.1 of rate schedule in Price Bid, the accepted price shall remain firm.

11.7 Mobilization Advance

No mobilization advance is payable under this tender specifications.

11.8 INTEREST BEARING RECOVERABLE ADVANCE

Interest bearing (rate of interest shall be prime leading rate of SBI plus 2% per annum, on monthly reducing balance basis) recoverable advance limited to 5% of the contract value may be paid by BHEL at its discretion depending on the merit of the case against receipt & acceptance of bank guarantee from the contractor for the amount sought. This bank guarantee (BG) shall be valid at least for one year or the recovery duration. In case recovery of dues does not get completed within the aforesaid BG validity period, the contractor must renew the validity of BG or submit fresh BG for the outstanding amount and remaining recovery period. BHEL is entitled to make

recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement as above.

Recovery of dues will be made minimum @ 10% of the admitted gross running bill amount from the first applicable running bill onwards till entire due (principal plus interest) is recovered. In the event sufficient time duration is not left for recovery @10%, the rate of recovery shall be suitably enhanced so that entire due is recovered by the time contractor reaches 90% billing of total value of work executed & within the contract period (including extensions granted or foreclosure if any).

11.9 DEFINITION OF WORK COMPLETION

The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities are completed satisfactorily and so certified by BHEL site in charge. The decision of BHEL in this regard shall be final and binding on the contractor.

11.10 WELD JOINTS (IBR and NON-IBR) : The quantity Site weld joints and their NDT requirement including heat treatment shall be as per drawing requirement, suiting to site lay out and BHEL Site Engineer's instruction for entire Carbon Steel, Alloy Steel and Stainless Steel piping tonnage actually erected. The required drawings/documents will be furnished at site. No any extra claim on account of weld joints will be entertained.

Section-12

Special Conditions of Contract

12.0 Terms of Payment

12.0.1
The contractor shall submit his monthly RA account 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. However, first RA Bill shall be released only after signing of Contract Agreement.

12.0.2
Clause 2.6 of general conditions of contract shall be referred to as regards mode of payment, and measurement of the work completed.

12.0.3
Release of payment in each running bill will be restricted to 95% of the value of work admitted, as per the percentage break-up for the stage of work completion stipulated vide clauses hereinafter.
The 5% thus remaining shall be on account of workmanship guarantee of work executed. The same will be released after completion of the guarantee period of **12 months** from the date of completion of entire work as certified by BHEL.

However, on specific request of vendor, this amount may be released on pro rata basis for the value of work executed and accepted by BHEL, along with any RA Bill and onwards, subject to receipt and acceptance of bank guarantee of 5% of contract value in BHEL's prescribed format. The BG shall be kept valid till completion of such guarantee period and an additional six months claim period. This is also subject to the condition that the contractor has started the work and also furnished/remitted the initial Security Deposit as per contract.

12.0.4
The payment for running bills will normally be released within around 30 days of submission of running bill with measurement sheets. Contractor shall make his own arrangement for making payment of impending labour wages and other dues in the meanwhile.

12.0.5
BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, the following details are to be furnished by the Contractor pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker:

1. Name of the Company
2. Name of Bank
3. Name of Bank Branch
4. City/Place
5. Account Number
6. Account type
7. IFSC code of the Bank Branch
8. MICR Code of the Bank Branch

BHEL may also choose to release payment by other alternative modes as suitable.

12.2 Stages Of Progressive Pro-Rata Payments

12.2.1 Contractor shall quote a single lump sum price for the entire scope of work which covers the following –

a) Local transport from Djibouti port to Finchaa Sugar Factory (Say - L)
b) Erection and Commissioning
   i Material management at site (Say - M)
   ii Erection and Commissioning of STG and BOP packages(Say - E)

i.e. Contract Price = L + M + E = 100%

12.2.2 For the purpose of progressive payment the contract price shall be sub divided in the following –

a) Local transport L = 25% of Contract Price
b) Erection & Commissioning
   i Material management at site M = 5% of Contract Price
   ii Erection and Commissioning E = 70% of Contract Price of STG and BOP packages

12.2.3 Progressive payment for Local Transportation from Djibouti Port to Finchaa site (= L as derived under para 12.2.2)

Bill of Quantity given at Appendix – IIB is 4000MT approximately. It is expected to be despatched in 200 consignments approximately by way of Containers / CBM. The modality of payment can be decided at site with mutual agreement. The payment can be either consignment wise or tonnage wise or any other option.

12.2.4 Progressive payment for Material Handling and Material Management service at Site (= M as derived under para 12.2.2)

Progressive payment for Material Handling and Material Management service at Site shall be made over a period of 16 months (13 months contract period and 3 months grace period) on certification of BHEL Engineer. The amount may be a lump sum amount every month or can be as per schedule mutually agreed at site.

I) 55% of rate shall be paid as soon as the materials are unloaded, and verified as per Lorry Way Bill subject to furnishing following information along with the bill.
   A) Shortage report/ open delivery taken w.r.t. Lorry Way Bill, if any and acceptance thereof by transporters.
   B) Proof of the claim lodged with transporters in respect of above shortage / open delivery.
   C) Material management forms duly filled and certified by bhel engineer.

Ii) 45% of the rate shall be paid after the materials are duly verified as per packing list / loading advice slip after opening the packages / boxes / crates whereever

necessary, repacking after verification, stacking, preparation of necessary records of inspection and location of stacking etc. Wherever necessary. Payment will be released on submission of information as per materials management forms by the contractor immediately after verification of materials and certified by bhel engineers. The requisite proforma would be supplied by site engineer. Normally, it is expected that the time lag between receipt of material and verification be kept at barest minimum possible.

12.2.5 Progressive payment for Erection and Commissioning of STG and BOP packages (= E as derived under para 12.2.2)

Progressive payment for Erection and Commissioning of STG and BOP packages shall be made as per the break up given below for each unit. Percentages allocated for the packages common for both the units may be clubbed together and paid accordingly.

Break up for Erection and Commissioning

2x12 MW Finchaa STG (Ethiopia)

Total value	Birr	(= L + M + E)
E&C	Birr	(= E)

A Broad Break up for Erection and Commissioning

Sl. No.	Description	% of 'E'	% For each unit		Remarks
			Unit-1	Unit-2	
1	Surface Condenser	10	5.000	5.000	
2	Steam Turbine	15	7.500	7.500	
3	Turbo Alternator	10	5.000	5.000	
4	Pumps and auxiliaries	4	2.000	2.000	
5	Piping	11	5.500	5.500	
6	Piping from Utility boiler to turbine	5	2.500	2.500	
7	Insulation, Cladding	4	2.000	2.000	
8	BOP (E &C)	17	8.500	8.500	
9	Electrical, Control & Instrumentation Sys etc	15	7.500	7.500	
10	Commissioning	9	4.500	4.500	
	Grand total (each unit)	100	**50.000**	**50.000**	
	Grand total (Both units)		**100.000**		

B Detail Billing Break up

Sl. No.	Description	% of 'E'	% For each unit		Remarks
			Unit-1	Unit-2	
1	**Surface Condenser and Deaerator (10%)**				
1.1	Chipping & Preparation of foundation	1.00	0.500	0.500	
1.2	Placement of condenser	5.00	2.500	2.500	
1.3	Assembly and welding of hot-well	1.00	0.500	0.500	
1.4	Erection & Welding of top connecting piece.	1.00	0.500	0.500	
1.5	Placement of S.S. bellows	1.00	0.500	0.500	
1.6	Condenser neck welding	1.00	0.500	0.500	
	Sub total of 1.0	**10.00**	**5.000**	**5.000**	
2	**Turbine (15%)**				
2.1	Preparation of foundation, matching, placement and levelling of sole plates/foundation plates.	2.00	1.000	1.000	
2.2	Placement of turbine on foundation	5.00	2.500	2.500	
2.3	Levelling and cantering of turbine on foundation	2.00	1.000	1.000	
2.4	Grouting of turbine base plates/frame	2.00	1.000	1.000	
2.5	Alignment of Turbine & Gear Box	1.00	0.500	0.500	
2.6	Couplings of turbine & Gear Box	1.00	0.500	0.500	
2.7	Erection of Turbo-visory instruments	1.00	0.500	0.500	
2.8	Final boxing up of bearings pedestals	1.00	0.500	0.500	
	Sub Total 2.0	**15.00**	**7.500**	**7.500**	
3	**Turbo Generator (10%)**				
3.1	Preparation of foundation, matching, placement and levelling of sole plates/foundation plates.	1.00	0.500	0.500	
3.2	Placement of Generator on foundation	5.00	2.500	2.500	
3.3	Levelling & centering of Generator on foundation	1.00	0.500	0.500	
3.4	Alignment of Generator rotor & Gear box	1.00	0.500	0.500	
3.5	Grouting of Generator foundation base plates/ base frame.	1.00	0.500	0.500	
3.6	Box up of Generator bearings.	0.50	0.250	0.250	
3.7	Erection of Generator air coolers	0.50	0.250	0.250	
	Sub Total 3.0	**10.00**	**5.000**	**5.000**	
4	**Pumps and auxiliaries (5%)**				
4.1	Placement of lube oil pumps.	1.00	0.500	0.500	
4.2	Placement of lube oil coolers	0.25	0.125	0.125	
4.3	Placement of oil centrifuge.	0.25	0.125	0.125	
4.4	Placement of duplex oil filter, oil accumulators	0.25	0.125	0.125	
4.5	Placement of Main lube oil tank	0.25	0.125	0.125	
4.6	Placement of Overhead lube oil tank.	0.25	0.125	0.125	
4.7	Main oil pump, Aux oil pump, emergency oil pump, jacking oil pump	1.00	0.500	0.500	
4.8	Placement of Gland Steam Condenser	0.25	0.125	0.125	
4.9	Placement of Condensate Extraction Pumps	0.25	0.125	0.125	
4.10	Placement of Steam Jet Air Ejector	0.25	0.125	0.125	

	Sub Total of 4.0	**4.00**	**2.000**	**2.000**	
5	**Piping (11%)**				
5.1	Erection and welding of Condensate piping from condenser Hot well upto CEP to Boiler	2.00	1.000	1.000	
5.2	Erection and welding of CEP re-circulation piping	0.50	0.250	0.250	
5.3	Erection & welding of Aux Steam piping	1.00	0.500	0.500	
5.4	Control oil piping, jacking oil piping	0.50	0.250	0.250	
5.5	Erection & welding of Extraction piping from Turbine to battery limit	1.00	0.500	0.500	
5.6	Gland steam leak off piping	0.20	0.100	0.100	
5.7	Erection and welding Turbine drains piping	1.00	0.500	0.500	
5.8	Erection and welding of bearing cooling water piping	1.00	0.500	0.500	
5.9	Erection and welding of bearing cooling water return piping	0.60	0.300	0.300	
5.10	Erection and welding of exhaust hood spray piping from CEP discharge to turbine	0.20	0.100	0.100	
5.11	Erection and welding of Compressed air piping	1.00	0.500	0.500	
5.12	Erection and welding of Lube oil piping around lube oil tank, oil coolers, duplex filters.	2.00	1.000	1.000	
	Sub Total 5.0	**11.00**	**5.500**	**5.500**	
6	**Piping from Utility boiler to turbine**	5.00	2.500	2.500	
	Sub Total 6.0	**5.00**	**2.500**	**2.500**	
7	**Insulation, Cladding (4%)**				
7.1	Insulation & Cladding of Aux steam piping	1.00	0.500	0.500	
7.2	Turbine insulation	1.00	0.500	0.500	
7.3	Turbine integral piping insulation	1.00	0.500	0.500	
7.4	Insulation & Cladding of Turbine system piping	1.00	0.500	0.500	
	Sub Total 7.0	**4.00**	**2.000**	**2.000**	
8	**BOP (E &C) - (17%)**				
8.1	CW Pump - 3 Nos with motor, Bearing cooling water pumps, Make up pumps,	3.00	1.500	1.500	
8.2	Cold water tank	0.50	0.250	0.250	
8.3	Compressed air system	2.00	1.000	1.000	
8.4	EOT Crane and hoists	3.00	1.500	1.500	
8.5	Air Conditioning and Ventilation system	2.50	1.250	1.250	
8.6	Fire fighting system	2.00	1.000	1.000	
8.7	MISC Equipments	4.00	2.000	2.000	
	Sub Total 8.0	**17.00**	**8.500**	**8.500**	
9	**Electrical, Control & Instrumentation System etc (15%)**				
9.1	LV Switch gear and MCC	1.00	0.500	0.500	
9.2	11KV Switch gear, Breaker panel etc	1.00	0.500	0.500	
9.3	110V DC Battery & Battery Charger	1.00	0.500	0.500	
9.4	Man Machine Interface	1.50	0.750	0.750	
9.5	Distributed Digital control system	2.00	1.000	1.000	
9.6	HT, LT and Control Cabling	3.00	1.500	1.500	

9.7	Cable trays and supports	3.00	1.500	1.500	
9.8	Electronic Governor for Turbine	0.50	0.250	0.250	
9.9	Neutral grounding resistors, CTs	0.50	0.250	0.250	
9.10	Placement of Generator relay & Control panels and DAVR panels	0.50	0.250	0.250	
9.11	Erection of field Junction Boxes	0.50	0.250	0.250	
9.12	Erection of Field instruments	0.50	0.250	0.250	
	Sub Total 9.0	**15.00**	**7.500**	**7.500**	
10	**Commissioning (5%)**				
10.1	Oil flushing	1.50	0.750	0.750	
10.2	Barring Gear operation	1.50	0.750	0.750	
10.3	CEP Commng	1.00	0.500	0.500	
10.4	BFP Commng	1.00	0.500	0.500	
10.5	Rolling & Synchronization	2.00	1.000	1.000	
10.6	Trial operation completion	2.00	1.000	1.000	
	Sub Total 10.0	**9.00**	**4.500**	**4.500**	
	Grand total (each unit)		**50.000**	**50.000**	
	Grand total (Both units)	**100.00**	**100.000**		

12. 3 Currency of Payment

a) The payments shall be made as below:

1) **70%% of the Total Contract Price will be paid in Indian Rupees**
2) **Balance 30% of the Total Contract Price will be paid in local currency (i.e. BIRR)**

The above payment mode is applicable for each Running Bills.

The exchange rate for amount to be paid as 30% of Indian Rupee into BIRR in each RA Bill shall be the date on which payment made by BHEL (i.e. – Example- If Ra bill in Indian Rs has been admitted for Rs 100/- , then Rs 70/- shall be paid to bidder in Indian Rupees & Balance Rs 30/- shall converted to BIRR as per the exchange rate on the date of payment by BHEL.)

12.2.6 Progressive payment for Civil package (= C as derived under para 12.2.2)

Section -13

Special Conditions of Contract

13.0 Extra Charges for Rectification and Modification

13.1 If extra works (requiring less than **100 man-hours**) for modification, rework, revamping, in brief, any work done to change the state existing to a stage desired and also fabrication, all or any, are needed due to any change in or deviation from the drawings and design of equipment, operation/ maintenance requirements, mismatching, transit damages and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, are done, no extra charges will be paid. The tenderers are requested to take this aspect into account and the quoted rate should include all such contingencies.

13.2 It may also be noted that if any such said extra works arise on account of the contractor's fault it 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.

13.3 However, BHEL may consider for payment as extra, for such of those works detailed in clause 13.1 which require more than **100 man-hours** and such payment will be regulated by the terms, conditions and stipulations contained in the clauses 13.4 to13.8 and/or 14.2.1 to 14.2.10 as the case may be. It may be specifically noted that the decision of BHEL as to whether such payment is due shall be final and binding on the contractor.

13.4 BHEL may, at their absolute discretion, consider for payment as extra on man-day basis as found by them as justifiable for such of those works specified in clause 13.1 which require major modification/ repair/ reworks/ rectification etc It may also be noted that only those works which are identified as major and warrant extra payment and certified as such by the site engineer and accepted by the designers and/or competent authority of BHEL, will be considered for extra payment.

13.5 For extra works arising out of transit, storage and erection damages, payment, if found due, will be regulated by clauses 14.2.1 to 14.2.10.

13.6 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 ie. Daily log sheets. It may, however be noted that signing of log sheets by BHEL engineer does not mean the acceptance of such works as extra works. All admissible claims shall be submitted to BHEL

13.7 BHEL retains the right to award or not to award any of the major repair/rework/modification/rectification/fabrication works under clauses 13.1 to

13.6 to the contractor, at their discretion without assigning any reason for the same.

13.8 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.

Extra charges

Single average man-day rate, including overtime if any, and other site expenses and incidentals, including consumables, tools and tackles, for carrying out any major rework/ repairs/ rectification/ modification/ fabrication of 8 hours as may arise during the course of erection. (refer clauses 13.1 to 13.8 and 14.2.1 to 14.2.10)

ETB. 100/- (Rupees one hundred Ethiopian Birr only)

No payment will be made if an item of work lasts less than 100 man-hours.

SECTION-14
SPECIAL CONDITIONS OF CONTRACT

INSURANCE

15.0 EARNEST MONEY DEPOSIT, SECURITY DEPOSIT & BANK GUARANTEE

15.1 Earnest Money Deposit:

i) EMD for this tender is Rs. 2,00,000/- (Rupes Two lakhs only).
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 Nagpur.
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 with this office (BHEL:PSWR:Nagpur) which will enable them to participate in all the future tender enquiries in respect of Erection and Commissioning services issued from this office. Interested bidders may clearly send their consent for converting the present EMD into a "One Time EMD" in their offer.
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/PSWR, Nagpur shall be enclosed along with the Offer

15.1.1 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.

15.1.2 EMD shall not carry any interest.

15.1.3 In the case of unsuccessful bidders, the Earnest Money will be refunded to them after acceptance of tender by successful bidder

15.2 Security Deposit

15.2.1 Security Deposit shall be furnished by the successful bidder. The rate of Security Deposit will be as below:

SN	Contract Value	Security Deposit Amount
1	Up to Rs. 10 lakhs	10% of Contract Value
2	Above Rs. 10 lakhs upto 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.

The security Deposit should be furnished before start of the work by the contractor.

15.2.2 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 should have the approval of BHEL.

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 remitted (either by cash/DD or **BG for maximum 50%** of total SD) before start of the work and the balance 50% may be recovered from the running bills.

viii. EMD of the successful bidder shall be converted and adjusted against the cash Security Deposit excepting for such bidder who has remitted One Time EMD.

ix. The Security Deposit shall not carry any interest.

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.

15.2.3 SECURITY DEPOSIT SHALL NOT BE REFUNDED TO THE CONTRACTOR EXCEPT IN ACCORDANCE WITH THE TERMS OF THE CONTRACT

15.3 BANK GUARANTEE

i. It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be held liable for issue of any reminders regarding expiry of the Bank Guarantees.

ii. In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly conveyed through the Construction Manager to BHEL PSWR/HQ, Nagpur

iii. 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.

iv. **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.**

v. Bidders to ensure that the Bank Guarantees submitted are exactly as per format given in the Tender documents.

vi. The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due). However, in exceptional cases, where guarantee is directly received by Vendor, the Vendor shall instruct the Bank to send an unstamped duplicate copy of the guarantee directly to BHEL under Registered Post (Acknowledgement Due).

15.3.1 Guidelines for acceptance of Bank Guarantees are as follows :

- Vendors are advised to obtain BG from any of the following BHEL consortium banks

State Bank of India	The Hongkong and Shanghai banking Corporation Ltd.
ICICI Bank Ltd	ABN Amro Bank N.V
Bank of Baroda	IDBI Ltd
Canara Bank	Punjab National Bank
Citi bank N.A	Standard Chartered Bank
Corporation Bank	State Bank of Travancore
Detshe Bank	State Bank of Hydrabad
HDFC Bank Ltd	Syndicate Bank

- The Bank Guarantees of all Public sector banks shall be accepted (Other than consortium banks also).
- The Bank Guarantees of Co-operative banks shall not be accepted.
- Bank Guarantees of other banks (banks other than consortium bank, public sector bank, & Co-operative banks) can be accepted subject to an overall exposure limit (at BHEL, PSWR, Nagpur) of RS. 10 crores for banks with net worth of more than Rs. 500 crores as on last balance sheet date and Rs 5 crores for banks with net worth between Rs. 350 to Rs 500 crores (A certificate and copy of latest Balance Sheet to be given at the time of submission of bank guarantees .
- In case Bank Guarantees given by non consortium banks (Private sector or Public sector), the bank Guarantees shall be enforceable at Nagpur, Maharastra.

Appendix-I

Tentative Scope of Equipments/Systems Covered under this Tender Specification.

(A) Steam Turbine & Auxiliaries:

1. Steam turbine
2. Emergency Trip Cum Stop valve
3. Blanket plate for steam blowing.
4. Turbine steam governing valves(HP and LP).
5. Steam Strainer Built into Stop valve.
6. Reduction Gear box between Turbine & Generator.
7. Coupling and coupling guard between Turbine and Gear Box.
8. Coupling and coupling Guard between Guard between Gear box & Generator.
9. Manual Barring Device.
10. Turning Device –Electric.
11. Solenoid Valve for Remote Tripping.
12. Turbine Sole Plates.
13. Foundation Bolts.
14. Shafts Grounding Device.
15. Mating Flanges for Turbine Inlet, Exhaust and Extraction Flanges.
16. Gland Steam Leak off Piping.
17. Exhaust Hood spray system.
18. Prime coat of paint.
19. Vacuum Breaker Valve.
20. Turbine Drain Water Piping within TG Block.
21. Turbine insulation mineral wool mattress
22. Insulation of integral piping
23. QCNRVs in Uncontrolled Extraction line & Controlled Extraction Line.
24. Turbine Enclosure.

(B) Oil Supply System:

1. Main Oil Tank (Carbon Steel) Including Drain & Maintenance Openings ,Level Indicator ,Level Signalisation High/Low, Connection for Purifier
2. Main Oil Pump with AC Motor.
3. Auxiliary Oil Pump with AC Motor.
4. Emergency Oil Pump with DC Motor.
5. Jacking oil pump with AC motor, if required.
6. Duplex filter with lube
7. Trans- flow valves for Duplex oil filters.
8. Oil –Mist fan with Ac Motor (2x100%)
9. Pressure throttles for bearings.
10. Complete lube oil piping (CS material up to LO filter)
11. Complete lube oil piping (SS material from LO Filter to Bearing).
12. Complete Return Lube oil piping (CS material).
13. Complete control oil piping (stainless steel material)

14. Complete jacking oil piping including throttle valves, Relief valves etc.
15. Overhead lube oil tank with complete piping (Stainless steel material)
16. Control oil accumulators (as required)
17. Oil purifying system (1000 LPH capacity)
18. Governing console consisting of Duplex filter for control oil, main trip solenoid valves, Electric -Hydraulic converters, Solenoid valves for opening and closing emergency stop valves , solenoid valve for resetting the turbine , local Gauge board with governing oil system instruments, other hydraulic components.

(C) Surface Condenser:

1. Two pass divided water box cylindrical condenser.
2. Carbon steel dome, shell, hot well, water box etc and admiralty Brass tubes.
3. Stand pipes for mounting instruments.
4. Sacrificial anodes inside water box for cathodic protection.
5. SS Expansion Bellow.
6. Primer coating on outer surfaces and epoxy coating on water box internals
7. Accessories like rupture disc, water expansion relief valve, vent and drain valves etc.

(D) Steam Jet Air Ejector:

1. 2x100% running ejector with inter and after condensers and one starting ejector with silencer.
2. Nozzle and diffusers for ejectors.
3. Inter and after condensers with carbon steel shell, tube sheet, water box & stainless steel SA 249 TP304 tubes.
4. Steam and air pipes.
5. Accessories like water expansion relief valve vent and drain valves etc.

(E) Gland steam Condenser:

1. GSC with 2x 100% fan & motor.
2. Carbon steel shell, water box and stainless steel SA249 TP 304 tubes.
3. Accessories like tube side relief valves vent and drain valves etc.
4. Primer coating on outer surfaces

(F) ST Oil Cooler :

1. Vertical 2x100% capacity ST Oil cooler.
2. Coolers with carbon steel shell, water box etc and Admiralty Brass tubes.
3. Manually operated 3 – way change over valve.
4. Primer coating on outer surfaces
5. Accessories like vent and drain valves etc.

(G) Generator and Auxiliaries:

1. Closed circuit air cooled generator consisting of stator with output leads (3 phase + 3 neutral)taken out from the sides of the m/c, Rotor suitable for overhang BLE, Bearings , base frame, built in RTDs ,space heaters, Bottom mounted air to water coolers (CACW) with n+1)cooler elements.
2. Over hang brush- less exciter with PMG.

3. Line side terminal box accommodating CTs ,PTs ,LA & SP equipment and with facility for onward connection of cables from the line side terminals box. Neutral terminal box accommodating the neutral connection and neutral CTs with facility for connection of cables from neutral to NGR.
4. Neutral Grounding Resistor to limit the fault current to 100A for 30 sec with motorised isolator.
5. Generator conventional control, metering & synchronising panel with auto-synchroniser and multifunctional micro processor based numerical relay panel with protections for generator.
6. Interconnecting control cables for connection between Generator and generator control and relay panels (length considered is 100m. unit length applicable beyond this length).

(H) STG Air Coolers :

1. Bottom mounted STG Air Cooler.
2. High fin Admiralty Brass tubes Copper fins, Carbon steel frames.
3. Accessories like CW inlet/ outlet valves vent and drains valves etc.
4. Primer coating on outer surface

(I) Control & Instrumentation for STG & Integral portion :

1. Scope :-
   1.1 Electronic Governor for control of Turbine speed, Load, inlet stem pressure, extraction pressure.
   1.2 Dual Channel Turbine Shaft Vibration and Axial Displacement Monitoring system (TSI rack) which includes proximity type probes, proximeters and extension cables for the following
      a) Shaft vibration at turbine front bearing.
      b) Shaft vibrations at turbine rear bearing.
      c) Shaft vibrations at Generator front bearing.
      d) Shaft vibration at Generator rear bearing.
      e) Shaft vibration at Gear box high speed shaft.
      f) Shaft vibration at Gearbox low speed shaft.
      g) Turbine Axial displacement
      h) Key phasor for turbine shaft.
2. Primary instruments to realise the turbine auxiliaries interlock and protections for the following drives in DCS.
      a) Main oil pump.
      b) Auxiliary oil pump.
      c) Emergency lube oil pump.
      d) Jacking oil pump.
      e) Oil Vapour Extraction fan.
      f) Turning gear.
3. Field Instruments (for STG Integral Portion):
   3.1 Bearing thermo-elements for monitoring Bearing Metal Temperature for following (monitoring in DCS)
      a) Turbine front journal Bearing Temperatures.

b) Turbine rear journal bearing temperatures.
c) Turbine Thrust Bearing Temperatures (Active & Non active).
d) All Gear box Bearings temperatures.
e) Generator front journal Bearing Temperatures
f) Generator rear journal Bearing Temperatures

3.2 Local pressure Gauges within Battery limits.
3.3 Local Temperature Gauges within battery limits.
3.4 Level gauges for main oil tanks and over head oil tanks.
3.5 Instruments mounted on local gauges board.
3.6 Instruments mounted on Governing console board
-Control oil pressure
- start up oil to ESV Pressure
-Trip oil to ESV Pressure
- HP Secondary oil to HP Governing valve pressure
- LP Secondary oil to LP Governing valves pressure.
- Trip oil Header pressure.
3.7 Primary instruments required for alarms trips and interlocks for STG integral portion (Realised in DCS)
3.8 Transmitters / Temperature elements for Remote Indication and Control for STG integral portion (Realised in DCS)

4. Safety Relief valves for controlled extraction line.
5. Control valves for Turbine Gland sealing steam supply, turbine gland steam dump, Wander Extraction Pressure (2 nos).
6. I/P Converters for all pneumatic control valves.
7. Calibration kit for transmitters.
8. GI instruments air supply lines.
9. Impulse lines along with fittings for instruments in pressure parts.

(J) TG Package Control:

Distributed Digital control system: STG and its auxiliaries including regulating controls, interlocks, operator interface units, interconnection cabling and requisite terminations encompassing the following systems:

1. Turbine controls (for STG and Auxiliaries) comprising of :
   a) Electronic system cabinets: 1 set of 3 panels – per TG
      (Catering to TG integral)
      - Electro hydraulic turbine control catering to speed control, load/frequency control, inlet pressure control, extraction pressure control, wanders extraction pressure control.
      - Turbine protection, including separate over speed trip (2 of 3).
      - Steam turbine integral interlock and protection.
   b) Electronic system cabinets : one suite of panels – per TG
      (Control catering to STG-BOP / regenerative cycle as below)
      - Main steam – flow , pressure, temp monitoring
      - Condenser–Level control, min. recirculation, level alarm

- CEP Control– 2 nos.CEP Header pressure, temp indications.
- MP Extraction line & header – flow , pressure ,temp monitoring.
- LP Extraction line & header – flow, pressure, temp monitoring.
- MP De-superheater + spray control – 2 nos.
- LP De-superheater + spry control – 2 nos.
- Aux steam PRDS – 1 No.
- Aux steam to GCS , Dearator, Steam, steam ejector, gland steam

c) Common system for both turbines : one suite of 2 panels
(Catering to common control system for 2 turbines as below)

1. Cooling tower consisting of
   - Level control, level alarms
   - CW Pump control – 4 nos.
   - ACW pump controls – 4 nos.
   - CW makes up pump control – 2 nos.
   - De-superheaters spray water booster pump control- 2 nos.
   - Inst air compressor monitoring (control in local panel) – 2 nos.
2. Electrical controls
   (Approximate I/O Count: DI = 150 Nos DO = 60 Nos. AI = 20 NOS.)

d) Vertical panel for mounting TSI Rack : 1 set.

1. Man Machine Interface : 1 set
   (Common for all 2 TG and its auxiliaries)
   - Operator stations: 2 nos.
   - Engineering station; 1 no.
   - Historian: 1 no.
   - Max LINK Station: 1 no.
   - Colour LaserJet printer (a4) :1 no.
   - Laser printer A3/A4 (B&W):1 no.
   - Dot matrix printer (132) col):2 no.
   - Turbine emergency trip PB: 2 nos.
   - Ethernet switches :1set
   - TCP / IP cables :1 set

2. Instrumentation / cable for TG package comprising of : 2set.
   - ST on base instrument to Field JBs.
   - Instrument of ST auxiliaries to field JBs.
   - Field JBs of TG to Electronic system cubicles.
3. Digital Automatic Voltage Regulator for: 2 nos.

(Brush less excitation of generator (1 auto 1 manual configuration)

(k) Balance of plant piping & Equipment. :

1. Turbine Exhaust hood spray piping from terminal point to turbine.
2. Thermal insulation required for the piping in scope

(L) Balance of plant Equipment – Mechanical.

1. COOLING WATER SYSTEM
   a. One no RCC Cooling tower with three cells.
   b. Three no of cooling water pumps with drive motors for condenser.
   c. Two no of make- up water pumps with drive motors for RCC cooling tower.
   d. One no RCC Cooling tower with one cell for bearing cooling water.
   e. Two no cooling water pumps with drive motors for bearing cooling
   f. Two no of make- up water pumps with drive motors for RCC cooling Tower.
   g. Two no of Bearing recirculation water pumps.
   h. One no of Bearing recirculation water sump.
   i. One number of cold water tanks.
   j. Piping, valves and fittings for the above system
   k. Two spray water pumps.

2. CONDENSATE SYSTEM
   a. Four no of horizontal condensate extraction pumps (2W +2S)
   b. Piping, valves and fittings for the above system

3. COMPRESSED AIR SYSTEM
   a. Three no of reciprocating air compressors (2W +1S)
   b. Two no of air dryers.
   c. One no air receiver.
   d. Piping, valves and fittings for the above system

4. MAINTENANCE EQUIPMENT
   a. One no 15/5 ton EOT Crane for STG Hall.
   b. One no hoist for CW Pumps
   c. One no hoist for reciprocating compressors.

5. AIR CONDITIONING AND VENTILATION
   a. Packaged type air conditioners for control room.
   b. Pressurized ventilation for switchgear room.
   c. Ventilation for STG hall.

6. FIRE FIGHTING SYSTEM.
   a. Fire and smoke detectors for STG hall including DGFAP.
   b. Extension of fire hydrant in STG Hall.

(M) Balance of plant Equipment –Electrical

S.no.	Description	Qty
1.	HT(11kV) switchgear consisting of two VCB type breaker panels (2 Generator incomers with PT), copper bus bars ; breaker ratings 2000Amps, bus	1 set

	rating 2000Amps, fault rating 31.5kA for 0.5 sec.	
2	LV (380V) switchgear : Common MCC 380V(for two STG sets, BOP TG hall loads), 2000A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	1 set
3	LV (380V) switchgear : BOP MCC 380V(for BOP loads inclusive of CW system loads, MCC located at CT pump house), 2000A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	1 set
4	110V DC System : 110V DC battery system consisting of 110V, 55cells, 200Ah lead acid battery bank with battery racks and other standard maintenance accessories.	1 set
5	110V DC System : 110V DC battery charger system consisting of SCR type FC+FCBC(off line boost charger) charger , DC distribution board with Cu bus bars, 10kA for 1 sec, with MCCB incomers & 15nos. MCB outgoing feeders in non-draw out fixed type execution, and DC starters for DC ELOP	1 set
6	HT(11kV) Cu conductor XLPE armoured cable with cable kits (Approx. cable run distance between Generator & HT swgr assumed 50mtrs)	1 set
7	Weather Proof sheet steel Local control push button stations with/without ammeters	1 lot
8	LT power 1.1kV, PVC/XLPE insulation, Cu conductor	1 set

	armoured cable & cable accessories	
9	LT control 1.1kV, PVC/FRLS insulation, Cu conductor armoured cables & accessories	1 set
10	Above ground earthing material for equipment grounding (Cu strip min 120sqmtrs, PVC copper cable)	1 set
11	Cable support system inclusive of GI sheet ladder type cable trays, structural steel & accessories for power generation package	1 set

(N) Balance of Plant Equipment – Control & instrumentation

S.no	Description	Qty
1.	Pressure, temp, level & flow measurement (nozzles/orifice) for -MS Steam line up to turbine inlet -Condenser equipment -CEP discharge header upto Dearator Hot well inlet -Desuperheater spray water booster line upto desuprheaters inlet -Cooling water line from cooling tower to condenser & return -IP (8 BAR)Extraction line -LP (2.8 BAR) Extraction line	2 lot
2.	Signal ,RTD & Thermocouple cable up to field JB for BOP Scope	2 sets
3	Instrument hook up material for BOP Instruments	2 sets
4	Desuperheaters: - Desuperheater to IP steam extraction (8 bar) - Desuperheater to LP steam extraction (2.3 bar) - Desuperheater for LP steam extraction back up (2.3 bar)	2 sets

	- Aux steam PRDS for gland steam & ejector	
5	Control valve for with pnematic positioner & I/P converter : 1.Condenser level control 2.condenser min. recirculation 3.Pressure , contol for aux steam for steam ejector,GSC, D'rator. 4.Steam to condenser 5.Desuperheater spray control valve – As required	2 sets
6.	SWAS system consisting of ph & conductivity analyer at CEP outlet and Ph analyser at condenser hotwell.	2 sets

Appendix – II (A)

Tentative Weight details and Dimensions of Major Equipments

SL	DESCRIPTION	PKG.SIZE(MM)	GR.WT IN MT	REMARK
A	**Steam Turbine & Auxiliaries**:			
1	Steam turbine	L4500 x B4000 x H4500	37	
2	Gear Box	L1700 x B2000 x H2000	8	
B	**Oil Supply System Aux,Pumps and other Auxiliaries :**			
1	Lube oil tank	L3400 x B2500 x H2050	4.05	
2	Over head tank	1800(Diameter) x H2780	1.7	
3	A.O.P	L2000 x B9200 x H1030	0.9	
4	E.O.P	L2000 x B1451 x H910	0.605	
5	J.O.P	L1000 x B900 x H750	0.25	
6	Oil purification	L2300 x B1700 x H1860	1.5	
7	Duplex Filter	L1220 x B392 x H1210	0.6	
8	Exhaust Fan	L442 x B280 xH522	0.075	
9	Oil Accumulator	L760 x B700 x H2500	0.4	
C	**Surface Condenser**:	L9800 x B2300 x H2400	15	
D	**Steam Jet Air Ejector:**	L4000 x B1100 x H1100	3(each)	2 nos.
E	**Gland steam Condenser:**	L2500 x B1000 x H1200	1.5	1 No
F	**ST Oil Cooler :**	L3000 x B1100 x H1100	3.1(each)	2 nos.
G	**Generator and Auxiliaries:**			
1	Generator package	L5700 x B2900 x H2350	28	
2	Air cooler	loose items	2	
3	Brushless Exiciter (130 Kw)	L699 x B1176 x H1250	0.843	
4	Permanent Magnet Generator (2.5 KVA)	L525 x B394 x H394	0.13	
5	Terminal Boxes & NGR			
5.1	Ph. Side terminal box	L1200 x B1200 x H2000	1.5	
5.2	Neutral side terminal box	L1200 x B1200 x H2000	1.5	
5.3	NGR Cubicle	L1250 x B1250 x H1540	1	
6	Control,metering,Relay, protection & synchronising panels			
6.1	control panel	L1000 x B800 x H2300	1	
6.2	Relay and protection panels 1 & 2 (each one)	L1000 x B800 x H2300	1.5	
7	Cables (for both the units)			
	TYPE	**LENGTH**	**Kg/km**	
7.1	*10T X .5 Sq.mm*	900M	2000	
7.2	*3C X 4 Sq.mm*	1600M	610	

7.3	*3C X 6 Sq.mm*	800M	720	
7.4	*2C X .75 q.mm*	400M	500	
7.5	*5C X 2.5 Sq.mm*	5000M	650	
7.6	*10C X 2.5 Sq.mm*	1600M	1100	
SL	**DESCRIPTION**	**PKG.SIZE(MM)**	**GR.WT IN MT**	
H	ST Generator Air Cooler	L4300 x B620 x H420	1 (each)	4 Nos

I) Control & Instrumentation for STG & Integral portion :

EXHIBIT – I (DETAILED SCOPE) : The scope of supply consists of erection , Calibration, testing, loop checking & commissioning.

AA. LOCAL / FIELD MOUNTED INSTRUMENTS AND DEVICES:

Sl.No.	ITEM DESCRIPTION	ERECTION QTY (Nos)	CALIBRATION QTY (Nos)	REMARKS
1.	Pressure gauges.	41	55	Refer documents: TD901001 TD900984 TD801296 TD900985 IN800194
2.	Pressure switches	21	30	
3.	Differential pressure indicator	1	1	
4.	Differential pressure switches	1	1	
5.	Temperature Gauges	21	25	
6.	Thermocouple	6	6	
7.	Bearing thermo elements	14	14	
8.	RTD	3	3	
9.	Thermo wells	34	38	
10.	Level gauges	3	3	
11.	Smart pressure Transmitter	13	13	
12.	Diffl pressure Transmitter	4	4	
13.	Level switches	3	3	
14.	Vib,Axial displacement,speed probes	13	13	
15.	proximitors	16	16	
16.	Safety relief valves	1	1	
17.	Control valves	4	4	
18.	I/P Transducers	3	3	
19.	Solenoid valves	1	6	
20.	***Panel mounted instruments***			
	Vibration, Axial displacement monitoring system.	1	1	Bently Nevada 3500 series

BB. PANELS AND CUBICLES:

Sl.No.	ITEM DESCRIPTION	DIMENSION	QTY.	REMARKS
1.	LOCAL GAUGE BOARD	1425 x 1600(mm)	1	
2.	GOVERNING CONSOLE BOARD	1300 x 1600(mm)	1	

CC .FABRICATION,ERECTION OF STRUCTURE STEEL:

Sl.No.	ITEM DESCRIPTION	DIMENSION	QTY.	REMARKS
a.	CHANNEL 100 X 50mm	313mts		REF DOC: TD501614
b.	ANGLE 50 X 50 X 6mm	419mts		
c.	SHEET 4mm THICK (400 X 120mm)	181mts		
d.	PLATE 10mm thick (375 X 770mm)	454mts		

DD. PROCESS IMPULSE TUBING AND PNEUMATIC TUBING FITTINGS

Sl.No.	ITEM DESCRIPTION	QTY(MTS)	REMARKS
1.	CS PIPE 21.3 X 3.73	400	REFER DOCUMENT: TD501614 & TD301058
2.	Cr-Mo PIPE 21.3 X 3.73	500	
3.	SS TUBE 12.7 X 2.1.	400	
4.	SS PIPE 60.3 X 2.8	100	
5.	SS PIPE 6.35 X 0.9	60	
6.	SS PIPE 21.3 X 2.8	30	

EE. LOOP CHECKING:

Sl.No.	ITEM DESCRIPTION	NO. 0F LOOPS	REMARKS
1.	PNEUMATIC.	4	.
2 .	ELECTRICAL	100	

FF. SCOPE OF WORK OF C&I ERECTION COTRACTOR

NOTES:

1. Clamping material ,identification ferrules, tags,U clamps, bolts, nuts required for laying Pneumatic Tubing & Process impulse piping are not supplied by BHEL. The same are to be supplied by erection contractor.
2. Erection, calibration, testing and commissioning for all C&I items are enumerated under scope of supply in this document. (which are in the scope of supply of T&C engg of BHEL-Hyderabad).
3. Erection of instruments shall include fabrication of instrument stands and hardware like nuts & bolts for mounting instruments on to stands.
4. Cable laying shall include drilling of gland holes, fixing of cables, glands, tagging, ferruling, termination & continuity checking. Consumables like aluminium tags, lugs and ferrules shall be supplied by the erection contractor.
5. Rack erection & testing shall include chipping, levelling, grouting and small modifications, if any, and removal of instruments for calibration and refixing.
6. TSI proximator and probes erection shall include proximator housing erection, support tube erection and protective flexible conduit erection.
7. Impulse Tubes & Piping erection shall include hydraulic test.
8. The necessary tools and accessories like clamping, material identification tags, ferrules, supports, U clamps, bolts, nuts etc. required for laying pneumatic tubing process Impulse piping and cables are not supplied by BHEL. The same are to be supplied by erection contractor.

J) TG Package Control:

S. no	Equipment Description	Dimensions (W X H X D) in mm without packing. Add 10% for packing in MM	No of packages	Unit Wt in Kgs - Gross	Lot Wt in Kgs - Gross
1	TG Controls	2000 X 2345 X 400	10	1100	11000
2	DCS- BOP	2000 X 2345 X 400	4	1100	4400
3	Digital Automatic Voltage Regulator	1250 X 2295 x 1250	2	700	1400
4	HMI System	1000 X 2345 X 400	1	400.00	400
5	HMI Computers	2500 X 2000 X 1500	1	600.00	600

K) PIPE QUANTITIES:

S.No	Description	Approx.length (mtrs)
a	Pipe line from live steam terminal point to turbine inlets	200
b	Pipe line from 8 bar turbine uncontrolled extraction to inlet of de-super heater	25
c	Pipe line from 8 bar desuperheater outlet nozzle to terminal point.	25
d	Pipe line from turbine 2.3 bar controlled extraction to inlet of de-superheater	25
e	Pipe line from 2.3 bar desuperheater outlet nozzle to terminal point.	25
f	Piping from 2.3 bar desuperheater to boiler 2.3 bara steam terminal point.	25
g	Piping from 0.1 bar a pressure condensate	--
h	Condensate piping	250
i	De- superheating water piping.	250
j	Compressed air piping	50
k	Bearing cooling water piping	250
l	Turbo -alternator condenser cooling water piping.	250
m	General usage water	100

n	Drain water	50

L) Balance of plant Equipment – Mechanical.

SL.No	Equipment Description	qty	Dimension each	Unit Weight each	Total weight
Unit		no	LxBxH (m)	Tons	tons
1	Cooling water system				
a.	Main cooling water pumps with drive motor for Condenser	3	2.5 x 1.5 x 1.0	2	6
b.	Cooling water pumps with drive motor for Bearing Cooling	2	2.5 x 1.5 x 1.0	2	4
c.	Return cooling water sump pumps	2	2.5 x 1.5 x 1.0	2	4
d.	Spray water pumps	2	2.0 x 1.5 x 1.0	1.5	3
e.	RCC Cooling tower with 3 cells for condenser	1	30.0 x 14.0 x 14.0	1.0(Max wt to be handled on cooling tower)	
f.	Bearing Cooling tower(RCC)	1	10.0 x 14.0 x 14.0	1.0(Max wt to be handled on cooling tower)	
g.	Cold water tank(CS)	1	5.0 x 5.0 x 5.0	1	1
h	Water sump	1	15.0 x 15.0 x 15.0		
2	Condensate system				
a.	CEPs -2 nos for each Unit	4	2.0 x 1.0 x 1.0	1	4
3	Compressed Air system				
a.	Reciprocating Air compressors(2 W+1 S)	3	3.5 x 2.0 x 3.5	6	18
b.	Air driers	2	2.5 x 3.0 x 1.5	2	4
c.	Air receiver	1	Dia 1.5 x 4.0	0.5	0.5
4	Maintenance Equipment				
a.	EOT Crane 30/5 T	1	TG Hall span 21 m;Length of TG Hall 35 m		40
b	Hoist for CW pumps	1			5
c	Hoist for Reciprocating Compressors	1			5
5	Air Conditioning				
a	Package type AC for Control room size 6m x21 m				

6	Ventilation				
a	Pressurised ventilation for switchgear room size approx 6 m x 35 m				
b	Roof exhausters for STG Hall of size 21 m x 35 m	10	Dia 0.75	5Kg	0.05
7	Fire fighting system				
a	Fire and smoke detectors for STG Hall incl DGFAP	1			
b	Extension of fire hydrant in STG Hall				
8	Piping, Valves and fittings,insulation and supports for BOP piping			300	300

Note:
1. All pipes shall be supplied in available commercial lengths. Bidder shall consider the edge preparation, cutting of pipes as per requirement and stub welding to pipes as per isometric drgs in their scope.

M)	**Balance of plant Equipment –Electrical**			
S.no.	**Description**			
1	HT(11kV) switchgear consisting of two VCB type breaker panels (2 Generator incomers with PT),copper bus bars ; rating 2000Amps, fault rating 31.5kA for 0.5 sec.breaker ratings 2000Amps, bus rating 2000Amps, fault rating 31.5kA for 0.5 sec.	2460w x 2355d x 2700h	3.5	1 set
2	LV (380V) switchgear : Common MCC 380V(for two STG sets, BOP TG hall loads), 2000A,50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	13032w x 1300d x 2430h	7.2	1 set
3	LV (380V) switchgear : BOP MCC 380V(for BOP loads inclusive of CW system loads, MCC located at CT pump house), bus bars with microprocessor based protection 2000A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	14780w x 900d x 2430h	13	1 set
4	110V DC System : 110V DC battery systemconsisting of 110V, 55cells, 200Ah lead acid battery bank with battery racks and other standard maintenance	4000l x 800d x 1750 h	1.8	1 set

5	110V DC System : 110V DC battery charger systemconsisting of SCR type FC+FCBC(off line boostcharger) charger , DC distribution board with Cubus bars, 10kA for 1 sec, with MCCB incomers &15nos. MCB outgoing feeders in non-draw out fixedtype execution, and DC starters for DC ELOP	5600w x 900d x 2400h	4.5	1 set
6	HT(11kV) Cu conductor XLPE armoured cable withcable kits (Approx. cable run distance betweenGenerator & HT swgr assumed 50mtrs)	11kv (UE) 1 cx 630 sqmm,XLPE armoured cu cable, 1500mtrs		1 set
7	Weather Proof sheet steel Local control push button stations with/without ammeters	180 x 300 x 125	5.0 kg per unit	1lot
8	LT power 1.1kV, PVC/XLPE insulation, Cu conductor armoured cable & cable accessories			
9	LT control 1.1kV, PVC/FRLS insulation, Cu conductor armoured cables & accessories			
10	Above ground earthing material for equipment grounding (Cu strip min 120sqmtrs, PVC copper cable)			
11	Cable support system inclusive of GI sheet ladder type cable trays, structural steel & accessories for power generation package			

N) Balance of Plant Equipment – Control & instrumentation

1.0 List of Items to be Procured, Erected & Commissioned by Erection Contractor

Sl. No.	Item Description	Applicability (Note1)	Quantity	Remarks
1	Cable Glands (Non –ex proof), Double compression, Ni coated brass/SS.			
	Size- ½"	Y	500	
	Size- ¾"	Y	300	
	Size-1"	Y	300	
	Size-1-1/4"	Y	200	
	Size- 1-1/2"	N	400	
	Size- 2"	N	200	
2	Cable Glands (Ex- proof)), Double compression, Ni coated brass/SS.			
	Size- ½"	Y	-	
	Size- ¾"	Y	-	
	Size-1"	Y	-	
	Size-1-1/4"	Y	-	
	Size- 1-1/2"	N	-	
	Size- 2"	N	-	
3	Tinned Cable Lugs at both ends			
	Size- for 0.5 mm2 cable	Y	LOT	
	Size- for 1 mm2 cable	N		
	Size- for 1.5 mm2 cable	Y	LOT	
	Size- for 2.5 mm2 cable	Y	LOT	
4.	PVC Cable Gland shrouds (covers)	Y	As per cable glands	
5	Cable ferruling numbers & characters	Y	As required	
6.	Name plates/Tag plates with tying/fixing material for cable's both end & filed instruments	Y	LOT	@ 100 meters per run of cable
7	Cable Markers	Y	As required	@ 100 meters per run of cable
8	Cable Supporting channels/angles (MS) with clamps, from JB to instrument	Y	As per Inst. list	@25 meters from JB to each inst.
9	2" GI pipe for transmitter and JB mounting	Y	1200 Mts	@1.5 meter per transmitter
	2" Pipe Caps		500	
	2" GI pipe Elbow		500	
10	MS angle iron- 50x50x6 mm for panel base frame & its site fabrication	Y	10 Mts/Panel	As per no of panels
11	MS angle iron- 50x50x6 mm for JB mounting & its site fabrication	Y	4mts/JB	For 30 JB's
12	Impulse line supporting clamps for			@ interval of ¼ meter.

	Pipe-3/4"	Y	LOT	
	Pipe-1/2"	Y	LOT	
	Tube-1/4"	Y	LOT	
13	Laminated JB Terminal Drawing	Y	Qty same as JB's	@ 2 copies per JB
14	Sheet 2mm TH for Canopy for transmitters, MS	Y	30m x 1m	
15	Gusset Plates (6mm TH) 200mm x 80mm, MS	Y	1000	
16	Base Plates (6mm TH) 250mm x 250mm, MS	Y	500	
17	Sheet 2mm TH for Canopy for transmitters, MS	Y	30m x 1m	
18	40x40x4 mm Angle, MS	Y	500m	
19	35x35x4 mm Angle, MS	Y	500m	
20	100x50 mm Channel, MS	Y	100m	
21	6mm TH plate, MS	Y	20m x 20m	
22	50 x 6 mm Flat, MS	Y	100m	
23	Nuts & Bolts, Clamps	Y	As required	
24	Cable Fastening Material	Y	As required	

2.0 Items to be Supplied by PED(C&I) and Erected & Commissioned by Erection Contractor

2.1 Instrumentation Package

S No.	Description	Qty
1	Control valves (Approx weight 80 kgs)	20
2	Desuperheaters (Approx weight 100 kgs)	5
3	Turbine Bypass system(Approx weight 130 kgs)	2
4	Pressure Safety valves (Approx weight 75 kgs)	8
5	Thermal Safety valves (Approx weight 75 kgs)	6
6	Flow orifice plates (Approx weight 80 kgs)	10
7	Flow nozzles (Approx weight 80 kgs)	8
8	Mass flow meters	-
9	Pressure gauges	40
10	Pressure transmitters	30
11	Pressure switches	20
12	Diff. pressure gauges	10
13	Diff. pressure transmitters	25
14	Diff. pressure switches	10
15	Temperature gauges	40
16	RTDs	15

17	Thermo couples	20
18	Level gauges	20
19	Level transmitters (Displacer Type)	10
20	Level switches	20
21	Annubars	3
22	Handheld Calibrator	2
23	Instrument canopies	300
24	Erection material for above items	
	(i) ~~needle/~~ globe valve	150
	(ii)comp & con. fittings	LOT
	(iii) condensing chambers	50
	(iv) Syphon	40
	(v) 5 way manifolds	25
	(vi) Air filter regulators	20
	(vii) Thermowells	70
25	Impulse pipes &tubes for impulse connection for instrument hookup	
	(i) SS tube 12.7 x 2.1 mm	600m
	(ii) SS tube 6.35 x 0.9 mm	200m
	(iii) ERW / SAW Steel tube 60.8 x 3.65 (NB 50)	1200m
	(iv) SS pipe 33.4 x 3.4 mm	500m
	(v) SS pipe 21.3 x 3.7 mm	200m
	(vi) SS pipe 6 x 1 mm	200m
26	STRL Steel (Std Quality)	
	(i) Strl ST equal angle 50 x 50 x 6	300 Nos
	(ii) Strl St channel 100 x 50	200 Nos
	(iii) Strel St PL 6	50 Nos

2.2 Cables Package

S No.	Description	Qty
1	**Signal Cables**	
	1P x 1.5 sq.mm, Individual & Overall shielded	6000m
	1T x1.5 sq.mm, Individual & Overall shielded	4000m
	1P x 16 AWG Cr-Al Extension	4000m
2	**Junction Boxes**	
	60 terminals, weather proof	50No's

2.3 Analysers Package

Erection & Commissioning of analyzers is in Erection Contractor scope.

S No.	Description	Qty
1	CONDUCTIVITY ANALYZERS	1 SET
2	PH ANALYZERS	1 SET
3	DISSOLVED OXYGEN ANALYZERS	1 SET

3.0 DCS Package

S No.	Description	Qty
1	Distributed Control System (DCS from M/s.BHEL-EDN)	1 SET
~~2~~	~~Interlock PLC's (BOP PLC from M/s SIEMENS)~~	~~1~~

NOTE:
Above weights & dimensions are tentative and may vary. All equipments & Aux. are to be handled & erected as dispatched from manufacturing units & received at site.

Appendix – II (B)

Summary of Tentative Weight Details of Systems Involved in this Tender Specification for each unit.

WEIGHT DETAILS

Sl.No.	EQUIPMENT / PACKAGE	APPROX. WT. FOR BOTH UNITS (in MT)
A	Steam Turbine & Auxiliaries:	90
B	Oil Supply System Aux,Pumps and other Auxiliaries :	20.16
C	Surface Condenser:	30
D	Steam Jet Air Ejector:	6
E	Gland steam Condenser:	1.5
F	ST Oil Cooler :	12.4
G	Generator and Auxiliaries:	74.946
H	STG Air Coolers :	4
I	Control & Instrumentation for STG & Integral portion :	38.8
J	TG Package Control:	
K	Piping	300
L	Balance of plant Equipment – Mechanical	120
M	Balance of plant Equipment – Electrical	75
N	Balance of Plant Equipment – Control & instrumentation	50
O	**Reinforcement steel for civil works**	**326**
P	**Structural steel for civil works**	**1332**
Q	**Cement for civil works**	**1366**
R	**Material for BOP Civil**	**300**
	TOTAL	**4146.806**
	Rounded of:	**4147**

Appendix-II (C)

Tentative Schedule of Insulation

INSULATION SCHEDULE

IE065

FINCHAA SUGAR FACTORY,ETHIOPIA(2X12 MW STG)

PIPING

WO : 1-0-198-050-00

SL NO	LINE	OPER TEMP DegC	PIPE SIZE in	INS THK mm	PIPE LEN m	ELBOW LR	ELBOW SR	ELBOW 45	EQ TEE	END CAP	FL	BL FL	SQ FL	VI	NI	TEMP STUB	RD SIZE1 in	RD SIZE2 in	RD TEE	REDU CER	VALVE SIZE in	VALVE
1	**GLAND STEAM**																					
1	1 1/2"-AS-21F-001	350	1.5	65	12	6			2								1.5	1		4	1.5	1
			1	60	12	4			1		2						1	.5		1	1	1
			.5	60	3																.5	1
2	4"-GS-11K-002	350	4	90	18	6			2	1						2	4	2		1	4	1
			2	75	1												2	1.5		1	.5	1
			1.5	65	1																	
			1	60	1									2								
			.5	60	6									3								
3	4"-GS-11K-003	350	4	90	6	3			2								4	3		1		
4	4"-GS-11K-004	350	4	90	9	3											4	2		1		
5	4"-GS-11K-005	350	4	90	9												4	2		1	4	1
			2	75	1																2	1
			.5	60										1							.5	1
6	6"-GS-11K-006	350	6	100	18	5			1								6	3		2	6	1
			4	90							2											
2	**CHIMNEY STEAM**																					
1	3"-GS-11K-007	338	3	90	6	2					2						4	3		1		
			2	75	1	1					2						3	2		1		

Appendix-II (C)

Tentative Schedule of Insulation

INSULATION SCHEDULE

IE065

FINCHAA SUGAR FACTORY,ETHIOPIA(2X12 MW STG)

PIPING

WO : 1-0-198-050-00

SL NO	LINE	OPER TEMP DegC	PIPE SIZE in	INS THK mm	PIPE LEN m	ELBOW LR	ELBOW SR	ELBOW 45	EQ TEE	END CAP	FL	BL FL	SQ FL	VI	NI	TEMP STUB	RD SIZE1 in	RD SIZE2 in	RD TEE	REDU CER	VALVE SIZE in	VALVE
2	3"-GS-11K-008	338	3	90	12	3					2						4	3		1		
			2	75	1	1																
3	4"-GS-11K-009	250	4	60	12	5			2							1					4	1
4	4"-GS-11K-010	250	4	60	18	5			1								1	.5		1	4	1
			1	50	15	6			2					2							.75	2
			.5	40	1																	
5	4"-GS-11K-011	250	4	60	18	5			1								1	.5		1	.75	2
			1	50	15				2					1								
			.5	40	1																	
3	**TURBINE WATER DRAIN**																					
1	1"-DR-13K-001	442	1	90	18	5			3								1	.5		1	1	2
			.5	90	6																	
2	1"-DR-13K-002	442	1	90	18	5			3								1	.5		1	1	1
3	1"-DR-11K-003	343	1	60	18	5			1								1	.5		1	1	1
4	1"-DR-11K-004	300	1	60	18	5			1								1	.5		1	1	1
5	1"-DR-11K-005	350	1	60	18	5			1								1	.5		1	1	1
4	**VACCUME BREAKER**																					
1	3"-VA-11G-014	100	3	40																	3	1

IE065

1-0-198-050-00

INSULATION VOLUME ESTIMATION SHEET

FINCHAA SUGAR FACTORY,ETHIOPIA(2X12 MW STG)

PIPE SIZE (in)	PIPE OD (mm)	INSULATION THICKNESS (mm)	PIPE LENGTH (m)	INSULATION VOLUME (Cu.m)	JACKETING AREA (Sq.m)
6	168.3	100	21.08	1.78	24.4
4	114.3	90	47.21	2.75	43.64
4	114.3	60	53.41	1.75	39.32
3	88.9	90	19.32	.97	16.33
3	88.9	40	.27	0	.14
2	60.3	75	4.58	.15	3.02
1	33.4	60	69.24	1.2	33.37
1	33.4	50	30.73	.4	12.88
1	33.4	90	37.44	1.31	25.1
1.5	21.3	65	13.52	.24	6.43
.5	21.3	60	9.18	.14	4.08
.5	21.3	40	2	.02	.64
.5	21.3	90	6	.19	3.8

TOTAL INSULATION VOLUME (Cu. m)	**10.9**	**10.9**	PIPE SIZE <= 14"
			PIPE SIZE >= 16"
TOTAL JACKETING AREA (Sq. m) :	**213.15**	**213.15**	PIPE SIZE < 12"
			PIPE SIZE >= 12" & <=36"
			PIPE SIZE > 36"

4

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Appendix-II (C)

Tentative Schedule of Insulation

NOTE:

1. Above schedule of insulation & scope mentioned in tentative only. Entire works have to be completed as per BHEL drawings/documents and site engineers instruction.
2. For mentioned Insulation thickness, it will be in multiple layers depending of standard thickness of mattress. Same shall be carried at site as drawings & BHEL site engineers instruction.

Appendix-III

Format for month-wise manpower deployment plan
(category-wise numbers to be indicated for each month)

Sl. No.	Category	Months						
		1	2	3	4	5	6	7
01	Resident engineer							
02	Erection engineers							
03	Erection supervisors							
04	Quality assurance engineer							
05	Safety engineer							
06	Materials management supervisors							
07	High pressure welders							
08	Structural & other welders							
09	Fitters							
10	Millwright fitters							
11	Crane operator							
12	Truck/trailer drivers							
13	Store keepers							
14	Electricians							
15	Semiskilled/ unskilled workers							
	Month wise total							

Signature of bidder

Date:

.....

Appendix– IV

Format for deployment plan for major Tools and Plants of contractor

SN	Description & capacity of T&P	Min. Qty	Months quantity						
			1	2	3	4	5	6	7
1.	Mobile Crane of suitable capacity	01							
2.	Trailer with Tractor of suitable capacity	01							
3.	TIG welding sets	2 sets							
4.	Pipe bending m/c electro-hydraulic	As reqd.							
5.	Stress relieving equipment with temperature recorders	As required							
6.	Radiography source & other arrangement	1set							
7.	Electric distribution board with energy meter	1set							
8.	Welding Generators/rectifiers	5 sets							
9.	Hydraulic test pump cap.150 Kg/cm2	1 Set							
10.	Any other major T&P planned by the contractor	As required							
11.	Lifting and shifting arrangement for heavy consignments / equipments	1 set							

(*) NOTE:

1. This list is neither exhaustive nor limiting. Quantities indicated above are only the minimum required. Contractor shall deploy all necessary T&P to meet the schedules & as prescribed by BHEL
2. No claim whatsoever will be entertained on this account.

signature of the bidder

Date:

.....

Appendix-V
Planned workers man-days in various areas

Sl. No.	Description of work	Mandays Planned	Remarks
1.	Surface Condenser		
2.	Turbine with Integral Piping		
3.	Generator		
4.	T G Auxiliaries		
5.	Piping		
6.	Other Auxiliaries		
7.	Electrical		
8.	Control & Instrumentation		
9.	Materials Management		

Appendix-VI

Concurrent Commitments

Sr. No.	Full postal address of client and name of officer in-charge	Description of the work	Value of the contract	Commenc-ement date	Schedu-led comple-tion	% compl-td. As on date	Anticipa-ted compln. Date	Remarks

Signature of the bidder

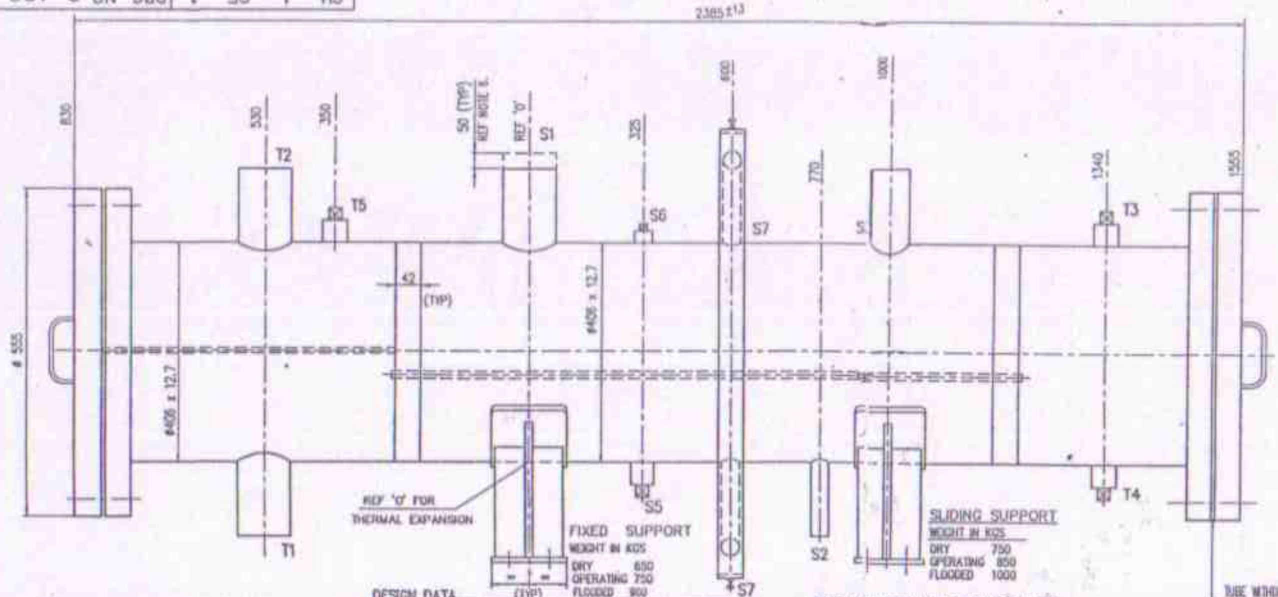
Date:

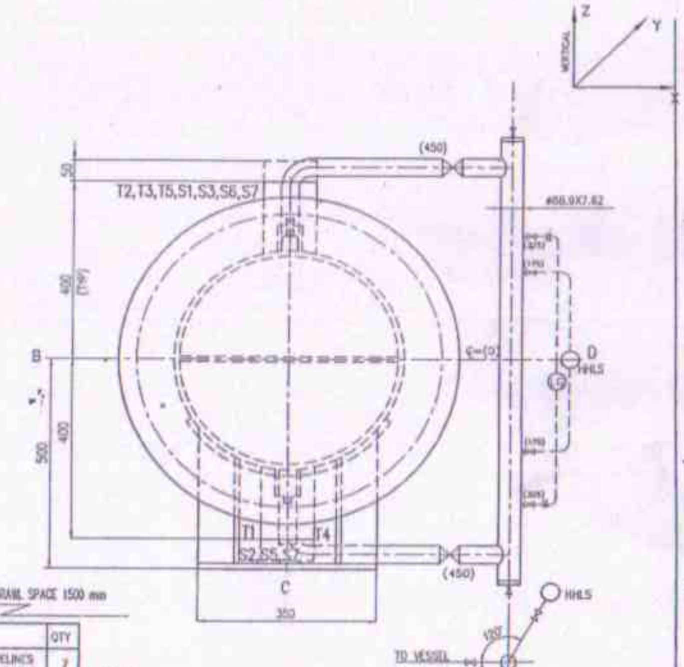
Appendix-VII

Analysis of unit rate quoted

Sl. no.	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		

date: Signature of the bidder





DESIGN DATA

DESIGN CODE :	THERMAL ----- HEI 6th EDN MECHANICAL ------- HEI/ASME SEC. VIII DIV .1. 2007 UPTO & INCLUDING ADD NIL

DESCRIPTION	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE Kg/cm(g)	20 & FULL VACUUM	20
TEST PRESSURE Kg/cm(g)	28	26
DESIGN TEMP °C	250	100
TEST TEMP °C	AMBIENT	AMBIENT
CORROSION ALLOWANCE MM	3.2	3.2
STRESS RELIEVING	——	——
PRESSURE DROP (kg/sq cm)	0.5	
NO. OF PASSES	ONE	TWO
MEDIUM	STEAM & AIR	CONDENSATE
RADIO GRAPHY	N.A.	N.A
SURFACE AREA SQ.M	6	
TUBE SIZE OD x Thk. x Length	ø19.05 x 0.889 x 1500L	
NO. OF TUBES REQD / PROVIDED	142/146 , PITCH - ' ' LAR. △	
PRESSURE DROP	0.5 kg/cm2	

LIST OF NOZZLES

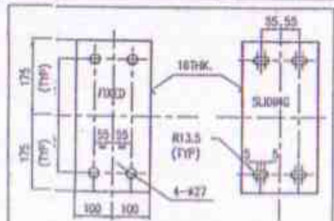
REF	DESCRIPTION	SIZE	QTY	
T1	CONDENSATE INLET	ø168.3x10.97 / 7.11	1	BW
T2	CONDENSATE OUTLET	ø168.3x10.97 /7.11	1	BW
T3	REAR WATER BOX VENT	1" ANSI 6000# CPLG	1	SW
T4	REAR WATER BOX DRAIN	1" ANSI 6000# CPLG	1	SW
T5	WATER EXPANSION REL VALVE CONN.	3/4" SW	1	SW
S1	STEAM INLET	ø114.3x11.13/6.02	1	BW
S2	DRAIN OUTLET	ø60.3x8.74/5.54	1	BW
S3	AIR OUTLET	ø60.3x8.74/5.54	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

VALVE SCHEDULE

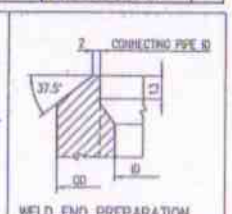
REF	DESCRIPTION	CONN SIZE	QTY	LOCATION
a	PRESSURE GAGE VALVE	1/2" SW	7	ON SHELL,T1,T2 PIPELINES AIR & STEAM TO EJECTOR
b	WATER BOX VENT VALVE	1" SW	1	ON REAR WATER BOX
c	WATER BOX DRAIN VALVE	1" SW	1	ON REAR WATER BOX
d	—	—		—
e	SHELL DRAIN VALVE	1" SW	1	ON SHELL
f	—	—		—
g	AIR OUTLET VALVE	4" FURF	2	ON S3 PIPE LINE
h	WATER EXPANSION RELIEF VALVE	INLET 3/4"SW OUTLET 1" SW	1	ON 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
l	HHLS ISOLATION VALVE	1" SW	2	ON STAND PIPE

LIST OF INSTRUMENT CONNECTIONS

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 800)	1" 300# RF	ON STAND PIPE	2
3	LEVEL SWITCH (C-C 350)	1"SW	ON STAND PIPE	2
4	WATER EXPAN. RELIEF VALVE	3/4"SW / 1" SW	ON WATER BOX	1
5	TEMPERATURE GAUGE	M33 x 2	ON S1,T1,T2 PIPELINES & STEAM TO EJECTOR	4



BASE PLATE DETAILS



WELD END PREPARATION FOR BUTT WELD NOZZLES

BILL OF MATERIAL

SL.NO	MATERIAL	SPECIFICATION
1	SHELL AND CHANNEL	CS, SA106 GR.B
2	TUBE PLATE, CHANNEL COVER	CS, SA516 GR 70
3	BAFFLE PLATES	CS, IS 2062
4	CHANNEL FLANGE	CS, SA516 GR 70
5	TUBES	SS, SA 249 TP304
6	IMPINGEMENT PLATE	SS, SA240 TP304
7	NOZZLES (PIPES)	CS, SA106 GR.B

ALLOWABLE FORCES, MOMENTS & MOVEMENTS

NOZZLE	FORCE IN KGF.			MOMENT IN KGM			THERMAL MOVEMENT mm		
	fx	fy	fz	Mx	My	Mz	Δx	Δy	Δz
T1	250	250	250	500	500	500	-0.6	0.0	-0.3
T2	250	250	250	500	500	500	-0.6	0.0	+0.8
S1	150	150	150	300	300	300	0.0	0.0	+0.8
S2	150	150	150	300	300	300	+0.6	0.0	-0.3
S3	150	150	150	300	300	300	+0.6	0.0	+0.8
S4	250	250	250	500	500	500	+0.6	-0.6	-0.8

NOTES:-

1. INSPECTION : B H E L / CUSTOMER.
2. PAINTING : (a) INSIDE ---- NIL
   (b) OUTSIDE - 2 COATS OF HEAT RESISTANT ALUMINIUM PAINT.
3. FOUNDATION BOLTS: M24X300 (STUD WITH 2 NUTS) - 8 Nos.
4. S3 NOZZLE IS TO BE CONNECTED WITH 2x100% FAN WITH MOTOR ASSLY AT SITE.
5. NOZZLES T1,T2,S1,S2,S3,S7 ARE PROVIDED WITH 50MM EXTRA LENGHTS FOR REMOVAL OF HYDROTEST BLANKS AT SITE & EDGE PREPARATION.

WEIGHTS IN KGS	
EMPTY	1000
OPERATING	1200
FLOODED	1500

REV.	DATE	ALTERED	CHECKED	APPROVED	REV.	DATE	ALTERED	CHECKED	APPROVED	REV.	DATE	ALTERED	CHECKED	APPROVED	REV.	DATE	ALTERED	CHECKED	APPROVED
ZONE					ZONE					ZONE					ZONE				

CONSULTANT: J P MUKHERJI & ASSOCIATES PVT. LTD.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 1X12MW FINCHAA SUGAR FACTORY, M/s.OVERSEAS INFRASTRUCTURE ALLIANCE(I) PVT. LTD. ETHIOPIA.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	A.K.SAHOO	A.K.SAHOO	21.08.08
CHD.	KIRAN		21.08.08
APPD	B.SRINIVAS		21.08.08

NO.OF VAR. NA

DEPT. HEE CODE 405	GRADE OF TOL.DIM. C/M/F	SCALE NTS	WEIGHT (KG) 1400	REF. TO ASSY DRG. NA	ITEM NO. NA	NO.OF ITEM NA

TITLE: GA OF GLAND STEAM CONDENSER

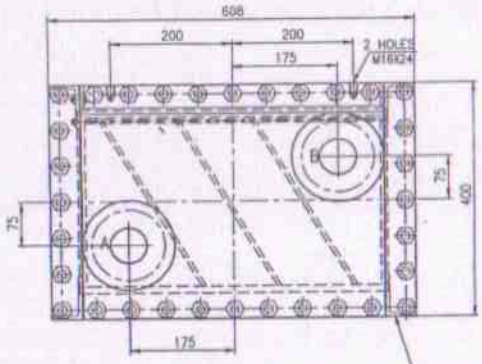
CARD CODE

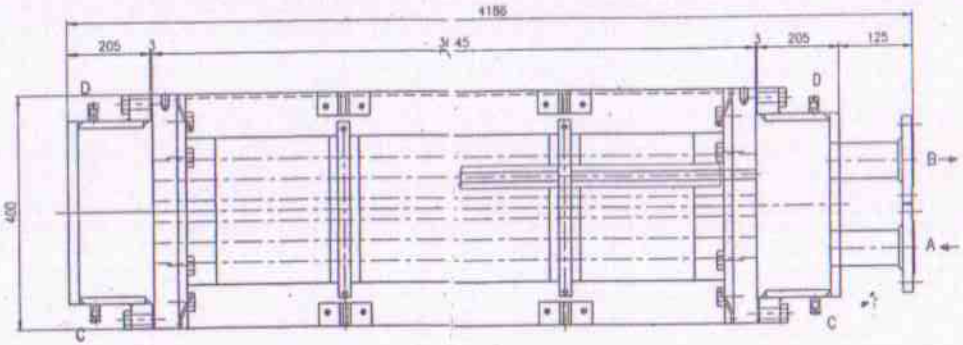
DRAWING NO. 2-162-14-00409 REV. 00

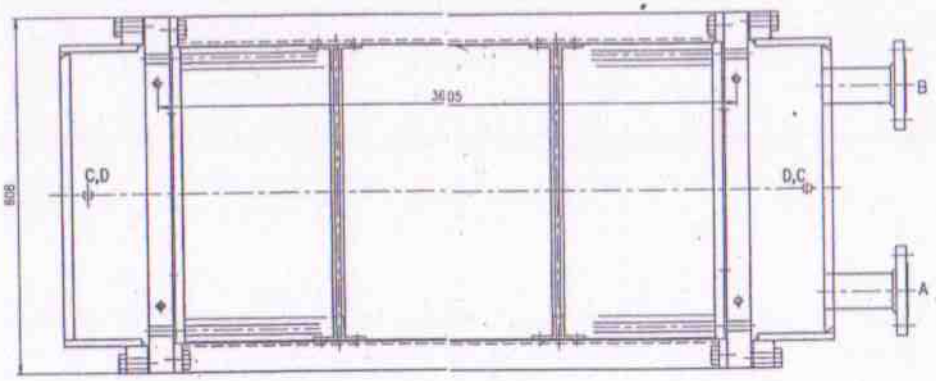
SHEET No. 1 NO OF SHEETS 1

(ALL DIMENSIONS ARE IN mm)

SH. 1 OF 1 ORG. NO. 2-166-03-00462

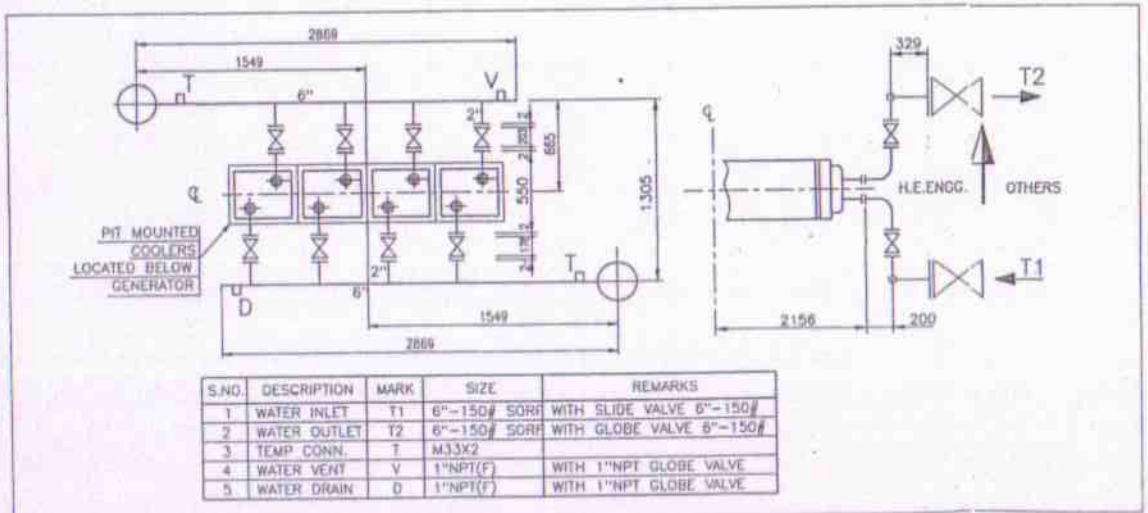






TECHNICAL DATA

1. HEAT DUTY	——	300 KW
2. QTY. OF AIR AT 40°C & 740MM OF Hg	——	33624 Cu.M/Hr
3. QTY. OF COOLING WATER	——	60 Cu.M/Hr
4. COOLED AIR TEMP.(OUTLET/INLET)	——	39°C/69.4°C
5. C.W INLET/OUTLET TEMP.	——	32°C/36.3°C
6. PRESSURE DROP ON WATER SIDE	——	7 M OF W.CL
7. PRESSURE DROP ON AIR SIDE	——	10 mm OF W.CL
8. FRAME SIZE OF COOLER	——	(12/11-4/4-4-353.5)
9. NO. OF COOLER ELEMENTS	——	3+1(SPARE ELEMENT)
10. DESIGN PRESSURE ON WATER SIDE	——	6 KG/Sq.CM
11. TEST PRESSURE ON WATER SIDE	——	7.8 KG/Sq.CM
12. NO. OF TUBES / ELEMENT	——	92



S.NO.	DESCRIPTION	MARK	SIZE	REMARKS
1	WATER INLET	T1	6"-150# SORF	WITH SLIDE VALVE 6"-150#
2	WATER OUTLET	T2	6"-150# SORF	WITH GLOBE VALVE 6"-150#
3	TEMP. CONN.	T	M33X2	
4	WATER VENT	V	1"NPT(F)	WITH 1"NPT GLOBE VALVE
5	WATER DRAIN	D	1"NPT(F)	WITH 1"NPT GLOBE VALVE

MATERIAL SPECIFICATION

SL.No.	DESCRIPTION	MATERIAL	SPECIFICATION
1	TUBE PLATE	CARBON STEEL	IS 2062 Gr 'B'
2	WATER BOX	CARBON STEEL	IS 2062 Gr 'B'
3	FRAME	CARBON STEEL	IS 2062 Gr 'B'
4	STUD & NUT	CARBON STEEL	IS 1862
5	TUBES	ADM. BRASS	SB111ALLOY No 443
6	FIN	COPPER	

LIST OF CONNECTIONS

CONN.	DESCRIPTION	SIZE	QTY	REMARKS
A	COOLING WATER INLET	2"	1	ASME 150# SORF
B	COOLING WATER OUTLET	2"	1	ASME 150# SORF
C	WATER BOX DRAIN	1/2"NPT	2	COUP+PLUG
D	WATER BOX VENT	1/2"NPT	2	COUP+PLUG

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

DRAWING CATEGORY:FOR INFORMATION ONLY

CONSULTANT:J P MUKHERJI & ASSOCIATES PVT.LTD.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: FINCHAA SUGAR FACTORY-2 X 12 MW,ETHIOPIA (M/s OVERSEAS INFRASTRUCTURE ALLIANCE (I) PVT. LTD.)

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME		DATE
DRN.	P.M.K.RAJU		27.05.08
CHD.	ACS		28.05.08
APPD.	VCK		28.05.08

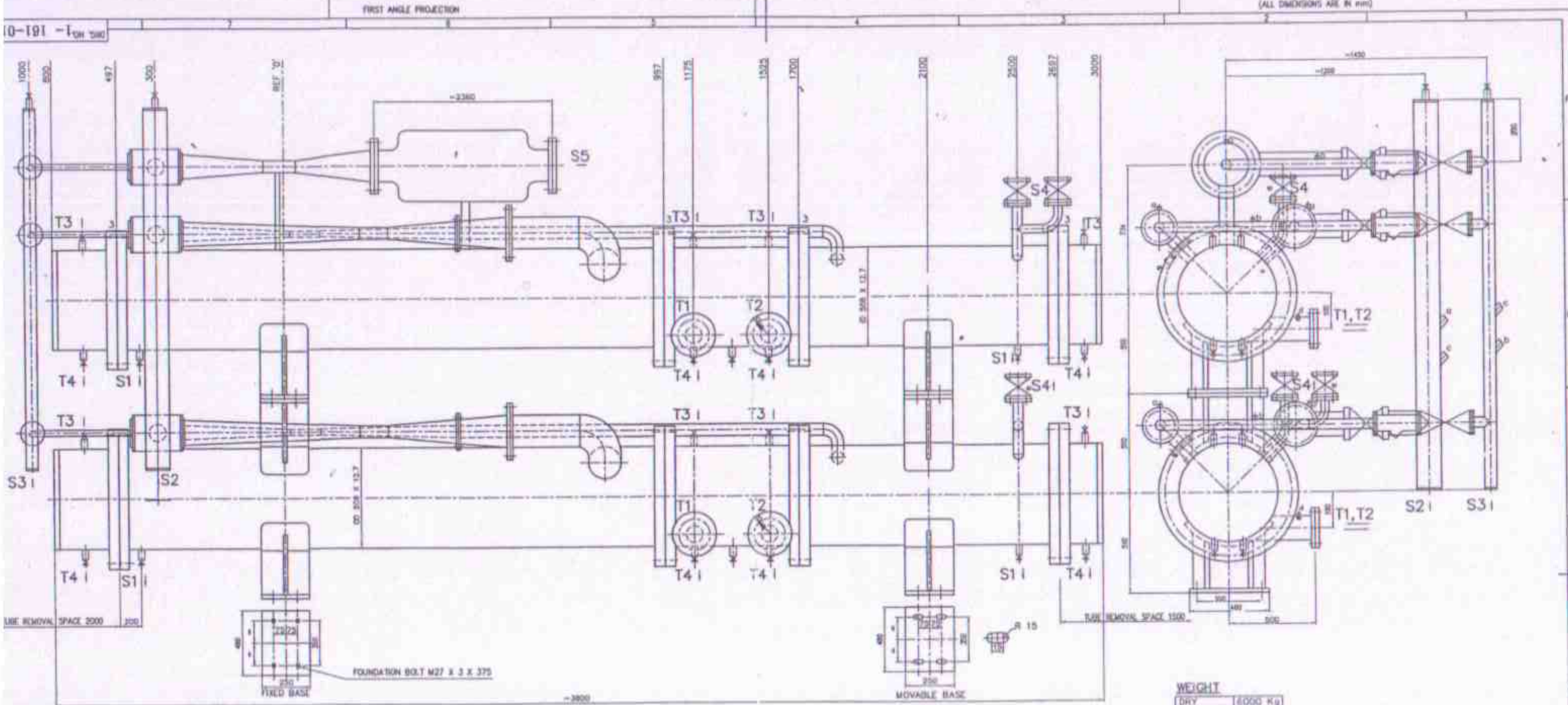
REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

DEPT. HEE | CODE 405 | GRADE OF TOLERANCE | SCALE NTS | WEIGHT (KG) 625.0 | REF. TO ASSY DRG. NA | ITEM NO. NA

TITLE: AIR COOLER ELEMENT | CARD CODE | DRAWING NO. 2-166-03-00462 | REV 01

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)



ST OF NOZZLE CONNECTIONS

	DESCRIPTION	SIZE	QTY
1	CONDENSATE INLET	4" ANSI 150 RF	2
2	CONDENSATE OUTLET	4" ANSI 150 RF	2
3	WATER BOX VENT (WITH VALVE)	ø21.3 X 4.78	12
4	WATER BOX DRAIN (WITH VALVE)	ø21.3 X 4.78	14
1	INTER & AFTER COND. DRAIN (WITH VALVE)	ø60.3 X 5.54	4
2	AIR INLET	ø168.3 X 7.11	1
3	STEAM INLET	ø88.9 X 7.62	1
4	AIR OUTLET	1 1/2" ANSI 300 # RF	2
5	SILENCER OUTLET	6" ANSI 150 SORF	1

ST OF INSTRUMENTS

	DESCRIPTION	CONN. SIZE	LOCATION	QTY
a	PR. GAUGE (-1 TO 1.5 Kg/Cm²)	1/2" SW	ON 1 & 2 STG. ST. EJEC. AND S2	6
b	PR. GAUGE (0 TO 20 Kg/Cm²)	1/2" SW	ON STEAM INLET PIPE & T1,T2 PIPING	8
c	TEMP. GAUGE	M33 X 2	ON T1&T2 PIPING, S2 & S3	6
d	WATER EXPANSION RELIEF VALVE	1/2" X 1" SW	ON T2	2
e	AIR FLOW METER	1 1/2" ANSI 300 RF	ON S4	2
f	SILENCER	3" X 6" 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 ---------13 kg/cm² (g)
5. MOTIVE STEAM TEMPERATURE --------------350°C
6. DESIGN SUCTION PRESSURE------------- 0.035 ata
7. SUCTION QTY. :-

   DRY AIR ----------------- 8.16 Kg / hr
   WATER VAPOUR ---------- 17.96 Kg / hr
   TOTAL MIXTURE ---------- 26.12 Kg / hr

8. CONDENSATE FLOW :-

   a) Qty. ------------- 30000 kg/hr(min.)

9. MOTIVE STEAM CONSUMPTION ---------350 kg / hr

BILL OF MATERIALS:-

1. EJEC. AIR & STEAM PIPING---SA 106 Gr 'B' OR EQUT.
2. SUPPORT PLATES, MIXING CHAMBERS, DIFFUSERS STEAM STRAINERS & VALVES--- CARBON STEEL OR EQUT.
3. TUBES------SA 249 TP 304
4. NOZZLES---A 276, TP 304 OR EQUT.
5. TUBE PLATES------CARBON STEEL(SA 516 Gr 70)
6. SHELL, WATER CHAMBERS...CARBON STEEL (SA 106 Gr.B/ SA 672 Gr.B/SA 516/70 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----- 13 kg / sq.cm (g)
5. MOTIVE STEAM TEMPERATURE-------- 350°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 ------ 300 Kg / hr

DESIGN DATA :-

DESCRIPTION	INTER COND. (TUBE SIDE)	AFTER COND. (TUBE SIDE)	SHELL SIDE
DESIGN PRESSURE Kg/Cm²(g)	12	12	3.5 & FULL VAC
TEST PRESSURE Kg/Cm²(g)	15.6	15.6	4.55
DESIGN TEMP. °C	100	100	200
TEST TEMP. °C	AMBIENT	AMBIENT	AMBIENT
SURFACE AREA M²	16.4	10.5	–
NO. OF PASSES	4	4	–
NO. OF TUBES	196	196	–
TUBE SIZE	ø3/4"X20 BWG(ø19.05X0.889)	ø3/4"X20 BWG(ø19.05X0.889)	–

WEIGHT

DRY	6000 Kg
OPERATION	7000 kg
FLOODED	8000 kg

NOTE :-

1. PAINTING - INSIDE : NO PAINTING
   OUT SIDE: 2 COATS OF FERROTOL HEAT RESISTING ALUMINIUM PAINT-DFT. 30 MICRONS
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

CONSULTANT : M/S J.P.MUKHARJI & ASSOCIATES PVT. LTD.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: FINCHAA SUGAR FACTORY 2X12MW STG, ETHIOPIA.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

DRN. V.S.N. SARMA | CHD. M.VENKAT | APPD. B SRINIVAS

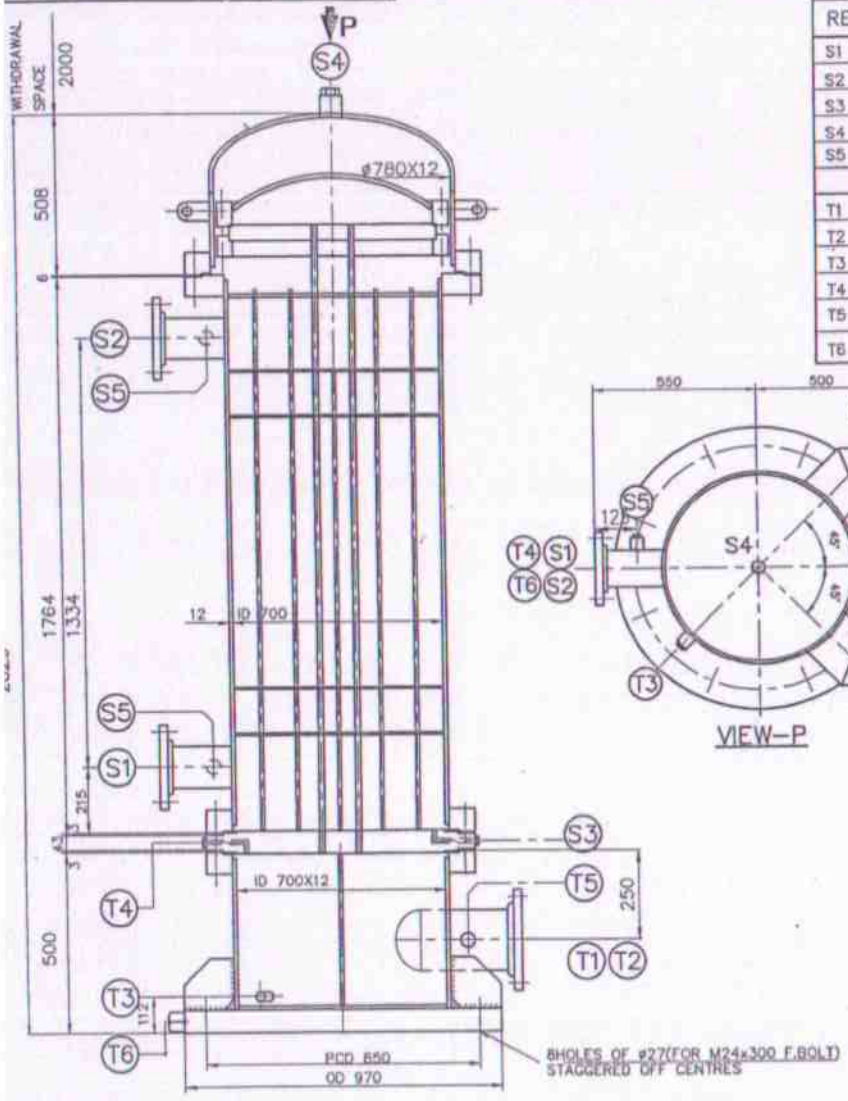
SCALE N.T.S | WEIGHT (KG) 6000.0 | REF. IN ASSY DRG. N.A

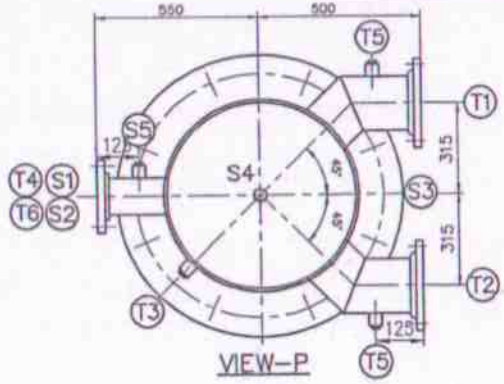
TITLE | DRAWING NO.

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3-165-01-00435





VIEW-P

LIST OF NOZZLES

REF	DES	QTY	SIZE
S1	OIL INLET	1	6" ANSI 150# SORF WITH CHANGE OVER VALVE
S2	OIL OUTLET	1	6" ANSI 150# SORF. WITH CHANGE OVER VALVE
S3	DRAIN	1	1/2"NPT COUPLING WITH GLOBE VALVE(F)
S4	VENT	1	1" 6000# NPT WITH GLOBE VALVE(F)
S5	TEMP.CONN.	2	M 33 X 2 COUPLING+PLUG
T1	WATER INLET	1	6" ANSI 150# SORF WITH GATE VALVE
T2	WATER OUTLET	1	6" ANSI 150# SORF WITH GLOBE VALVE
T3	DRAIN	1	1"NPT COUPLING WITH GLOBE VALVE(F)
T4	VENT	1	1/2" 6000# NPT WITH GLOBE VALVE(F)
T5	TEMP.CONN.	2	1" 6000# NPT COUPLING
T6	DRAIN	1	1/2" NPT PLUG

DESCRIPTION	MATERIAL
SHELL	SA 516 Gr.70
CHANNEL	SA 516 Gr.70
DISHED END	SA 516 Gr.70
TUBE PLATE	SA 516 Gr.70
TUBES (ADM.BRASS)	SB 111 C44300
FLANGE	SA 516 Gr.70
SADDLES	IS 2062

DESIGN DATA

CODE : ASME SEC.VIII DIV-1, 2007 EDITION
TEMA 'C' 2007

DESCRIPTION		SHELL SIDE	TUBE SIDE
DESIGN PRESSURE	Kg/sq.cm (g)	9.0	6.0
TEST PRESSURE	Kg/sq.cm (g)	11.7	7.8
DESIGN TEMP.	°C	80	65
CORROSION ALLOW.	mm	1.6	1.6
POST WELD HEAT TREATMENT		NIL	NIL
RADIO GRAPHY		SPOT	SPOT
NO. OF PASSES		1	4
MEDIUM		OIL	WATER
JOINT EFFICIENCY		0.85	0.85
FOULING RESISTANCE	Hr.sq.m.c/kcal	0.0002	0.0002
SURFACE AREA	sq.m	72	
NO. OF TUBES		776	
TUBE LENGTH	mm	2000	
TUBE SIZE	ODxThk	ø15.875X1.24	
PITCH/TYPE	mm	20.64/△	
NO. OF BAFFLES		9	
BAFFLE PITCH	mm	141	
HEAT DUTY	K.W.	316.38	
QTY.OF OIL	Cu.m/Hr	40.71	
OIL TEMP(OUTLET/INLET)°C		47/63.5	
QTY.OF COOLING WATER	Cu.m/Hr	140	
COOLING WATER TEMP.(INLET/OUTLET)	°C	32/34	
PRESSURE DROP ON C.W.SIDE	Kg/sq.cm	0.5	
PRESSURE DROP ON OIL SIDE	Kg/sq.cm	0.2	
NO.OF COOLERS		2 X 100%	
EMPTY WEIGHT	Kg	3100	
WORKING WEIGHT	Kg	3600	
FLOODED WEIGHT	Kg	3800	
INSPECTION		M/S B.H.E.L/CUST.	

NOTES:

1. SURFACE PREPARATION: - GRIT BLASTING
2. PAINTING:
   a). SHELL: - INSIDE: NIL
   CHANNEL: - INSIDE: ONE COAT OF APCODUR-696 BLACK.
   b) SHELL&CHANNEL: - OUTSIDE: PRIMER-ONE COAT OF EPOXY BASED ZINC CHROMATE.
   FINISH PAINT-TWO COATS OF EPOXY BASED FINISH PAINT.

DRAWING CATEGORY: FOR INFORMATION ONLY

CONSULTANT: J P MUKHERJI & ASSOCIATES PVT.LTD.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: FINCHAA SUGAR FACTORY-2 X 12 MW, ETHIOPIA (M/s OVERSEAS INFRASTRUCTURE ALLIANCE (I) PVT. LTD.)

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN	DATE	NO.OF VAR.
DRN.	P.M.K.RAJU		03.07.08	NA
CHD.	A.C.S		03.07.08	
APPD.	V.C.K		03.07.08	

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

DEPT.	GRADE OF TOL.DIM.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE		NTS	3100	NA	NA	NA
CODE 405						

TITLE: G.A.OF S.T.OIL COOLER

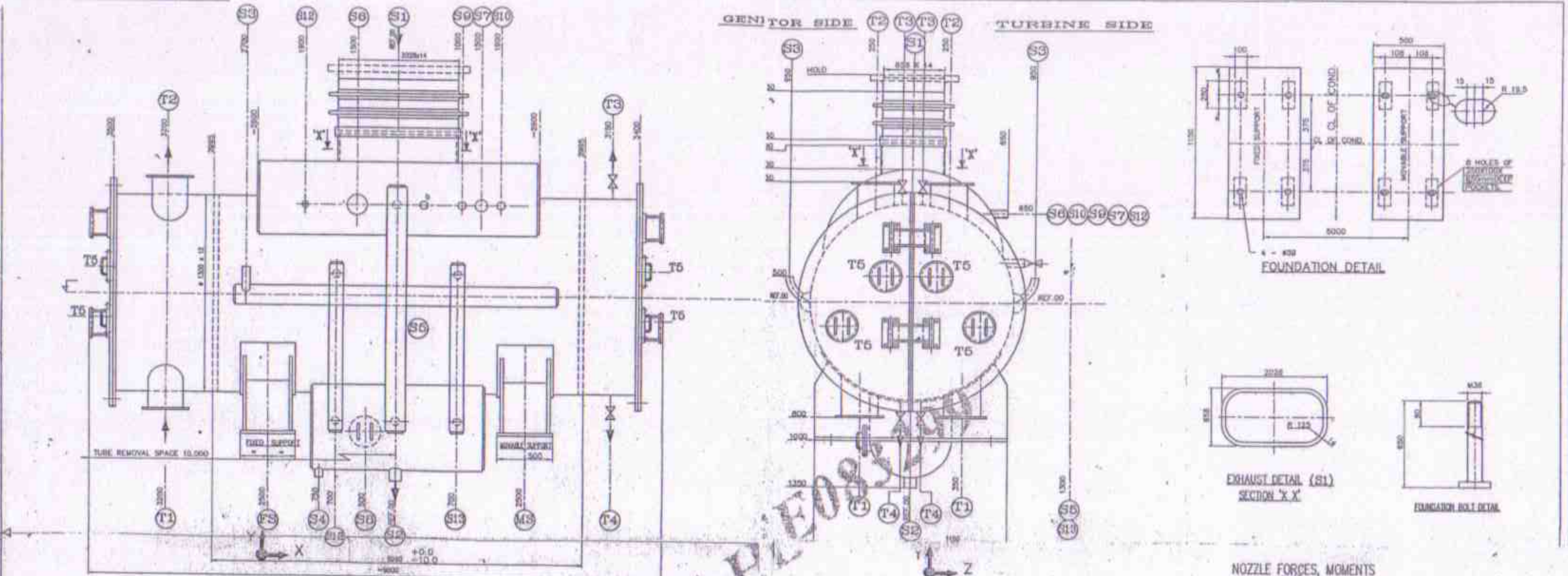
CARD CODE

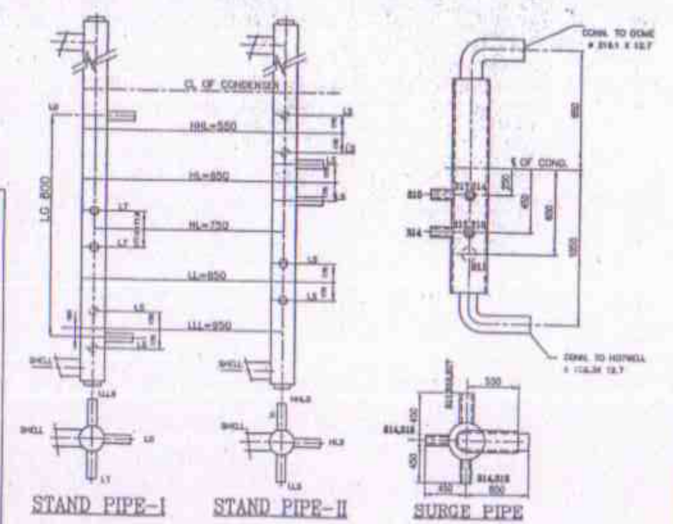
DRAWING NO. 3-165-01-00435

REV. 00

(ALL DIMENSIONS ARE IN MM)

DRG NO. 1-160-10-01





DESIGN DATA

DESIGN CODES HEI / B H E L			
DESCRIPTION		SHELL SIDE	TUBE SIDE
TYPE			2 PASS DIVIDED
DESIGN PRESSURE	Kg/sq.CM (g)	1 & FULL VC	4
DESIGN TEMPERATURE	°C	100	65
TEST PRESSURE	Kg/sq.CM (g)	HY.FILL	5.2
TEST TEMPERATURE	°C	AMBIENT	AMBIENT
CONDENSER PRESSURE	Kg/sq.CM (abs)	0.11	
STEAM QUANTITY (NORMAL)	t/hr.	5.9	
STEAM QUANTITY (MAXIMUM)	t/hr.	10.	
COOLING WATER INLET TEMP.	°C	30	
COOLING WATER QUANTITY	cu.M/hr.	65	
TOTAL SURFACE AREA	sq.M	31	
TUBE SIZE (OD X THICK)		Ø3/4" X 18 BWG (AVG)	
NO. OF TUBES		86	
PRESSURE DROP ON C.W. SIDE	M.W.C.	5.1	
HOTWELL CAPACITY (HL TO LLL)	MINUTES	1.4 M/TE	
EMPTY WEIGHT		12[illegible] Kgs	
WORKING WEIGHT		18[illegible] Kgs	
FLOODED WEIGHT		29[illegible] Kgs	
INSPECTION		[illegible]	
CLEAN LINESS FACTOR		[illegible]	

LIST OF INSTRUMENTS CONNECTIONS

REF	DESCRIPTION	SIZE	QTY	LOCATION
a	TEMPERATURE GAUGE	M33X2	7	[illegible]
b	COMPOUND PRESSURE GAUGE	1/2" SW.	4	ON SHELL
c	LEVEL GAUGE L=800	1"ANSI300 RF	2	ON STAND PIPE
d	LEVEL SWITCH CONNECTION	1" SW.	8	ON STAND PIPE
e	LEVEL CONTROLLER/TRANSMITTER CONN.	2"ANSI 150 RF	2	ON STAND PIPE
f	WATER EXPANSION RELIEF VALVE	3/4" / 1" S.W.	2	ON C.W. INLET

LIST OF NOZZLES

REF	DESCRIPTION	SIZE	QTY	REMARKS
	TUBE SIDE NOZZLES			
T1	COOLING WATER INLET	10" ANSI 150 SORF	2	FLANGED
T2	COOLING WATER OUTLET	10" ANSI 150 SORF	2	FLANGED
T3	WATER BOX VENT	Ø33.4X4.55	2	S.W.
T4	WATER BOX DRAIN	Ø33.4X4.55	4	S.W.
T5	WATER BOX INSPECTION HOLE	8"ANSI 150 RF	8	FLANGED
	SHELL SIDE NOZZLES			
S1	EXHAUST STEAM INLET	AS PER SEC.X-X	1	FLANGED
S2	CONDENSATE OUTLET	Ø114.3 X 7.11	1	B.W.
S3	AIR SUCTION	Ø88.9 X 5.54	2	B.W.
S4	HOT WELL DRAIN	Ø60.3X5.54	1	B.W.
S5	EXPANSION SURGE	Ø355.6X12.7	1	—
S6	BURSTING DIAPHRAM	10" ANSI 150 SORF	1	FLANGED
S7	GLAND STEAM LEAKAGE CONN.	Ø88.9 X 5.54	1	B.W.
S8	HOTWELL INSPECTION HOLE	10"ANSI 150 SORF	1	FLANGED
S9	CONDENSATE RECIRCULATION	Ø88.9 X 5.54	1	B.W.
S10	CONN. FOR MAKE UP WATER.	Ø88.9 X 5.54	1	B.W.
S11	DRAIN FROM STEAM INLET (PIPING TO TURBINE)	Ø168.3X7.11	1	B.W.
S12	CONDENSATE PUMP DEAERATION	Ø26.7X3.91	1	B.W.
S13	STAND PIPE	Ø114.3X6.02	2	--
S14	INTER CONDENSER DRAINS	Ø60.3X5.54	2	B.W.
S15	AFTER CONDENSER DRAINS	Ø60.3X5.54	2	B.W.
S16	DRAIN FROM SJAE AIR HEADER	Ø33.4 x 4.55	1	B.W.
S17	G S C DRAIN	Ø60.3 X 5.54	1	B.W.

NOZZLE FORCES, MOMENTS AND THERMAL MOVENTS

NOZZLE REF	MOMENTS Kg-M	FORCES Kgs	THERMAL MOVEMENTS X mm	Y mm	Z mm
T1	2150	800			
T2	2150	800			
S2	920	350			
S3	750	270			
S7	750	270			
S9	750	270			
S10	750	270			

MATERIALS

TUBES – CONDENSING ZONE	ADM.BRAS SB111 C44300
TUBES – AIR COOLING ZONE	ADM.BRAS SB111 C44300
TUBE PLATE	IS 2062
SHELL & OTHER PARTS	IS 2062
INTERNAL BOLTS & NUTS	SA 193 B7, SA194 2H
WATER BOX GASKETS	CAF-9

NOTES:—

1. ALL COUNTER FLANGES, FASTNERS AND PACKINGS ARE UNDER B.H.E.L. SCOPE OF SUPPLY.
2. TUBES ARE PROVIDED WITH SELF DRAINING ARRANGEMENT
3. • CONNS. MOUNTED ON EXPANSION SURGE PIPE-S5.
4. PAINTING:–
   THE SURFACE TO BE SAND BLASTED CLEANED & DEGREASED BEFORE 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. HOTWELL, CONNECTING PIECE, S.S.EXPANSION BELLOW, STAND PIPE & SURGEPIPE WILL BE SUPPLIED LOOSE TO SITE FOR ERECTION AND ASSEMBLY BY ERECTION AGENCY.

TYPE OF PRODUCT OF CUSTOMER/PROJECT: FINCHAA SUGAR

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME		DATE
DRN.	V.S.RAO		[illegible]
CHD.	A.K.GUPTA	A.K.GUPTA	[illegible]
APPD.	D.SRINIVAS	[illegible]	[illegible]

DEPT. HEX | CODE 403 | SCALE NTS | WEIGHT (KG) NA | REF. TO ASSY DRG. NA

TITLE

DRAWING NO.

GENERAL DIMENSIONAL LIMITS/FITS & TOLERANCES AS PER HY[illegible]