FOR OFFICIAL USE ONLY **TENDERER'S COPY**

NOT FOR PUBLICATION **ORIGINAL COPY**

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

TENDER NO. BHEL:NR(SCT): DARIBA:BLR-TG-CNI & MM:595

FOR

Erection, testing, commissioning and trial operation of Boiler with Auxiliaries, TG with auxiliaries, Piping, Control and instrumentation, Electrical and total Material Handling work of 2x80 MW CPP at DARIBA MINES, HINDUSTAN ZINC LIMITED, DIST- RAJASAMAND, RAJASTHAN.

PART I – TECHNICAL BID

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301 (INDIA)

Figure 1
ISO 9001-2000, ISO 14001 and OHSAS 18001 certified company
SubContract and Purchase Deptt.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301.INDIA
Phone: 0091-0120-2515476 / 2515464 / 2515479
Fax 091-0120-2515464 / 2515467
Email: sku@bhelpsnr.co.in / msd@bhelpsnr.co.in

TENDER NO. BHEL:NR(SCT): DARIBA:BLR -TG-CNI & MM:595

IMPORTANT NOTE

PURCHASER OF THIS TENDER DOCUMENT IS ADVISED TO CHECK AND ENSURE COMPLETION OF ALL PAGES OF TENDER DOCUMENT AND REPORT ANY DISCREPANCY TIMELY FOR CORRECTIVE ACTION, IF ANY, TO THE ISSUING AUTHORITY BEFORE THE BIDS ARE SUBMITTED. ORIGINAL COPY OF TENDER DOCUMENT COMPLETE IN ALL RESPECTS MUST BE SUBMITTED BACK AS PART OF THE BID WITHOUT WHICH THE SAME IS LIABLE TO BE REJECTED BY BHEL.

THIS TENDER SPECIFICATION ISSUED TO:

M/S----------

ISO 9001-2000, ISO 14001 and OHSAS 18001 certified company
SubContract and Purchase Deptt.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301.INDIA
Phone: 0091-0120-2515476 / 2515464 / 2515479
Fax 091-0120-2515464 / 2515467
Email: sku@bhelpsnr.co.in / swapan@bhelpsnr.co.in

TENDER NOTICE

Sealed tenders are invited from the contractors fulfilling qualifying requirements for the work of **Receipt, Unloading, Verification, Storage & Preservation of Materials, Materials Management Services for entire BTG package; Collection of materials from BHEL/Client's stores/storage yard, Transportation to site of work, Erection, Testing, Assistance for Commissioning, Final Painting and Handing Over of P.F. fired Boiler with Auxiliaries, ESP with Auxiliaries, TG with auxiliaries& piping,De-aerating Heater with approach platform, Tanks, Vessels, Re-generative System Piping, Power Cycle Piping, HP & LP Bypass System, Application of Thermal Insulation & Cladding , Erection of Control& instrumentation and Electrical** ***of 2x80 MW CPP at DARIBA MINES, HINDUSTAN ZINC LIMITED, DIST- RAJASAMAND, RAJASTHAN.***

TENDER NO. BHEL:NR(SCT): DARIBA:BLR -TG-CNI & MM:595

QUALIFYING REQUIREMENTS:

1.1 Tenderers who wish to participate must have successfully completed, during last seven years, at least one similar work consisting of Boiler of 240 TPH / 60 MW Unit 'OR' higher rating unit.

AND

1.2 Tenderers who wish to participate must have successfully completed, during last seven years, at least one similar work consisting of TG Set of 60 MW Unit 'OR' higher rating unit.

2.0 Tenderers should also have an average annual turnover of minimum of Rupees 660 lacs (Rupees Six hundred sixty lacs only) based on the audited accounts of last three financial years (2005-06, 2006-07 & 2007-08). Bidders shall submit audited balance sheets and profit & loss account in support of this.

3.0 Tie Up Arrangement

3.1 If a Tenderer has done only one of the two works given at 1.1 and 1.2 above, he may have a proper tie-up, subject to approval of BHEL, with an experienced party for the other work (i.e. work not executed by them). The composition of the Tie-up arrangement and role and

responsibility of each constituent must be well defined and the document submitted shall clearly indicate who shall be the lead partner.

3.2 In such a case, the number of partners including the Lead Partner shall not exceed two. The tenderer (Lead Partner) shall give an undertaking that the responsibility of execution of entire work shall lie with him and also that in case of dissolution of Tie up, the Lead Partner shall be liable for completing the work as per the terms of contract without any additional cost to BHEL or without affecting project schedule. Legal documents of tie up agreement, signed by both the partners, shall be submitted as a part of technical bid.

3.3 For the purpose of qualifying requirements as given at SL NO. 2.0 above i.e Financial Turnover, the collective financial position of both the partners shall be considered. However, information in this regard shall be furnished individually and collectively by the tenderer.

4.0 "Bidders selection is subject to approval of BHEL's Customer for this work.

NOTES:

(i) The Tender Documents comprises of following;

(a) Special Conditions of Contract (SCC), Tender Notice, Project Synopsis,
(b) GCC
(c) Rate Schedule

(ii) Tender Documents with complete details are hosted on BHEL's web page www.bhel.com. Bidder(s) intending to participate may download the tender document from the web site. Bidder(s) downloading the tender documents from the web site, shall remit Rs.1000/- (Rupees One thousand only) in the form of crossed demand draft (non-refundable), in favour of BHEL, NOIDA along with their offer

(iii) Bidder(s) can also purchase hard copy of tender documents from this office. Tender documents (non transferable) will be issued on all working days between 09.30 Hrs. to 12.30 Hrs within the sale period i.e ***upto* 07.01.2009** on payment of Rs.1,000/- (non-refundable) either in cash or by crossed demand draft in favour of BHEL, NOIDA. Request for issue of tender document should clearly indicate Tender no. and work.

(iv) Tenders must be submitted to the undersigned (Room No. 104) at the address given above **latest by 07.01.2009** before opening of technical bids commences. Technical bids shall **be opened at 15.30 Hrs. on 07.01.2009**. Tenders received after the due date & time shall be liable to be summarily rejected.

(v) Earnest Money Deposit (EMD): Refundable, Non-interest bearing **EMD of *Rs 2,00,000/-*** shall be deposited by Account Payee Pay Order 'OR' Demand Draft in favour of " Bharat Heavy Electricals Limited" payable at Delhi/NOIDA. Those bidders who have already deposited ' One Time 'EMD' of Rs. 2,00,000/- with BHEL, PSNR, NOIDA need not submit EMD with the present tender.

(vi) Tenders not accompanied with Full Earnest Money Deposit, as indicated above, will not be considered.

(vii) All corrigenda, addenda, amendments and clarifications to this Tender will be hosted in this web page and not in the newspaper. Bidders shall keep themselves updated with all such amendments.

(viii) BHEL reserves the right to accept or reject any or all tenders without assigning any reason whatsoever.

(ix) BHEL takes no responsibility for any delay/ loss of documents or correspondences sent by courier/post.

(x) **BHEL reserves the right to go for a Reverse Auction instead of Opening the submitted sealed bid, which will be decided after technical evaluation. As such, the bidders should submit their best prices in the 'Sealed Price Bid'. However, bidders are required to confirm their acceptance of "General terms and conditions" governing RA specifically in their technical bid. The "General terms and conditions" governing RA are given in the SCC of the NIT. Bidders are also required to furnish following details in their techno-commercial bid, for this purpose (RA).**

Authorization of representative who will participate in the on line Reverse Auction Process:

1. Name and Designation of official
2. Postal Address (Complete)
3. Telephone Nos. (Land line & Mobile both)
4. FAX No.
5. E-mail address
6. Name of Place/ State/ Country, wherefrom he will participate in the RA

(xi) Unsolicited rebate/ discount shall not be accepted after bid opening.

(xii) Purchase Preference will be given to CPSUs as per Govt. Guidelines.

DGM/SCP

ISO 9001-2000, ISO 14001 and OHSAS 18001 certified company
SubContract and Purchase Deptt.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301 (INDIA)
Phone: 0091-0120-2515476 / 2515464 / 2515479
Fax 091-0120-2515464 / 2515467
Email: sku@bhelpsnr.co.in / swapan@bhelpsnr.co.in

TENDER NOTICE - NEWSPAPER

LAST DATE OF SALE : 07.01.2009 **DATE OF OPENING : 07.01.2009**

NIT NO. / NAME OF WORK
TENDER NO. BHEL:NR(SCT): DARIBA:BLR -TG-CNI & MM:595 **Sealed tenders are invited from the contractors fulfilling qualifying requirements for the work of Erection, testing and commissioning of Boiler, TG, Piping, CNI, Electrical and Total Material Handling work of 2x80 MW CPP at DARIBA MINES, HZL, RAJASTHAN.**

NOTES:-

1. Purchase Preference will be given to CPSU as per Govt. Guidelines.
2. Please visit our website at www.bhel.com for complete details of the tender.

DGM/SCP

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A ,
Distt. Gautam Budh Nagar, NOIDA – 201 301.INDIA

PROCEDURE FOR SUBMISSION OF SEALED TENDERS:

The tenderers 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** also indicating on each of the cover tender specification no., date and time as mentioned in tender notice.

TECHNICAL BID (COVER-I)

Except **Price bid Part-II**, complete set of tender document consisting of General conditions of Contract, "Technical specification & Special terms and condition" (Part-I) issued by BHEL shall be enclosed in **Part I Technical Bid only**. All schedules, data sheets and details called for in the specification shall also be submitted along with technical bid. All details / Data / Schedules including offer letter duly signed and stamped are to be **submitted in duplicate**.

PRICE BID (COVER-II)

Tenderers may please note that price bid is **to be submitted only in original copy** of Tender i.e. Price bid (Part-II) issued by BHEL and no duplicate copy of same is required.

These Two separate covers i.e. cover I & II shall together be enclosed in a **third envelope (Cover-III)** and this sealed cover shall be superscribed with tender specification No., due date, time and submitted to officer inviting tender as indicated in tender notice on or before due date as indicated.

PROJECT INFORMATION

2 X 80 MW HINDUSTAN ZINC DARIBA POWER PROJECT

M/S Hindustan Zinc Ltd (HZL), a company incorporated in India under the Companies Act 1956 and having its registered office at Yarshad Bhawan Udaipur Rajasthan, is setting up a 2x80 MW Coal based Power Plant to be located at Dariba District Rajasamand Rajasthan. HZL has awarded a contract to BHEL for supply, transportation, storage and material handling at site, erection, testing and commissioning Boilers, Turbines, Generators, along with auxiliaries, including all Civil works & Balance of Plant on EPC basis

BHEL have awarded the works of Civil and Balance of Plant works to M/S Tata Projects Ltd (TPL) Hyderabad on back to back basis

For erection, testing and commissioning Boilers, Turbines, Generators, along with auxiliaries, BHEL it has to create its own storage and office facility at site.

Dariba Power Project is and is situated at Dariba Smelter Complex PO Dariba District Rajasamand 313211 Rajasthan on Udaipur – Chittorgarh road about 100 kms from Udaipur. Nearest Railway Station is Mauli about 35 kms from site and nearest airport is Udaipur.

The information furnished above are indicative and the bidders are requested to visit the site in order to get themselves acquainted with the prevailing conditions and situations before preparing their offer. A certificate to this effect has to be given by the bidder.No claims on account of non-familiarity with the site conditions, working conditions etc. shall be entertained at any point of time.
A certificate to this effect has to be given by the bidder.

Bidder shall note that their offer will be considered subject to the approval of BHEL's customer.

Bidder shall also note that 3 shift working has to be adopted by them for executing this work with the quoted price/rates.

OFFER OF BIDDER

TO,
AGM (SCP)
BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR – NORTHERN REGION
SECTOR 16A NOIDA UP 201301

DEAR SIR,

I/WE HEREBY OFFER TO CARRY OUT THE WORK DETAILED IN TENDER SPECIFICATION **No. TENDER NO. BHEL:NR(SCT): DARIBA:BLR & MM:559** ISSUED BY BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR – NORTHERN REGION, NOIDA, IN ACCORDANCE WITH THE TERMS AND CONDITIONS THEREOF.

I/WE HAVE CAREFULLY PERUSED THE FOLLOWING LISTED DOCUMENTS CONNECTED WITH THE ABOVE WORK AND AGREE TO ABIDE BY THE SAME.

1. 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 REQUISITE EARNEST MONEY DEPOSIT, DETAILS OF EMD PAYMENT ARE FURNISHED IN THE CHECK LIST.

EMD SHALL BE REFUNDED SHOULD OUR OFFER NOT BE ACCEPTED / EMD **NEED NOT BE REFUNDED AND THE AMOUNT MAY BE TREATED AS "ONE TIME EMD" FOR ERECTION AND COMMISSIONING TENDERS OF BHEL-PSWR, NAGPUR**. SHOULD OUR OFFER BE ACCEPTED, I/WE FURTHER AGREE TO DEPOSIT SECURITY DEPOSIT FOR THE WORK AS PROVIDED FOR IN THE TENDER SPECIFICATION WITHIN THE STIPULATED TIME AS MAY BE INDICATED BY BHEL, POWER SECTOR- NORTHERN REGION NOIDA.

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 BIDDER:

DATE : ADDRESS

WITNESSES WITH THEIR ADDRESS:

	SIGNATURE	NAME	ADDRESS
1.			
2.			

SPECIAL CONDITIONS OF WORK SECTION - III

Section-4 PART I

Special Conditions of Contract

4.0 Scope of Work

The scope of work under the tender specification covers Receipt, Unloading, Verification, Stacking, Storage & Preservation of materials, Materials Management Services for entire BTG package; Collection of materials from BHEL/Client's stores/storage yard, Transportation to site of work, Erection, Testing, Assistance for Commissioning, Final Painting and Handing over of P. F. Fired Boilers with Auxiliaries, ESP with Aux. Including De-aerating Heater with approach platform, Tanks, Vessels, Re-generative system piping / Power Cycle Piping, HP & LP Bypass System, Application of Thermal insulation of Boiler with Aux. Piping, Equipments including TG Equipments of 2x80 MW units.

The work under these specifications broadly comprises of the following:

A) Material Handling and Materials Management Services for:

I. Boiler & Auxiliaries package including ESP.

II. Turbine, Generator its auxiliaries, integral piping & its total packages.

III. Other items supplied by BHEL Units, their sub-vendors, bought-out items, etc.

IV. Any other material like BHEL's T&P (except heavy duty cranes), furniture, erection materials etc.

V. Electricals, Control and Instrumentation package.

VI. Insulation and Refractory for Boiler, ESP, Piping and TG Equipments etc.

B) Erection, testing and commissioning and Final Painting of 1x 80 MW Boiler and Auxiliaries, ESP, Coal Mills, Fans, Air-heaters and Application of Refractory & Thermal Insulation with retainers, Fixing components, Cladding sheet etc. Of Boiler & ESP with Aux. And Integral Piping, De-aerating Heater with approach platform etc.

C) Erection, Testing, Commissioning and Final Painting of Power Cycle Piping / Re-generative system piping, HP & LP Bypass System with valve, fittings, supports etc.

D) Application of Refractory & Thermal Insulation with retainers, fixing components, Cladding sheet etc. Of Boiler & ESP with Aux. Piping, tanks, vessels including TG Equipments etc.

The scope of work under this tender specification is detailed further as under.

4.1 Material Handling and Materials Management Services for various packages.

4.1.1
The scope of work of this tender specification of material handling and materials management for 2x80 MW CPP at Dariba mines, Hindustan Zinc Limited, Dariba Plant shall broadly be as under:

- Receipt of materials dispatched by road transport on door delivery basis at the BHEL/HZL stores inside the project premises and unloading thereof.
- Preliminary verification of materials at the time of unloading from road transport vehicle, reporting discrepancies like damages and shortages noticed immediately.
- Detailed verification of materials with reference to packing list and loading advice slip after unpacking of boxes & crates; repacking after detailed verification; preparation of receipt inspection reports.
- Stacking and storing at BHEL/HZL storage yard or covered stores or semi-closed sheds, submission of stacking/storing records.
- Preservation of the materials received inside the project premises in accordance with BHEL's preservation manual or as per BHEL's instructions.
- General cleaning, grass cutting and upkeep of storage yard, covered and semi-closed stores sheds within the quoted rates of unloading, verification and stacking.
- Providing services for materials management (operation of computerized materials management system – feeding data, updating, generation of status reports etc.).
- Re-handling and restacking of materials as and when called for by BHEL. This also includes excess/redundant materials returned to stores by BHEL's erection contractors.
- Handling and loading of outgoing materials that are to be sent to other destinations.
- Providing services of secretarial assistance for office & stores and office up-keeping/messengers.

Details of the packages to be handled under this scope are furnished in Appendix-I enclosed with this tender specification.

4.1.2
The intent of specification is to provide material handling and materials management services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or materials necessary for proper and efficient unloading, transportation, verification, stacking & preservation etc shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

4.1.3
The work shall be executed under usual conditions affecting major thermal power projects in an existing power plant and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of customer's contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

4.1.4
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor.

4.1.5
The contractor shall perform all required services which may not be specified herein but nevertheless required for the completion of work within quoted rates.

4.1.6
All necessary certificates and licenses required to carry out this work are to be arranged by the contractor expeditiously.

4.1.7
All cranes, transport equipments, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables (excluding those indicated as BHEL scope), etc required for this scope of work shall be provided by the contractor.

4.1.8
All expenditure including taxes and incidentals in this connection will have to be borne by the contractor unless otherwise specified in the relevant clauses elsewhere here. The contractor's quoted rates shall include of all such contingencies. In this connection refer relevant clause of general conditions of contract.

4.1.9

Responsibilities of the contractor and scope of work for receipt, unloading, verification and stacking (refer ‘section-a’ of rate schedule).

4.1.9.1
It will be responsibility of the contractor to keep in touch with officials of BHEL regarding advance information about arrival of consignments. The contractor shall collect lorry way bills or other such dispatch documents.

4.1.9.2
The contractor shall remain in regular contact with the concerned transporters based on the dispatch details obtained as stated above and make all necessary arrangements for collection / receipt of the consignment as applicable. Contractor shall take advance action to deploy all necessary resources for local transportation, handling and unloading of the anticipated consignments so as to ensure no loss of time upon arrival of the consignments.

4.1.9.3
Payment of demurrage/wharfage etc., which result due to contractor's fault, shall be the responsibility of contractor and to his account. If BHEL has to make payment of such demurrage/wharfage together with freight (payment of freight alone is in BHEL's scope), the amounts so paid as demurrage/wharfage for the reasons stated above shall be paid to BHEL by the contractor forthwith or shall be recovered from the bill payments due to the contractor.

4.1.9.4
It would be responsibility of the contractor to examine the packages, consignments etc. Immediately on arrival and bring to the notice of BHEL authorities regarding loss/damage/shortage/discrepancy, if any, observed in the consignments before taking delivery of the same.

4.1.9.5
In case of consignments in smalls, the weight of package shall be checked with the invoiced weight of the packages and any discrepancies shall be reported immediately to BHEL/transporter.

4.1.9.6
For all such consignments, observations regarding loss/damage/shortage/ discrepancy are to be recorded in appropriate document and informed to BHEL. In case it becomes necessary to take '**open delivery'** from the authorities, contractor shall make all arrangements for taking open deliveries. All expenses connected therewith shall be to the account of contractor. Any loss that accrue to BHEL on account of such failures shall be debited to the contractor and recovery effected from his running bills.

4.1.9.7
Any discrepancy/shortage/damage found in the consignment after taking clean delivery from the carriers shall be the responsibility of contractor and the resultant loss to BHEL on such account shall be recoverable from the contractor.

4.1.9.8
Consignments are expected to arrive during any time of the day, and count down for demurrage/ wharfage will start immediately, unloading of such consignments may be necessitated even in the night or round the clock. Contractor shall arrange to deploy his resources immediately and continue round the clock on such occasions without any additional cost to BHEL. Contractor shall arrange necessary spot lighting for working at night. Consignments arriving on weekly off days and holidays shall be similarly unloaded by the contractor.

4.1.9.9
Unloading at storage area/work site, stacking and restacking if necessity arises, of heavy/sophisticated equipments like tube wall panels of boiler, heavy motors, coal mill components, heavy bearing pedestals, fan impeller and servomotors, electrical panels and tg equipment like heavy turbine components, pumps, panels, etc shall be done as per storage and preservation manual of BHEL or as per directions of BHEL engineer if such procedure is not available in the manual.

4.1.9.10
All the consignments reaching the project site by rail shall be unloaded at the railway siding, followed by loading on truck/trailer, local transportation from railway siding to the storage yard/stores, unloading and stacking

4.1.9.11
The contractor shall verify the consignments in detail within the shortest possible time from receipt at site, usually within ten days. Contractor shall arrange all facilities to open packages - where required in the presence of BHEL engineer, verify the contents, repack wherever and whenever called for and properly stack them as per storage manual or/and as may be directed by BHEL.

4.1.9.12
The material shall be so stacked that it should facilitate easy identification, retrieval and handling for issue as and when need arises.

4.1.9.13
Pre-defined identification system of the locations of open storage yard, semi-closed shed, covered stores as well as storage racks has to be designed by the contractor with the approval of BHEL. Contractor shall put up prominent identification boards of segmental locations (for open and semi-closed stores) or inscription (on the storage racks) with clear visibility from a distance. Contractor shall also arrange to display plot plan at regular intervals in the covered/semi-closed/open storage. The display boards shall be made with structural steel & MS Plates and shall be painted with synthetic enamel paint. Contractor shall have to periodically repeat such exercise as the original displays may get lost/damaged/deteriorate with time. All materials and consumables for this purpose shall be arranged by the contractor.

4.1.9.14
The contractor shall execute the work in a professional manner. The stores shall be handled with due care and diligence. Any loss to BHEL due to contractor's lapse shall be made good by the contractor at his risk and cost.

4.1.9.15
If the contractor or his workmen or employees break, deface, injure or destroy any part of a building, road, kerbs, fence, enclosures, water pipes, cables, drains, electric or telephone posts or wires, trees or any other property or to any part of erected equipments, stored components etc. Within the project premises or outside the contractor shall make the same good at his own expenses.

4.1.9.16
Loading on to the transporter's trailer/truck for onward transmittal to other destinations is also scope of work of contractor. Payment for these shall be made as per relevant items of rate schedule.

4.1.9.17
Contractor shall arrange for cutting and removal of vegetation growth/ grass etc. In the storage yard as and when called for by BHEL as incidental to work. BHEL will take appropriate action at the risk & cost of the contractor in case of failure in this regard.

4.1.9.18
Certain packages are likely to be received at transporter's go-downs (located around Udaipur approximate distance of about 85km) as "smalls". It shall be the responsibility of the contractor to receive the same at the transporter's go-down and bring the consignment to site and store the same. Payment for such items will be made as per agreed rate of section-a under Sl no. "A.2" of Rate Schedule in Price Bid specification.

4.1.10 Heavy consignments

The scope of work includes handling certain heavy consignments. A broad indication of some of such consignments is given in appendix-i. Contractor shall make all necessary arrangements for handling all such consignments for receipt, unloading, verification, stacking, preservation etc and associated materials management services.

Unloading of heavy/sophisticated equipment like boiler drum, water wall panels, heavy motors, fans, bowl mills, air heaters, turbine, condenser, generator stator & rotor, electrical panels etc shall be done as per directions of BHEL engineer.

4.1.11 SHIFTING OF STACKED MATERIALS

During the course of the project, it may become necessary to shift certain materials already stacked previously. Contractor shall deploy necessary resources like manpower, t&p, equipments etc to carry out this exercise. Separate item rate shall be quoted for this activity as asked in the rate schedule.

4.1.12 SCOPE OF WORK FOR PROVIDING MATERIALS MANAGEMENT SERVICES

4.1.12.1
Services of the personnel deployed for materials management services shall be exclusively available to BHEL.

4.1.12.2
BHEL is operating computerized site operations management system that includes materials management, progress reporting, sub-contractor billing and material reconciliation through a fully computerized data base management system. Contractor shall engage personnel with proficiency in operation of computerized data base management system for the purpose of regular operation and updating of system. The persons shall also be fluent in basic computer operations like 'ms office' etc.

4.1.12.3
Scope of services shall include maintenance of stores records, supervision of issue and return of materials in respect of BHEL's erection agencies.

4.1.12.4
Contractor shall generate periodic status reports as required by BHEL (reports regarding material dispatches, receipts, shortage, damage, loss, issue, return, pending and critical materials etc.

4.1.12.5 PRESERVATION OF COMPONENTS

Contractor shall arrange for preservation of components as per BHEL's storage and preservation manual or as per instructions of BHEL engineer in case such information is not available in the manual.

One or more of following methods shall be adopted for preservation:

1) Coating with preservative paints/lubricant/inhibitors.

2) Covering with tarpaulins wherever required for items/packages including the electrical panels, skid, motors etc. Which are stored in open storage yard.

3) Capping/wrapping/covering.

4) Filling/immersion in oil/chemicals etc.

5) Periodic verification and maintenance of nitrogen pressure in tanks of all transformers.

6) HT motors

For preservation of ht motors, space heaters have to keep energized to avoid ingress of moisture. Insulation resistance has to be measured and recorded at specified intervals till these are issued for erection. BHEL will provide necessary cables, switches etc. For this however contractor shall install and maintain the same.

Contractor's cranes have to be used for handling of materials wherever required in preservation of materials. In this process the identification marks, component/ material codes, match marks, may have to be repainted. The contractor shall provide his own supervisors for this work. After preservation, components are to be stacked properly. Periodical reports on the preservation carried out should be submitted for perusal in the prescribed formats.

4.1.12.6 RESTACKING/REARRANGING

Over a period of time, restacking/rearranging of the materials stacked earlier may arise due to various reasons. The handling of such items will also be in the scope of this contract. The restacking/re-handling may be necessitated for any equipment/ materials covered within this work specification. Contractor shall carry out the same including proper inscription of identification marks if needed, preparation and

submission of list of items restacked, updating stock records about change in location etc.
Restacking and rearranging shall be applicable for materials returned by BHEL's erection contractors also.

4.1.12.7 RECORD KEEPING AND REPORT GENERATION

All the above functions of material dispatches, receipt, stacking, preservation, issuing etc will have to be properly recorded in the prescribed formats, registers etc. Manually and on computer and made available for verification by BHEL. The report generation will be exhaustive and will cover details like stock at site, pending materials to be received, materials in transit, components issued to the contractor, location plans of items stacked and other material status documents.

All personnel deployed for materials management should necessarily be proficient in computer operation. They should be capable of data entry in computers, report generation as prescribed and information management. Print-out of required information in the prescribed manner shall be taken by these personnel.

4.1.13 OTHER POINTS

4.1.13.1
The essence of the contract is material handling, preservation, accounting and providing assistance for BHEL site office upkeep.

4.1.13.2
All the necessary skilled/unskilled manpower to carryout the above work shall be arranged by the contractor. The persons so employed shall be fully trained and experienced in the nature of work.

4.1.13.3
The supervisory personnel employed by the contractor shall be fully qualified and the bio data shall be verified by BHEL before they are actually engaged on the work.

4.1.13.4
Before quoting for this tender, the contractor shall visit the site and assess the local conditions, entry and traffic restrictions and get acquainted with general procedures by customer related to BHEL/its agencies' interface activities. Claims for not having proper knowledge on site condition shall not be entertained.

4.1.13.5
All the materials shall be handled with care and diligence. Any loss or damage to BHEL due to contractor's lapses shall have to be made good by the contractor at his cost.

4.1.13.6
BHEL engineer's decision shall be final regarding the type and nature of painting to be done on the components as also for arranging the components sequentially to suit erection requirements.

4.1.13.7

The distances indicated in these specifications are only approximate. However, the bidders should assess the various distances and site conditions by visiting site before submitting their offer. No additional/extra claims for any variation in this regard will be entertained.

4.1.13.8
Some MT plant materials (comprising mainly structural items & other equipments) may have already reached at site and are unloaded at an intermediate location km away from identified open storage yard of this project. Contractor shall arrange to collect & transport these materials for regular erection work to site of work / shall shift to identified storage yard as part of scope of work as per instruction of BHEL engineer. The storage yard is located at about 1 ½ km from erection site.

4.2 Scope of Work for Erection & Commissioning of Boiler & Electro Static Precipitator with Auxiliaries, Power Cycle Piping & Re-generative system piping with fittings & supports, De-aerating Heater with FST & approach platform and other related Pumps/Skids, Tanks, Vessels and other related Auxiliaries & Integral Piping, Application of Refractory & Thermal Insulation with fixing of retainers/components etc of Boiler & ESP with Aux., Equipments under the scope, piping, tanks, vessels including TG Equipments etc.

Broad scope of work shall be as under.

1) Collection of material from BHEL/Client's stores/storage yard and transportation up to site of work including those to and from pre-assembly area.
2) Pre-assembly, if any, and pre-erection checks as applicable.
3) Erection, alignment, welding, bolting, fastening, grouting etc.
4) Non-destructive Examination & Post Weld Heat Treatment.
5) Pre-commissioning checks/tests.
6) Flushing, Chemical Cleaning, Steam Blowing
7) Testing and Commissioning
8) Trial Operation.
9) Final Painting.
10) Handing Over

The Boiler with integral piping, Power Cycle piping/Re-generative system piping, will be erected as per relevant provisions of latest Indian Boiler Regulations, and other related statutory regulations.

Further details of scope shall be as under.

4.2.1 Preparation of Foundations and Grouting of Equipments

A) Building foundations and other necessary civil works for supporting structures, equipments etc will be provided by BHEL / customer. The dimensional accuracy, axes, elevation, levels etc, with reference to benchmarks of foundations and anchor bolt pits have to be checked and logged by the contractor. The permanent benchmark / reference marks will have to be transferred to new locations with sufficient care to maintain the accuracy and protected / preserved with adequate care (to enable rechecking at later dates) as per BHEL instruction.

B) Minor adjustments of foundation level, dressing and chipping of foundation surfaces and blue matching (wherever required) for 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.

C) All temporary foundations and anchor points required for installing erection equipments and winches etc are in the scope of contractor. All building materials like cement, steel, etc for such temporary foundations shall have to be arranged by the contractor within the quoted rates. All such foundations shall be demolished and normal ground conditions restored after the use.

D) Contractor shall carry out scrapping and blue matching of embedded plates/ packers of rotating equipments. Chipping and the leveling 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 between the two surfaces.

BHEL will provide free of cost only 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 packers and shims by gas cutting / chiseling / grinding and de-burr the same. However, machining of the packers wherever necessary will be arranged by BHEL.

Complete grouting of structural columns, equipments, rotating machines including their drives, including anchor/ foundation bolts, beneath base, base hollows etc, as may be applicable for entire scope (Boiler with Aux. ESP with Aux., related equipments with Aux. Etc.) Of equipments with Aux and system included under these tender specifications, is included in the scope of contractor. Arranging all labour, building materials including cement, ordinary port land as well as quick setting – free flow - non-shrink grout mix (e.g. Conbextra GP-1/GP-2, as per instruction of BHEL Engineer/ Drawings requirement of Static and Rotary Equipments with Aux.), form work, shuttering, and any other requirements is in the scope of contractor. Contractor shall obtain approval of BHEL for cement (ordinary as-well-as quick setting – free flow- non-shrink grout mix) prior to procurement and 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.

G) The Quick-setting-Non-shrink-Free-flow special grout mix purchased by Contractor shall be from the latest BHEL approved vendor only. Following is the list of approved vendors as on date.

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

The list of approved vendors is subject to updating / addition / deletion from time to time by BHEL. 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. BHEL has arrangement with above suppliers for supervision services and the supervision charges for the same will be borne by BHEL. 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. Any overstay required due to contractor shall be charged to the contractor with BHEL's departmental charges. Contractor shall consult BHEL engineer before deciding upon the vendor for the above.

4.2.2 Boiler Pressure Parts

A. Installation of temporary structure for drum lifting is in the scope of the contract. The required rolled steel sections and plates etc for this purpose will be provided in random sizes by BHEL free of charge. These shall be cut to required size, profile & shape, erected and welded as part of the work. NDT has to be carried out according to FQP/instructions of BHEL. These structures have to be dismantled at appropriate stage and returned to BHEL as per the instructions of BHEL engineer. Necessary cutting, grinding and re-painting etc, will have to be done before returning these components. Also, the area of permanent structures, where the temporary structure was installed, has to be finished as instructed. No separate payment will be made for this work.

B. Pressure parts components like headers, panels, coils, loose tubes etc have to be checked for dimensional accuracy configuration and cleanliness before erection. Minor rectifications, if necessary will have to be done before erection. This will involve making appropriate bed of steel structures over the concrete blocks and blowing of compressed air through the pressure part coils/tubes/headers etc. Steel, in random sizes, for this purpose will be provided by BHEL from the packing materials / scrap etc. Necessary concrete blocks shall be arranged by the contractor. Bed shall be fabricated as per requirement. These shall be dismantled & returned to BHEL at appropriate stage. No separate payment for making / dismantling such bed is envisaged.

C) Normally the butt welded type high-pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding

tubes and pipes. All fittings like “T” pieces, weld neck flanges, reducers, etc, shall be suitably matched with pipes for welding (this is applicable to piping work also).

D) Tubes / pipes sent in standard length shall be cut and edge prepared to suit the site conditions and the layouts. Tubes or pipes wherever deemed convenient, will be sent in random lengths. Bends of tubes up to OD 65 mm will have to be formed at site as incidental to the work.

E) Welding of all attachments on pressure parts including those required for insulation work is in the scope of work.

F) Furnace area and heat recovery area of flue gas passage has to be made leak proof by seal welding. Air leak test by pressurization has to be conducted to prove effectiveness of the seal weld. Bubbling/ soap test will have to be carried out for the entire seal welds to ascertain the effective sealing is achieved. The tests may have to be repeated till satisfactory result achieved.

G) If required, the pressure parts, after initial erection and tests, will have to be preserved by either dry or wet preservation procedure. Contractor shall render all assistance for this and erect temporary piping with valves wherever necessary. Required material will be provided by BHEL.

H) The drum internals, if already installed, may have to be removed to facilitate tube expansion, inspection by statutory authorities and chemical cleaning. The drum internals are to be preserved properly and refitted afterwards as part of work.

I) **Boiler Tube Expansion**

The bank tubes and roof tubes are connected to the boiler drums by expansion. The tube expansion is a highly skilled and specialized job to be carried out by well-experienced technicians and supervised closely. The tube expanders with drive and required proper bits/tools etc., the machine deployed by contractor will be Automatic type to achieve the qualitative & uniform expansion of tubes.

The job involves surface preparation, thorough cleaning with special cleaning agents, taking and recording accurate measurements before, during and after expansion. Expansion is to be carried out with proper tools hydraulic / pneumatic drive equipments. Proper sequence of expansion has to be followed to minimize the strain and distortion.

The tube ends have to be trimmed and flared within specified tolerances after completion of expansion.

All the necessary tools & plants (tube expanders with necessary jaws and tools etc, mandrels, hydraulic/ pneumatic drive unit, control panels, air- compressor etc), MMD (inside and outside micrometers, vernier calipers) and consumables (like cleaning agents, clean clothes, etc) required for this operation are to be arranged by the contractor. Cotton waste should not be used for this operation.

4.2.3 Piping Systems

Erection of Power Cycle Piping between Boiler and Turbine including all fittings, hangers & supports is in scope of the work.

Erection of LP Piping as per the schedule including the valves and fittings, hangers supports etc.

Fabrication &Erection structure supports and all the connected works for completion of total Power cycling is under this scope.

A) The work on piping systems (air, water, oil, steam, fuel, gas etc.) Will include cutting to required length, laying, edge preparation, fixing & welding of the pipes / elbows / fittings/ valves etc. In the pipeline, fixing & adjustment of supports / anchors / 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.

B) Fittings like Bends Tees, Elbows, Miter Bends, Reducers, Flanges etc, will be supplied as loose items. However, bends of tube size up to OD 65mm will have to be formed at site at no extra cost**.** Servicing, Testing, pressure setting of valves/safety relief valves prior to erection and during pre-commissioning etc. Shall be the part of scope of work. Contractor shall prepare report and submit the record of such testing and pressure setting to BHEL as per requirement of BHEL.

C) 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 afresh and adopting specified heat treatment procedure at no extra cost. All openings/stubs in erected piping system shall be kept closed/covered.

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

E) Flame cutting of high-pressure piping and pressure parts is not permitted.

F) 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. This is applicable to trim piping of boiler pressure parts also.

G) 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.

H) It should be ensured that all the terminal point connections are done without transferring any undue load or strain to the other equipments. Necessary protocols have to be prepared for such fit-up along with BHEL / customer representative before connecting. All NDE including radiography of joints so made, Post Weld Heat Treatment if any, are also within the scope of work / specification.

I) Tubes & Pipes wherever deemed convenient will be sent in running lengths. Tubes/Pipes sent in random length shall be cut to suit the site conditions and the layouts.

J) Service & Instrument Air Piping

J.1) Laying of G.I. Pipes such as instrument air lines shall include cleaning of pipes from inside and outside, hacksaw/machine cutting from running length to required size, threading, installation of isolation valves, headers, root valves, moisture traps, check valves, supports and clamps etc.

J.2) Threaded joints of air lines shall be leak proof by use of Teflon tapes and / or sealing compounds as recommended by BHEL and leak test shall be conducted wherever called for. Welding in G.I. Pipelines is prohibited. Consumables for threaded jointing shall be in the scope of contractor.

J.3) Line shall be provided with proper slope as per drawing / standards and shall be supported at recommended pitching.

J.4) All fittings like bends, elbows, tees, reducers, sockets etc shall be provided by BHEL for laying of GI airlines. The rates quoted for piping shall include cost of installation of such fittings as no separate item-wise payment is envisaged.

J.5) Hydraulic / pressure testing of pipelines, wherever called for, shall be conducted as part of work.

4.2.4 Rotating Machinery

A) Specifications covered under the following para and also other relevant specifications contained in other paras elsewhere in this Tender document will be applicable for rotating machines like FD / ID / PA / Seal Air fans, Blowers, Mills, Air Heaters, Fuel Feeders, HP and LP Dosing Pump Skids and other similar auxiliaries. This also applies to other rotating machines like ESP rapping mechanism geared motors and lube oil units. However, rates for different rotating machines shall be as asked under different items in the Rate Schedule.

B) BHEL will provide the lube oil for flushing operation, Fresh filling and subsequent topping up during commissioning and trial run operation of Equipments, Pumps, Fans, Systems covered under these tender specifications such as ID/FD/PA Fans and Pulverizing Mills, HP& LP Bypass system with control oil piping system and associated Aux etc all services including labour will be provided by the

contractor for drawing it from BHEL / customer's stores, transporting, handling, filling, emptying, re-filling, accounting and return of surplus lubricants / empty containers / old & used lubricants after draining Contractor should clean the spilled / leaking lubricants thoroughly, consumables for such cleaning will be in contractor's scope.

C) 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 damages.

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

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

F) Hydraulic test of oil coolers of rotating machines, if any is included in the scope of work.

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

H) Protective lubricant coats / fill provided on / in the critical area of equipments have to be removed at appropriate stage and regular lubricants, after removal / cleaning of protective coat / fill, as per specifications should be filled / applied.

I) Chemical cleaning of the connecting pipes for the lube oil system has to be carried out as per instruction manuals / drawings.

J) After initial trial run 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 & power cabling as per BHEL engineer's instructions. Inspection & re-alignment of the concerned rotating equipments and restoration of the control and power cabling after re-alignment shall be included in the quoted rate.

K) 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.

4.2.5 Electrostatic Precipitator

A) Wherever called for, pre-assembly of supporting structures, casing walls, hoppers, funnels etc have to be done, on ground.

B) All site welds for casing, inlet & outlet funnels, ducting connections, hoppers, roof panels have to be kerosene tested for establishing leak proof weld joints. Clearance from BHEL engineer for application of insulation should be obtained after such leak testing and proper protocols should be maintained for the area / system clearance.

C) Loading of collecting electrodes either from top or bottom shall be done with due care as per instructions.

D) Straightness of all collecting electrodes has to be checked on ground prior to loading in the field. Necessary fixtures (hangers) should be made by the contractor within the quoted rates. Structural steel for the fixtures will be provided by BHEL free of charges on returnable basis. Wooden Mallets etc will be in the scope of contractor.

E) Minor correction of the 'G' profile, bends, dents etc in collecting electrodes shall have to be corrected by the contractor as a part of regular erection work. BHEL will provide the 'profile tool' for 'G' profile correction on returnable basis.

F) Bundle of collecting electrodes should be handled only with special fixture (lifting beam, set of fixed length slings) usually supplied by BHEL as regular DU. In case, the beam is not supplied by BHEL/ requirement of additional quantities, the contractor shall fabricate the Lifting Beam within the quoted rates. Structural Steel for this purpose will be supplied by BHEL. Contractor shall arrange for the fixed length slings in case not supplied by BHEL/additional requirement/damage to original supply.

G) BHEL will provide Huck bolting m/c with necessary auxiliaries free of charges on returnable basis. However, electrical connections, operation, scaffolding etc shall be arranged by the contractor.

H) Clearances as prescribed amongst collecting electrodes, emitting frames and casing walls have to be maintained. Spot heating of collecting electrodes wherever called for, shall be done as part of work to achieve the required clearances.

I) Erection, alignment and fixing in final position of high voltage rectifier-transformers, disconnecting switches, bushing insulators of ESP are in the scope of work. However testing, cabling, commissioning including oil filtration are excluded from the scope of work.

J) Erection of earthing coming within enclosed housings / enclosures (that are not possible to insert later on without dismantling those enclosures) heating elements, thermostats are in scope of this contract.

K) Installation of HV mechanical interlocks is in the scope of work. Rotary switches to be mounted in the Electrical panels is not in the contractor's scope.

L) Erection, alignment, mechanical checks, lube oil flushing, lube oil top-up, canopy erection, servicing (if necessary) of drive motors for rapping mechanism are in the scope of work.

4.2.6 Lining, Refractory, Insulation & Cladding

Application of refractory, wool insulation, sheet metal cladding, welding of studs/hooks/supports to hold insulation and refractory covered under this contract, shall include, but are 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) Application of bitumastic paint prior to application of refractory, wherever specified in drawings or as directed by BHEL engineer. Bitumastic paint as per BHEL specification is to be provided by the contractor as scope of work.

C) Wool insulation is received at site as bonded and un-bonded mattresses in standard size. These are to be dressed/cut to suit work by the contractor

D) Application of insulation and refractory works and sheet metal covering as given in various drawings/ specifications of BHEL, supplied to the contractor.

E) Aluminum sheet cladding by fabrication of aluminum sheets to the sizes and shapes specified in drawings, beading, swaging, beveling 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.

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

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

H) The contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL engineer to facilitate inspection by boiler inspector or during commissioning to fix gauges, fittings, and instruments. These gaps will have to be finished as per drawings at a later date by the contractor at no extra cost to BHEL.

I) The skin casing plates, scalloped bars and other materials that are to be matched with the erected components have to be cut and re-welded from the fabricated pieces for which no additional payment will be made to the contractor.

J) A logbook shall be maintained by the contractor for taking clearance of the location for application of refractory and insulation.

K) Refractory mixing for application will need use of pan mixers, which has to be arranged by the contractor.

L) Wastage allowance for refractory & insulation

Wastage allowance on Net Issued Quantity for refractory & insulation shall be as follows:

I)	Refractory & brick	2%
Ii)	Wool mattresses and cladding sheets	2%
Iii)	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 absolutely at BHEL's discretion.

The actual wastage shall be the difference between the Net Issued Quantity and the actually executed/applied quantity as jointly measured and certified by BHEL.

4.2.7 Other Products and Systems

A) Ducts/expansion bellows are normally supplied in loose wall plates /segments and these are to be assembled and welded at site before erection. All joints connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be tested by LPI/kerosene tested and made leak proof as per technical instruction / requirement.

B) Erection of the duct connection frame / insert at the chimney terminal point during chimney casting (and arresting with reinforcement rods) and the erection and welding of duct with chimney frame is in this scope of work.

C) Certain structural items will be supplied in running lengths which shall be cut to required suitable sizes and adjusted/trimmed as part of work.

D) Additional platforms of permanent nature for approaching different equipments like actuators, valves, instruments etc as per site / BHEL client's requirements, which may not be indicated in drawings, but essential for safe access, shall be made by the contractor from structural steel / materials supplied in random lengths / sizes. The contractor will be paid for this work on accepted erection tonnage rate for structures. No separate payment will be made for fabrication of structures.

E) Contractor has to make canopies for motors, ESP rapping motor, actuators, lub oil units, control valves, etc. Material for this will be supplied in running and random lengths / size. No separate payment for fabrication is envisaged. Only the erection tonnage rate applicable for structure will be paid for this work.

F) For structures, supports, stairways, platforms, galleries, hand rails grills, etc the structural material may be supplied in random length which have to be cut to required profile in order to suit the requirement as incidental to the work. Also it may sometimes be necessary to remove some of erected members to facilitate erection of bigger/ pre assembled equipments. In such cases, the removal and

re erection of such works as agreed by BHEL Engineer, will have to be done by contractor as incidental to work.

G) All the handrails and toe guards shall be provided as per drawing and safety requirements. After cutting the floor grills to suit site condition, the cut edges shall be painted with two coats of cold galvanizing paints conforming to Indian Standards.

H) Floor grills shall be fixed by Self Drilling Screws with the structural steel members. These screws are galvanized and having hexagonal head. These screws shall be installed with a portable power actuated tool specially devised for this purpose. The tool has a socket for fixing and removal of the self drilling screws. The clamps for fixing floor grills can be fixed on to the structures in a single operation by the self drilling screws. BHEL will supply the necessary self drilling screws for this. CONTRACTOR SHALL ARRANGE THE INSTALLATION TOOL WITH REQUIRED SOCKETS ETC. FOR FIXING SELF-DRILLING SCREWS.

I) Self Drilling Screws shall also be used for fixing Roof Sheeting. Scope shall be similar to above.

J) Platforms, Hand rails/guards have to be provided from the safety point of view in certain places though not indicated in the erection drawings. No separate payment is envisaged for this purpose.

4.2.8 Welding, Heat-Treatment, Radiography and Other Non-Destructive Examinations (NDE)

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, TIG + Arc or any 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) Welding of high-pressure joints shall be done by IBR certified high-pressure welders who have been permitted by CIB of state concerned for deployment at the site of work.

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

E) 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.

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

G) The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint etc will be in the contractor's scope.

H) 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 consumables like protective paints/tapes etc.

I) 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 calibrated 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 engineer 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 supply of materials(subject to approval of BHEL/CUSTOMER), 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 be noted that invariably the radiography work will be carried out after the normal working hours and close of other site activities only. Agency shall ensure availability of Radiography source, dark room facility etc for uninterrupted work

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/ 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) Where 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 and IBR systems shall be done by the IBR certified welders. 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. Contractor shall maintain register and log the record of loading of electrodes in oven, backing time, duration and temperature etc. In register and per instruction of BHEL Engineer. The oven shall have the temperature indicator with due calibration certificate.

4.2.9 Final Painting.

4.2.9.1
Preservation painting of exposed metal surfaces / damaged shop-painted areas during execution of the work (Complete Boiler, ESP, TG with Aux. And piping etc.) Under scope of this contract and Final Painting, marking of colour bands, inscription on equipments/lines, flow-direction arrow, SWL of Hoists etc. For identification and specification as decided by BHEL/ Customer at site for the Equipments, structures, piping and Auxiliaries etc covered under this tender specification shall be carried by contractor.

Contractor at no extra cost to BHEL shall supply all paints; primers, tools and other consumables including scaffolding materials required for finish painting. Paint is to be BHEL approved make only and painting should be as per colour scheme and quality approved / specified by Engineer. Valid Test Certificate for the paint so supplied shall be made available before use of the same on work.

4.2.9.2

All exposed metal parts of the equipment including piping, supports, structures, railing, tanks/vessels, Equipments with Aux. (Complete etc.), as applicable shall be painted after thoroughly cleaning the surface free from dust, rust, greases, oil, scales, etc. By wire brush, scrapping, buffing by machine, water washing, etc. As specified in relevant erection documents. The above parts shall then be painted with specified number of coats of specified paint over the shop primer/paint. Also, where the shop primer/paint has peeled off, the affected area shall be cleaned thoroughly by the specified method and then two coats of primer to be applied. Similarly, few components may be supplied without any primer/paint coat from shop. The surface of such items shall be cleaned as per requirement, coated with suitable primer and final paint. The dry film thickness (DFT) after final coat should be as per specification.

4.2.9.3 PREPARTION OF SURFACES

Components will generally be with one coat of finish paint. In cases where such shop paints have peeled off / damaged, the same shall have to be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes or shot / sand blasting shall be adopted to clean the surfaces to SA 2 ½ .Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER / ENGINEER.

4.2.9.4 FINISH PAINT

Epoxy paint conforming to IS 14209 shall be used for finish coats. After cleaning the dust on the dried up primer, first coat of Epoxy paint shall be applied. After this first coat dries up hard, the gloss from the entire surface shall be gently removed and surface dusted off. Thereafter, the second finish coat of Epoxy paint shall be applied.

THE SUGGESTED COLOUR CODES FOR PAINTING

SN	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admiralty Grey	632	-	-
2.0	Boiler casing, ESP and ducting	Nut Brown	413	-	-
3.0	Crane				
3.1	Crane structure	Golden Yellow	356	-	-
3.2	Trolley and hook	Crimson	540	-	-
4.0	Fans, pumps, motors, compressors	Light Grey	631	-	-
5.0	Tanks (without insulation and cladding)				

SN	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
5.1	Outdoor	Aluminium	-	-	-
5.2	Indoor	Light grey	631	-	-
6.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631	-	-
7.0	Switchgear	Light grey	631	-	-
8.0	Control & relay panels	Light grey	631/7078 of IS 1650	-	-
9.0	Turbine	Golden Yellow	356	-	-
10.0	Generator & exciter	Light grey	631	--	-
11.0	Transformers	Aluminium	-	-	-
12.0	Machinery guards	Signal red	537	-	-
13.0	Piping (without insulation and cladding)				
13.1	Water System				
	Boiler feed	Sea green	217	-	-
	Condensate	Sea green	217	Light brown	410
	D M Water	Sea green	217	Light orange	557
	Soft water	Sea green	217	French blue	166
	Bearing cooling water	Sea green	217	French blue	166
	Potable & filtered water	Sea green	217	French blue	166
	Service & clarified water	Sea green	217	French blue	166
	Raw water	Sea green	217	White	-
	Cooling water	Sea green	217	French blue	166
13.2	Air System				
	Station air	Sky blue	101	-	-
	Control air	Sky blue	101	White	-
13.3	Oil system				

SN	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
	Fuel oil	Light brown	410	French	166
	Light oil	Light Brown	410	Brilliant green	221
	Lubricating oil	Light brown	410	Light grey	631
	Transformer oil	Light brown	410	Light orange	557
13.4	Gas system				
	Carbon dioxide	Canary yellow	309	Light grey	631
13.5	Fire services	Fire red	536	-	-
13.6	Vacuum pipes	Sky blue	101	Black	-
13.7	Fuel pipes (pulverised coal)	Light brown	410	-	-
13.8	Drainage	Black	-	-	-

Notes :

This colour code basically refers to IS:2379 for piping with necessary modifications.

Where band colour is specified, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

Above Colour Code may have to be decided or can be altered by Customer at site. The decision of Customer/BHEL Engineer at site shall be final and biding on contractor.

4.2.10 Testing, Pre-Commissioning and Commissioning

A) Testing, pre-commissioning, & commissioning will involve, though not limited to these, various testing, trial runs of relevant equipments erected and systems installed; flushing of the lines by air, water, oil or steam as the case may be, chemical cleaning of various systems & piping, steam blowing of the pipe lines, floating of safety valves 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.

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

C) Contractor shall lay / install necessary temporary piping, pumps, valves, blanks, gauges, cables, switches etc for conduct of hydraulic / pressure test, Steam / air blowing etc. This may involve cutting of some portion of existing piping / valves,

placing of rubber wedges/ blanks in the valves and other openings, fabrication and installation of temporary tanks and temporary access platforms etc. Where required, bends have to be fabricated / formed at site from random length/size of pipes/structural steel. Temporary installation itself has to be tested, tried, and subject to non-destructive examinations as per the instructions of BHEL as part of work**.**

Various items to be handled at BHEL stores, transported, fabricated, serviced, erected, tested, commissioned, dismantled, cleaned and returned to BHEL stores in respect of temporary systems for Steam Blowing etc. Shall be as under.

- Support Structures with associated civil work.
- Temporary Piping with associated fittings, manual and electrical valves, Electrically operated Temporary Valves, structural and hanger supports.
- Associated electricals like Cabling, Push Buttons, Panels for electrically operated equipments.
- Associated Civil works like excavation, foundations, grouting etc.

D) All materials, equipments necessary for installation of temporary system as above will be supplied by BHEL in random sizes/lengths. However, fabrication, erection, dismantling of the same, servicing after completion of the process, and handing over back to BHEL stores will be the responsibility of the contractor.

E) Contractor shall dismantle all the temporary equipments, pipelines, foundations and other temporary installations after completion of respective activity.

F) Fabrication, fit-up, pre-heating, welding, and post-weld-heat treatment if any, of requisite blanks for conduct of hydraulic test / leakage test is part of work. Similarly, removal of blanks, restoration and normalization of the concerned system / line is to be done as part of work. No separate payment is envisaged for these activities.

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

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

I) Transportation of oil drums from customer's / BHEL's stores, filling of oil for flushing, first fill of lubricants and subsequent topping up during trials, tests and commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Also after completion of flushing operation, contractor shall replace the flushed oil with fresh oil and return the flushed oil to BHEL/customer stores as per instruction of BHEL Engineer duly accounted. 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 chemicals and the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.

J) During trials/ tests, pre-commissioning / commissioning, replacing / changing mechanical / other seals of equipments like pumps, removal and cleaning / replacing of filters etc is within the scope of work.

K) In case any defect is noticed during tests, trial runs of all equipments and their auxiliaries, such as interferences, rubbing, loose components, abnormal 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.

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

Similarly, during the course of erection, if certain portion of equipments 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 contractors / 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.

M) 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 customer after trial operation completion.

N) Commissioning activities will continue till the completion of trial operation. During this period contractor shall make available the services of separate dedicated workforce comprising of suitable skilled and semi-skilled / un-skilled workmen and supervisory staff along with necessary tools and plants, consumables etc.

O) 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.

P) 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.

4.2.11 General Responsibility of the Contractor

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.

4.2.12 Preservation & Protection of Components

A) 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.

B) 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.

C) 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.

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

E) 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.

4.3 General Requirements

A) The intent of specification is to provide 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 execution of this work shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

B) The terminal points decided by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

C) The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of BHEL, BHEL's customer, customer's consultants and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.

D) The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful & timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

E) Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

F) All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory authorities like Boiler inspectorates, Electrical inspectorates, Factory Inspector, Safety Inspector, Labour Commissioner, PF Commissioner etc. Are to be arranged by the contractor at his cost in time to ensure smooth progress of work.

All necessary certificates and licenses required for carrying out this work are to be arranged by the contractor expeditiously.

G) The boiler and all IBR/HP pressure piping will be erected as per relevant provisions of latest Indian boiler regulations.

H) The work shall conform to dimensions and tolerances specified in the various drawings / documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings 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 BHEL and recoveries will be effected from the contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.

I) The contractor shall perform any services, tests etc. Which may not be specified but nevertheless required for the completion of work within quoted rates.

J) The contractor shall execute the work in the most substantial and workmanlike manner. The stores shall be handled with care and diligence.

K) BHEL reserves right to recover from the contractor any loss, which arises out of undue delay/discrepancy/shortage/damage, or any other causes due to contractor's lapse during any stage of work. Any loss to BHEL due to contractor's lapse shall have to be made good by the contractor.

L) All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, materials, manpower, supervisors/ engineers, consumables etc,

except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the contractor.

M) During the course of erection, testing and commissioning certain rework / modification / rectification / repair / fabrication etc, may become necessary on account of feedback / revision of drawing. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc, promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc shall be maintained by the contractor for such reworks. Claim of contractor if any, for such works will be governed by clauses 13.1 to 13.8.

N) All works such as cleaning, leveling, 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, gouging, 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 within the quoted rates.

O) The contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work (excepting those specifically included in BHEL scope).

P) The contractor shall take delivery of the components, equipments, lubricants etc from BHEL stores/ storage area after getting the approval of BHEL engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to BHEL and reconciled monthly along with RA bill.

Q) 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 area/ site to enable other agencies to carry out their work or for any other reason, contractor shall do it most expeditiously. No claim for extra payment for such work will be entertained.

R) Plant materials should not be used for any temporary supports / scaffolding / preparing pre-assembly bed etc

S) The details of equipments to be erected under this contract are generally as per the weight schedule given in relevant appendix-II. These details are approximate and meant only to give a general idea to the bidder about the magnitude of the work involved. Actual quantum and type of equipments will be based on the erection documents which will be furnished in the course of erection and the

weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.

U) All welded joints should be painted with anticorrosive paint immediately after completion of radiography and stress relieving works.

V) Hangers & suspensions, supports etc for tubes, piping, & ducts etc, will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required.

W) 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.

Setting of spring hangers & supports in cold condition and hot condition at appropriate stages shall be carried out as per drawing/documents requirement and instruction of BHEL Engineer. The Final decision of BHEL Engineer shall be final and binding on contractor.

X) 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 pipelines even after completion of erection.

Y) Welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow metering & measurement devices, and control valves is within the scope of this specification even if

1. Items are not specifically indicated under the respective product groups as given in the technical specifications.
2. 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.

Z) Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/speed switches of motors, accumulators etc are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments and hand over to C&I contractor for calibration and re-erection**.**

AA) 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.

AB) 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.

AC) 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.

AD) Erection, testing and Commissioning of all systems and equipments under the scope here shall be done in accordance to the quality requirements as specified in erection drawings, manuals, field quality plan and renowned codes & standards.

AE) The scaffolding materials used for ladders, platform shall be of steel. No wooden scaffolding is permitted.

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

AG) 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.

AH) 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.

AI) 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.

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

AK) Deaerator & FST etc.

Lifting & placement to desired elevation/foundation and further works of assembly, Erection, fit up, welding & NDT etc of Deaerator, Feed Storage Tank and their accessories, associated components, access platform, stairs and associated structures are in the scope of work. Contractor shall arrange all required T&P

arrangements & crane etc.for lifting & placement of FST with Deaerator to required foundation/elevation and to carry out further assembly and erection works.

AL) Surface Condenser shell weighing about 44 MT will be unloaded near to the TG Building.

AM) Generator Stator weighing about 100 MT will be unloaded as near as possible to the GT Building within 100 Meters.

4.4 Testing, Pre-Commissioning, Commissioning and PG Test Assistance

4.4.1
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, of various systems & piping, oil-flushing, Chemical cleaning, 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.

4.4.2
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.

4.4.3
For the purpose of Steam blowing, Oil flushing & Hydraulic test of piping, contractor shall lay/install necessary temporary piping, valves for conduct of hydraulic test, Oil flushing, 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.

4.4.4
All materials, Valves etc. As necessary for installation of temporary system for Steam Blowing 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, Oil flushing and Hydraulic test will be arranged by contractor.

4.4.5
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 normalization 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.

4.4.6
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.

4.4.7
After chemical cleaning/pickling of lubricating system (including oil piping, oil tank and other fittings) of systems, 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.

4.4.8
Transportation of oil drums from customer's/BHEL's stores, filling of oil for flushing, first fill of lubricants and subsequent topping up during commissioning and post commissioning activities are included in the scope of this contract. The contractor shall have to return all the empty/unused/partly used drums to the customer/BHEL stores. 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.

4.4.9
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.

4.4 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.

4.4.11
In case any defect is noticed during tests, trial runs of systems, Equipments & 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.

4.4.12
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.

4.4.13
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.

4.4.14
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

4.4.15
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.

4.4.16
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.

4.4.17
Erection and commissioning of HP Bypass Valves with associated control oil piping system and Aux. Including HP Bypass valves (as supplied from BHEL Trichy under PG-22) shall be carried out as part scope of piping.

4.4.18
BHEL shall not supply any Tig wires/Filler wires for erection & welding of Boiler & Boiler Aux equipments including its integral piping and HP/LP Bypass system with associated control oil piping system with Aux.. Same shall be arranged by Contractor as part of scope of work.

BHEL will provide the filler wires for high pressure joints of Power Cycle piping system to the extent as supplied from manufacturing unit (Piping Centre Chennai under PG-80) as part of scope of supply. For any further additional requirement and requirement of filer wires for rest of equipments/system under the scope of this tender specification, contractor shall arrange required quantity of filler wires as required for satisfactory completion of work as scope of work.

4.4.19 Assistance for PG Test

The contractor shall carry out the erection of all PG Test related works including providing the tapping points for Pressure/ Temperature/sample etc. As per PG test schemes, drawing / PID drawings requirement and instruction of BHEL Engineer at site. Contractor shall also provide assistance for conducting Performance

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

4.5 Material Management Supervision Services:

The Contractor shall extend various Material Management services, Office up keeping, Secretarial Services to BHEL site establishment as specified and explained in the following clauses. These Services are in addition to the scope of work specified in the clauses earlier in Section-4 of Special Conditions of Contract as in the Tender Specification issued previously.

Separate item rate for these services are not envisaged. Bidder shall include the price of such services in the item rates of the Rate Schedule.

These services shall be available to BHEL irrespective of Terminal points of Material Management Services of work covered under this tender. BHEL may use these services in any of the defined services at this project at its discretion. The service categories are:

(i) Supervisory Services for Material Management- 1 Service point.

(ii) Secretarial/Record keeping services for Material Management- 1service point

(iv) Secretarial / Record keeping services for Office- 1 service point

(v) Office upkeep Services – 2 Service points.

4.5.1 MATERIALS MANAGEMENT SERVICES

4.5.1.1

The Contractor shall extend various Materials Management (MM) Services to BHEL site establishment as specified and explained in the following clauses. These MM Services are in addition to the scope of work specified in the various clauses of Special Conditions of Contract under this Tender Specification.

4.5.1.2 Scope of Materials Management Services

The Contractor under this contract shall provide following categories of services towards proper Materials Management at the project site. The resources deployed for MM services by contractor shall be at the exclusive disposal of BHEL on a full time basis. These shall not be used for any activities associated with the regular materials handling activities (like Receipt, Unloading, verification, stacking and regular Stock Verification of Project materials).

Supervision Services:

The working Level Supervision of each work spot shall be in the scope of Contractor under regular material handling work; On the other hand, Supervisory Services under MM Services shall be at one level higher than Working Level Supervision. BHEL requires that these services hall be to oversee and monitor the various operations/activities of Material Handling process. MM Supervisory Services shall ensure setting broad guidelines to the working level supervisors, monitoring progress of overall plan vis-à-vis implementation, proper and prompt

traceability of stock in the stores, Identification of corrective & preventative actions in Material Handling & Storage work and implementation of a systematic process to finally ensure achievement of the project schedule.

Scope includes **supervision of various activities** as follows.

Receipt, unloading, carrying out receipt inspection, detailed verification, stacking and regular stock verification of project materials at site.

Preparing various reports at appropriate stages and reporting damage/loss during receipt as well as storage and any other associated responsibility as assigned by BHEL from time to time. Responsibility shall include the following activities:

Examination of incoming consignments to detect any loss or shortage or outward damage and recording it on the LR/LWB before making acknowledgement of it's receipt from the transporter and simultaneously obtaining endorsement of the vehicle driver on the same.

Reporting such discrepancy to BHEL immediately on receipt of consignment.
Assisting BHEL in lodging insurance claims in respect of loss/damage as stated above.

Issue of materials to BHEL's erection contractors, preservation of stacked materials, re-stacking/re-handling as necessary, progressive and final reconciliation with BHEL's erection agencies and preparation of necessary document/ record in respect of these activities.

Return of excess/defective materials by various erection contractors of BHEL.
Loading and Dispatch of outgoing materials.

Expected minimum quality of service

Contractor shall render the Material Management Supervisory Services by ensuring deployment of requisite personnel with adequate educational qualification of engineering/technical background, having thorough field experience to enable understanding the intricacies of and special requirements involved in handling of project materials, inconsistencies and uncertainties associated with in/out flow of materials, project activities at odd hours & holidays and irregular working hours. Contractor shall ensure prompt and timely availability of such services as and when required by BHEL.

Preservation of Components

Contractor's scope under this MM Services work includes handling of the materials that requires preservation, as well as handling of other materials around the former in order to make proper access/approach for work. Contractor shall deploy necessary Supervisors, Labourers and T&P for all such activities.

Contractor shall arrange for preservation of components as per BHEL's storage and preservation manual and/or as per instructions of BHEL engineers.

One or more of following methods shall be adopted for preservation.

Coating with preservative paints/lubricant/inhibitors

Capping/wrapping/covering

Filling/immersion in oil/chemicals etc

Periodic checks/maintaining required nitrogen pressure in tanks of Transformers, BHEL will provide the nitrogen gas for the same. However contractor shall handle the cylinders, fit-up refills and return empty cylinders to BHEL Stores.

HT Motors

For preservation of HT motors, space heaters have to be kept energized to avoid ingress of moisture. Insulation resistance has to be measured and recorded at specified intervals till these are issued for erection. BHEL will provide necessary cables, switches etc. For this, however contractor shall install, operate and maintain the same.

Contractor shall provide red oxide zinc chromate (ROZC) primer conforming to IS:2074 of reputed manufactures (e.g. Asian Paints, Berger, Jenson & Nicholson, Bombay Paints, Shalimar or any other BHEL approved manufacturer) required for preservation shall be provided by the contractor and used for this purpose.

In the process the identification marks, component/material codes, match marks may have to be repainted. This work after preservation components are to be stacked properly, periodical reports on the preservation carried out should be submitted to BHEL in the prescribed formats.

Record Keeping

Creation and Maintenance of proper records of dispatch, receipt, stock, issue, return, damage, insurance claims, preservation, restacking, receipt inspection, stock verification etc. Of project materials are vital in nature. Contractor shall ensure that all such records are created and updated promptly to facilitate latest possible information to BHEL and concerned erection agencies of BHEL. Records shall be crated and maintained in BHEL's computerized Data Base programme (named SOMS) as well as in Hard Copy (Registers, File, Folder etc.) As a back up. The contractor shall deploy adequate number of personnel with proficiency in computerized Data Base operations for operating SOMS. Contractor shall also deploy adequate personnel for creation & maintenance of manual records with experience in materials management work.

Contractor shall prepare, maintain and update various MM records, associated with Materials Management operation of BHEL at project site. Two systems of record keeping/capturing information & data at various stages are in vogue viz.

Manual Ledgers & Records.

Computerized Database Application: BHEL has developed a software application named Site Operations Management System (SOMS) that captures all the data in the entire chain of transactions starting with master list of project materials, records of dispatch, receipt, inspection, issue, return, consumption etc.

Some of these records are Master shipping/packing list, LR/RR register, daybook register, stock register, records of issues to & return of materials in respect of various erection subcontractors, Insurance Claim records, periodical status reports in various formats covering desired aspects and output information as per BHEL/Client's requirement.

BHEL will provide necessary hardware, software & stationary etc. For the above. Contractor shall take utmost care of ensure that these properties and records are protected from any damage or loss. BHEL will recover the cost of such property / expenses of restoration from the contractor with 30% overhead charges in case of any loss/damage attributable to negligence/failure on contractor's part.

Secretarial & Other Misc. Services

The contractor under this contract shall also provide free of cost services exclusive to BHEL.

- **Qualified computer operators (minimum 'O' level qualified) capable of operating the material management/Billing /Progress software package / other packages available at site or for office work for total 30 manmonths,**
- **Qualified experienced engineer for assisting site work total 15 manmonths**
- **Qualified workers for maintaining store record and posting stock ledgers for a total 30 manmonths**
- **Skilled workers for working in store, colony and in maintenance of office for a total 30 manmonths and**
- **Unskilled workers for working in office for a total 30 manmonths.**

Persons so deployed shall have to work in extended hours whenever required. Workmen provided as per the above provisions shall be fully trained and experienced in the nature of work for which they are deployed.

In case contractor fails to provide above-mentioned manpower as desired by BHEL, the latter shall have the right to hire such services from other agencies at the risk and cost of the contractor. However, if BHEL does not utilize the manmonths as per above provision, fully or partly, recovery at the rate of the prevailing minimum wages at Site for the workers categories stated above plus 10% and Rs.10000/- plus 10% against each engineer's man-months will be made from the final bill of the contractor.

4.5.5 Price and Stage Payment

Separate item rates for these services are not applicable. Bidder shall include the price of all such services defined in the preceding clauses under clause no. 4.5 in their rates for various items of work listed in the Schedule of Rates and Quantities (Price Bid Specs).

For further details of progressive payment and final payable amounts, please refer clause no. 12.2.5 of Sectioon-12 (SCC).

4.5.6 N A

4.5.6.2 N A

4.5.6.3 NA

4.6
Acid cleaning/Chemical Cleaning of Boiler System and Alkali Flushing of Pre-Boiler System

4.6.1
The entire work of supply of materials for temporary installations materials like Piping, Valves, Bends, Reducers, Orifice Plates, Elbows, MS Flanges, Circulation Tank, Orifice plates, Circulating Pumps & Acid transfer pumps with Motors, Pump control panels/MCC panel, supply of required quantity of Chemicals like Acid (HCL-30% concentration), Ammonium Hydroxide, Hydrazine Hydrate, Citric Acid, Acid Inhibitor, Filled Nitrogen cylinders, Neutralizing agents (like Soda Lime/Quick Lime), assembly, erection & welding of required arrangements/circuits as required, carrying out the complete operations of Acid Cleaning, Acid Pickling, Citric Acid Rinsing, DM water Rinsing, Neutralizing, First Stage & Second Stage Passivation, flushing, cleaning etc. And disposal of chemical waste & neutralized waste etc. In Effluent disposal pit at specified location under the supervision of BHEL Engineer for Complete Boiler System, Pre-Boiler Systems (like Feed water system, Condensate system, Drip / extraction system piping etc.) Is in the scope of contractor under this tender specification. The detailed scope is further defined as under:

Supply, handling, assembly & erection, dismantling after completion of work of required quantity of Dissolving Tank, Circulating/Chemical Pumps, Valves of various sizes & Diameters, Headers, Pipe lines of various sizes for cleaning and naturalization operations.

Mobilization of required number of trained and experienced staff of various categories for execution of work in smooth, safe and efficient manner.

Supply of necessary Electrical equipments such as control panel, Starters, cables for motors of Circulation & Acid transfer pumps.

Supply of required quantity of Chemicals including the neutralizing agents and filled Nitrogen Cylinders for entire jobs under this mentioned scope.

Supply and installation of super heater plugs and orifice plates for down comers.

Supply of High pressure gas regulating valve header assembly for connecting Nitrogen Cylinders.

Execution of complete process including detail engineering and monitoring the process with own laboratory up to Passivation.

Erection of Motor Pumps sets and control panels.

Providing Sample coupons in steam drum and the blending tank before start of process at appropriate elevation/locations.

Cleaning & Removal of loose debris and other impurities from Drum after its opening for inspection.

To carry out the necessary fabrication of temporary circuits with main Boiler system and Pre-Boiler system pipings.

Neutralizing the acid/chemical wastes to acceptable limits as per Indian Standard requirement for healthy & pollution free environmental and disposal the chemical wastes al at safe & specified location in Effluent disposal pit.

Customer will provide the DM Water, Aux. Steam, Construction Power free of charges and same will be tapped by contractor by making his own necessary arrangements from tapping point as provided by Customer.

All other activities and processes will be carried out by contractor as part of normal scope of work including supply of the required quantity of Chemicals like Di-Sodium Phosphate (Na2 HPO4) and Tri-Sodium Phosphate (Na3 PO4) for Alkali Boil out process which is treated as part of normal scope of work.

For above entire process of work including the supply of temporary materials, Chemical cleaning, Acid transfer pumps, Chemical Circulating Pumps and Chemicals etc. Erection and dismantling etc. Shall be the part of scope of work and progressive payment for same shall be made per **clause 12.2.4(II)** as per section-12 of tender specification.

Some of the renowned agencies available in the country who can carry out such kind of Acid/Chemical cleaning and Alkali flushing job including supply of temporary arrangement materials, Chemical cleaning Pumps and Chemicals etc. Are as under:

1. M/S.ARUCHEM
   NO.79 (OLD NO. 29/9), VALMIKI STREET,
   THIRUVANMYUR,CHENNAI -600 041 (TAMILNADU) (FAX :: 044-24424755)

2. M/S.VALLABHA INDUSTRIAL CHEMICAL ENGINEERS
   B-132, PARIS NAGAR SOCIETY,
   RACE COURSE ROAD, VADODARA- 390007 (GUJARAT) (FAX :: 0265-2310365)

3. M/S.D.C.INDUSTRIAL PLANT SERVICES,
   WHITE HOUSE, SECOND FLOOR,

119, PARK STREET, CALCUTTA- 700 016. (FAX :: 033-2495138)

4. M/S.DESEIN BEIZ TECHNIK PVT. LTD.
DESEIN HOUSE, GRATER KAILASH,
NEW DELHI-110 048. (FAX :: 011-29218393/29219566)

5. M/S.WRIGHT & COMPANY,
19, STRAND ROAD (FIRST FLOOR)
CALCUTTA- 700 001. (FAX: 033-2103902 / 2206274)

6. M/S.TANDEX PROCESS TECHNOLOGIES PVT.LTD.
NO.16/2, MOWBRAYS I CROSS EXTN. OF CHITARANJAN ROAD,
ALWARPET, CHENNAI -600 018 (TAMILNADU) (FAX :: 044-24320605)

4.6.2 Further detailed part of process will be as under:

4.6.2.1 Boiler System Acid / Chemical Cleaning

4.6.2.1.1 Acid Cleaning:
Scope:

During acid cleaning process, all steam-generating surfaces of the boiler and the economizer are included in the scope of cleaning. However, super heaters are isolated by providing plugs at the mouths of the off take tubes from the drum.

Technique:
Pickling is carried out by circulating a mass flow of water containing inhibited (0.1% - 0.15% cationic inhibitor) Coronil – 213 Spl Hydrochloric acid (4 to 6% W/V) and 0.25% ammonium biflouride at a temp of 60^{o}c.

Pickling is followed by a DM water rinse and a rinse at 55^{o}c using ammoniated citric acid of 0.2% concentration. The ph value of solution is maintained at 3.5 to 4.0. When the iron content in the samples level out the boiler is drained under N_2 capping. Later the system is thoroughly rinsed with DM water till the remnant iron is not more than 25 ppm.

The entire pickled surface is neutralized with a solution of sodium carbonate at a temperature of 75^{o}c to 80^{o}c. Finally the cleaned surface is passivated with a solution of DM water containing a minimum of 200 ppm Hydrazine and ammonia (ph 10.0).

Prior to the stem blowing operation the surface is again passivated at a pressure of 40 Kg/Cm^2 with hydrazinated ammoniated DM water.

Preparation

Complete the fabrication of 10 to mixing tank. The tank should be located at a sufficient height to give 1.0 M to 1.5 M positive suction for the circulation pumps.

Complete the erection of all temporary equipments and piping as per scheme

Insulate with mineral wool mattresses mixing tank, discharge piping to boiler from circulation pumps and return line the mixing tank.

Remove all drum internals.

Blank super heater off take tubes from the drum side by putting plugs.

Make arrangements for pressurizing super heater.

Install orifices on the down comers inside the steam drum.

Make arrangements for nitrogen blanketing as per enclosed drg. Check and ensure that the nitrogen blanketing line is not choked.

Close isolation valves on all tapping points from drum
Ensure that drum safety valves are protected by installing hydrostatic test plug.

Suspend a representative water wall tube tube sample inside the drum and mixing tank to ascertain quality of cleaning.

Take trial run of individual circulation pump and check the total system to the shut off pressure of the pump for any leakages.

Back fill the super heaters with 200 ppm hydrazinated water (ph 10.0) and pressurize super heaters to 5.0 Kg/Cm^2 and check each plug to ensure tightness. Close the drum manhole doors.

Complete the land flow test of the economizer and the water walls.

Check the effectiveness of the inhibitor and other chemicals.

Remove internals of economizer inlet non-return valves.

Procedure
4.6.2.1.2 Acid Pickling:

Fill the entire system with DM water establish the required flow by running the circulating pumps. Maintain 1 to2 Kg/Cm^2 pressure in the drum.

Ensure that water flow from the drum vents to the collecting tank and to the mixing tank.

Admit steam into the mixing tank and raise the temp. Of circulating water to 60^oc as measured in return line. Continue circulation for eight hrs. For the purpose of hot flushing and drain the system completely.

Take fresh DM water into the tank and establish circulation as per steps 1+2 and raise the temp. Of water to 60^oc.

Cut off steam and add required quantity of inhibitor, with the pumps running to achieve thorough mixing.

Add required quantity of 30 – 32% Hydrochloric acid in a controlled manner so that acid concentration as measured in the sample from pump discharge does not exceed 6% and 0.25 % Ammonium bi fluride. This sample is to be collected at an interval of 10 minutes.

Total quantity of acid required to achieve acid concentration of 4% in the circulating solution is to be added in one hour. Simultaneously charge calculated quantity of ammonium bifluoride into the mixing tank by several increments.

Collect sample from circulating solution, at an internal of 15 minutes, at the pump discharge and return line and analyze for acid strength and iron concentration.

Stop circulation once three consecutive samples show almost same values of acid and iron concentration.

Drain the system under nitrogen blanket. Neutralize the spent acidic solution with lime.

4.6.2.1.3 D.M. Water Rinse:

On Completion of draining of acidic solution, fill the system with plain D.M. water and establish circulation.

Raise the temp. Of water to 45^{o}c and circulate for one hour.

Collect samples from pump discharge and return line and analyze for acid and iron concentration

Drain the system under Nitrogen blanket.

4.6.2.1.4 Citric Acid Rinse:

On completion of draining, fill the system with DM water and establish circulation.

Raise the temp. To 55^{0}C and add 0.2% w/v citric acid monohydrate.

Add ammonia to raise the ph of the solution to 3.5 to 4.0 and circulate for 2hrs.

Collect samples and analyze for ph and iron content, drain the system under nitrogen cover when the values stabilize.

4.6.2.1.5 DM Water rinse:

On completion of draining rinse the system with plain DM water.

The rinsing operation is to be continued till the iron content drops down to 50ppm and acidity is absent.

All the draining operation is to be done under Nitrogen blanket.

4.6.2.1.6 Neutralisation

Fill the system with plain D.M. water raise the temp to 75^{0}C - 80^{0}C after establishing circulation.

Add required quantity of 1% of Sodium carbonate and maintain circulation for 6 hrs.

Hot drain the system under atmospheric air and open the drum vents.

4.6.2.1.7 First Stage Passivation

Fill the system with plain D.M. water and raise the temperature to 75^0C - 80^0C.

Add required quantities of Hydrazine hydrate and ammonia to get hydrazine content of 200ppm and ph 10.0.

Circulate for 20 hrs. Hourly samples should be collected and analysed for hydrazine content and ph.

During this period add chemicals whenever necessary to maintain hydrazine content and ph. Value at 200ppm and 10.0 respectively.

Drain the system and open vents and drum Manhole covers.

4.6.2.1.8 Second Stage Passivation:
The gap between the first stage passivation and the second stage passivation should not be more than 3 weeks.

Preparation:

Remove super heater plugs and back flush super heaters

Remove orifices installed on all down corners.

Install drum internals after cleaning them by blowing with compressed air.

Cut all temporary connections from ring headers and flush the headers with water Jet.

After preparing the boiler for light up carry out hydraulic test.

Procedure

Fill D.M. water in the De-aerating Heater and Feed Storage Tank.

Add required quantity by hydrazine hydrate and ammonia to achieve 200ppm of hydrazine and ph 10.0

Run the BFP on re circulation for one hour and fill boiler.

Light up the boiler and raise the pressure to 40 Kg/Cm^2 following O & M instructions.

Maintain pressure for 24 hours.

During this period, feed water taken for make up should have 25ppm hydrazine content and ph 10.0. For this, dose N_2H_4 + NH_4OH mixture continuously into the feed water through L.P. dosing system.

On completion box up the boiler and allow it to cool down. Open the drum vent at 2 Kg/Cm^2 drum pressure.

4.6.2.2 Alkali Flushing of Pre-Boiler Systems:

Contractor shall carry out the Alkali flushing /cleaning of Pre-Boiler Systems meant for feeding water to the Boiler to make them free of contaminations like Oil, Grease, Loose materials etc. For trouble free commissioning and subsequent trouble-free operation of the plant. The further details are as under:

4.6.2.2.1 Scope

The piping connected with the following systems are covered in the scope for the purpose defined.

Condensate flow system: (CRP Suction & discharge, Re-circulation lines, Balance leak-off lines Deaerator, Drip system lines etc. Further as advised by BHEL engineer at site)

Feed water System : (Feed storage Tank, HP/IP/LP, BFP suction & discharge lines, Re-circulation / balance leak-off lines, Feed control station, feed lines to boiler, overflow piping etc. Further as advised by BHEL engineer at site)

Condensate System ☹CEP discharge, GSC piping, Drain Cooler piping, excess condensate return lines, lines to and from CPH- dearerator etc, further as advised by BHEL engineer at site).

4.6.2.2.2 Technique

The flushing has to be carried out using 0.05% (500 ppm) Lissopol detergent as cleaning/flushing agent. The detergent is circulated for six hours or more as per requirement to ensure the proper cleaning of systems, followed by DM rinsing. Passivation of the system is carried out using Hydrazine (200 ppm) and ammonia to maintain the ph at 9.5 to 10.0 by keeping the system under circulation for six hours or more as per requirement.

4.6.2.2.3 Preparation

Hydraulic test of the system as applicable shall be completed and circuits as per instruction of BHEL engineer shall be made.

Cleanliness of feed storage tank, deaerator shall be checked and ensured.

For circulation, temporary pumping arrangement shall be made and feed storage tank shall be used as (Chemical) mixing tank.

Chemical dozing shall be done through any available opening in the feed storage tank.

For level monitoring purpose, deaerator gauge glass will be used.

All flow measurement devices and pneumatic operated control valves in the circuit shall be installed after the completion of flushing operation and wherever required spool pieces shall be used at these locations.
Wherever possible the flaps of check valves shall be removed in the circuit and same shall be installed after the completion of flushing operation.

Making arrangement for disposal and the disposition of effluent shall be made at specified location.

Lab facility arrangement for analysing the ph, conductivity and Hydrazine content shall be made.

4.6.2.2.4 Inputs required.

Temporary arrangement:

Chemical circulation pumps (150 TPH) 3 Nos.
Sealing water arrangement for thr pumps.
Temporary pipes, valves with fittings.
Draining arrangement for the effluent.
Sample testing arrangement.
LT Power supply arrangement for pumps.

Chemicals required:

Lissopol – as per requirement
Hydrazine hydrate – as per requirement
Liquor Ammonia- as per requirement

4.6.2.2.5 Procedure:

Cleaning of the system, which are divided into various circuits, shall be carried out as follows.(Desired schemes will be made at site)

Cold water flushing
Detergent cleaning
DW water rinsing
Passivation

4.6.2.2.5.1 Condensate System:

Circuit-1: Feed storage tank-CRP (Condensate re-circulation pump) suction line-Temporary circulation Pumps-CEP discharge line-GSC bypass line-Mixing chamber spool-CRH return line-Control station-Deaerator**.**

Circuit-2: Feed storage tank-CRP (Condensate re-circulation pump) suction line-Temporary circulation Pumps-CEP discharge line-GSC bypass line-Mixing chamber spool-Control station-CRH return line-CRP re-circulation & balance leak off lines-deaerator.

Circuit-3: Feed storage tank-CRP (Condensate re-circulation pump) suction line-Temporary circulation Pumps-CEP discharge line-excess condensate return line-loop line-deaerator over flow line-deaerator.

4.6.2.2.5.2 Feed System:

Circuit-4: Feed storage tank-HP/IP/LP BFP suction lines-Temporary circulation pumps- HP feed line through control station, IP feed line through control station, LP feed line through control station-Return line from CPH-deaerator.

Circuit-5: Feed storage tank-HP/IP/LP BFP Suction lines-Temporary circulation pumps- HP/IP/LP BFP re-circulation lines, balance leak-off lines-deaerator.

4.6.2.2.5.2.1 Cold Water Flushing:

The system is to filled with DM water till normal water level in feed storage tank. The system is put under circulation for about 2 hours or more (as per requirement) covering all the circuits. The systems are drained totally.

4.6.2.2.5.2.2 Detergent cleaning:

The system is to filled with DM water again and the required quantity of **Lissopol** is added in the feed storage tank. The solution is circulated for about six hours or more as per requirement. During the circulation, sample analysis is made for conductivity at the inlet and outlet of the system. The circulation is topped and the system is drained.

4.6.2.2.5.2.3 DM Water rinsing:

The system is to filled with DM water again and circulated. During the circulation, sample analysis is made for conductivity at the inlet and outlet of the system. The circulation is topped on reaching stabilized conductivity and the system is drained. .

4.6.2.2.5.3 Passivation:

The system is filled with DM water and the following chemicals are added into the feed tank.

Hydrazine Hydrate- to maintain 200 ppm in the system

Liquor ammonia - to maintain the system ph at 9.5 to 10.

The system is kept under circulation for six hours or more as per requirement and at the end of it drained to complete the cleaning operation.

Thorough mechanical cleaning of line which are not covered in above cleaning process.

Inspection and cleaning of de-aerator/ Feed Storage Tank.

Contractor shall have to carry out erection, commissioning and load testing of Hoists supplied from respective manufacturing units/vendor for operation & Maintenance purpose of Boiler with Aux, ESP with Aux etc. Equipments as part of scope of supply. The contractor shall carry out the load testing of these hoists shall obtain the approval from competent Authority of concerned state as approved by Customer.

4.7 Exclusions:

1. Electrical and control & Instrumentation work except which are specifically included.
2. Erection of Turbine, Turbo-Generator and their Auxiliaries.

SECTION- 4 PART II TG SCOPE

Special Conditions of Contract

4.0 Scope of Work

The scope of work under the tender specification covers Collection of materials from BHEL/Client's stores/storage yard, Handling at Stores/ Storage Yard, Transportation to site of work including via pre-assembly yard, Erection, Testing, Assistance for Commissioning, Final Painting & Handing Over of Condenser, Steam Turbine, Generator, Static Equipments, Pumps & Auxiliaries including TG Integral Piping, ESV to Turbine & Gland Steam Piping etc. of 2x80 MW Units

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

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

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

(ii) Checking/verification of materials at the taking of receipt and generating report pending materials list .

(iii) Transportation to pre-assembly area and upto & including site of work.

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

(v) Erection, Alignment, Testing, Commissioning of equipments / systems with associated auxiliaries and stage inspection by Statutory Authorities like Boiler Inspector, Factory Inspector, Electrical Inspectorate 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.

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

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

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

(ix) Fabrication & Erection of foundation frames of electrical equipments supplied as part of Mechanical scope like pumps-motors etc. and approach platform of valves.

(x) Erection of Electrical motorised & control valves

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

(xii) Trial operation of TG set, Final painting, providing assistance during Stability run, Completion of PG test related works of the equipments and handing over of the unit 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.

4.1.3
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.

4.1.4
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.

4.1.5
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.

4.1.6
The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor should ensure successful and timely completion of the work. The contractor must deploy adequate quantity of tools, construction aids, equipment etc. He must also deploy adequate number of trained, qualified and experienced supervisory staff and skilled personnel.

4.1.7
All necessary certificates and licenses, permits & clearances required to carry out this work are to be arranged by the contractor expeditiously at his cost.

4.1.8
All tools, tackles, fixtures, equipments, materials handling and transportation except those specifically to be provided by BHEL, manpower, supervisors/engineers, consumables etc, required for this scope of work shall be provided by the contractor. These tools & plant, equipments, men & material shall remain at site throughout the duration of contract and extension thereof, if any. Diversion/removal of these shall be done only on the approval of BHEL. For further details refer sections-5,6 & 7.

4.1.9
During the course of erection, testing and commissioning certain rework/ modification/ rectification/ repair/ fabrication etc, will be necessary on account of feed back from various power station units already commissioned and/ or units under erection and commissioning and also on account of design discrepancies or manufacturing defects and site operation/ maintenance requirements. This will also include modifications/ re-works suggested by FES/ other inspection group(s). Contractor shall carry out such rework/ modification/ rectification/ fabrication/repair etc, promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc Shall be maintained by the contractor. Claim of contractor if any, for such works will be governed by clauses 13.1 to 13.8.

4.1.10
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.

4.1.11
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 extended hours. Contractor's offer shall cover all such contingencies.

4.1.12
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.

4.1.13

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.

4.1.14
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 Preparation of Foundations and Grouting of Equipments

4.2.1
Building foundations and other necessary civil works for supporting structures, equipments etc Will be provided by BHEL's client. 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.

4.2.2
All minor foundations and anchor points/arrangements required for installing erection equipments and winches etc are in the scope of contractor.

4.2.3
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.

4.2.4
BHEL will provide free of cost only 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. However, machining of the packers wherever necessary, will be arranged by BHEL.

4.2.5
Complete grouting of structural columns, equipments, rotating machines including their drives, including anchor/ foundation bolts, beneath base, base hollows etc, as

may be applicable for entire scope(TG equipments and associated TG Aux. etc.) of equipments with Aux and system included under these tender specifications, is included in the scope of contractor. Arranging all labour, building materials including cement, ordinary port land as well as quick setting – free flow - non-shrink grout mix (e.g. Conbextra GP-1/GP-2, as per instruction of BHEL Engineer/ Drawings requirement of Static and Rotary Equipments with Aux.), form work, shuttering, and any other requirements is in the scope of contractor. Contractor shall obtain approval of BHEL for cement (ordinary as-well-as quick setting – free flow- non-shrink grout mix) prior to procurement and 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.

4.2.6
The Quick-setting-Non-shrink-Free-flow special grout mix purchased by Contractor shall be from the latest BHEL approved vendor only. Following is the list of approved vendors as on date.

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

The list of approved vendors is subject to updation / addition / deletion from time to time by BHEL. 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. BHEL has arrangement with above suppliers for supervision services and the supervision charges for the same will be borne by BHEL. 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. Any overstay required due to contractor shall be charged to the contractor with BHEL's departmental charges. Contractor shall consult BHEL engineer before deciding upon the vendor for the above.

4.3 **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 IBR certified high pressure welders who have been permitted by CIB of state concerned for deployment at the site of work.

2) Welding of all attachments to pressure parts/ Equipments, 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 the IBR qualified welders. 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.

The portion of work coming under IBR purview (e.g. Welding, heat treatment of HP joints) has to be executed as per the latest version of Indian Boiler Regulation and amendments thereof. BHEL will furnish IBR

documents for piping & fittings and further approvals of IBR/ Statutory Authorities for pre-assembly & erection and other works shall be taken by contractor.

4.4 Condenser Installation

4.4.1
The Spring type loading, Surface Condenser will be despatched in dismantled condition, comprising of Condenser Shell, Hotwell, Dome, Tubes, Connecting Piece, Foundation Springs, Stand Pipe, Surge Pipe, Air Extraction Pipe, Water Boxes and other foundation parts etc. Further works like placement on foundation, assembly, tube insertion/expansion, welding/NDT, erection & Commissioning tests etc shall be carried at site by Contractor by using his own required Tool & Tackles and handling equipments. **Condenser shell weighing about 44 MT** is to be handled at site including taking delivery from BHEL/Customer Stores/storage yard, Loading on trailer, transportation to site of work, unloading at site, shifting/lifting, positioning & placement on foundation in TG hall shall be carried out by contractor using his own required suitable capacity crane and suitable Transport arrangements.
Contractor shall submit his plan for handling and erection of Condenser along with Technical Bid.

4.4.2
Materials of Condenser tube for condensing zone and A.C. zone of condenser are Al. Brass, SB111 (Alloy No.C68700) and Stainless Steel respectively. Contractor shall arrange all required T&P like tube expander with cutting & expanding tools. Blast cleaning and painting of steam space, Water Space and external surface of condenser as required shall be carried out by contractor as part of scope of work including supply of paints & primers as [per drawing requirement and instruction BHEL Site In-charge. Painting of Steam Space & Water Space shall be carried with Steam Washable Paints & Coal Tar Epoxy paints.

4.5 Generator Installation

4.5.1
Generator Comprising of Stator, Rotor, Bearings, Exciter and Foundation parts along with accessories will be dispatched in dismantled condition. Further works like placement on foundation, assembly works and erection & commissioning tests as required shall be carried at site by Contractor by using his own required Tool & Tackles and handling equipments. Generator Stator will be unloaded within 200 Metres from respective unit TG hall building by existing material unloading agency of BHEL. Contractor shall carry out the further handling of Generator Stator at site including taking delivery from already unloaded area/storage yard, Loading on trailer, transportation/shifting to site of work, unloading at site/working area, shifting/lifting, positioning & placement on foundation which is at about 11 meter elevation in TG hall by contractor using his own required suitable capacity crane and suitable Transport arrangements.

4.5.2 Generator Stator Lifting

To facilitate the lifting and placement of Generator Stator (which is weighing about 100 MT), Certain columns/structure members of TG Building may have to be kept under hold. **Due to non-availability adequate capacity E.O.T. Crane in**

TG hall and space constrains, Generator Stator shall has to be lifted by Lift & Shift method (e.g. Portal Gantry Crane, Four Point Lifting System etc.). Contractor is advised to visit the site and shall arrange to deploy necessary equipment for this purpose. Some of the renowned agencies available in the country who can carry out such kind of Heavy lifting job are as under.:

1. M/s. Fagioli PSE India Pvt. Ltd, 203,
   Krishna Bhavan, Govandi Station Road, Deonar,
   Mumbai-400088, Tel.No. 022-66819999, Fax No. 022-66819988).

2. M/s. Freight Wings (P) Ltd.,
   309, Rex Chambers, Walchand Hirachand Marg.
   Ballard Estate, Mumbai-400001, Tel. No.022-22631714/22619988.

3. M/s. Dorman Long Technology Ltd.
   233, Bharat Industrial Estate, Lal Bahadur Shashtry Marg, Bhandup (West),
   Mumbai-400078, Tel No. 022-25961960, Cell No. 09820192807.

4. M/s. Basu & Basu Engineers (Pvt.) Ltd.,
   Kolkata, Tel. No. 033-24642967/24664069, Fax No. 033-24664621.

Contractor may contact above agencies or any other similar agency known to contractor and have tie up for this lifting activity. Generator Stator shall be required to be lifted and put on foundation within one week time after availability of material and other essential inputs and clear the holds for further civil & structural works. All above shall be the part of scope of work and progressive payment for same shall be made per **clause 12.1.1** as per section-12 of tender specification.

Lifting of Generator Stator by Jack and Sleeper method is <u>not permitted.</u>

4.6 Steam Turbine Installation

4.6.1

Steam Turbine comprising of Lower & Upper parts of outer Casings, Inner casings & Exhaust Hoods, Guide Blade carriers, Rotor assembly, Bearings and foundation parts etc will be dispatched in dismantled condition. Further assembly, erection, testing and commissioning works including handling at site, taking delivery from BHEL/Customer Stores/storage yard, Loading on trailer, transportation to site of work, unloading at site, shifting/lifting, positioning & placement on foundation in TG hall shall be carried out by contractor using his own required suitable capacity crane and suitable Transport arrangements. However Customer's 30 MT capacity EOT crane may be used in TG hall for erection of TG equipments subject to capacity, accessibility, approachability & availability. Gas type bolt heating device as supplied from manufacturing unit will be made available for works and required consumables/Gas shall be provided by Contractor.

4.6.2

For Main Steam Piping between the Turbine Emergency Stop Valves & Control valves of Turbine, the materials specifications is Alloy Steel **"X-20 (Cr Mo V 12.1 material)**" and there are about 20 Nos. of weld joints of this system having pipe size OD-170 mm and thickness 14.27 mm and weight about 3.5 MT. Contractor shall have to provide the required quantity of filler wires and take special note to provide the filler wires and requirements of other process like Welding process, Pre- heating & Post heating requirement during welding etc. The complete work of laying, alignment, fixing, supporting, Welding with Radiography & NDE, Pre & Post heat treatment shall form the integral part of TG and TG Aux. work.

4.7 Other Rotating Machines Installation

4.7.1
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.

4.7 2
Trial run of the drive in un-coupled state and then coupled with equipment has to be done after necessary alignment etc

4.7.3
Forced lube oil systems of motors and/or rotating equipments form the part of work under this specification

4.7.4
Performance of hydro test of oil coolers & Air coolers of rotating machines, if any, is included in the scope of work.

4.7.5
Certain rotating machinery after, initial runs and commissioning of the equipment, may have to be hot aligned.

4.7.6
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.

4.7.7
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.

4.7.8
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.

4.7.9
Vital clearances of shop assembled rotating machines should be checked at site and adjusted if required.

4.8 Testing, Pre-Commissioning, Commissioning, Stability Run/PG Test

4.8.1
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.

4.8.2
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.

4.8.3
For the purpose of Steam blowing, Oil flushing & Hydraulic test of TG piping, contractor shall lay/install necessary temporary piping, valves for conduct of hydraulic test, Oil flushing, 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 arrangements like tanks, piping, 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.

As such there is no such major system/piping involved, which requires the Chemical cleaning. For major systems / piping which are in Boiler contractor's scope, the Chemical cleaning including providing the arrangements & chemicals for such Boiler system / pre-boiler system is included in Boiler scope.

For any small system/ piping under these specification, which may require chemical cleaning as per site/customer or procedural requirement, contractor in consultation with BHEL site engineer may make suitable arrangement/tie-up with Boiler erection agency and carry out erection of such systems/ piping well in advance, align his operations and complete including termination & welding of terminal joints of his this work to get these flushed simultaneously. For acid pickling of lube line etc. Wherever required, contractor shall have to make his exclusive arrangement.

4.8.4
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, Oil flushing and Hydraulic test will be arranged by contractor.

4.8.5
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.

4.8.6
Overhauling, cleaning, servicing of tanks, equipments, valves, during erection and commissioning stages are in the scope of work. Gaskets, packing for replacement will be provided by BHEL.

4.8.7
Transportation of oil drums from customer's/BHEL's stores, filling of oil for flushing, first/fresh fill of lubricants and subsequent topping up during commissioning and post commissioning activities are included in the scope of this contract. The contractor shall have to return all the empty/ unused/partly used drums to the customer/ BHEL stores. 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.

4.8.8
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.

4.8 9
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.

4.8.10
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.

4.8.11

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.

4.8.12
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.

4.8.13
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.

4.8.14
Commissioning activities will continue till the completion of trial run/Stability 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

4.8.15
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.

4.8.16
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.

4.8.17 Assistance for Stability run/PG Test

The contractor shall provide assistance for conducting Stability run and complete Performance Guarantee (PG) Test related works as a part of his regular scope of work. This shall include installation of instrument tapping points / fixing & welding of thermowells, manpower assistance, small T&P, providing access platforms/ scaffolding/ ladders, lighting arrangements and other enabling facilities associated with above typical test.

4.9 Final Painting

4.9.1
Preservation painting of exposed metal surfaces / damaged shop-painted areas during execution of the work under scope of this contract and Final Painting,

marking of colour bands, inscription on equipments/Pipe lines, flow-direction arrow etc. for identification and specification as decided by BHEL/ Customer at site for the equipments, structures, piping and Auxiliaries etc covered under this tender specification shall be carried by contractor. Contractor shall arrange consumables like brush, cleaning agents etc with all T&P, manpower and supervision etc as part of scope of work.

Contractor at no extra cost to BHEL shall supply all paints; primers, tools and other consumables including scaffolding materials required for finish painting. Paint is to be BHEL approved make only and painting should be as per colour scheme and quality approved / specified by Engineer. Valid Test Certificate for the paint so supplied shall be made available before use of the same on work.

4.9.2 PREPARTION OF SURFACES

Components will generally be with one coat of finish paint. In cases where such shop paints have peeled off / damaged, the same shall have to be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes or shot / sand blasting shall be adopted to clean the surfaces to SA 2 ½ .Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER / ENGINEER.

4.9.5 FINISH PAINT

Epoxy paint conforming to IS 14209 shall be used for finish coats. After cleaning the dust on the dried up primer, first coat of Epoxy paint shall be applied. After this first coat dries up hard, the gloss from the entire surface shall be gently removed and surface dusted off. Thereafter, the second finish coat of Epoxy paint shall be applied.

4.9.6 SUGGESTED COLOUR CODES FOR PAINTING

SN	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admirality Grey	632	-	-
2.0	Boiler casing, ESP and ducting	Nut Brown	413	-	-
3.0	Crane				
3.1	Crane structure	Golden Yellow	356	-	-
3.2	Trolley and hook	Crimson	540	-	-
4.0	Fans, pumps, motors, compressors	Light Grey	631	-	-

SN	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
5.0	Tanks (without insulation and cladding)				
5.1	Outdoor	Aluminium	-	-	-
5.2	Indoor	Light grey	631	-	-
6.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631	-	-
7.0	Switchgear	Light grey	631	-	-
8.0	Control & relay panels	Light grey	631/7 078 of IS 1650	-	-
9.0	Turbine	Golden Yellow	356	-	-
10.0	Generator & exciter	Light grey	631	--	-
11.0	Transformers	Aluminium	-	-	-
12.0	Machinery guards	Signal red	537	-	-
13.0	Piping (without insulation and cladding_)				
13.1	Water System				
	Boiler feed	Sea green	217	-	-
	Condensate	Sea green	217	Light brown	410
	D M Water	Sea green	217	Light orange	557
	Soft water	Sea green	217	French blue	166
	Bearing cooling water	Sea green	217	French blue	166
	Potable & filtered water	Sea green	217	French blue	166
	Service & clarified water	Sea green	217	French blue	166
	Raw water	Sea green	217	White	-
	Cooling water	Sea green	217	French blue	166
13.2	Air System				
	Station air	Sky blue	101	-	-
	Control air	Sky blue	101	White	-
13.3	Oil system				

SN	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
	Fuel oil	Light brown	410	French	166
	Light oil	Light Brown	410	Brilliant green	221
	Lubricating oil	Light brown	410	Light grey	631
	Transformer oil	Light brown	410	Light orange	557
13.4	Gas system				
	Carbon dioxide	Canary yellow	309	Light grey	631
13.5	Fire services	Fire red	536	-	-
13.6	Vacuum pipes	Sky blue	101	Black	-
13.7	Fuel pipes (pulverised coal)	Light brown	410	-	-
13.8	Drainage	Black	-	-	-

Notes :

This colour code basically refers to IS:2379 for piping with necessary modifications.

Where band colour is specified, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

4.10.0 General Responsibility of the Contractor

4.10.1
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.

4.10.2
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.

4.10.3
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.

4.11 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.

4.11.1
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.

4.11.2
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.

4.11.3
The entire surplus, damaged, unused materials, package materials/ containers, special transporting frames, gunny bags, etc, shall be returned to BHEL stores by the contractor.

4.11.4
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.

4.11.5
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.

4.12 Common Requirements

4.12.1
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.

4.12.2
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.

4.12.3
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.

4.12.4
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.

4.12.5
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.

4.12.6
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.

4.12.7
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.

4.12.8
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.

4.12.9 Insulation

As such application of thermal insulation of TG equipments will be carried by erection agency including the welding of attachments such as studs/hooks/ supports on equipments to hold insulation will be carried out by contractor under these specification as scope of work. Contractor shall co-operate, coordinate, extend the necessary help/assistance and complete the erection work of his scope of all related equipments and system well in advance as per instruction of BHEL engineer's instruction at site to achieve the total integrated committed schedule of project.

The insulation of temporary system as required during steam blowing/flushing/ chemical cleaning for operations of scope of work under these specification shall be carried out by contractor as part of scope of work. BHEL will provide the insulation materials for such temporary work.

4.13 Piping Installation

4.13.1
The work on piping systems (Air, Water, Oil, Steam, Gas 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.

4.13.2
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 65mm will have to be fabricated at site at no extra cost.

4.13.3
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 IBR & Non-IBR pipes and adopting specified heat treatment procedure at no extra cost.

4.13.4
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.

4.13.5
Flame cutting of piping, where required shall be done as per BHEL engineers instructions.

4.13.6
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.

4.13.7

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.

4.13.8
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.

4.13.9
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 .

4.13.10
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.

4.13.11
Erection of Critical piping systems like Main Steam upto ESV, Feed Water system, Condensate, Extractions system works (excluding which are specifically included under this tender specification) which are to be connected with equipments under this tender specification, will be carried out by other erection agency. Contractor shall carry out erection and placement of related equipments and auxiliaries on priority basis as per instructions of BHEL Site-In charge to enable to achieve day to day activities/milestone events and the over all commissioning schedule of project.

4.14 Laying Of Pipes/Tubes including Impulse Pipes

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.

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.

C Contractor shall provide GI clamps for impulse pipe and GI pipes within the quoted rate for installation of the same.

D Erection of impulse piping work shall be carried out upto nut & tail including root valves.

4.15 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 may be called for if required. This shall be done within the quoted rate.

4.16 Field Instrumentation

As such Electrical and instruments works like placement of panels, calibration, cabling and tray works etc. are excluded from scope of works of this tender specification, However contractor shall provide necessary assistance for erection, testing and commissioning for instruments which are received with main equipments including the works of turbo-supervisory systems etc. Contractor shall abide by BHEL site Engineer's instruction and shall be binding on Contractor.

4.17 Exclusions

The following works are specific exclusions from the scope of work / specification :-

1. Application of spray insulation of steam Turbine.

SECTION-4 PART III C&I AND ELECTRICAL SCOPE

SPECIAL CONDITIONS OF CONTRACT

4.0.0 Scope of work involving Erection, Testing, Commissioning Assistance, Checking of Calibration etc.

4.1.1
The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship, engineering and construction management. The contractor should ensure timely completion of work. The contractor must have adequate quantity of tools, measuring instruments, calibrating equipment etc. in his possession. He must also have on his rolls adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor should match requirement of sophistication involving microprocessor-based systems.

4.1.2
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor 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.

4.1.3
All the work shall be carried out as per the instructions of BHEL engineer. *BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.*

4.1.4
The services, tests and support to be provided by the agency for the work mentioned in the various sections of this tender are indicative and not exhaustive, but not limited to these for the completion of the work in all respects.

4.1.5
Contractor shall calibrate, erect and commission all the equipment, cabinets/panels, instruments and cabling etc. as per sequence prescribed by BHEL at site. The sequence of erection / commissioning methodology will be decided by the BHEL engineers depending upon the availability of materials/work fronts etc. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection / commissioning of similar jobs or for any reasons whatsoever.

4.1.6
The work to be carried out under the scope of this specification covers the complete work of loading, handling, transporting, unloading, pre-assembly, erection, calibration, testing, air flushing, pre-commissioning tests, commissioning of systems, trial run of various auxiliaries, achieving various activities till handing over of the unit. The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection. If any portion of the work is found to be

defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies or departmentally and recoveries will be effected from contractor's bills towards expenditure incurred including 30% departmental charges.

4.1.7
The terminal points as decided by BHEL shall be final and binding on the contractor.

4.1.8
The technical description of the control and instrumentation of various packages is available in Appendix-I to give general idea to tenderer about the type of equipment to be erected, calibrated, tested and commissioned.

4.1.9
During the course of erection, testing and commissioning C&I and electrical work of 2 x 80 MW CPP, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feedback from various thermal power stations or 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 and consumables used etc. shall be maintained by the contractor and got signed by BHEL engineer everyday. Claims of contractor, if any, for such works will be dealt as per clauses 13.1 to 13.9.

4.1.10
The contractor's scope of work is further described in the clauses hereafter:

4.1.11
All tools, tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables, electrodes including oxygen, acetylene argon, nitrogen etc gases, paints etc. required for this scope of work shall be provided by the contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor’s quoted rates should be inclusive of all such contingencies. Electrodes shall be baked / dried in the electrode drying oven (range 375 – 425 deg C) to the temperature and period specified by BHEL Engineer before their use. Necessary drying oven / portable oven shall be provided by the contractor at his cost.

4.1.12
The scope of work under this tender specification covers transportation, calibration, erection, testing and commissioning, etc. of control / instrumentation and electrical equipments of the following packages.

A. Boiler Control & Instrumentation and its Auxiliaries
max DNA based system panels for FSSS, SADC, soot blowers, coal milling system, feeder remote /local, Electronic water level indicator, air heaters, electrical panels for DC control supply, starter panel for mill lube oil /fans and field devices/ instrumentation work for above system, piping, cabling etc.

B. ESP and Its Auxiliaries
Complete Electrical and Control system for the ESP

C. Steam Turbine, Generator and Its Auxiliaries
max DNA based system panels for ATRS, EHTC, GSPC, Turbine Protections, Generator controls and protection system, instrumentation work for above system, piping, cabling etc.

4.1.13
Equipment/instruments required to be erected for this work, though not limited to but are generally as per rate schedule. For any items or class of work not specified herein but required for total completion of work, the same shall be carried out as per BHEL requirement. However the payment of these items/class of work shall be regulated on the basis of mutually agreed rate arrived at by either of the following methods, which should be done prior to undertaking the work:

A. Based on rate of identical/similar items in the rate schedule.

B. Based on the rate arrived from nearby items in the rate schedule.

C. Wherever any item rate for similar type of work or nearby item rate does not exist in the rate schedule, rate will be worked out on the basis of work element or from fundamentals of estimation or existing rates in other job.

Contractor shall provide necessary resources for completion of such work within the stipulated time schedule. Value of such work shall be included while computing the total value of work finally executed for all contractual purposes, particularly for contract variation purpose.

4.2.0 Collection of Materials

4.2.1.1
The contractor shall take delivery of equipment, materials from the storage yard/ stores/sheds of BHEL/customer. He shall also make arrangements for verification of equipment, safe custody, watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The contractor shall note that transportation of equipment 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 equipment such as laboratory equipment, measuring and control equipments, gauges, panels, console inserts, switches, transmitters, controllers, power cylinders, cables, conduits etc. shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions. The contractor should also note that while taking delivery of materials from BHEL stores (open/closed), it may be necessary to handle other items which could be blocking the exit route of the materials. *This aspect shall be taken care of in the quoted rates and no extra payment shall be done in this regard*. It shall be the contractor’s responsibility to arrange necessary cranes/tractors, trailer, trucks, slings, labour, etc., etc., for transport of equipment.

4.2.1.2
The contractor shall take delivery of the components, equipments and special consumables from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer.

4.2.1.3
The contractor shall hand over all parts/materials remaining extra over the normal requirement with proper identification tags in a packed condition to BHEL stores. In case of any misuse or use in excess of actual design requirements, BHEL reserves the right to recover the cost of parts/materials used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.

4.2.2
Loading at storage yard, transport to site, unloading at site/working area, pre-assembly of equipments at the pre-assembly yard or at working areas for inspection, checking, erection, calibration, testing and commissioning.

4.2.3
All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments/components for checking and cleaning, fabrication of tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing of cut- outs / openings for mounting of console inserts, modules, indicators, recorders, drilling of holes for gland entries, reaming, scrapping, cable laying, dressing, fitting up etc. as may be applicable in such erection works are treated as incidentals to erection work and are necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work.

4.2.4
Overhauling, cleaning, revisioning, servicing of equipment / instruments, valves etc. during erection and commissioning stages will be arranged by the contractor. However, gaskets /packing for replacement will be provided by BHEL free of cost. All equipments shall be preserved and protected before and after erection as per the advice of BHEL engineer.

4.2.5
The contractor should take all reasonable care to protect equipment and materials under his custody either in his stores or at site. Copper tubing, brass fittings, brass valves etc. forming an integral part of equipment or system are liable to greater damages / pilferages /theft / losses. It will be responsibility of contractor to arrange for adequate security round the clock for protection from such damages / pilferages / theft / losses.

4.2.6
All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and/or handling of the equipments without the specific written permission of the engineer. The equipment from the storage yard shall be moved to the actual site of erection/location at the appropriate time as per the direction of BHEL engineer so as to avoid damage/loss of such equipment at site.

4.2.7
The contractor shall collect all scrap materials periodically from various elevations of the power plant, working areas of the power station, auxiliary and piping around power station and collect he same at one place earmarked for the same. Loads of scraps are to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

4.2.8
All the surplus, damaged, unused materials, package materials, containers, special transporting frames, gunny bags etc. shall be returned to the BHEL stores/ customer's stores by the contractor.

4.2.9
All pipes and tubes, equipments, instruments issued to contractor and kept at site for erection shall be covered with plastic caps/steel caps or shall be closed with suitable plugs by the contractor.

4.2.10
The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipment are erected in position.

4.2.11
Contractor shall plan and transport equipments/components from storage yard/sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Materials shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. It may be specifically noted that the space available for putting up the thermal power plant is limited and accumulation of material may lead to the necessity of shifting and restacking the materials to enable other agencies to carry on with their work or to comply with customer's requirements. If required, the contractor shall arrange shifting of surplus material expeditiously failing which the same will be arranged by BHEL and all charges together with departmental charges at 30% will be recovered from his bills.

4.2.12
Housekeeping in the erection and pre-assembly area is as important as the well-planned and orderly work. The access to site for inspection approaches by BHEL and customer engineers and leading of the material shall be made available by the contractor at all times. The shifting and re-shifting of erection materials, tools and plants and clearance of restrictions, filling of ditches, undulation near the pre-assembly and boiler area is the responsibility of the contractor. Contractor should visit the site and acquaint himself with all restrictions and difficulties that he may encounter during erection/commissioning stages.

Brief description of work

Installation of Panels

Electrical control panels, electronic control panels, unit supervisory control desk, etc., are normally supplied in suit of either one/two/three or loose shipping sections with integral base frame or loose supplied.

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.

4.3.2

Installation of panel shall include fixing of base frame, fabrication of base frame if required, levelling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubicle interconnection hardware, 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 and sealing of cable entries. In certain case where canopies are not supplied but have to be fabricated out of MS sheets provided by BHEL, payment will be done on square meter basis.

4.3.3

Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc. which shall be part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc. Panel have to be erected at different locations and elevation in boiler, TG hall, LT & HT switchgear room, unit control room, ESP control room etc.

4.3.4

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.

4.3.5

Wherever 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 rates shall be applicable.

4.3.6

Normally the panels shall be supplied with instrument, relay, meters, electronic modules etc. mounted and pre-wired. However, if these are supplied loose / separately for safety in transit, contractor shall mount/wire such devices as part of the panel installation work and no separate rates shall be applicable unless otherwise *specially* listed in the rate schedule.

4.3.7

No separate payment shall be made for replacement of any devices like electronic modules, relays, conductors, terminal block, push buttons etc., which are found defective during pre-commissioning / post-commissioning of the panels.

4.3.8

Minor civil works like drilling, chipping, punching holes and opening in concrete floors, slabs and brick walls, grouting, related to Rack, support installation, minor civil works required for installation of control panels, Junction boxes etc., shall be included in the erection cost of such items. Also all miscellaneous civil works like chipping away and making good as necessary in floor slab/wall for cabling / earthing etc., as required are included in the scope for which no separate payment is applicable. The scope also includes supply of grouting material, if any.

4.4.0 Structural steel fabrication and installation

4.4.1

Structural steel material like MS angles, channels, beams, flats, plates etc. shall be supplied in running meter and same shall be used for fabrication of panel base frame, cable tray supports, canopies, instrument and junction box frames, impulse pipe/instrument air pipe supports and instruments etc.

4.4.2

This shall include cutting into size, conduiting of end connections, if required, welding, grinding of excess weld deposits, 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.

4.4.3

All the fabricated supports/frames shall be applied with one coat of primer red oxide paint before installation and two coat of synthetic enamel of prescribed shade of final paint,. If required, BHEL shall prescribe time gap between first and second coat of final paint.

4.4.4

Frame installation/cable tray accessories' 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***.**

4.4.5

In certain packages, galvanised members of junction box frames and instrument racks shall be supplied in cut to sizes and frame assemblies are required to be done as per drawing by bolting/welding. The installation rate as quoted shall include the assembling of the frames.

4.4.6

Gas cutting of tray/impulse pipe support and gas cut holes in frame shall not be allowed. Only drilled hole shall be permitted in frame etc.

4.5 Laying of pipes and tubes (impulse pipe & instrument air pipe)

4.5.1

Root valves are generally provided on process pipe line by other agencies. Prior to starting impulse pipe, contractor to identify the process point with respect to PIDs.

4.5.2

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/CS valve manifolds and compression fittings, providing supports, clamping, conducting leak test/hydraulic pressure test and painting and other accessories as per instrument hook-up diagram. Piping works shall involve either arc or tig welding.
All the impulse pipes are required to be hydraulically tested after erection. The contractor must arrange for necessary equipments/consumables at his own cost for doing the same.

4.5.3
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.

4.5.4
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 and seal welding of threaded joints.

4.5.5
Threaded joints of air pipelines shall be made leak proof by using Teflon tapes or sealing compound. All consumables shall be in the scope of contractor.

4.5.6
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 and no separate rates are envisaged.

4.5.7
Contractor shall provide GI "U" clamps for impulse pipe and GI pipes within the quoted rates for installation of the same.

4.5.8
Impulse pipes shall be applied with one coat of primer red oxide paint and two coats of synthetic enamel of prescribed shade of final paint. BHEL may prescribe a time gap between first coat and second coat of final paint.

4.6 Cable trays/cable ducts

4.6.1
Various types of sheet metal, galvanised cable tray, i.e. Perforated, ladder type, seal metal duct, solid bottom tray, shall be provided in a standard length along with accessories like hardware, bends, reducers, coupler plate, tray covers and tray clamps etc.

4.6.2
Installation of cable tray/cable duct shall include cutting, laying, jointing, supporting, drilling holes in the support, providing tees/reducers/bends/clamps as per tray route layout. Fabrication of bends/tees/reducers from straight length, fixing of tray covers, welding of tray on support, cleaning and application of cold galvanising paint on weld joints including supply of paint is in the scope of contractor. *Installation of*

tray/duct covers, wherever provided, will be done as a part of tray erection and no extra rates will be payable.

4.6.3
In case cable trays 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 instance.

4.6.4
Cable trays/ducts have to be routed underground in cable trench, over head on structure, valves, floors etc. for various applications such as cable laying, copper tubes, conduits, thermocouple, temperature gauge capillary etc.

4.6.5
Installation of Copper tubes/SS tubes/copper pipes shall include cutting into required length, laying, bending, cleaning, brazing wherever required, fixing of brass 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.

4.7 Cable laying (power/control/instrumentation shielded cables/plug-in cables/intra-plant bus/data highway, armoured/ un-armoured, single/multi-core, PVC/HR PVC/FRLS/TEFLON/XLP insulation)

4.7.1
Cable laying include cutting to the required length, laying in overhead/underground cable trench/through pipes/flexible conduits, dressing/clamping in tray, drilling of holes in gland plates in panels and junction box, glanding, splicing, dressing of spliced wire inside the panel and JBs, printed ferrules, termination by using crimp type copper tinned/aluminium lugs, insulated/un-insulated, termination (crimp, soldering, etc.), plug-in connections with insert type crimping, providing identification cable tags, PVC/aluminium at both the ends and at appropriate interval throughout the route length, continuity checking, insulation resistance checking, high voltage test on HT cables.

4.7.2
Entry to the panels and JBs may be at top, sides or bottom. All cables are required to be properly supported and clamped near to the JB/panel.

4.7.3
Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, prefab plug-in cables, etc., for such cases cables may have to be lifted inside the panel by either making cut-out in gland plate and providing rubber profile for sharp edge protection or alternatively, providing 4” or 6” PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.

4.7.4
Supply of copper tinned lugs of various types (pin, ring, fork, snap-on) upto 4 sq.mm, PVC cable ties, PVC button and tapes, cable identification tag of PVC/metallic, clamping and dressing material with hardware, PVC sleeves etc. shall

be supplied by the contractor within the quoted rates for cable laying. Ferruling shall be done by ferruling machines with printed termination details on single sleeves as a part of this job. The quality of material shall be got approved from BHEL engineer prior to their use on job.

4.7.5

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

4.7.6

Cable shielding – all signal cables are supplied with bare shielded copper wire/with braided wire shield. Generally shield wire is kept isolated at instrument/field device end and continuity is maintained through JBs and grounded at panel end only. While terminating the shield wire either in panel or JBs, PVC sleeves are to be used to avoid two-point earthing.

4.7.7

Wherever cables run through ducts, conduits, valves, etc., they shall be sealed using fire/weather proof compound. In addition to this, cable entry in panels, MCCs, instruments, electrical actuators etc., are also required to be sealed. The required material for doing so shall be deemed to have been included by contractor in the cable laying.

4.7.8

Many of the cable trays and cables have to be laid in cable trenches. For this purpose, the cover of the trenches have to be opened for working in site and whenever the cables are to be laid in existing cable tray, all safety precautions have to be observed.

After completing the work, the trenches have to be cleaned and covers put back into position. Contractor shall also carry out de-watering from the trenches if required and arrange pumps etc., at his cost.

4.7.9

Looping wire at terminal block of panels and electrical actuator as shown in the inter-connection diagrams or as required is to be done by contractor at no extra cost.

4.7.10

Contractor shall carefully plan the cutting schedule of each cable drum in consultation with site engineer such that wastage are minimised.

4.7.10.1

The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits;

Sl No.	Item	% Wastage on issued Qty
1.	Fabrication steel	2
2.	Each size of power cables	1
3.	Each size of control/Inst cables	2
4.	Impulse pipe/tubes/GI pipes/copper tube	1

If however, the bidder quotes for more wastage than specified above, the excess portion will be considered for adjustment during the tender evaluation at the quoted supply rate of material.
If the actual wastage be more than the specified figure, then equivalent price of the excess portion will be deducted from the contractor's bill.

4.8 Field instrumentation

4.8.1
Various type of primary/secondary indicating/recording instrument for pressure, temperature, flow, level and analytical measurement shall be supplied either loose or mounted along with the equipment.

4.8.2
Scope of work under erection/calibration/testing/commissioning shall include calibration, setting, adjustment, writing instrument tag number with paint, report making, installation, servicing, minor repairs/servicing, putting instrument into service, signal checking from field upto the functional group panels and remote indicating instrument, functional checks, interlock and protection/alarm checks by simulating the field devices, providing assistance for trouble shooting during pre-commissioning/post-commissioning till system is handed over to the customer.

4.8.3
It is the responsibility of contractor to make erection, calibration/testing protocols for various C&I equipments/devices and they should get duly certified by customer/ BHEL engineer and should be submitted to BHEL engineer regularly. However, sample formats will be given by BHEL and have to be printed by contractor in adequate numbers.

4.8.4
Contractor shall establish calibration laboratory with adequate facilities and they should arrange standard test instruments duly calibrated from recognized agencies and calibration report of the same to be submitted prior to start of calibration of the field instruments/devices.

4.8.5
Fixing and seal welding of the thermowells for temperature measurement is in the scope of mechanical contractor. However, the contractor will coordinate and assist the mechanical contractor in identifying the tapping points and fixing the same as per PIDs.

4.8.6

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.

4.8.7
Some devices line solenoid valves, feedback position transmitters, limit switches, air filter regulators, airlock relays, positioners etc., are supplied assembled along with mechanical equipments like pneumatic control valves, power cylinders, trip valves, dampers, etc. These will need removal, calibration/testing, refixing, adjustment, etc., and commissioning. Separate payment shall not be made for this. The rates quoted for the commissioning of these equipments (viz., pneumatic control valves, power cylinders, trip valves, dampers, etc.) should take care of the above. Also, the contractor shall remove such devices prior to erection either at site or at store to avoid damages/pilferages and keeping in safe custody and the same shall be installed prior to commissioning of such equipment. The rates quoted in the rate schedule for such items will be applicable only if the items are received as loose items and not as an integral part of mechanical equipments.

4.8.8
It shall be the responsibility of the contractor to ensure that the calibrated instruments show correct reading while installed in the system.
However, recalibration may become necessary due to reasons not attributable to the contractor, e.g. Lapse of Time after first calibration, Need for change in range/parameter, etc. If re-calibration is required due to no fault of the contractor, the rates payable for re-calibration shall be as under:

Recalibration Charges = 60% of the Percentage Stage Payment for Calibration as per split-up defined in Terms of Payment (Section-12)
The contractor shall keep record of such instrument with the reason for re-calibration and certified by the BHEL Engineer.

Note: For recalibration of skid mounted items or other systems where lumpsum rates are quoted, the recalibration charges, if admissible, will be calculated from the relevant unit rates quoted for same / similar items elsewhere in the rate schedule. The decision of BHEL Engineer shall be final and binding on the contractor.

4.8.9
For the very few cases where required, the contractor shall carry out re-orientation of bottom/top entry arrangement for process connection if needed due to site condition in existing instrument rack/enclosure/JB and re-location of existing instrument including removing of the existing tubing and re-installation of the same at appropriate location due to any change in grouping of the instrument and no extra payment shall be applicable.

4.8.10
In certain cases instruments / devices are supplied on equipment or drawn by other agencies as part of mechanical package. The same are to be received or to be collected from other agencies for keeping in safe custody to avoid damages. The same are to be erected back after calibration for which unit rate shall be applicable for erection and calibration. Contractor shall maintain record of such instrument

duly certified by BHEL engineer. However for removal of such instrument, no separate rate/payment shall be applicable.

4.9.0 Unit Control Desk

4.9.1
The installation of the unit control desk is not in the scope of this contract. However, the contractor has to install and commission loose items supplied separately for the unit control desk / control desk for completion of work included in this contract. No extra payment shall be made for installation / commissioning of such items unless specifically mentioned in the rate schedule.

4.10.0 INSTALLATION OF PANELS AND MCC

A. Electrical control panels, electronic control panels, unit supervisory control desk, 415 volt LTMCC, 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.

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 hardware, 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. Payment for such fabrication will be effected on measured quantity at the rate applicable for structural steel fabrication and installation. Special material required for fireproof sealing of the panels shall be supplied by the contractor within the quoted price. 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 Boiler and STG hall, LT & HT switchgear room, 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.

4.10.1 MAX DNA System Panels

Steam generator, turbo generator, station C&I / Balance of Plant and Electrical Control System panels are based on digital distribution control philosophy. Max system is having ethernet communication to various panels (dpu), max storian, max link and max stations and its peripherals like printer etc. Max system comprises of event monitoring, video process control, alarm management, calculation and logging, comprhensive history, reports, statistics, file archiving. The various components / devices are located in control room / panel room and shift in-charge room. The entire work of erection, testing, commissioning of the connected devices/ equipments as listed in rate schedule is to be carried out including laying of peripherals cables (either plug-in or plugs to be fabricated at site), placement of computer furniture in computer room as per layout. The computer furniture shall be supplied either assembled or in knocked down condition, which have to be assembled at site. The quoted rate shall be inclusive of cable laying, termination and placement of furniture against each devices as given in the rate schedule.

4.11 Final Painting

4.11.1

All the fabricated frames, instrument racks, Junction box frame, trays / impulse pipes, supports, panel base frame, etc., wherever applicable shall be first painted with one coat of primer paint (metal red oxide) and then two coats of synthetic enamel paint of approved shade by BHEL Engineer after thoroughly cleaning the surface of dust, rust, scale, grease, oil, etc., by wire brushing, scrapping or any other suitable method. The quoted rates should be inclusive of all these including supply of paints and consumables.

Contractor at no extra cost to BHEL shall supply all paints; primers, tools and other consumables including scaffolding materials required for finish painting. Paint is to be BHEL approved make only and painting should be as per colour scheme and quality approved / specified by Engineer. Valid Test Certificate for the paint so supplied shall be made available before use of the same on work.

4.11.2
Other equipment like JB, Panels, transmitter racks, Local gauge boards etc., shall be painted with two coats of synthetic enamel paint. The quoted rates should be inclusive of application of two final coats of synthetic enamel paint. All the consumables such as wire brush, other cleaning materials, painting implements, etc., is to be arranged by the contractor at his own cost. The quoted rates should be inclusive of supply of paints and consumables. All equipment painting shall be done by spray painting.

4.11.3
All the weld joints of GI cable trays and GI structural members shall be applied with a coat of cold galvanising zinc paint. The quoted rates should be inclusive of supply of paints and consumables.

4.12 Misc. Other instrument/equipment Erection, Calibration and Commissioning.

4.12.1
Wherever panels, pneumatic power cylinders and control valves and actuators have been erected by the mechanical contractor, calibration/ commissioning has to be carried out by the contractor.

4.12.2
SADC power cylinders are to be erected by contractor in coordination with other agencies as per instructions of BHEL. For SADC power cylinders, copper tubing will be supplied by BHEL. The copper tubing work from the instrument line header to the power cylinder and the internal connection to be carried out by the contractor as per site requirement. *Necessary security against pilferage is to be arranged by contractor.*

4.12.3
In the case of electronic water level indicator, electrodes may be supplied loose and the same need to be fixed in the pressure vessel as per the drawings. No extra charges will be payable.

4.12.4
Position transmitters are to be erected by contractor if supplied loose.

4.12.5
The solenoids on the oil guns will be received in mounted condition and the same will be erected by the mechanical contractor. The contractor has to provide the services required for removing the solenoids and remounting the same after servicing/adjustment. Payments will be made as per testing/commissioning portion of the rate quoted for these items and no extra charges will be payable for removal and re-fixing.

4.12.6
Dimension and weight as mentioned against control panels, MCC, etc. in rate schedule are only approximate and there may be changes in dimension and weight in actual supply of the equipment and no rate variation shall be applicable on this account.

4.12.7
Wherever brief description of the system is given under various sub-heads, it is only for the understanding system requirements. It does not indicate the total specification of work. For such system, other clauses are also applicable wherein work details are specified.

4.12.8
Supervision services for certain sub-vendor supplied packages will be in supplier's scope for installation and commissioning. However, contractor shall carry out the work as per the instruction of their engineers and also provide necessary assistance during the execution of the work.

4.12.9
Normally, cable glands on junction boxes side are received in mounted condition. While terminating the cables as per drawings, the cable glands are to be removed and fixed. Wherever cable glands are not received along with junction boxes, the cable glands as per the requirement will be provided by BHEL and the contractor has to make necessary holes/adjust the available holes in the JB for fixing these. No separate payment will be made for drilling of holes and fixing the cable glands to the junction boxes. Nameplates for JB will be supplied separately. These are to be suitably written and fixed onto the JB. Separate payment will not be made for this.

4.12.10
The push buttons and indicators in C&I systems are provided as loose with different type of connectors. The fixing of connectors and their wiring from push buttons to indicators shall be the responsibility of contractor. No separate payment will be made for fixing of connectors. The cable laying and termination charges will be paid as per applicable rate schedule.

4.13.0 Pre-commissioning/Commissioning and post-commissioning activities

4.13.1
The work is also inclusive of various commissioning activities of the boiler and turbine package along with its auxiliaries and station package. The various activities, tests, trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of customer/consultant/ statutory authorities like boiler inspector, electrical inspector etc.

4.13.2
In case any malfunctioning and/or defects are found during tests, trial runs such as loose components, undue noise or vibration, strain on connected equipments etc., the contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment and realignment is necessary, the same shall be done as per BHEL engineer's instructions.

4.13.3
During each stage of commissioning, if any part of the instrument needs repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim, if any, for such repair/rectification/ rework/replacement etc. for reasons not attributable to contractor will be governed by clause 13.1 to 13.9 of the specification. The parts to be replaced shall however be provided by BHEL free of cost.

4.13.4
The pre-commissioning activities will start prior to light up of boiler and various trials, commissioning operations shall continue till the unit is handed over to customer. Simultaneous commissioning activities will be in progress in various areas, checking of equipments erected, making ready for trial runs, alkali flushing, chemical cleaning, mass flushing etc. All these works need specialised gangs including electricians/instrument mechanics in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted.
The mobilisation of these commissioning gangs shall be such that planned activities are taken up in time and also completed as per schedule and the work undertaken round the clock if required. It is the responsibility of contractor to discuss on day to day / weekly / monthly basis the requirement of manpower, consumables, tools and tackles with BHEL engineer and arrange for the same. If at any time the requisite manpower, consumables, T&P are not arranged then BHEL shall make alternate arrangements and necessary recoveries with overhead charges will be made from the bills of the contractor.

4.13.5

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

4.13.6
In case any rework / repair / rectification / modification / fabrication etc. is required because of contractor's faulty erection which is noticed during commissioning or at any stage, the same has to be rectified by the contractor at his cost. If any improvement /repair /rework/ rectification/ fabrication/ modification due to design improvement/requirement is involved, the same shall be carried out by the contractor promptly and expeditiously. Claims if any, for such works from the contractor shall be governed by clauses 13.1 to 13.9.

4.13.7
It is the responsibility of contractor to provide for necessary labour, tools and tackles and consumables till the completion of work under these specifications even in case erection, testing and commissioning of this work is delayed due to reasons not attributable to the contractor.

4.13.8
During commissioning activities and carrying out various tests, minor items like gauges, manometers, etc., have to be temporarily erected and put in service to suit the commissioning activities. BHEL will provide the necessary gauges and equipment. Contractor has to carry out the erection, calibration, dismantling of the same. After completion of activities the temporary systems have to be removed and returned to stores. No extra charges will be payable towards these.

4.13.9

During pre-commissioning, commissioning, post commissioning and trial operation stages of various systems, certain category of manpower assistance with T&P and consumables will have to be provided to BHEL commissioning engineers exclusively at their disposal. It shall be the responsibility of the contractor to provide following category of minimum manpower assistance including necessary consumables, hand tools, calibration equipment etc. The quoted rates shall include this.

1)	Supervisor (diploma in Electrical / Instrumentation Engg)	2 nos.
2)	Electrician (ITI)	4 nos.
3)	Instrument technician (ITI)	2 nos.
4)	Helper/fitter/welder	6 nos.

The above figures shows only minimum required personnel over and above manpower required to complete works. Contractor has to augment the manpower as and when required as per work demand and necessity at site.

4.13.10
It shall be specifically noted that above employees of the contractor may have to work round the clock and hence considerable overtime payment may be involved. No additional compensation by for the same shall be payable, irrespective of number of hours per day.

4.13.11
For electrical works, 415 volts and above, the contractor has to bring qualified electricians.

4.13.12
Certain systems will be supplied with portable programming units, which are to be connected at various locations during pre-commissioning to handing over. Necessary cabling interconnecting the programming units and other connected panels has to be carried out by the contractor and are to be dismantled after work. For the purpose of testing, monitoring, commissioning, etc., these programming units will have to be repeatedly connected and disconnected at various locations. No separate payment will be entertained for the above.

4.13.13
The contractor in addition to erection and commissioning of the AVR and Generator Protection, Control Panel is to carry out the integrated system testing as per following:

1. Relay Testing in static condition for Generator, Transformer, and associated protection system.

2. Testing and checking of control and protection system in static and dynamic system.

3. Checking the Healthiness of Insulations, Resistance, Polarization Index of individual systems / equipments, and combined system.

4. Simulation checks.

5. Relay setting and checking the stability checks of protection relays and systems in static and dynamic condition.

6. Functional checks / testing of synchronizing schemes during the static and dynamic conditions.

7. Conducting test on Generator during open circuit and short circuit conditions. Optimization of protection and relays setting / systems. Recording and monitoring measurement.

8. Functional checks of relays of protection system by primary injection and secondary injection from field devices.

9. Checks during the synchronization of the machine.

10. Compilation of test records.

11. Conducting test on Generator surge protection system and recording of measurement.

Any other tests need to be carried out during the integration of control and protection system for generator, transformer and associated equipment.

4.13.14 Calibration, Testing & Commissioning Assistance

Calibration, testing & commissioning activity as specified in this technical specification and rate schedule against various equipments, devices, systems etc. are broadly classified below. However, there may be some overlapping between the activities (erection, calibration and testing, commissioning). The classification of activity is only a guideline for understanding the total 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 the work.

A. Calibration

Verification after drawing of material of various types, range of the field devices with respect to instrument schedule, data sheet or system document.

Codification of instruments as per system tag numbers Calibration / adjustment of instrument as per system requirement / set values.

Providing head correction in case of pressure measurement as per calculated values or actual measured value for the instrument, which are used for interlock protections / monitoring. This is generally applicable for turbine / generator, lube oil systems, lube oil system of fans etc.

Verification of installation of instruments for range, type, tag number as per physical location of process point as per process, instrumentation diagram.

Checking and ensuring the proper function of instrument.

All the recorders shall be made functional with proper chart movement and ink marking.

B Erection

Drawal of material from store, verification, inspection as per shipping list, drawings and documents.

Preservation, upkeeping, safe custody of the erected equipments till handing over to the customer.
Verification of installation as per drawing and document for the correctness of cabling, JBs, impulse pipe, various field device, panels, instruments etc.
Continuity check and IR value check of cables.
Verification of correction of cable termination with respect to instrument, electrical hook-up diagram, panel interconnection diagram, JB schedule.
Checking earthing of the equipments and cable shield wire continuity.
Energizing the functional group control panels and field devices.
Flushing of impulse pipe before making the instruments process connections through.
Any leakages, damages to impulse pipe, field device connections, air connections etc. shall be fully attended by contractor.
All cable glands/piping/tubing to be fixed as per installation requirement before commissioning.

C Testing & Commissioning Assistance

Checking/verification of binary/analogue input and output signal from field and panel and upto recording/indicating instrument/MMI monitors.
Adjustment, testing, calibration of pneumatic drive (control valve, trip valve, power cylinder for gate/dampers), electrical actuator operated valve/gate/dampers of other functional elements.
Checking the operating electrical/pneumatic drive through functional group panel, remote control desk, MMI, CRT operation and repeatability and smooth operation to be checked.
Checking the interlock, protection and alarm for various process by simulation of field devices/process changes.
Functional check of sub-loop control, sub group control and auto loop and fine tuning.
Adjustment of limit switches / feedback position transmitter checking the actuator for correct Limit switch operation for correct position indication and repeatability shall be ensured.
Motor IR value measurement, bearing/winding RTD checking, drying out of motor, providing assistance for trial run of motor which includes monitoring temperature rise winding/bearing during trial run.
Contractor shall prepare calibration/testing report/protocols.
During trial run of various systems, if the performance of any instrument is found erratic, un-satisfactory and requires re-adjustment, re-calibration etc., the defect shall be attended by contractor.
Observing and checking the performance of the various devices on load/process variation. Any deficiencies/defect noticed during the variable load conditions, the same should be attended properly.
Observe the proper functioning of sub-group/sub-loop control.
Check the operation of various control in manual /auto mode for smooth functioning.
Clearing of all bad / invalid signals noticed during commissioning.
Providing necessary assistance for trial operation of the unit. Trial run activity shall continue for a month's time and smooth operation and availability of all instrument/control shall be ensured. Contractor shall provide adequate numbers of skilled manpower for this purpose.
If any small wiring correction or minor modification in control panel wiring is noticed during the commissioning, it shall be carried out as a part of commissioning activity.

D Post-commissioning

Contractor shall rectify the defect observed/informed by customer during the trial run.

Contractor shall submit the as- built drawing as per guidelines and instruction of BHEL engineer.

4.14.0 Guidelines for erection

4.14.1 Impulse Pipelines

4.14.1.1

All impulse pipelines, air lines shall be thoroughly cleaned by removing the dust, burrs etc., and any foreign matter inside the pipe/air line is to be cleaned by compressed air or any other suitable means before installation.

4.14.1.2

The routing of pipelines shall include sufficient flexibility near tappings to allow for thermal expansion of process equipment.

4.14.1.3

The pipes shall be cold bent using hydraulic bending machines only.

4.14.1.4

The horizontal impulse pipelines shall be laid with proper slopes towards the tapping point.

4.14.1.5

Supports for piping and tubing shall be adequate and in no case exceed limits shown below:-

A) 1/4" OD / 3/8" OD copper	continuous
B) 1/2" NB pipe/tube	5 ft.
C) 3/4" NB pipe/tube	5 ft.
D) 1" NB pipe/tube	8 ft.

4.14.1.6

All CS impulse line welding shall be done with welding generator/rectifier and only structural welding could be done with welding transformer.

4.14.1.7

Impulse pipes of alloy steel/SS/carbon steel etc. shall be TIG welded. Contractor shall arrange for necessary TIG welding sets, electrodes etc.

4.14.1.8

Minimum number of fittings shall be used on all lines wherever possible, to keep threaded joints to a minimum wherever threaded connections are to be made.

4.14.1.9

On completion of pipelines installation, the pipelines shall be hydraulically tested. Contractor shall arrange for hydraulic pump and standard gauges and conduct the test satisfactorily.

4.14.1.10 Testing

The impulse lines shall be isolated from instruments and tested at 2 times the maximum working pressure. The fall in pressure shall not be more than 1 kg/cm^2 or 1% of the working pressure whichever is less, in 30 minutes and there shall be no leaks at any of joints/welds when isolated from source of pressure.

4.14.1.11 Air Pipelines

All instrument air pipelines shall be isolated from the instruments and pressurised pneumatically to maximum working pressure. They shall then be isolated from the source of pressure and fall shall be less than 1 PSI in 20 minutes.

4.14.1.12 Pneumatic signal lines

All pneumatic signal lines shall be disconnected and blown through with instrument air. The line shall be blanked off and pressurised pneumatically 20 psi and checked with soap solution for leaks and attended accordingly.

4.15.1 Electrical cabling /wiring

All the cables will be properly laid in cable trays, dressed and clamped with aluminium flats. The cable will be terminated at both ends with suitable lugs and printed ferrules and will be glanded properly. Suitable equipment and consumables for ferrule printing has to be arranged by the contractor at his own cost. For cable identification, the contractor shall provide at his cost aluminium tags at regular intervals through one run of the cable.

4.15.1.1

All electrical connections shall be tested for polarity and proper connections.

4.15.1.2

Insulation test of the various circuits shall be done.

4.15.1.3

The checking of operation of individual equipment and instruments to which the cabling/wiring connected shall also be done by the contractor.

4.15.1.4

Wherever supplied, GI cable trays shall be of bolted construction only with fixing screws and coupler plates.

4.15.1.5

To the extent possible, all the trays shall be fixed in vertical orientation

4.15.1.6

Sharp bends of cable trays shall be avoided in all type of cable trays.

4.15.1.7

Installation of cable racks and supports structure shall be carried out in all the required areas. Steel embedment shall be provided in the cable trenches, ceiling slabs and concrete blocks for installing the cable racks and support structures.

A) ladder perforated type able trays shall be used in cable trenches and vertical risers.
B) Perforated type cable trays shall be used in higher elevations in boiler and TG areas.

4.15.1.8
Cable racks in the trenches and control room are to be shared with other contractors installing cables in different areas wherever required. Contractor shall cooperate with the other contractors in sharing the cable trays and proper dressing and clamping the cables.

4.15.1.9
Where power and control cables are to be laid in the same route, suitable barriers to segregate them physically shall be employed.

4.15.1.10
Space equal to the diameter of cable shall be provided between power cables of six over 50 mm in diameter.

4.15.1.11
When cables pass through floors, walls etc., it shall be passed through a pipe for mechanical protection and the pipe ends sealed suitably.

4.15.1.12
Care shall be taken to avoid short bending and kinking of conductor damaging insulation and stressing the cable beyond pulling force recommended by the manufacturer. Cable shall be protected at all times from mechanical damage.

4.15.1.13
The minimum radius of formed bend of an insulated cable shall be 12d for un-armoured cables and 15d for armoured cables where‘d’ is the overall diameter of the cables.

4.15.1.14
No cable shall be laid in ducts or trenches where other services such as oil pipes, steam or water pipes are laid.

4.15.1.15
Where cabling passes through brickwork or concrete work, the contractor shall provide suitable local protection against mechanical damage wherever necessary.

4.15.1.16
The layout of all cables shall be arranged to give adequate clearance from other services and cables shall be routed to avoid hot zones.

4.15.1.17
Jointing of cables shall be avoided as far as practicable. However, jointing if at all necessary shall be done by crimping type cable joints after getting approval of BHEL.

4.15.1.18

The cable schedules indicating cable sizes, tentative cables routing information will be furnished by BHEL at site to the contractor. Required steel inserts on cable trenches, ceilings of the platforms in TG hall for erecting the cables will be provided by BHEL. The contractor shall design number of cable/racks to accommodate the cables on racks/trays properly.

4.15.1.19 TERMINATION OF CABLES:

The types of cable terminations are as detailed below:

1) Power cable : Crimping hydraulic/manual
2) Control cable: Manual crimping
3) Crimped/soldered plug-in-type

Screwed type.

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 as mentioned above.

Additionally ferrule printing machine for printing of sleeved ferrules of various sizes will also be arranged by the contractor.

4.15.2.0 Earthing Installations

4.15.2.1

All equipments shall be earthed by two separate and distinct connections. Earthing terminals will be available in all equipment supplied by BHEL.

Section-5

Special Conditions of Contract

5.0 Obligations of the Contractor (Tools, Tackles, Consumables etc.)

5.1 Labour Colony

No space/land for labour colony will be provided by BHEL/customer. The bidder has to make his own arrangements for labour colony including providing the Water, Electricity, Sanitation, Fire prevention & firefighting arrangement, Medical facility, labour colony area fencing etc.

5.2 Tools & Plants, MMD

5.2.1
The contractor shall provide all required tools and plants, inspection, measuring and monitoring devices (MMD), test & calibrating equipment, handling & transportation tackles/equipments etc. For the scope of work covered under these specifications including the T&P and crane/arrangements for handling/lifting & placement of Heavy equipments like Turbine, Generator Stator, Surface Condenser & Dome, De-aerator with FST, Over head Oil Tank, HP heaters, Turbine components, Ceiling girders of Boiler, Boiler drum, Lower & Upper drum, Erection of Boiler structure and high reach components etc. required to carry out and complete the works covered under this tender specification. EOT crane of customer/BOP vendor will be provided free of charges for handling and erection of TG equipments subject to its availability and accessibility. No claim on account of non availability of EOT crane will be entertained.

An indicative list of major T&P /MMDs to be deployed by the contractor is given in the Appendix-VI**.** It may be noted that this list is not intended to exhaustively cover the contractor's responsibility with regard to T&P to be deployed by him.

Contractor will provide the skyraks (min 2 nos) during Boiler erection to facilitate the erection and inspection as scope of work.

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.
All the tools and tackles, calibrating instruments etc. to be deployed for this work shall have range and accuracy level prescribed by BHEL and shall have valid calibration from approved agencies to be specified by BHEL.

The contractor shall provide all the necessary steel scaffolding materials, temporary structures and necessary safety devices etc. during pre-assembly, calibration, erection, testing and commissioning of the equipment.

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,calibrating/measuring/testing instruments 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, machineries, calibrating and testing equipments and non availability of the same owing to breakdown or otherwise, BHEL will resort to hiring out the same from outside agencies or may provide their own equipment, if available or may resort to buying of equipment at the cost of the contractor. Full cost of equipment/hire charges/ rental charges along with applicable departmental overheads (presently@ 30%) will be charged to the contractor.

5.2.6
The T&P/MMDs 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&P etc shall be the contractor's responsibility. Timely deployment and required quantity is the responsibility of contractor. Also he should be able to augment the erection equipments at short notice to match the planned programme every month and to achieve the milestone events. Air compressor, blowers, etc., required for erection purpose like cleaning of panels, impulse pipes, equipments, and for any other incidental work wherein compressed air is required, shall be arranged by contractor.

5.2.7
Normally, for welding only the use of welding generators/rectifiers will be permitted. The use of welding transformers 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 (MMD) and tests. Test/ calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL.

5.2.9
Contractor shall supply all temporary piping, valves, reducers, Flanges, orifices with fittings, Chemical Pumps and acid transfer pumps etc. Materials along with all required Chemicals and carry out the Alkali Boil out, Acid cleaning of Boiler with Aux. And Chemical flushing/cleaning operations of Pre-boiler system as part of scope of work and (refer clause 4.6).

5.3 Consumables

5.3.1
The contractor shall provide all consumables including fuel, lubricant, hydraulic oil and grease for all his T&P etc as required from time to time for carrying out the work covered under these specifications excepting those, which are specifically indicated as BHEL scope.

Special Consumables like Hylomer, Golden Hermite, Stag-B, Molycote, Anbond compound, Rubber fixing compound, Grouting materials (like Portland cement, Conbextra GP-1 & GP-2) etc. And any other routine consumables for entire scope of work for Boiler & Boiler Aux. Along with ESP, Anti corrosive paint (Bitumastic) for inside painting of cladding sheets, Anti corrosive paints for site weld joints, as required shall be supplied by contractor as part of scope of work.

The consumables and items to be provided by BHEL free of charges are indicated in Appendix-II**.**

All small fixtures of required quantity like bolts, nuts, washers etc. for fixing the instruments, clamps for dressing and clamping cables, impulse lines etc., Teflon tapes etc. required to complete the job as per good engineering practice and in all respects, shall be supplied by the contractor at his cost.

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
Wherever required contractor shall provide concrete blocks, Wooden/Concrete sleepers for stacking of materials and pre-assembly alignment/leveling/checking of pressure parts/duct and other fabricated components is storage yard, Pre-assembly yard and closed shed as per required.

5.3.4 Chemicals

Contractor shall provide all required quantity of Chemicals, filled Nitrogen cylinders for chemical flushing/chemical cleaning/ Alkali flushing and Alkali Boil out and acid pickling etc. For entire scope of work.

All chemicals required for chemical cleaning/acid pickling of oil systems of equipments and systems covered under these tender specifications shall be provided by contractor as per BHEL specification as scope of the work.

5.3.5 Primers, Paints etc.

The contractor shall provide ROZC Primer conforming to IS:2074 for touch up painting of all site weld and gas cut joints/edges.

Contractor will provide paints with primer for Final/Finish painting of Equipments with Aux and piping system under this tender specification.

5.4 Welding Electrodes, Filler Wires For TIG Welding and Gases

5.4.1
Contractor at his cost shall arrange all the required welding electrodes as approved by BHEL. 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
Filler wires for TIG welding of high pressure joints of Power Cycle piping, to the extent as supplied by the BHEL manufacturing unit (**Piping Centre Chennai under PG-80**) as part of equipments supply scope will only be provided by BHEL free of cost. No filler wires shall be supplied by BHEL for Boiler & Boiler Aux. And other equipments including its integral piping under these tender specifications.

For any further additional requirement and requirement of filler wires for rest of equipments/system under the scope of this tender specification, contractor shall arrange required quantity of filler wires as required for satisfactory completion of work as scope of work.

5.4.3
All the required gases for welding and gas cutting 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.

5.5.0 Field Office

5.5.1
The contractor shall make his own arrangements for field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL/ customer free of charges as per the availability of space.

The contractor shall make his own arrangements for field office with necessary equipments, calibration laboratory tool room, office for staff, storekeeper, watch and ward etc. for the execution of the work. After the completion of work, contractor shall

dismantle the above structure and hand over the land clear of all debris and temporary constructions to BHEL/customer.

Contractor shall establish instrument testing/calibration laboratory including test benches, instruments and adequate space for storage of instrument.

5.5.2
On completion of work, all the temporary buildings, structures, pipelines, cables, etc shall be dismantled 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.

5.6.0 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.

5.7.0 Construction Power & Water (Free of charge)

5.7.1
Construction power (415V/440V) will be provided **Free of charge** at a single point for total scope of work inside the project site. The contractor shall provide all necessary cables, glands, fuses, switches, switchboards, ELCB, energy meters etc. And any other installation as specified by statutory authority in this regard for further drawl of power. Obtaining approvals, payment of necessary fees, duties etc towards the clearance of such installations, prior to their being put to use or as may be specified, shall be the responsibility of the contractor.

5.7.2
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.

5.7.3
The contractor shall install necessary Capacitor Bank etc. With appropriate control mechanism to maintain the Power Factor as per the guidelines in vogue from time to time in this regard. Any levy imposed by the customer / authority for any deviation in power factor shall be passed on to the contractor.

5.7.4

Contractor shall be 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 process that are underway at the time of power failure or important activities planned in immediate future.

5.7.3
The customer will provide water for construction purpose at a single point near the site. Further distribution, if permitted by the customer, has to be arranged by the contractor at his cost.

5.7.4
In case of non-availability of customer supplied power and/or water; it is the responsibility of the contractor to make alternate arrangements. Contractor shall be adequately equipped to arrange standby diesel welding generators in the event of construction power failure. Essential welding jobs shall not be stopped on account of main construction power failure.

5.7.5
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.

5.8 RESPONSIBILITIES WITH REGARD TO LABOUR EMPLOYMENT ETC.

5.8.1
The contractor will obtain independent license under the contract labour (regulations and abolition) act 1970 from the concerned authorities based on the certificate (Form –V) issued by the principal employer/customer.

Contractor will deduct the necessary amount from his employees towards provident fund and contribute equal amount as per government of India labour laws regularly, will deposit this amount to the provident fund commissioner and get the account code. Contractor shall submit the account code duly certified by PF commissioner to BHEL project in-charge.

Contractor shall also comply with the provisions of ESIS act in vogue and submit evidence thereof to BHEL site in-charge. Also all other employees' benefits to be borne by the contractor as per the labour laws. Contractor shall produce necessary certificates towards their compliance with such statutes and payment of all statutory dues.
Where applicable, provisions of workman compensation act shall be adhered to.

Also Refer clause 2.8 of General Conditions of Contract in this regard.

5.8.2
Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.

5.8.3

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.

5.8.4

It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.

5.8.5

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.

5.8.6

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 AND DUTIES

5.9.1 **TDS under Income Tax, Sales Tax, VAT etc,** if any, shall be deducted at prevailing rates on gross invoice value from the running bills unless Exemption Certificate from appropriate Authority / Authorities is furnished.

5.9.2 **Price quoted shall be inclusive of all taxes except service tax.** The service tax, as legally leviable & payable by the contractor under the provisions of applicable law/act, shall be paid by BHEL as per contractor's bill. However, contractor shall have to submit proof of service tax deposited by them immediately after the deposit but not later than the next bill submitted after the due date of deposit. The contractor shall furnish proof of Service Tax registration with Central Excise Division covering the services covered under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by contractor on BHEL for this project The contractor shall obtain prior approval of BHEL before billing the service tax amount.

With introduction of Cenvat credit rules 2004 which came into force w.e.f. 10.09.2004, excise duty paid on input goods including capital goods used for providing the output service and service tax paid on input service can be taken credit of against the service tax payable on output service. **As such, while offering the rates, the contractors may take into account the benefit of above provisions as the cost of input to contractors will be the cost net of excise duty and service tax and adjust their offer price accordingly to make it more competitive.**

5.9.3 In VAT applicable States, "Tax Invoice" if required under the relevant State VAT law shall be submitted alongwith other compliances as per concerned VAT Act.

5.9.4 Contractor shall get his organization registered with concerned sales tax/VAT authorities within 15 days of award of this contract, if applicable. The delay on this account and delay in bringing the material shall be to contractor's account and no extension of time shall be allowed on this account. The sales tax/VAT registration for this contractor shall be forwarded to BHEL within 30 days from the date of LOI. In case the contractor is already registered for sales tax/VAT with Govt. Authorities he must quote his registration no, while submitting their tender.

5.9.5 Contractor has to make his own arrangement at his cost for completing the formalities, if required, with Sales Tax/VAT Authorities, for bringing their materials, plants, and equipment at site for the execution of the work under this contract.

5.9.6 New Taxes/Levies

In case the Government imposes any new levy/tax on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual.

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

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

5.10.0 **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 / Customer'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 inform formats for these reports.

5.11
It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc. Necessary coordination with customer officials is the responsibility of the contractor. Contractor shall follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer/ BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permit for working beyond normal working hours.

5.12 Compliance with Requirements of Statutory/Mandatory Authorities

5.12.1
Refer Section-8 for contractor's responsibilities regarding the work related inspection by statutory authorities.

5.12.2
The responsibilities of contractor with regard to compliance with requirements of statutory/mandatory authorities have been specified in various clauses of the specification. However, in addition to those specified already, the requirements of any other authority viz factory inspector, provident fund commissioner, labour commissioner etc in connection with this work has to be complied with by the contractor.

Section-6

Special Conditions

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

6.1 Supervisory staff and labour

6.1.1
The contractor shall supply all the skilled labour and high pressure welders, carbon and alloy steel welders, gas cutters, riggers, sarangs, erectors, instrument fitters electricians, instrument technicians, instrument calibrators, etc. in addition to other skilled, semiskilled and unskilled labour required for all the work of handling and transporting from site, storage at erection site, calibration, erection, testing and commissioning and all other works envisaged in this tender. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserves the right to decide on the suitability of the workers and other personnel who will be employed by the contractor. 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 the list of personnel proposed to be deployed for this job alongwith their qualification, experience in similar type of job. The actual deployment will be so as to satisfy the erection and commissioning targets set by BHEL. The contractor shall give an organisation chart indicating the staffing pattern for the work. Each area shall be adequately supported by supervisors. This is only for guidance. During execution of work if any area needs extra attention, contractor shall post engineers/supervisors/skilled/semiskilled/ unskilled workers as per the advise of BHEL engineer. Contractor shall submit his manpower deployment plan as per appendix-IVA.

It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the target 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 targets will be final and binding on the contractor.

Contractor shall employ only qualified and experienced engineers/ supervisors for this job. They shall have professional approach in executing the work having adequate knowledge and experience in the fields of erection, erection methodology, calibration, testing and commissioning, quality control and quality assurance procedures, planning, safety etc. required to undertake the type of work as per this tender.

6.2 Safety aspects at site

6.2.1
The safety engineer/supervisor of contractor shall coordinate all aspects connected with this work. He shall be aware of the safety procedures, use of safety equipment, safe rigging and also in a position to enforce strict safety at site. He shall coordinate with the various contractors' engineers, supervisors working gangs to enforce safe

working procedures, he shall also coordinate the timely arrangement of work permits required for hot works and cold works. He should be trained and qualified to give proper guidance and direction to other supervisors and workers. He shall also submit weekly accident report in the format required by BHEL.

6.3 Industrial relations and labour laws

6.3.1

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.

6.3.2

The contractor's supervisory staff shall execute the work in the most substantial and workmanlike 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.

6.3.3

The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor and in general, see that the works are carried out in a safe and proper manner in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.

6.4 Watch and ward

6.4.1

Contractor has to arrange and provide watch and ward round the clock. Any theft or damage of component due to negligence of the contractor will have to be replaced/repaired by the contractor. The areas are unit control room, field and any other place where equipments are kept (stored or installed) by the Contractor.

6.5 Proposed site organisation chart for erection/commng.

6.5.1

Contractor to provide necessary engineers and supervisors for the work and they shall have adequate experience in similar type of work. Adequate staffing shall be provided by contractor in the following areas:-

A. Overall planning, monitoring & control
B. . Materials Management
C. Structures, non-pressure parts
D. Pressure parts
E. Boiler Rotating Auxiliaries
F. Boiler integral , Re-generative system & Power Cycle Piping
G. Electrostatic Precipitator
H. Insulation & Painting
I. Condenser & Auxiliaries
J. Turbine & auxiliaries

K. Generator and auxiliaries
L. Pumps & Auxiliaries
M. Piping
N. Welding & NDT
O. Quality Control And Quality Assurance
P. Safety, Fire & Security
Q. Industrial Relations , welfareand Fulfillment of Labour Laws

Contractor shall furnish an organization 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.

6.5.2
Contractor should provide a team of engineers with proven experience in microprocessor based DDC systems with regard to the software as well as hardware. They should be in a position to undertake specific assignments during the start up/ post start up situation of above system as per the instruction of BHEL engineer. Contractor has to provide names of the engineers with their bio data for the scrutiny of BHEL.

6.5.3
Planning - Contractor shall have his own planning cell headed by planning engineer. He shall work out the physical erection target area wise for his engineers and also plan the achievements for milestone events. He shall also monitor the input like T&P, materials, manpower, deployment position of the various working gangs. He shall furnish all the details required by BHEL as per the relevant contract clauses.

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 outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL /customer.

6.6 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.

6.7

If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor’s risk and cost. The expenditure incurred with overhead on this account will be recovered from the contractor's bills.

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 will provide consumables as under.

- **Cold Galvanizing Paint for G.I. floor grills**
- **Filler Wires for welding of high pressure joints of Power Cycle Piping to the extent supplied by BHEL manufacturing Unit (Piping Centre Chennai under PG-80).**
- **Lube oil for flushing, Fresh filling and subsequent topping up for lube oil system of respective system, ID/FD/PA Fans, Mills,, Hydraulic Oil for Huck Bolting M/c,**
- **Primer with Paints for Finish/ Final painting of Equipments/ Aux./ Piping/Structures and system as covered in these tender specifications.**

7.2. Test Blanks (Plates & Pipes)

BHEL will provide the raw material for preparation of test blanks for conducting the site qualification test of IBR welders only, whereas for test of structural welders contractor shall arrange materials. Contractor shall prepare the required test blanks from such raw materials.

7.3 Filler Wire for TIG Welding

Refer Section-5 in this regard.

7.4 Equipments – Tools & Plants

BHEL will make available the services of their T&P listed vide Appendix-V free of charge on sharing basis.

Facility of 25 MT capacity EOT crane inside the TG hall will be extended free of hire charges, 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 of Condenser, Turbine, Generator etc. which are beyond the capacity of the EOT crane. No claim of extra payment on account of non-availability of EOT crane shall be entertained at any point of time.

7.4.1 Other T&P

Drum lifting kit i.e. Winches, Pulleys etc have to be serviced, if required, by the contractor prior to use. Lubricants, packing, spares etc will be provided by BHEL whereas other consumables e.g. Cotton waste, cleaning fluids etc. Have to be provided by the contractor.

7.4.2

Special tools which are supplied by BHEL 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 as acceptable to BHEL/Customer.

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 imposition of penalty as decided by BHEL engineer.

7.4.4

If the above items issued to contractor are found not utilized / 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 Temporary Pipes, Temporary Structural Steel etc for Pre-Commissioning and Commissioning

7.5.1

Required temporary structural steel, pipes & fittings, valves for drum lifting cat head structure, conduct of hydraulic test, steam blowing / oil flushing etc, Shims/packers for permanent part of equipments shall be provided by BHEL

7.6 Fuel for BHEL/Customer T&P

7.6.1

Contractor shall provide the operators and fuel (excepting electricity for E.O.T. Crane) for the BHEL T&P within the quoted rates. Daily maintenance, preventive maintenance, repair & replacement in case of damage/loss/breakdown of BHEL T&P attributable to the contractor shall be carried out by the contractor at his cost. Spare Parts for replacement arising due to normal wear & tear or breakdown or accidental damage that are not attributable to the contractor will be provided by BHEL free of cost.

Section-8

Special Conditions

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/IBR 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 and post weld heat treatment records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/ specification. These records shall be submitted to BHEL/customer for approval from time to time.

8.3 A daily logbook of all measurements and testing/calibration should be maintained by contractor on the job for detailing inspection details of various equipments**.**

8.4 The performance of HP welders will be reviewed from time to time as per the BHEL/IBR standards. High-pressure welders' performance record shall be furnished periodically. 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 including HP welders shall carry identity cards as per the proforma prescribed by BHEL only welders duly authorised by BHEL/boiler inspector/customer/consultant shall be engaged on the work.

8.6 Contractor shall provide all the measuring monitoring devices (MMD) required for completion of the work satisfactorily. These MMD shall conform to job requirement in respect of measurement range, accuracy level & any other specification. The indicative list of MMD required for this work and to be made available by the contractor is given in appendix-VI. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed.

8.7 The MMD deployed by the contractor shall, at all stages of work, have valid and current calibration certificate. The calibration of these MMD shall be got done from the agencies accredited/approved by BHEL/Client. Copy of calibration certificates in respect of these MMD has to be submitted to BHEL. Periodical status report regarding validity of calibration has to be submitted to BHEL. Re-calibration/re-validation shall be done for the continuity of usage, as per BHEL specifications. Contractor shall conform to the specifications of BHEL regarding storage of the MMD.

Contractor shall record the identification number of the MMD used for measurement of parameters in the relevant FQP Log Sheet/joint measurement record. In case the contractor is found to be using / has used any MMD that does/did not have appropriate and valid calibration, a penalty of Rs. 2,000/- for every such incidence will be imposed by BHEL. This will be in addition to the consequential expenses to be borne by the contractor on account of re-work/ rectification of the affected work.

8.8 Re-work necessitated on account of use of invalid MMD 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.

8.9 In the course of work BHEL may counter/ finally check the measurements with their own MMD. Contractor shall render all assistance in conduct of such counter/final measurements**.**

8.10 Vibration indicators/vibration recorders/vibration analyzers will be provided by BHEL for checking and analyzing vibration levels of rotating equipments with necessary operators. Contractor shall provided necessary labour for carrying out such tests. Similarly, BHEL will provide the oscilloscope for any specific requirement.

8.11 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 for the services of quality assurance engineer.

8.12 **Stage Inspection by FES/QA Engineers**

8.12.1 Apart from day-to-day inspection by BHEL engineers stationed at site and also by customer's engineers, stage inspection of equipments under erection and commissioning at various stages of erection and commissioning by teams of engineers from field engineering services of BHEL's manufacturing units and quality assurance teams from field quality assurance factory quality assurance and commissioning engineers from technical services of BHEL will also be conducted. Contractor shall arrange all labour, tools and tackles etc for such stage inspections as part of work.

8.13.0 Statutory Inspection of Work

8.13.1 The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various relevant statutory authorities to show compliance with applicable regulations.

8.13.2 The work related statutory inspections, though not limited to, are as under:

1) Inspectorate of steam boilers and smoke nuisance

2) Any other authority connected to this work.

The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL engineer's instructions, submitting documents, radiographs etc and following up the matter with them. Contractor shall also make all

arrangements for offering the products/systems for inspection, as applicable, to the concerned authority.

8.13.3 The contractors shall pay all fees connected with testing of his welders/workers and testing, inspection & calibration of his MMD and T&P.

8.13.4 It shall be contractor's responsibility to obtain approval of statutory authorities, whenever applicable, for the conducting of any work which comes under the purview of these authorities. Any cost arising from this shall be contractor's account.

8.13.5 BHEL will pay fees for visits, inspection fees etc of these statutory authorities. All other expenses shall be borne by the contractor. 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.

8.13.6 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 in which project is being installed. Similarly it is the responsibility of contractor to obtain license from chief electrical inspector of concerned State, wherein project work is to be carried out for carrying out high voltage work. Contractor also should be aware of the latest IBR regulations and electricity act, including the amendments thereof.

8.14.0 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.

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 endeavor 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/-
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:

4 Memorandum of Understanding

BHEL, PSNR 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 No	YEAR	Amd upto	DESCRIPTION
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 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 No	YEAR	Amd upto	DESCRIPTION
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 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 No	YEAR	Amd upto	DESCRIPTION
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
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

11.0 Time Schedule, Mobilization, Progress Monitoring, Overrun etc.

11.1 Time Schedule & Mobilization

11.1.1
The contractor is required to commence the work within 15 days from the date of issue of letter of indent unless BHEL decided to fix any other later date. **However, BHEL Engineer will certify the actual date of start of work after adequate mobilisation of manpower and T&P by the contractor.**

The contractor has to mobilize his resources to commence the **materials receipt & handling activities** and shall further augment the manpower and T&P resources in such a manner that the entire work is completed to achieve the following tentative time schedule:

Entire work as detailed in the tender specifications **for both the units** shall be completed within **15 months** from the date of start of erection work. The various milestones for first unit are to be achieved as under: **Second unit shall have a phase shift of Three months from unit – I for these milestones.**

SN	Milestone / Event	Tentative Completion (within Months)
01	Boiler erection start	1/2
03	Drum Lifting	3 1/2
	Condenser erection start	4 1/2
	TG erection start	101/2
04	ESP readiness	9
05	Hydraulic Test	7 1/2
06	Boiler Light-Up	9 1/2
	TG BOXUP	9 1/2
	TG oil flushing	11
07	Steam Blowing completion	10 1/2
08	Rolling & Synchronization	11 1/2
09	Commissioning & Continuous Operation	12

10	Completion of PG test related activities and PG test Assistance	12

11.1.2
The contractor shall mobilize his resources within two weeks time after receipt of Letter of Intent for material unloading, verification stacking work and will mobilize to commence the erection, testing, assistance for commissioning work as per directions of BHEL engineer. Mutually agreed programme shall be drawn by the contractor primarily to achieve the schedule as aforesaid, 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 date of start of Contract Period shall be reckoned from the date of certification by BHEL. However the contractor shall mobilize resources as necessary prior to this event for other services like those at stores, materials management, watch & ward and other miscellaneous services under the scope of this contract.

11.1.3

The work under the scope of this contract is deemed to be completed in all respects, only when the contractor has discharged all the responsibilities laid down in the contract. The decision of BHEL on completion date shall be final and binding on the contractor**.**

11.1.4
In order to meet above schedule in general, and any other intermediate targets set, including compression of schedules to meet customer requirements, contractor shall arrange all necessary resources in consultation with BHEL within the quoted rates..

11.1.4

There shall be three shifts working for the execution of awarded contract. It is the responsibility of the contractor to engage his workmen to execute the awarded scope of work in three shifts basis. The contractor may have to organize his work on overtime basis also for achieving the targets set by BHEL and also during the period of commissioning and testing of unit. The contractor's finally accepted rates / prices shall include all these contingencies within finally awarded rates / prices of this contract.

11.1.3
In order to meet above schedule in general, and any other intermediate targets set, to meet customer requirements, contractor shall arrange all necessary resources in consultation with BHEL.

11.1.4 **Contract Period**
Contract Period will be of **15 (FIFTEEN) months**. Commencement of Contract Period shall be reckoned as defined in clause 11.1.2 above.

11.1.5 **Grace Period**
Contractor shall complete all the works in scope of these specifications within the Contract Period. A Grace Period of 2 (two) months beyond the Contract Period will be

allowed at the discretion of BHEL without any additional financial implications on either side.

11.2 Progress Monitoring, Contract Extension and Over Run

11.2.1 Progress Monitoring

Progress will be reviewed periodically including month end review vis-à-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 in 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 cl. 11.2.1 above will be made considering the availability of components to be erected and other 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:

A) Erection/Commissioning programme or Planned Targets not achieved owing to non-availability of fronts.

B) Erection/Commissioning programme or Planned Targets not achieved owing to non-availability of materials.

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

11.2.3 Contract Extension

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.

11.2.4

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 no. 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.

11.2.5

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 then on account of BHEL.

11.2.6 Overrun Compensation (ORC)

11.2.6.1

In case due to reasons not attributable to the contractor, the work gets delayed and the scheduled completion gets extended, the contractor shall not be entitled for any overrun compensation for a period of first **2 (Two)** months after the contractual completion date. In case the scheduled completion time gets extended beyond **2 (Two)** months as stated above, the contractor shall be considered for payment of fixed overrun charges @ **Rs.1,50,000/- per month (Rupees One lakh Fifty thousand only)** on receipt of advance notice intending to claim overrun and on fulfillment of following conditions: -

(a) The reasons for delay in completion of work are not attributable to contractor but however subject to the provisions of clause – 31 of GCC.

(b) Contractor achieves the targets fixed during the overrun period.

11.2.6.2

Once the claim of over run charges is admitted no other compensation whatsoever (like for delays in receipt of materials, availability of fronts etc.) will be entertained

11.2.6.3

The contractor shall maintain sufficient workforce and other resources required for completion of the job expeditiously for the entire contractual period including total extended period.

11.3 PRICE VARIATION

The finally accepted rates for scope of work as defined in this tender are subjected to price variation provisions as per following formula:

$$P1 = \frac{0.75 \times P0\ (F1 - F0)}{F0}$$

P1 = Increase/decrease in billing amount (variation) for the particular month of billing.

P0 = Gross billed amount for the month as per contract provisions.

F1 = All India CPI published by Labour bureau, Simla, Govt. of India, for Industrial workers (Base 2001 =100) applicable for the month under consideration i.e. for which bill has been raised.

F0 = All India CPI published by Labour bureau, Simla, Govt. of India, for Industrial workers (Base 2001 =100) applicable for the month of opening of technical bid.

. .

11.3.2 The contractor will be required to raise the bills for price variation payments on a monthly basis irrespective of the facts whether any increase or decrease in CPI. Price variation as per above formula will be calculated and paid/ deducted on the total contract value on month-to-month basis from the date of award. BHEL however

reserves the rights to freeze variation for that much of duration of delays, from time to time, which are entirely attributable to the contractor. **Average of applicable index of PVC paid shall be taken as index for PVC FOR final 5% amount**.

11.3.3 With the provision of price variation as above **NO CLAIM / COMPENSATION** on account of any increase whatsoever, (irrespective of whether variation are steep / unanticipated or not compensated by the above escalation provisions in full towards minimum wages, consumables, electrodes, gases or any other item / reason) **will be payable** during the entire period of execution including extended period, if any.

11.4.0 RATE SCHEDULE

11.4.1 Contractor shall fully understand equipment description and scope of work before quoting. The scope of work and responsibility of the contractor as mentioned under these specifications shall be covered within the quoted rates.

11.4.2 The tenderer shall quote the rates as per the rate schedule only, in part II price bid (Original). Conditional price bids or price bids with any deviation / clarification etc. are liable to be rejected. No cutting / erasing / over writing shall be done.

11.4.3 Contractor's total quoted price as per rate schedule will be taken as tentative only. The contractor undertakes to erect / commission actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments will also be regulated for the same**. The quantities may vary to any extent and no compensation will be payable in variation of quantity. However, in case of over all variation in Contract value (as indicted in LOI), beyond (minus) 30%, the contractor will be eligible for compensation as per the following provision:**

"The total executed value shall be raised by 10 % subject to the condition that the total value of work executed plus increase as above shall be limited to 70 % of the awarded contract value"

However prices quoted for TG scope is on lumpsum basis. The quantities may vary to any extent and no compensation will be payable in variation of quantity.

Contractors are requested to take above into account while quoting. The contractor confirms that the rate quoted above takes care of such variation during execution stage.

11.5.0 **NOT APPLICABLE**

11.5 **N A**

11.6 Definition of Work Completion

The contractor's scope of work under these specifications will deem 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.

Section-12
Special Conditions of Contract

12.0 TERMS OF PAYMENT

12.1 Interest Bearing Recoverable Advance

12.1.1 Interest bearing advance limited to a maximum of 5 (five) % of the contract price shall be payable at site in stages in the following manner. Rate of interest shall be two (2) % above the PLR of State Bank of India applicable at the time of drawing the advance.

12.1.2 Two and a half (2.5) % maximum to be released on submission of following.
Unqualified acceptance to LOI.
Requisite security deposit as per tender document.
Bank guarantee (BG) equivalent to 1.2 times the advance amount valid for an initial period of one year.
Detailed bar chart and its approval by BHEL.
Opening of site office & on certification of the same by BHEL site.

12.1.3 Two and a half (2.5) % maximum to be released on submission of following.
Bank guarantee (BG) equivalent to 1.2 times the advance amount valid for an initial period of one year.
Deployment of tools & plants as agreed to be deployed.

12.1.4 Recovery of advance shall be made at the rate of 10 % from each bill starting from the 1st applicable RA bill (gross), till the entire amount is adjusted.

12.1.5 Each bank guarantee shall be kept valid till the entire advance amount paid against it is recovered. The BG amount shall be allowed to be reduced every six months by an amount equal to the amount adjusted against running bills.

12.1.6 Each BG against advance shall be returned after full adjustment of the entire advance paid against it.

12.2 Progressive Payment.

12.2.1 The 'Engineer' will certify regarding the actual work executed in the measurement books and bills, which shall be accepted by the contractor in measurement book.

12.2.2 Contractor shall submit bills for the work completed under the specification, once in a month detailing work done during the month. The format for billing shall be approved by BHEL before raising invoices.

12.2.3 Contractor shall submit shortage / damage reports on BHEL's standard materials management forms. No payment shall be released till the contractor submits these reports and are verified by the Engineer.

12.2.4 Subject to any deduction that BHEL may be authorised to make under the contract, the contractor on the certificate of the Engineer at site be entitled

for payment as explained hereunder.

I An amount limited to **1.0% of** the awarded contract value shall be payable in **one or more installments**, solely at the discretion of Construction Manager/ BHEL at different stages of the contract execution to facilitate resource augmentation or to meet any exigency of work. In case of its non-utilization 'OR' its part utilization, the entire/ balance payment against this category shall be released along with commissioning of sets.

II **PROGRESSIVE PAYMENT ON PRO-RATA BASIS FOR MATERIAL HANDLING WOGRKS FOR Sl. No. A of Rate Schedule SHALL BE AS FOLLOWS:**

A. **54 %** of the rate shall be paid after the materials are unloaded and verified as per RR / LWB / loading advice / box packing slip subject to furnishing of following information along with the bills as per above clause.

1 Material transporting vouchers stating work order and quantity of material for each consignment. Shortage report / open delivery taken w.r.t LWB, if any and acceptance thereof by way authorities/ transporters.

2 Proof of claim lodged with ways/ transporters in respect of above shortage / open delivery.

3 Material management forms duly filled and certified by the Engineer.

B **40%** of the rate shall be paid as soon as the materials are duly shifted to desired location, stacked and verified by opening of cases / re-packing, wherever necessary (with contractor's own labour and T&P).

Payment will be released on submission of the information, as per material management forms by the contractor immediately after verification of materials as certified by the Engineer. The Engineer at site would supply the requisite Performa.

Contractor must ensure the stacking and verification of materials within 15 (fifteen) days from the date of unloading the materials in store, otherwise the same shall be done by engaging other agency on the risk and cost of contractor and decision of Engineer in this regard shall be final and binding on the contractor.

NOTE: BHEL site incharge, at his discretion can split / regroup above payment schedule, to facilitate site operations.

III **BOILER SCOPE OF WORK AS PER SL. NO. BI OF RATE SCHEDULE**

III.A **PROGRESSIVE PAYMENT on pro-rata basis shall be as follows**

80% of unit rates for Erection Testing & Commissioning Of Boiler, ESP & Piping etc. except INSULATION AND REFRACTORY work

a 35% of the contract rate on pro-rata basis on placement in position and

rough alignment for the items.

b 45% of the contract rate on pro-rata basis on completion of final alignment / fastening / welding / grouting along with proper supports including radiography / NDT / stress relieving wherever involved.

III.B 80% of unit rates for INSULATION AND REFRACTORY work

a 55% of the contract unit rate on fabrication/fixing of retainers, lagging & stitching of mattresses and welding of retainers, fixing of casing supports, fabrication, beading, sealing, bitumen painting, installation and screw fixing of cladding & completion of all jobs as per specifications. The above work includes transportation of required material on location and its proper protection

B 25% of the contract unit rate payable on system completion and area cleaning.

III C MILESTONE PAYMENTS for BOILER (8% of Total amount of SL. NO. BI OF RATE SCHEDULE)

0.75% of CV on successful completion of hydro- test of the each boiler i. e. 2X0.75% =1.5%

0.75% of CV on successful charging of each ESP i. e. 2x0.75%=1.5%

1%of CV on successful completion of alkali boil out of each unit i. e. 2x 1%=2.% .

0.75% of CV value on successful completion of steam blowing and SVF each unit i. e. 2x0.75% =1.5% ..

0.5% of CV on coal firing operation of each unit i. e. 2x0.5%=1%.

0.25 % of` CV on full loading of each unit i. e. 2x0.25%=0.5% .

NOTE:

If the commissioning activities could not be carried out due to no fault of contractor, BHEL Site Incharge, at his discretion, after recording reasons for exercising such option, can split and release payment up to 50% of milestone payment on completion of work, to the extent possible, required for carrying out that particular milestone / commissioning activity.

III D BALANCE PAYMENTS for SL. NO. BI OF RATE SCHEDULE

1.0 FINAL PAINTING- (4% of Total amount of SL. NO. BI OF RATE SCHEDULE)

2 X 2% of **Total amount of SL. NO. BI OF RATE SCHEDULE** on successful completion of final finish painting including supply of paint (BHEL Site in charge at his discretion may split above and release payment on prorata basis for supply as well as for application of paints)

2.0 PROVIDING TEMPORARY PIPING MATERIALS: (2% OF Total amount of SL. NO. BI OF RATE SCHEDULE)

As per Clause 4.6 of tender specifications: (2 X 1%).

IV TG SCOPE AS PER SL. NO. BII OF RATE SCHEDULE .

A Progessive payments of SL. NO. BII OF RATE SCHEDULE shall be as under 87 % of Lump sum price

1.	**CONDENSER**	**2 x 6 %**
2.	**TURBINE**	**2x 7.5 %**
3.	**GENERATOR**	**2 x 16 %**
4.	**STATIC AND ROTARY AUXILIARIES**	**2 x 7.5%**
5.	**TG INTEGRAL PIPING WITH VALVES FITTINGS, SUPPORTS ETC**	**2 x 6.5%**
	TOTAL	**87 %**

NOTES

1.The above break up is only for payment purposes and does not cover all equipment in the scope of the subject work. The total scope of work shall be as detailed in the tender specification.

2.Pro-rata payments shall be made every month in proportion to the work carried out by the contractor during the month, which shall be measured on the basis of percentages fixed above. The engineer shall carry out the assessment of the work for payment within the above percentages and it shall be final and binding on contractor. However, further percentage break up for payment against above clauses, will be mutually discussed and finalized at site

B PRE-COMMISSIONING & COMMISSIONING (5% OF Total amount of SL. NO. BII OF RATE SCHEDULE)

	Barring gear	2x 0.5%
	Completion of Oil flushing.	2x 0.5%
	Completion of Generator gas tightness test	2 x 0.5%

	Completion of Steam rolling and synchronizing	2x 0.5%
	Completion of Trial operation	2x 0.5%

NOTE:

If the commissioning activities could not be carried out due contractor, BHEL Site in-charge, at his discretion, after record exercising such option, can split and release payment up to 50 payment on completion of work, to the extent possible, requir out that particular milestone/ commissioning activity.

C **2 x 1.0% of Total amount of SL. NO. BII OF RATE SCHEDULE Payable on pro-rata basis for 'PAINTING' as per scope of work of this specification.**

V **ELECTRICAL AND C&I SCOPE AS PER BIII AS PER BIII OF RATE SCHEDULE.**

The agreed rates for each item shall be paid progressively as per the break up given hereunder (aggregating 94%), based on the stages of completion.

SN	Sections of Rate Schedule	Calibration/ Checking	Erection	Testing and Commissioning	Final painting
1	A.1 to A.3	N.A.	51%	40%	3%
2	A.4to A.6	N.A.	NA	91%	3%
3	A.7 to A.23, A25 to A27	N.A.	51%	40%	3%
4	A24	NA	NA	94%	NA
3	B.1 to B.30	20%	35%	39%	N.A.
4	C.1 to C.14	N.A	N.A.	94%	N.A.
5	D.1 to D.14, D41	N.A.	91%	N.A.	3%
6	D.15 to D.40	N.A.	94%	N.A.	N.A.

For the items where the payment is to be made against unit of weight, the actual weight of items erected by contractor will be paid after assessing the weight on the basis of shipping list or standard engineering practice. BHEL engineer's decision will be final and binding on contractor in this regard.

i) Payment for the Work Completed

The tenderer shall quote separate rates for each item as detailed in Rate Schedule. No other form of quoted price shall be acceptable and such offers shall be liable for rejection.

ii) Measurement for Payment

In Rate Schedule, all inclusive unit rates have been called for entire scope of work for respective item including erection, calibration, testing and commissioning as applicable for various device and instrument and payment shall be made as per split up furnished in the table earlier in this section.

iii) Basis of measurement

For all payment purpose, measurement shall be made on the basis of physical verification. Physical verification/measurement shall be made by Contractor in presence of BHEL engineer. Contractor shall maintain records for system-wise utilization of material.

iv) Disposal of scrap

All the surplus, scrap and serviceable materials shall be returned by the contractor to BHEL stores as per the instruction of engineer

v) Surplus items

All the cables returned to stores should carry an aluminium tag indicating the size and type of cables. Cable of more than five-meter length is termed as "serviceable material".

Any item returned to stores shall be clearly identified and tagged for its serviceability or any defects in the returned items.

vii) Additional works

Wherever additional instrumentation work has to be carried out for performance guarantee test, the same has to be executed by the contractor as per the applicable rates already provided in the Rate Schedule.

VI **2.5%** of Contract Value will be payable on handing over of the PLANT to BHEL's Customer or 3 months after contractor has discharged his responsibilities as stipulated in this contract, whichever is earlier, if delay in handing over is not attributable to contractor. The **unit** shall be considered as handed over on completion of trial operation.

VII **2.5% CV** shall be payable on completion of all pending work, rework wherever required, area cleaning, reconciliation of materials, fulfillment of contractual obligations, and on submission and passing of Final Bill.

NOTE: No payment shall be made for handling of sleepers, blocks and other items issued from BHEL stores for storing, stacking of materials and their return for material handling work.

NOTE**: Payments at VI & VII shall be released after adjustment of the CV based on actual contract value / work carried out.**

12.0.5 Release of payments;

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.

Section-13

Special Conditions of Contract

13.0 EXTRA WORK:

13.1 BHEL may consider for payment of extra works on man hour basis @ **Rs.30/-** (Rupees thirty only) per man hour only for such of those works which:

A Require major revamping or rework and which are totally unusual to normal erection work.

B Require rectification / modification for improvement in the design during commissioning,

C Requiring fresh fabrication of components in place of rejected / replaced components.

13.2 The rates indicated as above, shall include over time, if any, consumables, supervision, use of tools and tackles and other site expenses and incidentals.

13.3 The extra works, if any, shall be carried out by a separate gang, which will be identified for certification of man-hours. This gang will not be utilized for any other work during the period that they are engaged in the extra-work. Logbook should be maintained and should be signed jointly by the contractor's representative and BHEL Engineer on day-to-day basis. However, signing of the logbook does not necessarily mean acceptance of the extra works, which would be identified by Engineer, whether work is covered in one of the above categories. Only those works and man-hours that are certified by the BHEL Engineer-in-charge will be considered for payment. The decision of BHEL in this regard shall be final and binding on the contractor.

SECTION-14

SPECIAL CONDITIONS OF CONTRACT

14.0 Insurance

14.1 Marine, Storage cum Erection (MCE) Insurance and Repairing Damages

14.1.1
BHEL/client has an MCE insurance cover, inter-alia, for all the permanent project equipments/components supplied by BHEL under scope of this work by way of a transit and storage cum erection policy covering liability against damages/ losses etc.

14.2 Reporting Damages and Carrying out Repairs

14.2.1
Checking all components/equipments at siding/site and reporting to transporter and /or insurance authorities of any damages/losses will be done by BHEL.

14.2.2
Contractor shall render all help to BHEL in inspection including handling, re-stacking etc, assessing and preparing estimates for repairs of components damaged during transit, storage and erection, commissioning and preparing estimates for fabrication of materials lost/damaged during transit, storage and erection. Contractor shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.

14.2.3
Contractor shall report to BHEL in writing any damages to equipments/ components on receipt, storing, and during drawl of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.

14.2.4
Contractor shall carry out fabrication of any material lost/damaged as per instructions from BHEL engineer.

14.2.5
BHEL, however, retains the right to award or not to award to the contractor any of the rectification/rework/repairs of damages and also fabrication of components.

14.2.6
All the repairs/rectification/rework of damages and fabrication of materials lost, if any, shall be carried out by a separately identifiable gang for certification of man-hours. Daily log sheets should be maintained for each work separately and should be signed by contractor's representative and BHEL engineer. Signing of log sheets does not necessarily mean the acceptance of these as extra works.

14.2.7
All rectification, repairs, rework and fabrication of components lost, which are minor and incidental to erection work (consuming not more than 100 man-hours on each occasion) shall be treated as part of work without any extra cost.

14.2.8
Insurance cover under this policy will generally be as per clauses 2.10.1 to 2.10.4 of General Conditions of Contract unless and otherwise specified differently in the Special Conditions.

14.2.9
In case the loss/damage is not attributable to the contractor, Payments of all extra works on account of repair / rectification / reworks of damages and fabrication of materials lost will be as per provisions of Section-13 of SCC.

In case the repairs/rectification/rework and fabrication of materials lost, the work has been done by more than one agency including the contractor, the payment towards extra charges will be on pro-rata basis and the decision of BHEL in this regard is final and binding on the contractor.

In case of theft / damage / loss of materials due to **repeated/continued instances of negligence/failure** attributable to the contractor, the expenses incurred on account of repair/ replacement of such components including BHEL's overhead expenses as applicable (presently @ 30%) in excess of the amount realized from the underwriters, if any, shall be recovered from the contractor. Recovery will be limited to Normal Deductible Franchise (DF)/Excess as per applicable Insurance (TAC) tariff guidelines for every incidence of loss/damage.

14.2.12
In case any insurance claim does not become tenable due to **willful** negligence/ damage/loss attributable to the contractor, the total cost of repair/replacement including BHEL overhead expenses shall be recovered from the contractor.

14.3 Insurance by the Contractor and Indemnification of BHEL

14.3.1
BHEL has taken third party liability insurance, indicating in the proposal for such insurance that sub-contractors will be taking part in the erection work detailed in this tender specification. However, the bidder has to bear any expenses/consequences over and above the amount that may be reimbursed to BHEL by such coverage of third party liability insurance taken by BHEL.

Such additional liability will be to cover and indemnify BHEL and its customer of all liabilities which may come up and cause harm/damage to other contractors/ customer/BHEL properties/ personnel or all or anybody rendering service to BHEL/ customer or is connected with BHEL/ customer's work in any manner whatsoever. The bidders' specific attention is also invited to clause 2.10 of General Conditions of Contract.

14.3.2
Contractor shall obtain suitable statutory as well as non-statutory insurance policies for all the properties belonging to him and also for his personnel deployed at project for execution of the contract work.

SECTION-15

Special Condition of Contract

15.0 LIQUIDATED DAMAGES (LD)

15.1 For delay in completion of work attributable to the contractor, the LD shall be applicable at the rate of ½% of the contract value per week of delay or part thereof limited to a ceiling of 10% of the contract value as mentioned under clause no.25.5 of the GCC of the tender.

16.0 SECURITY DEPOSIT

16.1 The contractor shall submit Security Deposit within 15 days from the date of issue of LOI as per clause no. 16.2 of the General Conditions of Contract (GCC). In case the contractor opts to furnish Bank Guarantee as a part of Security Deposit, the BG shall be issued as per the Performa enclosed as per Annexure-H of the GCC and also that the BG should be issued preferably through any of the Member Banks listed on Page No. 34(a) of the GCC;

For BG through any other Nationalized Bank (Not covered in the list of Member Banks of GCC), the discretion of its acceptance shall lie solely with BHEL.

17.0 OTHERS

17.1 In case of any contradiction between General Conditions of Contract(GCC) and Special Conditions of Contract (SCC), the latter shall prevail.

17.2 The tenderer shall specifically confirm he has inspected the site of work and is fully conversant with the prevailing conditions under which work is to be executed and will not raise claim of any nature due to lack of knowledge of site condition. He will also confirm that local taxation laws at the site have been clearly understood by him.

17.3 **The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of pre-qualification evaluation / Techno-commercial bids and acceptance of customer. BHEL reserves the right to reject the bidders with unsatisfactory past performance in the execution of a contract. HEL's decision in this regard shall be final & binding.**

(Certificates should be held in the name of Contractor furnishing the security and duly pledged in favour of BHEL and discharged on the back).

APPENDIX-I PART I

APPROXIMATE WEIGHT OF MATERIALS FOR MATERIAL HANDLING & MM SERVICES

SN	Description of Material	Total Weight of the Package (MT)	Weight of Single Heavy Component in MT
I	**TOTAL BOILER &AUXILLARIES PACKAGE.**	**4400**	
	LIST OF MAJOR HEAVY COMPONENTS		
1	Boiler drum		
1 a)	Upper Drum		80
1 b)	Lower Drum		23
2	Ceiling graders		18
3	Water wall headers		15
4	Water wall panels		10
5	Buckstays & frames		10
6	Super heater headers & coils		9
7	Structure, supports galleries etc		
II	**TURBINE,GENERATOR, CONDENSER,BFP,AUX.**	**600**	
1	Condenser shall	44	14
2	Tubes in bunch	45	
3	Hot Well	19	
4	Dome	23	
5	HP heater 1		12
6	HP Heater 2		13
7	LP HEATER 1		7
8	LP HEATER 2		6
9	Dearetor (Heater)		10

APPENDIX-I PART I

APPROXIMATE WEIGHT OF MATERIALS FOR MATERIAL HANDLING & MM SERVICES

SN	Description of Material	Total Weight of the Package (MT)	Weight of Single Heavy Component in MT
10	Feed Storage Tank (FST)		19.5
11	Generator Rotor		25
12	Gen. Stator		100
13	Turbine Casing Upper		15
14	Turbine Casing Lower		16
15	Exhaust Hood Upper		15
16	Exhaust Hood Lower		23
17	Turbine Rotor Assembly		24
III	HT MOTORS	50	4
IV	Power Cycle Piping/Re-generative system Piping	265	
V	Construction Equipments, Consumables and Miscellaneous Items	35	
	Total WT OF Materials for one unit Approximately	5,350 MT	

Additional Information about the Single Heaviest Ceiling Girder of Boiler:

(i) Weight -17.900 MT
(ii) Depth – 1.8 Meter
(iii) Width -0.5 Meter
(iv) Length – 14.6 Meters
(v) Top Elevation – about 42.15 Meter
(vi) Bottom Elevation – about 40.35 Meter

APPENDIX-I PART II BOILER SCOPE

DETAILS OF QUANTITIES AND SCOPE OF WORK FOR ERECTION & ASSISTANCE FOR COMMISSIONING.

(AA) BOILER & AUXILIARIES:

Sl.No.	PG-MA	Description	WEIGHT (MT)	REMARKS
1.	04-Xxx	Boiler Drum (Upper) & Suspension	80	PP
2.	04-xxx	Boiler drum lower	24.4	PP
3.	05-Xxx	WW Headers	14.5	PP
4.	06-Xxx	Water Wall Panels	121.3	PP
5.	07-Xxx	Down comer Lines & Links	106.5	PP
6.	08-Xxx	Buck Stays	58.3	NPP
7.	09-Xxx	Seal Boxes	4.0	NPP
8.	10-Xxx	Super heater Headers	14.0	PP
9.	11-Xxx	SH Coils TP 347 H 25%, ALLOY STEEL 75 %	98.3	PP
10.	12-Xxx	SH Links	19.8	PP
11.	18-Xxx	Roof Casing	2.9	NPP
12.	19-Xxx	Economizer Components	156.4	PP
13.	20-Xxx	Soot Blowers, LRBS	11.0	Rotating M/c
14.	21-XXX	Soot Blower Piping with fittings and supports	6.0	PP
15.	24-Xxx	Boiler Trim Piping, Valves Etc.	32.1	PP
16.	28-Xxx	Doors, Fasteners	2.3	NPP
17.	30-Xxx	Boiler Enclosure	11.6	NPP
18.	31-Xxx	Skin Casing	3.4	NPP
19.	32-Xxx	Fixing Components For L&I	68.5	INSULATION
20.	33-Xxx	Mineral Wool & Enclosures	166.0	INSULATION
21.	XXXX	PEM&BHEL Hyderabad supplied Insulation materials (Mattresses thickness-25/40/50/60/75 MM & pipe sections etc.)	61.0	
22.	XXXX	PEM & BHEL Hyderbad supplied Aluminium sheet with related fixing materials like hooks & binding wires etc.)	27.0	

Sl.No.	PG-MA	Description	WEIGHT (MT)	REMARKS
23.	35-Xxx	Boiler Columns	384.4	STRUCTURES
24.	36-Xxx	Floors, Stairs, Ladders	309.2	STRUCTURES
25.	37-Xxx	Boiler Outer Casing	12.4	NPP
26.	38-Xxx	Inter connecting walk-ways	188.0	STRUCTURES
27.	39-Xxx	External Structures	216.5	STRUCTURES
28.	41-Xxx	Oil & gas burner ,igniters	1.8	NPP
29.	42-Xxx	Oil & Gas System Piping	9.5	PP
30.	43-Xxx	Igniters & Scanner Air System	26.1	NPP
31.	45-Xxx	Coal burner system	28.0	NPP
32.	47-Xxx	Pulverized fuel piping & Ceramic bends	102.2	NPP
33.	48-Xxx	Ducts, Dampers Etc.	458.7	NPP
34.	52-Xxx	Air Pre-Heater Regenerative Tri sector	105.5	Rotating M/c
35.	56-Xxx	FD, ID & PA Fans	120.6	Rotating M/c
36.	61-Xxx	Pulverizing Mills (XRP 623) 4 Nos	172.0	Rotating M/c
37.	67-Xxx	Mill plant auxiliaries	11.3	Rotating M/c
38.	78-Xxx	ESP	1000.0	ESP
39.	80-Xxx	Boiler Integral Piping	51.0	PP
40.	81-Xxx	Tanks, Vessels, Thermowells, Dozing Pump skids	8.0	PP
41.	81-Xxx	Fixing Components, Insulation & Cladding	6.5	Insulation
42.	89-Xxx	Galleries & Stairs for ESP	26.0	ESP
43.	97-Xxx	Electronic Level Indicator, Condensing Pots & associated Impulse piping with valves & fittings, MTM Clamps & Pads,	1.0	PP
44.	97-xxx	Pneumatic Actuators for Air & Flue Gas System	1.5	NPP
45.	----------	HT Motors	50.0	Rotating M/c
46.	----------	De-aerating Heater, FST, Gauges & accessories	23.0	PP
47.	----------	De-aerating Heater Platform & Accessories	10.0	Structures

Sl.No.	PG-MA	Description	WEIGHT (MT)	REMARKS
48.		HP Flash Tank	2.5	PP Equipment
49.		LP Flash Tank	0.80	PP Equipment

(BB) POWER CYCLE PIPING / RE-GENERATIVE SYSTEM PIPING WITH VALVES, SUPPORTS AND FITTINGS ETC.

SL	PGMA	DESCRIPTION	AREA	CSR WT
1	80300	MS FROM SUPERHEATER TO BOILER STOP	PLPC	6000
2	80301	MS FROM BOILER STOP VALVE TO ESV	PLPC	32000
3	80303	MS HEADER TO AUX PRDS	PCEP	2500
4	80304	MS HEADER TO HPBP VALVE	PLPC	4000
5	80305	MS DUMP TO CONDENSER	PCEP	4300
6	80307	HP & LP BYPASS WARM UP	PCEP	100
7	80330	EXTRACTION STEAM TO LP HEATER-1	PCEP	3000
8	80331	EXTRACTION STEAM TO LP HEATER-2	PCEP	1400
9	80335	EXTRACTION STEAM TO DEAERATING HEAT	PCEP	1800
10	80336	EXTRACTION STEAM TO HP HEATER NO.1	PCEP	700
11	80337	EXTRACTION STEAM TO HP HEATER-2	PCEP	700
12	80340	AUX STEAM HEADER	PCEP	900
13	80341	AUX STEAM HEADER INTERCONN BETWEEN UNITS	PCEP	3000
14	80345	AUX STEAM TO DEAERATING HEATER	PCEP	1500
15	80347	AUX STEAM TO SJAE - TG SCOPE	PCEP	700
16	80373	AUX STEAM HEADER SV EXHAUST	PCEP	800
17	80375	UNLISTED SV EXHAUSTS - TG SCOPE	PCEP	3000
18	80381	HP HEATER VENTS - TG SCOPE	PCEP	800
19	80382	LP HEATER VENTS	PCEP	800
20	80388	CONDENSER AIR EVACUATION PIPING	PCEP	1000
21	80398	TURBINE WASHING STEAM	PCEP	1500
22	80400	CONDENSATE SUCTION	PCEP	800
23	80401	CD FROM PUMP TO LPH1/DC INLET TEE&R	PCEP	4300
24	80402	CD FROM LPH1/DC INLET TEE TO TG TP	PCEP	1000
25	80403	CD FROM TG TP TO DEAERATING HEATER	PCEP	2400
26	80407	CONDENSATE FOR SEALING OF VACUUM	PCEP	2200
27	80408	CONDENSATE DUMP FROM HEADER	PCEP	200
28	80412	CONDENSATE TRANSFER	PCEP	400
29	80420	BOILER FEED PUMP SUCTION	PCEP	4400

SL	PGMA	DESCRIPTION	AREA	CSR WT
30	80421	BOILER FEED PUMP RECIRCULATION	PLPC	1300
31	80422	BOILER FEED PUMP LEAK-OFF & WARM-UP	PCEP	100
32	80423	BOILER FEED PUMP TO HPH INCLUDING B	PLPC	14500
33	80425	BFD FROM FINAL HPH TO SG TP	PLPC	7500
34	80431	SPRAY WATER TO AUX PRDS	PCEP	200
35	80432	SPRAY WATER TO BOILER DESH UPTO SG	PCEP	200
36	80435	UNLISTED SPRAY WATER - TG SCOPE	PCEP	600
37	80444	LP HEATER-2/3/4/5 DRAINS&DRIP PUMP IN	PCEP	1900
		SUB TOTAL		112500
38	80447	HP HEATER DRAINS	PCEP	3100
39	80449	TG CYCLE PIPING DRAINS & VENTS	PCEP	14000
40	80451	BOILER INTEGRAL PIPING DRAINS	PCEP	1500
41	80452	HP PIPING DRAINS - SG SCOPE	PCEP	2500
42	80493	HP FLASH TANK VENT TO CONDENSER	PCEP	600
43	80494	LP FLASH TANK VENT TO CONDENSER	PCEP	500
44	80495	LP FLASH TANK DRAIN TO COND	PCEP	300
45	80497	DRAIN FLASH TANK DRAIN TO COND	PCEP	200
46	80601	LOW PRESSURE DOSING PIPING	PCEP	500
47	80673	LUBE OIL PIPING SYSTEM	PCEP	1500
48	80920	H&S FOR HYDRO TEST	PCHS	1500
49	80923	H&S FOR STEAM BLOWING	PCHS	10000
50	80928	H&S FOR BOILER LIGHT UP - TG	PCHS	11000

APPENDIX –I PART III BOILER SCOPE

TENTATIVE WEIGHT DETAILS OF EQUIPMENTS WITH AUX. AND PIPING ETC.

(AA) BOILER, ESP & AUXILIARIES etc.:

Sl.No.	PG-MA	Description	WEIGHT PER UNIT (MT)	REMARKS
50.	04-Xxx	Boiler Drum (Upper) & Suspension	80	PP
51.	04-xxx	Boiler drum lower	24.4	PP
52.	05-Xxx	WW Headers	14.5	PP
53.	06-Xxx	Water Wall Panels	121.3	PP
54.	07-Xxx	Down comer Lines & Links	106.5	PP
55.	08-Xxx	Buck Stays	58.3	NPP
56.	09-Xxx	Seal Boxes	4.0	NPP
57.	10-Xxx	Super heater Headers	14.0	PP
58.	11-Xxx	SH Coils TP 347 H 25%, ALLOY STEEL 75 %	98.3	PP
59.	12-Xxx	SH Links	19.8	PP
60.	18-Xxx	Roof Casing	2.9	NPP
61.	19-Xxx	Economizer Components	156.4	PP
62.	20-Xxx	Soot Blowers, LRBS	11.0	Rotating M/c
63.	21-XXX	Soot Blower Piping with fittings and supports	6.0	PP
64.	24-Xxx	Boiler Trim Piping, Valves Etc.	32.1	PP
65.	28-Xxx	Doors, Fasteners	2.3	NPP
66.	30-Xxx	Boiler Enclosure	11.6	NPP
67.	31-Xxx	Skin Casing	3.4	NPP
68.	32-Xxx	Fixing Components For L&I	68.5	INSULATION
69.	33-Xxx	Mineral Wool & Enclosures	166.0	INSULATION
70.	XXXX	PEM & BHEL Hyderbad supplied Insulation materials (Mattresses thickness-25/40/50/60/75 MM & pipe sections etc.)	61.0	

71.	XXXX	PEM & BHEL Hyderbad supplied Aluminium sheet with related fixing materials like hooks & binding wires etc.)	27.0	
72.	35-Xxx	Boiler Columns	384.4	STRUCTURES
73.	36-Xxx	Floors, Stairs, Ladders	309.2	STRUCTURES
74.	37-Xxx	Boiler Outer Casing	12.4	NPP
75.	38-Xxx	Inter connecting walk-ways	188.0	STRUCTURES
76.	39-Xxx	External Structures	216.5	STRUCTURES
77.	41-Xxx	Oil & gas burner, igniters	1.8	NPP
78.	42-Xxx	Oil & Gas System Piping	9.5	PP
79.	43-Xxx	Igniters & Scanner Air System	26.1	NPP
80.	45-Xxx	Coal burner system	28.0	NPP
81.	47-Xxx	Pulverized fuel piping & Ceramic bends	102.2	NPP
82.	48-Xxx	Ducts, Dampers Etc.	458.7	NPP
83.	52-Xxx	Air Pre-Heater Regenerative Tri sector	105.5	Rotating M/c
84.	56-Xxx	FD, ID & PA Fans	120.6	Rotating M/c
85.	61-Xxx	Pulverizing Mills (XRP 623) 4 Nos	172.0	Rotating M/c
86.	67-Xxx	Mill plant auxiliaries	11.3	Rotating M/c
87.	78-Xxx	ESP	1000.0	ESP
88.	80-Xxx	Boiler Integral Piping	51.0	PP
89.	81-Xxx	Tanks, Vessels, Thermowells, Dozing Pump skids	8.0	PP
90.	81-Xxx	Fixing Components, Insulation & Cladding	6.5	Insulation
91.	89-Xxx	Galleries & Stairs for ESP	26.0	ESP
92.	97-Xxx	Electronic Level Indicator, Condensing Pots & associated Impulse piping with valves & fittings, MTM Clamps & Pads,	1.0	PP
93.	97-xxx	Pneumatic Actuators for Air & Flue Gas System	1.5	NPP
94.	99-Xxx	Various Handling & Lifting Equipments, Hoists etc.	4.0	Elevator & Lifting Tackles
95.	----------	HT Motors	50.0	Rotating M/c

96.	----------	Deaerator, FST, Gauges & accessories	23.0	PP
97.	----------	Deaerator Platform & Accessories	10.0	Structures
98.		HP Flash Tank	2.5	PP Equipment
99.		LP Flash Tank	0.80	PP Equipment

(BB) POWER CYCLE PIPING/RE-GENERATIVE SYSTEM PIPING WITH VALVES, SUPPORTS AND FITTINGS ETC.

SL	PGMA	DESCRIPTION	AREA	CSR WT
1	80300	MS FROM SUPERHEATER TO BOILER STOP	PLPC	6000
2	80301	MS FROM BOILER STOP VALVE TO ESV	PLPC	32000
3	80303	MS HEADER TO AUX PRDS	PCEP	2500
4	80304	MS HEADER TO HPBP VALVE	PLPC	4000
5	80305	MS DUMP TO CONDENSER	PCEP	4300
6	80307	HP & LP BYPASS WARM UP	PCEP	100
7	80330	EXTRACTION STEAM TO LP HEATER-1	PCEP	3000
8	80331	EXTRACTION STEAM TO LP HEATER-2	PCEP	1400
9	80335	EXTRACTION STEAM TO DEAERATING HEAT	PCEP	1800
10	80336	EXTRACTION STEAM TO HP HEATER NO.1	PCEP	700
11	80337	EXTRACTION STEAM TO HP HEATER-2	PCEP	700
12	80340	AUX STEAM HEADER	PCEP	900
13	80341	AUX STEAM HEADER INTERCONN BETWEEN UNITS	PCEP	3000
14	80345	AUX STEAM TO DEAERATING HEATER	PCEP	1500
15	80347	AUX STEAM TO SJAE - TG SCOPE	PCEP	700
16	80373	AUX STEAM HEADER SV EXHAUST	PCEP	800
17	80375	UNLISTED SV EXHAUSTS - TG SCOPE	PCEP	3000
18	80381	HP HEATER VENTS - TG SCOPE	PCEP	800
19	80382	LP HEATER VENTS	PCEP	800
20	80388	CONDENSER AIR EVACUATION PIPING	PCEP	1000
21	80398	TURBINE WASHING STEAM	PCEP	1500
22	80400	CONDENSATE SUCTION	PCEP	800
23	80401	CD FROM PUMP TO LPH1/DC INLET TEE&R	PCEP	4300
24	80402	CD FROM LPH1/DC INLET TEE TO TG TP	PCEP	1000
25	80403	CD FROM TG TP TO DEAERATING HEATER	PCEP	2400
26	80407	CONDENSATE FOR SEALING OF VACUUM	PCEP	2200
27	80408	CONDENSATE DUMP FROM HEADER	PCEP	200
28	80412	CONDENSATE TRANSFER	PCEP	400
29	80420	BOILER FEED PUMP SUCTION	PCEP	4400
30	80421	BOILER FEED PUMP RECIRCULATION	PLPC	1300
31	80422	BOILER FEED PUMP LEAK-OFF & WARM-UP	PCEP	100
32	80423	BOILER FEED PUMP TO HPH INCLUDING B	PLPC	14500
33	80425	BFD FROM FINAL HPH TO SG TP	PLPC	7500
34	80431	SPRAY WATER TO AUX PRDS	PCEP	200
35	80432	SPRAY WATER TO BOILER DESH UPTO SG	PCEP	200
36	80435	UNLISTED SPRAY WATER - TG SCOPE	PCEP	600
37	80444	LP HEATER-2/3/4/5 DRAINS&DRIP PUMP IN	PCEP	1900

SL	PGMA	DESCRIPTION	AREA	CSR WT
		SUB TOTAL		**112500**
38	**80447**	HP HEATER DRAINS	PCEP	3100
39	**80449**	TG CYCLE PIPING DRAINS & VENTS	PCEP	14000
40	**80451**	BOILER INTEGRAL PIPING DRAINS	PCEP	1500
41	**80452**	HP PIPING DRAINS - SG SCOPE	PCEP	2500
42	**80493**	HP FLASH TANK VENT TO CONDENSER	PCEP	600
43	**80494**	LP FLASH TANK VENT TO CONDENSER	PCEP	500
44	**80495**	LP FLASH TANK DRAIN TO COND	PCEP	300
45	**80497**	DRAIN FLASH TANK DRAIN TO COND	PCEP	200
46	**80601**	LOW PRESSURE DOSING PIPING	PCEP	500
47	**80673**	LUBE OIL PIPING SYSTEM	PCEP	1500
48	**80920**	H&S FOR HYDRO TEST	PCHS	1500
49	**80923**	H&S FOR STEAM BLOWING	PCHS	10000
50	**80928**	H&S FOR BOILER LIGHT UP - TG	PCHS	11000
51	**80930**	H&S FOR SYNCHRONISATION - TG	PCHS	8500
52	**80992**	IMPORTED ELECTRODES	PCELE	200
53	**81415**	TEST THERMOWELLS	PCSD	100
54	**PG-22**	HP BYPASS SYSTEM WITH VALVES AND RELATED CONTROL OIL SYSTEM WITH AUX.	TRICHY VALVES GROUP	2500
		TOTAL WEIGHT APPROXIMATLY	**Wt kgs**	**171000**

NOTE:

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

Payment for variation in weight shall be paid as per contract clause11.4.1 of tender specification.

APPENDIX –I PART IV BOILER SCOPE

(A)TENTATIVE LIST OF BOILER HP (IBR) JOINTS TO BE DONE AT SITE

SN	DESCRIPTION	TUBE SIZE	MATERIAL	No. OF WELDS
1	Water-wall			
	A) Burner Panel	Dia 63.5 x 4.8	SA 192	160
	B) Front waterwall Panel	Dia 63.5 x 4.8	SA 192	202
	C) Front wall roof tubes	Dia 63.5 x 5.0	SA 192	206
	D) Rear waterwall panel	Dia 63.5 x 4.8	SA 192	408
	E) Side waterwall panel	Dia 63.5 x 4.8	SA 192	610
	F) Boiler Side wall tubes	Dia 63.5 x 5.0	SA 192	80
2	Riser Tubes	Dia 88.9 x 6.3	SA 106 Gr B	112
3	**Boiler Bank Tubes	Dia 51 x 4.0	SA 192	2480
4	Ring Header & Downcomer	Dia 323.9 x 35/25	SA 106 Gr C	20 (4+16)
5	Saturated Links	Dia 127 x 12.5	SA 106 Gr B	48
6	Desuperheater Links	Dia 323.9 x 32	SA 106 Gr B	4
7	Superheater			
	A. Platen SH	Dia 44.5 x 6.3	SA 213 T 11	52
		Dia 44.5 x 4.0	SA 213 T 11	52
		Dia 44.5 x 5.0	SA 213 T 11	52
	B. Final SH	Dia 51 x 4.5	SA 213 T 11	102
		Dia 51 x 7.1	SA 213 T 22	102
8	Economiser	Dia 44.5 x 4.0	SA 210 Gr A1	171
9	Economiser connecting links to drum	Dia 219 x 22.2	SA 106 Gr B	3
10	Soot Blower valves/fittings	Dia 2” Sch 40 Dia 38 x 3.6 mm thk	SA 210 Gr A1	50
11	Boiler valves & fittings	Dia 2” Sch 80 Dia 2.5” Sch 80 Dia 1” Sch 80 Dia 108x12.5 mm thk	SA 210 Gr A1 SA 210 Gr A1 SA 210 Gr A1 / T 11 SA 335 P 22	200

**** Not to be counted for considering variation in HP joints**

(B) TENTATIVE LIST OF (IBR) JOINTS FOR POWER CYCLE PIPING

SN	PIPE SIZE	MATERIAL SPECIFICATION	NOS. OF JOINTS	REMARKS
1	Pipe Dia 711.2X10	SA 243 WPB	16	
2	Pipe Dia 711 X 10	SA 335P 22	08	
3	Pipe Dia 508 X 10	SA 243 WPB	12	
4	Pipe Dia 508 X 10	SA 672 GB 70 CL 22A	110	
5	Pipe Dia 508 X 10	SA 355 P22	05	
6	Pipe Dia 355.6 x 36	SA 355 P22	95	
7	Pipe Dia 355.6 x 8	SA 234 WB	30	
8	Pipe Dia 355.6 x 8	SA 106 GB	06	
9	Pipe Dia 406.4 x 10	SA 672 GB 70 CL 22A	10	
10	Pipe Dia 323.9 x 6.35	SA 106 GB	45	
11	Pipe Dia 273.0 x 28	SA 335 P22	80	
12	Pipe Dia 273.0 x 10	SA 335 P22	20	
13	Pipe Dia 273.0 x 6.35	SA 335 P22	08	
14	Pipe Dia 273 x 6.35	SA 106 GB	40	
15	Pipe Dia 219.1 x 6.35	SA 106 GB	35	
16	Pipe Dia 219.1 x 25	SA 106 GB	220	
17	Pipe Dia 168.3 x 27.5	SA 234 PW P22	80	
18	Pipe Dia 168.3 x 11	SA 335 P22	30	
19	Pipe Dia 168.3 x 7.11	SA 106 GB	85	
20	Pipe Dia 114.3 X 6.02	SA 335 P22	07	
21	Pipe Dia 114.3 X 6.02	SA 106 GB	150	
22	Pipe Dia 114.3 x 13.49	SA 106 GB	220	
23	Pipe Dia 88.9 x 11.23	SA 335 P22	50	
24	Pipe Dia 88.9 x 6	SA 234 PB	100	
25	Pipe Dia 60 x 5.54	SA 103 GB	200	
26	Pipe Dia 60 x 5.54	SA 335 P11	250	
27	Pipe Dia 48.3 x 5.08	SA 106 GB	33	
28	Pipe Dia 33.3 x 6.35	SA 106 GB	250	
29	Pipe Dia 33.4 x 6.35	SA 335 P22	10	
30	Pipe Dia 114.3 x 17.12	SA 234 WPC	50	
31	Pipe Dia 48.3 x 5.08	SA 234 P22	10	
32	Pipe Dia 60 x 12	SA 335 P22	50	

Above list for High Pressure Joints (IBR) for Boiler and Power Cycle piping is tentative and the work shall be carried out as per drawing requirement & instruction of BHEL Site engineer. The Non-IBR weld joints shall be as per requirement on actual basis.

All the related works of NDT, Radiography, Pre-heating and Post heating shall be carried out as per drawing requirement & instruction of BHEL Engineer.

BHEL's decision with regard to classification of a particular product group is binding on the contractor.

Appendix-II PART I TG SCOPE

(Page 1 of 3)

Tentative Scope of Equipments/Systems under this Tender Specification.

(A) Surface Condenser

1. Spring loaded Condenser (shell in assembled condition)
2. Hotwell, Atmospheric relief valves, water Boxes, Water expansion relief valves
3. Condenser Tubes, Collar, top Connecting piece
4. Stand & Surge pipes, Sacrificial anodes and vents & drain valves
5. Foundation parts

(B) Steam Turbine & Auxiliaries:

1. Steam Turbine with parts in dismantled condition
2. Emergency trip cum stop valve
3. Blanket plate for steam blowing
4. Steam turbine Governing valve
5. Steam strainer built into Stop valve
6. Manual barring device
7. Electric Hydraulic Turning Device
8. Solenoid valve for remote tripping
9. Turbine sole plates & foundation bolts
10. Shaft grounding device
11. Mating flanges for turbine inlet & extraction flanges
12. Gland sealing system including inlet and Dump control valves
13. Gland Steam leak off piping
14. Turbine drain water piping within TG block
15. Safety relief valve in controlled extraction line
16. Main Steam Piping from Emergency Stop Valves to Steam Turbine Control Valves.

C) Oil Supply System:

1. Main oil tank including drain & maintenance openings, level indicator, level signalling device, connection for Oil purifier/oil centrifuge.

a. Main oil pump with AC Motor
b. Auxiliary oil pump with AC Motor
c. Emergency Oil pump with DC Motor
d. Jacking oil pump with AC motor
e. Duplex Filter for lube oil.
f. Oil accumulator
g. Trans-Flow valves for Duplex Oil Filter
h. Change over device for oil coolers
i. Vent & drain valves for oil coolers on water and oil sides
j. Oil mist fan with AC motor
k. Pressure throttles for bearings
l. Complete Lube oil piping (supply, return, vent & drain etc) between MOT to Equipments bearings including pumps & Aux.
m. Complete control oil piping .
n. Overhead Lube oil tank with complete piping
o. Oil accumulators
p.

Appendix-II PART I TG SCOPE
(Page 2 of 3)

Tentative Scope of Equipments/Systems under this Tender Specification.

q. Oil Centrifuge along with complete oil piping
r. Governing Console consisting of Duplex filter for control oil, Main trip solenoid valve, Electric Hydraulic Converters, solenoid valves for remote engagement of tripping device & other hydraulic components.

2. Steam Jet Air Ejector
a. Running erectors 2X100%
b. Starting ejector 1X100%
c. Steam & air vapour suction headers
d. Slide plates & Foundation parts
e. Isolation valves on steam supply header & Individual ejector
f. Water expansion relief valves
g. Instruments isolation valves
h. Vents & drain valves
i. Silencer for starting ejector
j. Strainers

3. **Gland Steam Condenser** with Steam jet ejectors 2X100%, Water expansion relief valve, Stand pipe, Isolation valves for instruments & stand pipes, Vents & drain valves.

4. **Lube oil coolers (2 Nos.)** with change over valves device, Isolation valves on CW side, Drain & vents valves, counter flanges on CW side with gaskets & fasteners.

5. Generator & Auxiliaries:
   a. Closed circuit air cooled Generator with stator, Rotor, Bearings and foundation parts & Generator air coolers with CW side inlet/outlet valves for each cooler and inlet/outlet terminal point of customer, Isolation valves for each header and related Aux..
   b. Brushless exciter with PMG
   c. CO_2 fire extinguishing equipment for generator.

6. Balance of Plant- Mechanical
   a. Vertical CEP with AC Motors & Accessories –2 sets
   b. Boiler Feed Pumps with related Aux. & lube oil system –2 sets
   c. LP Heaters-1&2 (Vertical– each 1 No.
   d. HP Heaters-4&5 (Vertical – each 1 No.)
   e. Drain Coolers
   f. Equipment drains.
   g. Turbine drains piping.
   h. Chimney steam piping.
   i. Gland steam piping.

Appendix-II PART I TG SCOPE
(Page 3 of 3)

Tentative Scope of Equipments/Systems under this Tender Specification.

j. Balance piston piping.
k. Extraction lines to Gland Steam Condenser.
l. Instrument air piping from terminal point to consumption point in STG hall.
m. Thermal insulation of piping.
n. Cooling water inlet & out let piping from Heat exchangers to terminal points.

NOTE:

Bill of quantity, dimension, weight of components are tentative and will be received in loose condition. Apart from above certain items will be supplied in assembled condition. Entire work along with instruments/items supplied in assembled condition shall be carried at site as per BHEL drawings & terminal points issued at site & instruction of BHEL site engineer.

Appendix – II PART II TG SCOPE

Tentative Weight details and Dimensions of Major Equipments

Sl No.	Description / Dimensions (in mm)	Weight (in MT)
1.	**Surface Condenser**	
	(i) Shell (Size (W5000XH4400XL11000 mm)	43.5
	(ii) Hot-well (Size W3400XH2200XL6500 mm)	19.0
	(iii) Dome (Size W3400XH2200XL7000 mm)	23.0
	(iv) Stand Pipe (Size Dia 114.3 X L 5500 mm)	2.0
	(v) Surge Pipe (Size Dia 506XL5500 mm)	3.0
	(vi) Tubes (OD 22XThk-1 XL7500 mmX10365 Nos.)	44.5
2.	Steam Jet Air Ejector (W 2000XH 3200X L 6000 mm)	7.5
3.	Gland Steam Condenser (Size Dia 406 X L 2800 mm)	1.1
4.	Drain Cooler (Size Dia 600 X L 5200 mm)	5.2
5.	LP Heater-1 (Dia 1200 X H 9400 mm)	6.7
6.	LP Heater-2 (Dia 1200 X H 7500 mm)	5.7
7.	HP Heater-4 (Size Dia 1300 X H 9400 mm)	11.5
8.	HP Heater-5 (Size Dia 1300 X H8300 mm)	12.0
1.	Steam Turbine Oil Cooler (Dia1250XL 3000 mm X 2Nos. Weight 3 T each)	6.0
10.	Generator Air Coolers (Size W700XH500X L 4200 X 8 Nos., Weight 0.96 T each)	7.7
11.	**Steam Turbine**	
	(i) Outer Casing (Upper part, size 3725x3110x 1600 mm)	14.0
	(ii) Outer Casing (Lower Part, size 3495x3100x1600 mm)	15.0
	(iii) Exhaust hood (upper part, size 5800X2100X2000 mm)	15.0
	(iv) Exhaust hood (Lower part, size 5800X2100X2000 mm)	22.0
	(v) Rotor assembly (size 7200x2300x2300 mm)	23.0
	(vi) Front Brg. housing assly. with bed plate (size 1600x2000x1500 mm)	7.5
	(vii) Rear Brg. housing assly.(size 4300x1600x1500 mm)	7.0
	(viii) Inner Casing (size 1300x1500x1250 mm)	4.0
	(ix) Guide blade carrier-I (Size 600x1300x1200 mm)	1.8
	(x) Guide blade carrier-II (Size 600x1500x1500 mm)	4.7
	(xi) Guide blade carrier-III (Size 350x2000x2000 mm)	3.5
	(xii) Guide blade carrier-Iv (Size 420x2400x2200 mm)	4.8
12.	Lube oil pump Assly. (Size 2500x1000x900 mm, 2 Nos., weight 1.1 T each)	2.2

Appendix – II PART II TG SCOPE

Page 2 of 2

Tentative Weight details and Dimensions of Major Equipments

13. EOP Assly. (DC) (Size 1600x750x700 mm)	0.7
14. JOP Assly. (AC&DC) (Size 1550x1350x800 mm)	2.0
15. Oil accumulator assembly (Size 1000X500X2300 mm)	0.6
16. Lube oil tank (Size 4450X2700X3000 mm)	5.5
17. Oil Centrifuge (Size 2200X1900X2000 mm)	1.0
18. Duplex oil filter (Size 1500X500X2000 mm)	0.5
19. Over head tank (Dia2800 X2700X2800mm)	3.0
20. Governing Console (Size 1800X1500X1500 mm)	1.0

21 Generator

(i)	Stator (Size L6000XB3500XH3500 mm)	100.0
(ii)	Rotor (Size L8300XB1000XH1000 mm)	23.7
(iii)	Bearings (Size L2000XB1000XH1200 mm)	4.6
(iv)	Exciter (Size L1500XB1200XH1500 mm)	2.0
(v)	Foundation items (Loose)	6.7
(vi)	Air Coolers Ducting items (Loose)	3.0
(vii)	CO_2 System with cylinders (Loose)	3.0

22. Condensate Extraction Pumps(2 sets)

(i)	Pump Assembly (Size Dia 711XH4774 mm)	2.08
(ii)	Canister (Size Dia 880 XH380 mm)	0.5
(iii)	Foundation Ring (Dia 1080 XH150 mm)	0.185
(iv)	Suction Strainer (Size Dia 825 X 920 mm)	0.55
(v)	Drive Motor (Size Dia 2130 X H 2170 mm)	3.3
(vi)	Motor Stool (Size Dia 1150 XH 440 mm	0.215
(vii)	Connecting coupling (loose)	0.42
(viii)	Tools & Tackles (loose)	0.11

23. HP Boiler Feed Pumps (2 sets)

(i)	Boiler Feed Pump set (Size L 2500X B 2400 X H 2200 mm)	5.4
(ii)	Seal Water Cooler (Size L 700X B 700 X H1200 mm)	0.11
(iii)	Suction strainer (BP) (Size L 2500X B 2400 XH 2200 mm)	0.32
(iv)	Connecting Coupling(BP/Motor) (Size L400X B250 XH 250 mm)	0.025
(v)	Connecting Coupling(Motor/HC) (Size L750X B400 XH 400 mm)	0.17
(vi)	Connecting Coupling(HC/BFP) (Size L600X B300 XH 300 mm)	0.045
(vii)	Booster Pump (Size L2000X B1400 XH 2000 mm)	2.5
(viii)	Motor (Size L4800X B3600 XH 3000 mm)	8.8
(ix)	BFP Lube Oil Unit skid (Size 2000X2000X2500 mm)	3.2
(x)	BFP Hydraulic Coupling	1.7
(xi)	Tools & Tackles (loose)	0.7

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 PART III TG SCOPE

Summary of Tentative Weight of Systems Involved in this Tender Specification.

SN	Description	Total Weight Involved (MT)
1.	Condenser & Auxiliaries	135.0
2.	Steam Jet Air Ejector	7.5
3.	Gland Steam Condenser	1.1
4.	Drain Cooler	5.2
5.	LP Heaters –1 & 2	12.4
6.	HP Heaters -- 4&5	23.5
7.	Steam Turbine & Aux.	122.3
8.	Steam Turbine Lube oil Pumps, Tanks & Aux.	22.5
9.	Generator & Auxiliaries	150.7
10.	Boiler Feed Pumps & Aux.	43.0
11.	Condensate Extraction Pumps & auxiliaries	15.0
12.	**Piping, Valves, Hanger & Supports & Fittings Aux.**	
	(i) Carbon steel Piping	20.0
	(ii) Alloy Steel Piping	1.5
	(iii) Alloy steel Piping (X-20, Cr Mo V 12.1 Material) (Pipe size OD 170 x 14.27 Thick, 20 Joints)	3.5
	(iv) Stainless Steel Piping	3.0
	Total Weight	**566.2MT**

NOTE :

All above weight details given are only tentative and likely to vary. The erection, testing, commissioning has to be carried out for all the Equipments/Auxiliaries/Items covered under this tender specification that are necessary for completion of the total system.

Appendix- III PART I ELECTRICAL AND C&I SCOPE

List of Systems and Equipment in Scope of Contract

Details (wherever required) of the items listed in the Rate Schedule
Please Note:

1. All the items are generally to be erected and commissioned by the contractor, unless specifically mentioned otherwise.
2. In such cases where systems are described with component lumpsum rates are to be quoted. No separate payment will be made for the component items of those systems, although these systems may have certain items for which separate unit rates are also available elsewhere.

Sl No A.1 to A.3: Control panels and accessories.
These are microprocessor based sophisticated electronic control panels and accessories. Lumpsum rate to be quoted.
Sl No A.4
DC starter box for scanner fan dimension approx 800x400x1200, weight approx 100 KG.
Sl No A.5: Pulveriser Lube oil skid
The scope of work includes removal of instruments, calibration, refixing, checking cable connection from JB to instruments, motor connection, meggering and improving IR value of motor etc. and commissioning the skid.
Equipment per set:
DP/Pressure Switch – 10 Nos
Temperature Switches- 4 Nos.
RTD – 2 No.
Pressure/DP Gauge- 6 Nos.
Temperature Indicators- 4 Nos.
Flow Indicators- 4 Nos.
Lumpsum rate per set is to be quoted.

Sl No A.6: Fan Lube oil skid
The scope of work includes removal of instruments, calibration, refixing, checking cable connection from JB to instruments, motor connection, meggering and improving IR value of motor etc. and commissioning the skid
The approximate total quantity of instruments *for all the 12 Nos. skids put together* is given below:
Pressure/DP Gauges - 88 Nos.
Temperature Gauges – 36 Nos.
DP Switches – 12 Nos.
Pressure Switches - 50 Nos.
Level Switches - 12 Nos.
Lumpsum rate per set is to be quoted.

Sl No A.7: Feeder Control Cabinet

- Lump sum rate is to be quoted.

Sl No A.8: ERV Controller
The controller box to be erected near the ERV and impulse piping to be done. It has 220V DV rated pressure switches inside which are to be calibrated. Dimension: 350 x 290 x 180 mm; weight: 5 kg each. Lumpsum rate per set is to be quoted.

Sl No A.9: Electronic water level indicator (EWLI)

Electronic Water Level Indicator EWLI comprises of the following:

Pressure vessel with loose supplied electrodes (24 nos). Pressure vessel will be erected by mechanical contractor.

2 Nos. of Ascertor Units (Local) with Display, each of dimension: 600 x 350 x 600 mm; Weight: 25 kg each

4 Nos. of Remote Display Unit (100 x 90 x 234 mm) (Two numbers at operating floor and two numbers at control room)

Interconnecting cables between local panel and 24 electrodes (included in cabling BOM)

Lumpsum rate per set is to be quoted.

Sl No A.10: Air Heater Rotor stoppage box

Rotor Stoppage Alarm Box- including sensors (magnetic switch), timer relays, interconnecting cables etc. Lumpsum rate per set is to be quoted.

Sl No A.15: HEA Exciter System

H.E.A. Excitor box along with retractor assembly, flexible spark rod, spark tip, flexible HT cable assembly, S.S. Hose (1 Mtr long, 6.35 mm ID), Air Filter Regulator, HEA Exciter etc. Lumpsum rate per set is to be quoted.

Sl No A.16: Flame Scanner head assembly

It includes erection of fibre optic cable of length 120", Lens Barrel Assembly, Miniature 6 way Junction Box etc. Lumpsum rate per set is to be quoted.

Appendix- III PART II ELECTRICAL AND C&I SCOPE

Consumables/Items to be provided by BHEL free of charge

Metallic Cable glands

Cable lugs more than 4sqmm size

Structural Steel for permanent supporting of equipment/components/instruments that form part of permanent installation.

Appendix- III PART III ELECTRICAL AND C&I SCOPE

List of major testing & measuring instrument/ tools and tackles to be deployed by contractor.

SN	Description	Quantity
I. MMD (Instruments)		
01	Dead weight tester rated 400 and 700 kg/cm2 with weights and test gauge facility. Make 'Budenberg or 'Ravika'	1 no. Each
02	Oil temperature bath suitable to calibrate the instruments range 0 – 200 deg. C with standard temperature gauges and thermostatic control	2 nos.
03	Muffle furnace – 800 deg. C with standard temperature gauges	1 no.
04	Standard gauges 12" dial size make "Budenberg" or "H Guru" or "Odin"	
	– 1-0 kg/cm2 pressure gauge(vacuum gauge) 0 – 5 or 6 kg/cm2 pressure gauge 0 – 10 kg/cm2 – do – 0 – 25 kg/cm2 – do – 0 – 60 kg/cm2 – do – 0 – 100 kg/cm2 –do – 0 – 250 kg/cm2 – do – 0 – 600 kg/cm2 – do – 0.2 to 1 kg -- do --	1 no. 1 no. 1 no. 1 no. 1 no. 1 no. 1 no. 1 no. 1 no.
05	Manometers (+/-) 1000 mm water column With hand bulb for lab and small manometers for field purpose.	2 nos.
06	Manometer (+/-) 500mm mercury column with hand bulb for lab and small manometer for field purpose.	1 no.
07	Inclined manometer (+/-) 300 mm water column	1 no.
08	Portable air compressor with drier and regulator make "Toshniwal" / "Khosla" rated for 7 to 10 kg/cm2	2 nos.
07	Soldering iron "Soldron" make 25 watt	6 nos.
09	Vacuum pump	1 no.
10	Multimeters	
A) B) C)	Digital, 3 1/2 digit Motwane/HIL/Fluke Analog: Motwane make Digital, 4 1/2 digit Motwane/HIL/Fluke	10 nos 2 nos. 4 nos.
11	Standard milliamps / millivolts source of reputed make. Range 0 to 60 ma and 0 to 100 mv	4 nos.
12	Insulation tester hand operated 250V / 500V / 1000V rated mains/battery operated	1 no. Each
13	DC power supply 0-50 VDC, 5 A make "Aplab" or equivalent	5 nos

SN	Description	Quantity
	(variable source)	
14	Single phase variac 250 V, 8 amp	1 no
15	3 phase variac rating 5 amps	1 no.
16	Glass thermometer 0-120 deg. C, 0-200 deg.c and 0-600 deg.c	1 no. Each
17	Tong tester AC 5/10 and 25/60/300 amp of reputed make	1 no. Each
18	Tong tester DC 30/60/300 amp	1 no.
19	Secondary current injection kit upto 300 amp	1 no.
20	Tarpaulin fire proof	5 nos.
21	DC shunt 400 amp 75 mV	1 no.
22	Tachometer non-contact type 0 to 4000 rpm	1 no.
23	Industrial type vacuum cleaner	1 no.
24	RTD/Pt 100 source	2 nos.
25	Decade resistance box	2 nos.
26	Teletalk 2 wire system	6 sets
27	Equipment and consumables for LPI/MPI test on impulse pipes	1 set
28	Function generator	1 no

Note:

MMD/T&P listed above are for the regular works only. However, separate sets of T&P and MMD are to be arranged and provided with commissioning assistance gang. If contractor fails to arrange the testing instruments as listed above, BHEL will arrange the same at the risk and cost of Contractor. Contractor shall get the MMD calibrated at approved laboratory traceable to NPL and submit calibration certificate prior to deployment of same at site and periodical calibration of the same to be arranged by contractor as per procedure of BHEL.

SN	Description	Quantity
II. Handling equipment		
1	Turn buckles	As per reqmt
2	D-shackles	
3	Steel wire ropes	
4	Manila ropes	
5	Chain pulley block/turfer	
III. Major T&P		
1	Pipe bending machine – 2” size	2 nos
2	Grinding machine	2 nos
3	Drilling machines 1/4”, 1/2”, 3/4” & 1”	1 no. Each
4	Copper tube bender and cutter sizes 6mm, 8mm,	1 no. Each

SN	Description	Quantity
	1/2", 1/4"	
5	Dye sets for threading upto 2" pipe.	2 nos
6	Spirit level	2 nos.
7	Tap sets for both BSP and NPT threads upto 1" each	1 set each
8	Measuring instruments like micrometers and callipers	1 set each
9	Welding generators	3 nos.
10	Welding transformer	2 nos.
11	TIG welding set	1 no.
12	Mechanical tool kit for fitters	6 sets.
13	Electrician tool kit	6 sets.
14	Crimping tool upto 2.5 sq.mm cable	4 nos.
15	Flood light fittings	4 nos.
16	Fire extinguishers as required	1 set.
17	Distribution boards with power cable complete as required	1 set
18	Painting brush	As per reqmt.
19	Fire proof tarpaulin	As per reqmt.
20	Safety belts and safety helmets	As per reqmt.
21	24V AC transformer & hand lamps	4 nos.
22	Ferrule printing machine	2 nos
23	Electrode drying ovens	As required

Note:

The list of instruments / equipments to be brought by the contractor as shown above is only indicative. Any other instruments / equipments required for the execution of the work is to be necessarily arranged by the contractor. The testing/calibration instruments that are being used shall be duly calibrated in the interval prescribed by BHEL engineer from the BHEL-approved agencies. And test certificate to be furnished.

Appendix- III PART III ELECTRICAL AND C&I SCOPE

The following materials/consumables are to be arranged by the Contractor for erection and commissioning as part of the scope.

SN	Description
1	Welding electrodes for welding AS/CS/SS pipe and other welding from BHEL approved vendors only
2	Filler wire for TIG welding
3	Argon, oxygen and acetylene gas
4	Provision for temporary scaffoldings.
5	GI “U” clamps with nuts and washers for impulse and GI pipe clamping.
6	Round aluminium tags (30mm dia x 3mm thick)
7	Teflon tape and insulation tape.
8	“Holdtight” Compound, Tefflon Tape, Bitumen Tape for GI pipe coupling.
9	Paints required for primer coating and for protective coating from BHEL approved vendors only.
10	Solder wire (60/40)
11	Protocol/calibration report sheets as per BHEL format.
12	Panel/JB sealing compound material (for cable entry from bottom/top of panel).
13	PVC cable tie, aluminium strip and hardware for clamping of cables, copper tube, temperature gauge capillary.
14	Copper lugs upto 4 sq.mm. PVC sleeve of different size, PVC button & tape

APPENDIX-IV

List of T&P to be provided by BHEL free of Hire Charges on Sharing Basis

Sl.	Description & Capacity Of T&P	Quantity	Remarks
01	10 T Winch	2 Nos.	For Drum Lifting
02	60T Multi Sheave Pulley Block	4 Nos.	For Drum Lifting
03	10T Single Sheave Pulley Block @	8 Nos.	For Drum Lifting
04	400 Kg/cm^2 Hyd. Test Pump	1 No.	For Hydraulic Test of Boiler and Pipelines
05	12 &16 mm Huck Bolting Machine	2 Nos.	For ESP Huck Bolting
06	Crane 120/160 MT*	1 No.	For Boiler erection

@ - The number of pulleys may vary as per site requirement.

Contractor shall have to carry out the necessary work of overhauling, assembly/ trial of drum lifting kit for safe operation as scope of work and return it to BHEL stores in good dismantled condition.

*Crane shall be deployed by customer to be used as per customer terms and conditions. Non provision of this ocrane shall not be a contractual reason for any delays/claims.

APPENDIX – V

MAJOR TOOLS AND PLANTS & MMD TO BE DEPLOYED BY CONTRACTOR

A: **Tool & Plants PART I BOILER SCOPE***

SN	Description	Capacity	Min. Qty
1.	Mobile crane (For material handling & erection of ESP)	75 T or higher	1 No. (As per requirement)
2.	One crane of higher capacity	100 T or above	1 No. As per requirement for erection of Boiler including suiting the requirement of erection of Boiler ceiling girders and other high reach components, Deaerator with FST etc.
3.	Tyre-Mounted Mobile Crane	8/10 T	1 No.
4.	Welding Generators	As required	As per Site Requirement
5.	Electric Winch	As required	As per Site Requirement
6.	Air Compressor	140 CFT/min 7kg/cm^2	1 No
7.	TIG Welding Torch Air/Water Cooled	-	As Per Site Requirement
8.	Tube Expanding Machine with all accessoires for Boiler (Automatic Pneumatic)	As required	2 Nos
9.	Digital Hardness Tester	As required	1 No
10	Theodolite (20 Sec accuracy)	As required	1 No
11	Stress Relieving Set	As required	1 No.
12	3 Ph Distribution Board With Complete Set Up For Drawl Of Construction Power	400 Amp	1 Nos.
13	Electric Cable For Drawal & Distribution Of Construction Power	As required	As Per Site Requirement
14	Pipe Bending Machine electro hydraulic	Up To 3” Dia	As per required
15	Radiography Arrangement Including Source	IR 192	1 Set
16	Trailer with Prime mover	As required	As per requirement
17	Self-Drilling cum screw fixing machine for floor grill fixing and Boiler Roof Sheeting	As required	As per requirement

SN	Description	Capacity	Min. Qty
18	Hydraulic Jacks of suitable capacity	---	As per requirement
19	Torque wrench 0-2000 n-m capacity		As per requirement
20	Vacuum cleaner-Industrial		As per requirement
21	Mixer for grouting of equipments		As per requirement
22	Slings for lifting of heavy equipments.		As per requirement
23	Spanner/Eye bolts/Jack bolts of all sizes		As per requirement
24	Long filler gauze set		As per requirement
25	Electrode Baking oven (Big & Portable)		As per requirement
26	Acid Transfer Pumps and Chemical circulating pumps/ cleaning pump sets with all arrangements for chemical cleaning & Alkali Boil out		As per requirement
27	Hydraulic test pump	250 Kg/Cm2	As per requirement

PART II TG SCOPE*

SN	Description & capacity of T&P	Min. Qty
1	Mobile Crane of suitable capacity	01
2	Trailer with Tractor of suitable capacity	01
3	TIG welding sets	3 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	6 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
12	Hydraulic Jacks of adequate capacity	As required

PART III ELECTRICAL AND C&I SCOPE

Included in Appendix III.

(*) NOTE: 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. No claim whatsoever will be entertained on this account.

B: **MMD*:**

Measuring and Monitoring Devices (instruments) as necessary for completion of the scope of work under this tender specification shall be in the scope of the contractor.

APPENDIX – V I

DECLARATION BY BIDDER'S AUTHORISED SIGNATORY

I, hereby certify that all the information and data furnished by me with regard to this tender specification **No.** 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

APPENDIX – VII

CERTIFICATE OF DECLARATION FOR CONFIRMING THE KNOWLEDGE OF SITE CONDITIONS

We,…… …… Hereby declare and confirm that we have visited the project site under the subject namely, ……and acquired full knowledge and information about the ***site conditions, wage structure, Industrial climate and total work involved***. We further confirm that the above information is true and correct and we will not raise any claim of any nature due to lack of knowledge of site condition.

Tenderers Name and Address

Place: (Signature of the Tenderers with stamp)

Date:

ANNEXURE-VIII

NON DISCLOSURE AGREEMENT
Memorandum of Understanding

BHEL PSNR is committed to information Security Management System as per Information Security Policy.

M/s ……..,providing……..service to BHEL PSNR, Noida hereby undertake to comply with the following in line with Information Security Policy of BHEL PSNR:

- To maintain confidentiality of documents & information which shall be used during the execution of the Contract.

- The documents & information shall not be revealed to or shared with third party which shall not be in the business interest of BHEL, PSNR.

( ) ( )
M/s BHEL, PSNR M/s……..

APPENDIX-IX

GENERAL TERMS AND CONDITIONS OF REVERSE AUCTION (RA)

Against this NIT for the subject work, **tender shall be processed through Reverse Auction mode i.e., ON LINE BIDDING ON INTERNET. The General Terms and Conditions of the RA shall be as follows:**

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
3. BHEL will inform to the vendor in writing, in case of reverse auction along with the details of Service Provider to enable them to contact & get trained.
4. **'Business rules'** like event date, time, Start price, bid decrement, extensions etc. also will be communicated through service provider for compliance.
5. Vendors have to fax the Compliance form in the prescribed format (provided by Service provider) before start of Reverse auction. Without this, the vendor will not be eligible to Participate in the event.
6. BHEL will provide the calculation sheet (e.g., EXCEL sheet), which will help to arrive at "Total Cost to BHEL".
7. Reverse auction will be conducted on scheduled date & time.
8. At the end of Reverse Auction event, the lowest bidder value will be known on the network.
9. The lowest bidder has to Fax the duly signed Filled-in prescribed format as provided on case-to-case basis to BHEL through Service provider within 24 hours of Auction without fail.
10. During Reverse Auction, if no bid is received within the specified time, BHEL at its discretion, may decide to revise opening price/ scrap the reverse auction process/ proceed with conventional mode of tendering.
11. **Sealed bid Reverse Auction:** The opening bid (In the initial auction) of the bidders shall be same as that quoted in their Final Sealed price submitted to BHEL. **The bidders shall confirm in writing to BHEL that their opening bid (In both cases) shall be same as that quoted in their final sealed price bids submitted to BHEL against this NIT along with Technical Bid (Part-I)**.
12. BHEL reserves the right to cancel Reverse Auction (RA) without assigning any reasons and resort to considering the sealed bids submitted by vendor for processing and finalizing the tender.
13. Any variation between the on-line bid value and the signed document will be considered as sabotaging the tender process and will invite disqualification of vendor to conduct business with BHEL as per prevailing procedure.
14. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
15. Bids-given by the bidders during the Reverse Auction process will be taken as an offer to execute the work. Bids once made by the bidder, cannot be cancelled/withdrawn and bidders shall be bound to execute the work as mentioned above at the final bid price. Should be bidder (Lowest) back out and not execute the contract as per the rates quoted, BHEL shall take action as appropriate.

APPENDIX-X

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

Bharat Heavy Electricals Limited
Power Sector – Northern Region,
Plot No. 25, Sector - 16A ,
Distt. Gautam Budh Nagar,
NOIDA – 201 301.INDIA

Sub.: No Deviation Certificate for Erection, testing and commissioning of Boiler, TG, Piping, CNI, Electrical and Total Material Handling work of 2x80 MW CPP at DARIBA MINES, HZL, RAJASTHAN.

TENDER NO. BHEL:NR(SCT): DARIBA:BLR -TG-CNI & MM:595

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website and in case of observance at any stage; it shall be treated as null and void. We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT and confirm our acceptance to reverse auctioning process and we hereby convey our unqualified acceptance to all terms and conditions as stipulated in the tender and NIT. In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer strictly in accordance with tender instructions.

Thanking you,

Yours faithfully,

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

RATE SCHEDULE

TENDER NO. BHEL:NR(SCT): DARIBA:BLR-TG-CNI & MM:595					
HINDUSTAN ZINC 2X80MW DARIBA PROJECT					
RATE SCHEDULE CUM BOQ					
Sl. No.	**DESCRIPTION OF WORK**	**QTY**	**UOM**	**UNIT RATE (Rs.)**	**AMOUNT (Rs.)**
A	**RECEIPT, UNLOADING, VERIFICATION, STACKING OF MATERIALS AS PER SCOPE SPECIFIED IN TENDER SPECIFICATION WITH ASSOCIATED AMENDMENTS, CLARIFICATIONS ETC. VARIOUS ITEMS OF WORK ARE AS FOLLOWS.**				
A.1	Materials received at site in trucks, trailers/ carriers for consignments consigned to project, unloading at BHEL storage yard/sheds, erection site, verification and stacking the same in assigned location including box verification for incoming materials	9600	MT		
A.2	Contacting road transporters/courier services go-down in and around Udaipur, based on LWB/GC notes handed over to the contractor and arranging collection, transportation of goods to BHEL storage yard, storage shed, erection site, unloading, verification and stacking the same in assigned location including box verification for incoming materials	40	MT		
A.3	Shifting of materials already stored or stacked at BHEL stores/sheds/ erection site to customer's premises or premises of other agencies in HZL complex or vice versa by loading, transporting, unloading and stacking. Approx. Lead distance 3km.for incoming materials	300	MT		
A.4	Loading of materials into trucks/carriers at site stores/erection site for onward transportation to other destinations by other agencies (out going materials)	100	MT		

A.5	Collection of smalls from BHEL stores/ erection site, transporting to railway station/transport company's go-downs and booking for onward transportation by railways/road carriers to other destinations.	20	MT		
A.6	Preservation of components by surface cleaning, application of one coat of ROZC (IS:2074) primer and inscription of identification number/code etc.	100	MT		
B	**ERECTION, TESTING & COMMISIONING**				
BI	Erection, Testing, Assistance for Commissioning, Final Painting and Handing Over of P.F. fired Boiler with Auxiliaries, ESP with Auxiliaries, De-aerating Heater with approach platform, Tanks, Vessels, Re-generative System Piping, Power Cycle Piping, HP & LP Bypass System, Application of Thermal Insulation & Cladding AS PER SCOPE SPECIFIED IN TENDER SPECIFICATION SECTION 4 PART I WITH ASSOCIATED AMENDMENTS, CLARIFICATIONS ETC. SCOPE AS PER APPENDIX I	8934	MT		
BII	CONDENSER, STEAM TURBINE WITH AUXILIARIES, LUBE OIL SYSTEM, TURBO-GENERATOR (INCLUDING LIFTING ARRANGEMENT FOR GENERATOR STATOR AND PLACEMENT ON FORMDATION), CONDENSER EXTRACTION PUMPS, BFP, LP&HP HEATERS, SJAE, DRAIN COOLER AND AUXILIARIES INCLUDING INTEGRAL PIPING WITH VALVES, M.S. PIPING BETWEEN ESV TO STEAM TURBINE, FITTINGS AND SUPPORTS ETC. AS PER ITEMS APPENDIX-II AND TENDER SPECIFICATION SECTION 4 PART II WITH ASSOCIATED AMENDMENTS, CLARIFICATIONS ETC. **LUMPSUM RATE FOR 2 UNITS**			N A	RATE FOR 2 UNITS

BIII	**ELECTRICAL AND CONTROL &INSTRUMENTATION** AS PER ITEMS APPENDIX-III AND TENDER SPECIFICATION SECTION 4 PART-I WITH ASSOCIATED AMENDMENTS, CLARIFICATIONS ETC. FOR 2 UNITS TOTAL RATE. FOR ITEMS AS DETAILS IN BIV			**UNIT RATES AS PER BIV**	
	GRAND TOTAL AMOUNT IN FIGURES (Rs.)				

NOTE

1. THE RATE BSHALL BE ENTERED IN FIGURES AS WELL AS IN WORDS. IN CASE OF DIFFERENCE IN RATES BETWEEN FIGURES AND WORDS, THE LESSER OF THE TWO WILL BE TREATED AS VALID RATE.

2. Only 'Unit Rate' shall be considered for evaluation and award.

3. The quantities indicated against each item above are tentative and these are liable to vary depending upon the site requirement. The contractor has to handle / erect / commission all items indicated by BHEL Engineer for achieving unit wise milestone and completion of workrate.

4. In case of omission in quoting any rate, the evaluation will be done considering the highest quoted rate obtained against that item. But the work, if awarded, will be on the lowest quoted rate obtained against that item.

5. 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 also indicating on each of the cover tender specification no., date and time as mentioned in tender notice.

(Seal and Signature of Tenderer)

B IV-DETAILS OF TOTAL PRICE OF ITEM BIII OF RATE SCHEDULE

SN	DESCRIPTION	QTY	UOM	UNIT RATE (Rs)	TOTAL RATE (Rs)
	SECTION A - CONTROL PANELS, LOCAL PANELS, COMPOSITE SYSTEMS AND FIELD DEVICES				
A.1	max DNA based Electronic Control Panel for FSSS, Soot Blowers , SADC, EHTC,TP, TSE, GSPC,APRDS and ATRS Functions.(approx dimension L750 X B800 X H2415), Weight 400 Kg per panel.	**34**	Nos		
A.2	**max MMI (Details are as follows)**				
A.2.1	max Engineering Station, Link Station, Operator Station, Storian System and accessories	**14**	Nos		
A.2.2	max Network Panel (approx. dimension 600x800x2355mm)	**2**	Nos		
A.2.3	Printers for Max system, colour inkjet, laser jet, dot matrix along with print server	**14**	Nos		
A.3	Flame Scanner Amplifier Panel (CJF07) (Approx 750x800x2415)	**2**	No		
A.4	DC motor starter box for scanner fan (Approx 800x400x1200)	**2**	No		
A.5	Pulveriser Lube oil skid	**10**	Sets		
A.6	Fan Lube oil skid	**12**	Sets		
A.7	Feeder Control Cabinet (600x400x1200)	**10**	Nos		
A.8	ERV Controller (350x290x180) approximate weight 5 kg	**2**	No		
A.9	Electronic Water Level Indicator (EWLI) with two numbers of remote display unit at UCD, Two display unit at operating floor and two numbers ascertor panels.	**4**	Sets		
A.10	Air Heater Rotor Stoppage Alarm Box	**4**	Set		
A.11	Soot Blower MCC 5400x1000x2400) Double front non-drawout type	**2**	No		
A.12	ESP MCC (11000x1700x2400) double front non-drawout type.	**2**	Nos		
A.13	Electronic Controller for ESP, (approx L700 X B650 X H2000), weight 300kg/controller	**16**	Nos		
A.14	Rapcon control panel	**2**	Nos		

A.15	HEA Exciter system comprising of retract mechanism, transformer,spark rod and tip, flexible cable, hose, plug and accessories	**24**	Sets		
A.16	Flame Scanner Head Assembly with cable, JB and accessories	**32**	Sets		
A.17	AVR Control Panel 3050 (L)x750 (W)x2295 (H), Approximate total weight is 1000 Kg.	**2**	Nos		
A.18	Generator Relay and Control Panel along with Generator Control Desk and synchronising gear.	**2**	Nos		
A.19	CO_2 Panels,Cylinders and Piping for firefighting system for STG.	**2**	Set		
A.20	Turbosupervisory Equipment like, vibration sensor, Axial Shift, Expansion Probes along with proximeter, 3500 system rack, PC, cables and accessories.	**2**	Set		
A.21	Opacity Monitor System with accessories for ESP	**2**	Set		
A.22	Integrated Operating System (IOS) PC	**2**	Nos		
A.23	Local Instrument Racks	**30**	Nos		
A.24	INTEGRATED TESTING/ COMMISSIONING OF CONTROLS AND PROTECTIONS RELAY PANEL OF GENERATOR & ASSOCIATED EQUIPMENTS. (Scope of work as detailed in tender specification vide clause No. 4.15.13)	**2**	Sets		
A25	Generator Space Heater Panel	**2**	No		
A26	110V Control Supply Panel	**2**	No		
A27	Local Gauge Borad for Turbine, CEP and BFPs	**10**	Nos		
	SECTION B - FIELD INSTRUMENTS, CONTROLLERS (Details are as follows)	**0**			
B.1	Pressure Switch	**100**	Nos		
B.2	Differential Pressure Indicator/ Differential Pressure Switch.	**70**	Nos		
B.3	Pressure Gauge/Draft Gauge	**250**	Nos		
B.4	Electronic Pressure Transmitters	**50**	Nos		
B.5	Electronic Differential Pressure Transmitter for measurement of flow, level etc.	**10**	Nos		
B.6	Temperature Switch(Stem / Capilliary type), Thermostat	**10**	Nos		
B.7	Temperature Gauge with thermowell (both stem type and capillary type)	**200**	Nos		

B.8	Thermocouple with thermowell (all types except MTM for Boiler)	**70**	Nos		
B.9	MTM Thermocouple with clamp and clit.	**80**	Nos		
B.10	RTD (simplex / duplex) with thermowell	**40**	Nos		
B.11	Level Switch	**90**	Nos		
B.12	Level Indicator / Level Gauge	**30**	Nos		
B.13	Ash level indicator along with sensing probe, cable and accessories.	**16**	sets		
B.14	Flow switch (Mechanical / Electronic)	**2**	Nos		
B.15	Flow indicator / Flow Gauge / Flow meter	**2**	Nos		
B.16	Flow Transmitter (Pulse / mass flow / PD type) including flanges and pulse amplifier	**2**	Nos		
B.17	Vibration measurement system for Fans (Make: Shenk Avery)	**24**	Nos		
B.18	Speed Pick up and measurement system	**12**	Nos		
B.19	I/P converters	**70**	Nos		
B.20	Air filter regulator	**60**	Nos		
B.21	Limit Switch	**180**	Nos		
B.22	Speed Regulator	**24**	Nos		
B.23	Air Lock Relay	**24**	Nos		
B.24	Solenoid Valves	**110**	Nos		
B.25	Thermostats for ESP	**16**	Nos		
B.26	Support insulator thermostat	**2**	Nos		
B.27	Disconnecting switch	**8**	Nos		
B.28	Air flow rotameter	**4**	Nos		
B.29	4x4" power cylinders for SADC system	**80**	Nos		
B.30	power cylinders for Fan Inlet Vanes	**12**	Nos		
SECTION C- DEVICES ERECTED BY OTHER AGENCIES (Details are as follows)		**0**			
C.1	Only healthiness checking of embedded RTD / T/C in Pump/Fan motor bearings	**80**	Nos		
C.2	Limit Switches (checking and adjusting only).	**60**	Nos		
C.3	Commissioning of Pneumatic regulating drives: (Control Valve,)	**80**	Nos		
C.4	Commissioning of Open/Close type pneumatic gates / dampers / valves	**120**	Nos		
C.5	Commissioning of Mill Discharge Valve	**10**	Sets		

C.6	Commissioning of Electrical actuators	**120**	Nos		
C.7	Commissioning of Burner Tilt Powr Cylinders	**8**	Nos		
C.8	Oil filtration,Testing and commissioning of ESP Transformers	**16**	Nos		
C.9	Testing and commissioning of Heating elements in ESP (Hopper heater, support heater and shaft heaters)	**300**	Nos		
C.10	Rotary switch in ESP	**8**	Nos		
C.11	Interlock Board in ESP	**8**	Nos		
C.12	Electrically Operated Hoist for ESP and Fans	**8**	Nos		
C.13	Central Lub Oil System	**2**	Set		
C14	Soot Blowers (LRSB and RSB)	**12**	Sets		
	SECTION D - CABLE, CABLE TRAY, JBs, IMPULSE PIPE, STRUCTURAL STEEL AND OTHER HARDWARE (Details are as follows)	**0**			
D.1	Junction boxes12/24/ 36/48 way	**240**	Nos		
D.2	Local start stop push buttons	**40**	Nos		
D.3	**Impulse Pipe/ Tubes**				
D.3.1	S.S. Tube 12.7x2.1	300	M		
D.3.2	S.S. Tube 6.35X0.9	3000	M		
D.3.3	1/2 " Sch 40/80/160 CS Pipe	300	M		
D.3.4	1/2" Sch 40/80/160 SS / SA 106 Gr B Pipe	1100	M		
D.3.5	Copper tube 6mm/ 8mm / 1/4"/ 3/4" (Sheathed / bare)	**400**	M		
D3.6	1 Inch Schedule 80 CS Pipe	**200**	M		
D3.7	Flexible Hose 1" / ½"	**20**	Nos		
D3.8	Flexible Hose ¼ "	**64**	Nos		
D.4	Perforated cable tray (with or without cover) 50mm in pieces of 2.5M	**500**	Nos		
D.5	Ladder / Perforated cable tray (with or without cover) 100mm in 2.5mts length	**300**	Nos		
D.6	Ladder / Perforated cable tray (with or without cover) 150mm in 2.5 mts length	**850**	Nos		
D.7	Cable Duct 250 x 100x1000mm with cover, tee, bends etc.	**50**	Nos		
D.8	Cable Duct60 x 60x1000mm with cover, tee, bends etc.	**50**	Nos		

D.9	Ladder/perforated type cable tray (with or without cover) 300mm	**1500**	M		
D.10	Ladder / perforated type cable tray (with or without cover) 450mm	**300**	M		
D.11	1/2" flexible conduit for cables	**300**	M		
D.12	GI Earthing flat 50mmX6mm	**500**	M		
D.13	GI Earthing flat 30mmX5mm	**1000**	M		
D.14	GI Wire	**7000**	M		
D.15	UTP (Unsheilded Twistd Pair) Cable for networkig (in length of 300M)	**2400**	M		
D.16	Screened Copper Cable 1P / 2P x 0.5 sqmm armoured	**7000**	M		
D.17	Screened Copper Cable 4P x 0.5 sqmm armoured	**17000**	M		
D.18	Screened Copper Cable 8P x 0.5 sqmm armoured	**8600**	M		
D.19	Screened Copper Cable 10/12P x 0.5 sqmm armoured	**500**	M		
D.20	Screened Copper Cable 16P x 0.5 sqmm armoured	**500**	M		
D.21	1 sqmm PVC flexible cable	**500**	M		
D.22	Compensating cable 2P x 1.3 sqmm	**200**	M		
D.23	Copper Cable 2C x 1.5 sqmm armoured	**800**	M		
D.24	Copper Cable 3C x 1.5 sqmm armoured	**2800**	M		
D.25	Copper Cable 2P/4C x 1.5 sqmm armoured	**15000**	M		
D.26	Copper Cable 5C x 1.5 sqmm armoured	**1600**	M		
D.27	Copper Cable 4P / 7C x 1.5 sqmm armoured	**5000**	M		
D.28	Copper Cable 10C x 1.5 sqmm armoured	**8500**	M		
D.29	10T x 1.5 sqmm cable	**800**	M		
D.30	Copper Cable 10P / 12 P x 1.5 sqmm armoured	**3200**	M		
D.31	4C / 2P shielded unarmoured cable for scanners	**3000**	M		
D.32	2C x 2.5 sqmm Cable	**9000**	M		
D.33	5C x 2.5 sqmm Cable	**2000**	M		
D.34	10C x 2.5 sqmm Cable	**3000**	M		
D.35	3C x4 sqmm Cable	**2000**	M		
D.36	2C x 6 sqmm Cable	**500**	M		
D.37	3C x 6 sqmm Cable	**5000**	M		

D.38	3C x 10 sqmm Cable	**2000**	M		
D.39	3C x 35 sqmm Cable	**1000**	M		
D.40	2C x 70 sqmm Cable	**7000**	M		
D.41	Structural steel for fabrication	**8**	MT		
	GRAND TOTAL (IN FIGURES) CARRIED FORWARD TO ITEM BIII OF RATE SCHEDULE		**Rs.**		