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

No. - BHE/PW/PUR/BSJI-STG/440

FOR

RECEIPT OF MATERIALS FROM BHEL/CUSTOMER STORES/STORAGE YARD, HANDLING AT STORES/STORAGE YARD, SITE OF WORK, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR (INCLUDING ITS RECEIPT FROM TRAILER AND HANDLING), CONDENSER WITH R.E. JOINTS, TG INTEGRAL PIPING, EXTERNAL/ REGENERATIVE PIPING, EQUIPMENTS / TANKS / VESSELS, HP & LP HEATERS, DEAERATOR WITH ASSOCIATED PLATFORM, HP-LP BYPASS SYSTEM, POWER CYCLE PUMPS WITH ASSOCIATED AUXILIARIES, CW PUMPS ETC.. INCLUDING BOUGHT OUT ITEMS, PEM PACKAGES LIKE MISC. CRANES & HOISTS, WORK SHOP EQUIPMENTS, LAB EQUIPMENTS, PLATE HEAT EXCHANGERS, MISC. PUMPS, ETC. AND DG SETS OF UNIT-1 & 2 OF 2X 250 MW

AT

BHILAI ELECTRIC SUPPLY COMPANY PRIVATE LTD;
EXPANSION OF BHILAI POWER PROJECT (2x250 MW)
BHILAI, DISTT: DURG,

CHHATTISGARH

PART –I

(TECHNICAL BID SPECIFICATION, NOTICE INVITING TENDER and GCC)

BHARAT HEAVY ELECTRICALS LIMITED
(*A GOVERNMENT OF INDIA UNDERTAKING*)
POWER SECTOR : WESTERN REGION
345, KINGSWAY : NAGPUR 440 001

CONTENTS

LEGEND:

$: PLACED BEFORE 'GENERAL CONDITIONS OF CONTRACT' IN BOTH HARD AND SOFT COPY DOCUMENTS.

#: ATTACHED AT THE END OF HARD COPY OF TENDER SPECS. PART-I (TECHNICAL BID) AND AS A SEPARATE FILE TITLED 'WEB_NIT_GCC' AS SOFT COPY HOSTED IN WEB PAGE.

@: ISSUED AS SEPARATE BOOKLET IN HARD COPY AS PART-II (PRICE BID) AND AS SEPARATE FILE TITLED 'PRICE_BID' AS SOFT COPY HOSTED IN WEB PAGE.

BHARAT HEAVY ELECTRICALS LIMITED
(A GOVERNMENT OF INDIA UNDERTAKING)
POWER SECTOR - WESTERN REGION
SHREEMOHINI COMPLEX
345-KINGSWAY, NAGPUR - 440 001

FOR

RECEIPT OF MATERIALS FROM BHEL/CUSTOMER STORES/STORAGE YARD, HANDLING AT STORES/STORAGE YARD, SITE OF WORK, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR (INCLUDING ITS RECEIPT FROM TRAILER AND HANDLING), CONDENSER WITH R.E. JOINTS, TG INTEGRAL PIPING, EXTERNAL/ REGENERATIVE PIPING, EQUIPMENTS / TANKS / VESSELS, HP & LP HEATERS, DEAERATOR WITH ASSOCIATED PLATFORM, HP-LP BYPASS SYSTEM, POWER CYCLE PUMPS WITH ASSOCIATED AUXILIARIES ETC. OF Unit-1 & 2 of 2x 250 MW

AT

BHILAI ELECTRIC SUPPLY COMPANY PRIVATE LTD;
EXPANSION OF BHILAI POWER PROJECT (2x250 MW)
BHILAI, DISTT: DURG,

CHHATTISGARH

EARNEST MONEY DEPOSIT: Please see Section-15 of Special Conditions of Contract.

LAST DATE AND TIME FOR
RECEIPT OF OFFERS: Please visit web page www.bhel.com -> **"Tender Notification"** and **"View Corrigendum"**

THESE TENDER DOCUMENTS CONTAINING PART-I TECHNICAL BID AND PART-II PRICE BID, ARE ISSUED TO:

M/s. ……

……

PLEASE NOTE:

1) **THESE TENDER DOCUMENTS ARE NOT TRANSFERABLE.**
2) **TENDERER SHALL NOTE THAT THEIR OFFER WILL BE CONSIDERED SUBJECT TO THE APPROVAL OF BHEL'S CUSTOMER M/s JPL.**

For Bharat Heavy Electricals Limited

Dy. GEN MANAGER (PURCHASE)
PLACE: NAGPUR
DATE:

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
POWER SECTOR - WESTERN REGION
345, KINGS WAY - NAGPUR 440 001

PROCEDURE FOR SUBMISSION OF SEALED TENDERS

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

PART-I (TECHNICAL BID) COVER-I

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

PART-II (PRICE BID) COVER-II

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

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

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

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

1. CONTRACTOR SHOULD HAVE ADEQUATE RESOURCES INCLUDING MAJOR T&P AT HIS DISPOSAL FOR THIS JOB.

2. CONTRACTOR SHOULD HAVE SOUND FINANCIAL STABILITY.

3. TENDERER SHOULD MEET QUALITY REQUIREMENT REGARDING WORKMANSHIP, DEPLOYMENT OF PERSONNEL, ERECTION TOOLS AND NECESSARY INSPECTION, MEASUREMENT & TESTING INSTRUMENTS.

4. ALL INFORMATION AS CALLED FOR IN VARIOUS APPENDICES AND CLAUSES OF TENDER SPECIFICATION, SHOULD BE FURNISHED IN COMPLETENESS. PLEASE REFER THE CHECKLIST.

5. THE TENDERER, SHALL OBTAIN CLARIFICATION ON TENDER IF ANY, BEFORE SUBMITTING THEIR OFFER.

6. OFFERS MUST BE SUBMITTED WITHOUT ANY DEVIATION.

7. OFFERS RECEIVED WITH ANY DEVIATION OR WITHOUT RELEVANT INFORMATION AS DESCRIBED ABOVE ARE LIABLE TO BE REJECTED. PRICE BIDS RECEIVED IN THE FORM OTHER THAN SPECIFIED IN PART-II (PRICE BID) ARE LIABLE TO BE REJECTED.

PROJECT INFORMATION
PROJECT INFORMATION

INTRODUCTION

Bhilai Electric Supply Company Private Limited (BESCL), a joint venture of NTPC & SAIL, is going for expansion of Bhilai CPP-II by addition of two coal fired thermal units of 250MW ± 20%.

The proposed plant is located near the town of Bhilai, in Durg District of Chhattisgarh state. Contractor is advised to visit the site and appraise himself about the conditions of the site and infrastructure available in the area for fulfilling their commitment under the contract.

APPROACH TO SITE

The site is approximately 40 km from Raipur. The nearest railway junction station (Broad Gauge) is Durg. Durg is on Mumbai-Howrah main line.

Check List (Vide Para 1.3 Of Section-I of General Conditions Of Contract)				
1	Name of the Bidder with Postal Address for Correspondence			
2	Name of Contact Person with Telephone & Fax No.	Mr./Ms Tel No. Fax No.		
3	Nature of the firm	PROPRIETARY / PARTNERSHIP / LIMITED CO.		
4	Details of EMD Please Indicate whether 1) One Time EMD or, 2) Only for this Tender	DD No. …….. DD Date…… Name of Bank……... Amount: Rs……		
5	Validity of Offer (BHEL's Requirement: 180 days from Due Date)	Validity _____ days		
6	Mobilization Time (Please refer Section-11 of SCC)	Mobilization Time _____		
7	Whether any conditions stipulated?	**Yes** (vide Document reference:	**No**	
		Bidder to note that tender with conditions unacceptable to BHEL shall be rejected.		
8	Bidder has visited the project site and acquainted with the site conditions		Yes	No
9	Details of concurrent jobs are furnished (**Appendix-)**		Yes	No
10	Headquarters organization is furnished		Yes	No
11	Proposed site organization is furnished		Yes	No
12	Names and particulars of directors/partners are furnished		Yes	No
13	Financial status of the firm (**Annexure 'A' of GCC**) is furnished		Yes	No
14	**Profit & Loss Account** for preceding three years is furnished		Yes	No

	Check List (Vide Para 1.3 Of Section-I of General Conditions Of Contract)		
15	**Latest Certificate by Bidder's Banker for Overdraft & BG Limits** is Furnished (Certificate shall not be older than six months from the Last Date for offer submission)	Yes	No
16	Latest copy of **IT Return** along with copy of **PAN Card** are Furnished	Yes	No
17	Month-wise **Manpower Deployment Plan** (**Appendix –**) is furnished	Yes	No
18	**Analysis of Unit Rates** quoted (**Appendix-**) is furnished	Yes	No
19	**Month-wise deployment plan for major T&P** (**Appendix-**) is furnished	Yes	No
20	Whether all the pages of the Tender Specification documents are read, understood and signed	Yes	No
21	**Power of Attorney** enclosed in favour of person making offer	Yes	No
22	Bidder has familiarized himself with all Relevant Local Laws & Local Conditions	Yes	No
23	Safety Requirement of this work in a Running plant Premises has been understood.	Yes	No
24	Erection and Commissioning programme furnished	Yes	No
25	**List of Jobs completed** in last seven years is furnished (**Appendix-**)	Yes	No
26	Whether **copies of detailed Work Orders (with BOQ)** and **Completion Certificates** in support of above furnished	Yes	No
27	Whether contractor has left any job unfinished? If so, give reasons.	Yes	No
28	Whether any client has terminated the contractor's work before completion? If so, furnish reasons for the same	Yes	No

Note: strike off or tick **'yes'** or **'no'**, as applicable

Date: Signature of Bidder

DECLARATION BY BIDDER'S AUTHORIZED REPRESENTATIVE

I, HEREBY CERTIFY THAT ALL THE INFORMATION AND DATA FURNISHED BY ME WITH REGARD TO THE TENDER SPECIFICATION NO**. BHE/PW/PUR/BSJI-STG/440** ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE. I HAVE GONE THROUGH THE SPECIFICATIONS, CONDITIONS AND STIPULATIONS IN DETAIL AND AGREE TO COMPLY WITH THE REQUIREMENTS AND INTENT OF THE SPECIFICATION. I FURTHER CERTIFY THAT I AM DULY AUTHORIZED REPRESENTATIVE OF THE UNDER-MENTIONED TENDERER AND A VALID POWER OF ATTORNEY TO THIS EFFECT IS ALSO ENCLOSED.

AUTHORISED REPRESENTATIVE'S SIGNATURE WITH
NAME AND ADDRESS

DATE:

TENDERER'S NAME AND ADDRESS

CERTIFICATE OF NO DEVIATION

TENDER SPECIFICATION NO.

BHE/PW/PUR/BSJI-STG/440

I / WE, M / s .....

HEREBY CERTIFY THAT NOTWITHSTANDING ANY CONTRARY INDICATIONS/ CONDITIONS ELSEWHERE IN OUR OFFER DOCUMENTS, I/WE HAVE NEITHER SET ANY TERMS AND CONDITIONS NOR THERE IS ANY DEVIATION TAKEN FROM THE CONDITIONS OF BHEL'S TENDER SPECIFICATIONS, EITHER TECHNICAL OR COMMERCIAL, AND I/WE AGREE TO ALL THE TERMS AND CONDITIONS MENTIONED IN BHEL'S TENDER SPECIFICATION WITH ASSOCIATED AMENDMENTS AND CLARIFICATIONS.

SIGNATURE OF BIDDER

DATE:

SECTION-3
OFFER OF THE BIDDER

To,
DGM (PURCHASE)
BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - WESTERN REGION
SHREEMOHINI COMPLEX
345, KINGS WAY
NAGPUR 440 001

DEAR SIR,

I/WE HEREBY OFFER TO CARRY OUT THE WORK DETAILED IN TENDER SPECIFICATION NO. **BHE/PW/PUR/BSJI-STG/440** FOR UNIT-1 & 2 OF 2X250 MW, BHILAI ELECTRIC SUPPLY COMPANY LTD., EXPANSION OF BHILAI POWER PROJECT AT BHILAI, DIST DURG (C.G.) ISSUED BY BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR-WESTERN REGION, NAGPUR, IN ACCORDANCE WITH THE TERMS AND CONDITIONS THEREOF.

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

1. INSTRUCTIONS TO TENDERERS
2. GENERAL CONDITIONS OF CONTRACT
3. SPECIAL CONDITIONS OF CONTRACT
4. OTHER SECTIONS, APPENDICES, SCHEDULES AND DRAWINGS.

I/WE HAVE DEPOSITED / FORWARDED HEREWITH THE EARNEST MONEY DEPOSIT AS SPECIFIED IN THE TENDER SPECIFICATION. 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 SBE INDICATED BY BHEL, POWER SECTOR-WESTERN REGION, NAGPUR.
OR,
WE HAVE ALREADY DEPOSITED ONE TIME EMD OF Rs. 2,00,000/- (RUPEES TWO LACS ONLY), DETAILS OF WHICH ARE FURNISHED IN THE CHECK LIST.

I/WE FURTHER AGREE TO EXECUTE ALL THE WORKS REFERRED TO IN THE SAID DOCUMENTS UPON THE TERMS AND CONDITIONS CONTAINED OR REFERRED TO THEREIN AND AS DETAILED IN THE APPENDICES ANNEXED THERETO.

PLACE: SIGNATURE OF TENDERER:
DATE: ADDRESS:

WITNESSES WITH THEIR ADDRESS

SIGNATURE	NAME	ADDRESS
1.		
2.		

SECTION- 4

SPECIAL CONDITIONS OF CONTRACT

4.0 SCOPE OF WORK

The scope of work under the specification covers receipt of materials from BHEL/customer stores/storage yard, handling at stores/storage yard, site of work, transportation to site of work, erection, testing, assistance for commissioning and handing over of steam turbine, turbo-generator (including its receipt from trailer and handling), condenser with R.E. Joints, TG integral piping, external/ regenerative piping, equipments / tanks / vessels, HP & LP Heaters, Deaerator with associated platform, HP & LP bypass system, Power cycle pumps with associated auxiliaries, CW pumps etc.. including bought out items, PEM packages like misc. cranes & hoists, work shop equipments, lab equipments, plate heat exchangers, misc. pumps, etc. and DG sets of unit-1 & 2 of 2x 250 mw at Bhilai Electric Supply Company Private Ltd; expansion of Bhilai power project (2x250 MW), Bhilai, Distt: Durg,Chhattisgarh

4.0.1
The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for fabrication, engineering and construction management. The Bidder should ensure timely completion of work. The Bidder must have adequate quantity of tools, construction aids, equipments etc, in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel.

4.0.2
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Bidder and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

4.0.3
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineers decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

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

4.0.5
Contractor shall erect all the equipments as per sequence prescribed by BHEL at site. The sequence of erection, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the Contractor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets or for any reasons whatsoever.

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

4.0.7
The work to be carried out under the scope of these specifications covers the complete work of loading at stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, levelling, cold pulling, adjusting, Non-destructive testing, Post weld heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries covered under these specifications, commissioning and all other activities till handing over of the unit. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. that will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL at the cost and risk of the contractor.

4.0.8
The terminal points as decided by BHEL shall be final and binding on the Contractor.

4.0.9
The indicative schedule of weight of major equipments given in relevant appendices are meant for providing a general idea to the Contractor about the magnitude of the work involved.

4.0.10
During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feed back from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/rectification/fabrication/repairs etc., promptly and expeditiously. Daily log sheets indicating the details of work carried out, man hours, consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day. Claims of contractor, if any, for such works will be dealt as per clauses of Section-13, Special Conditions of Contract.

4.0.11
All tools and tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

4.0.12
The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

4.0.13
All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.

4.0.14
Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

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

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

4.0.17
The Contractor's scope of work is further described in the following clauses:

4.1 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

4.1.1
Contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc from the storage yard/stores/sheds of BHEL/ client. The Contractor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the Contractor, in appropriate manner as per BHEL's instructions.

4.1.2
The contractor shall return all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost of parts/materials used in excess or misused, with departmental charges.

4.1.3
Transportation of lube oil, Chemicals, Gas cylinders etc. from stores, is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores.

4.2 PREPARATION OF FOUNDATION

4.2.1
Buildings, foundations and other necessary civil works for supporting structures, equipments etc, will be provided by the customer. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits and also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations upto 25mm for achieving proper levels will be within the scope of work/specification.

4.2.2
All minor foundations and anchor points required for installing erection equipments like winches, anchors etc. are to be cast by the contractor.

4.2.3
The complete work of Secondary Grouting of equipments is included in the scope of work/specification. Contractor shall arrange all manpower; T&P, formwork and shuttering materials, all grouting materials such as Ordinary Portland Cement, Sand, Stone Chips etc & Quick-setting-Non-shrink-Free-flow special grout mix of required specification (like Conbextra-GP-2 or equivalent).

4.2.3.1
The Quick-setting-Non-shrink-Free-flow special grout mix shall be purchased only from the BHEL approved vendors; names of some such current vendors are as under. Contractor shall obtain updated list from BHEL before procurement action.

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.

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. Contract shall consult BHEL engineer before deciding upon the vendor for the above.

4.2.3.2
Cleaning of the foundation surfaces, pocket holes, anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods will be within the scope of this work.

4.2.4
BHEL will provide only shims and packer plates (either machined or plain), which are received from BHEL's manufacturing plants and go as permanent part of the equipment. Additional packer plates and shims if required will have to be prepared by the contractor out of steel plates, steel sheets to meet site requirements. Necessary steel plates for this purpose will be provided by BHEL free of cost.

4.2.5

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

4.2.6
Packer plates shall not only be blue matched with foundations but also inter-packer contact surfaces, contact surfaces between packer and pedestals, contact surface between packer and foundation frame etc. shall also be blue matched and required percentage contact shall be achieved by chipping and scrapping as per engineer's instructions.

4.3 EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS

4.3.1
Filling of lubricants for steam turbine, turbo-generator and other rotating auxiliaries for purpose of oil flushing, initial fill up and subsequent topping up during various stages of work.

4.3.2
All works such as cleaning, levelling, aligning, hot alignment, trial assembly, dismantling of certain equipments/components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, grinding, straightening, chamfering, filling, machining, chipping, drilling, reaming, scraping, lapping, shaping, fitting-up, drilling of holes, making dowel pins, minor rectification of foundation bolts etc. are incidental to the erection/commissioning and any other work/activity which is necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

4.3.3
Cleaning, servicing, lubrication of actuators, pumps, headers, governing system, ESV & IV, control valves, LP bypass & HP Bypass valves, Cold Re-heat Non Return Valves with power cylinders and other valves, tanks, vessels etc. during erection and commissioning stages is in the scope of work. However, gaskets/packings/lubricants for replacement will be provided by BHEL free of cost.

4.3.4
All equipment shall be preserved and protected periodically before and after erection as per advice of BHEL engineer. The journals of steam turbine rotors, generator rotor, HT motors and other rotating machines shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.

4.3.5
Trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment.

4.3.6
After initial trial of rotating equipments, control and power cabling for motors and other equipments/instrumentation may have to be disconnected for checking alignment and resetting/realignment/hot alignment. Contractor will have to provide services for disconnection and reconnection of control and power cables.

4.3.13

All racks or assembled units like Governing Rack, LP Bypass Rack & HP Bypass system, Cold Re-heat Non Return Valve, Seal Oil Unit, Gas Unit, Seal Oil Valve Rack, Gas Cylinder Racks etc supplied from manufacturing units will be tested in BHEL/ Customer stores or at site. This may require transportation, filling of oil, water etc in these racks for carrying out testing of these racks. Defects noticed during testing of these racks will have to be rectified by the contractor free of charges. Further, any pipeline / flanges / fittings not found assembled properly, the same have to be rectified / corrected by the contractor free of charges.

4.4 PIPING INSTALLATION

4.4.1
The scope of work in piping system (air, Gas, Water, Oil, Steam, Governing oil/Control oil etc.) will include cutting to required length, edge preparation, laying, fixing and welding of the elbows/fittings/valves etc., fixing supports/hangers/shock absorbers/ guides and restraints etc. and carrying out all other activities/works to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in these specifications as per engineer's instructions and/or as per approved drawings. **Weld joints and NDT requirement for all TG Integral piping, External/ Regenerating System and other pipings as applicable under tender specification shall be as per drawings/schemes and suiting to site requirement. The necessary drawings/documents for these weld joints will be provided at site during execution of work.** Indicative list of schemes of piping and their approximate weights are provided relevant **Appendix.**

4.4.2
Carrying out of piping as per the specifications between equipments constituting terminal points, whether the terminal equipments fall within the scope of the work/specification or not, is within the scope of the work/ specification. The contractor shall complete terminal joints at either ends, with due NDE & PWHT if applicable, for all the piping schemes covered in the scope of work.

4.4.3
Fit up and welding/bolting/fastening of piping to the terminal points (such as stubs, valves, flanges on terminal points/equipments, stubs on headers, battery limits etc) forming part of the scope of work/specification and stress relieving and radiography of joints so made are also within the scope of work. Permanent fasteners and gaskets will be supplied by BHEL.

4.4.4
Interconnection/ Hook-up, if any, with the existing system shall form part of work. Such interconnections, hook-ups may require shut down of running plant and the relevant work has 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.

4.4.5
All drains / vents / relief / escapes / safety valve piping to various tanks/ sewage / drain canal / flash box / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by contractor is completely covered in the scope of this tender specification.

4.4.6
The following items of work shall be incidental and forming part of piping fabrication and erection:

(1) To locate cause of vibrations in equipments/auxiliaries/pipelines and carrying out necessary corrections in case the same is attributed to the contractor.
(2) Fabrication and erection & welding of racks, steel supports, guides, restraints for all the piping. Steel for this purpose will be supplied by BHEL free of charge in random and running lengths.
(3) Pre-assembly of spring suspension/hangers and shock absorber as per requirement.
(4) Erection of steam traps, filters, flow nozzles/ flow indicators/ flow orifices other measuring elements in the piping. These may have been supplied either by BHEL or their customer. This may involve cutting of pipe lines, fresh edge preparation and welding with stress relieving wherever applicable.
(5) Fabrication / making of bends for pipes and tubes of diameter upto 65mm.
(6) Matching of all fittings like tees, bends, flanges, reducers valves, socket fittings, etc with pipes for welding.
(7) Servicing of valves, Power Cylinders and actuators etc.
(8) Cleaning of all pipes by wire brushing / blowing by compressed air.
(9) Welding of root valves with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles/orifices/metering/ measuring elements fixed on piping.
(10) welding of blanks with stress relieving if required on a temporary basis.

4.4.7
Pipelines will be field routed as per schemes/ suggestive layout or as per the instructions of BHEL engineer. Pipes & tubes will be supplied in random lengths and running lengths. The contractor shall have to lay the piping after carrying out the necessary fabrication, edge preparation, routing etc to suit site requirement in best professional manner.

4.4.8
As far as possible pre-assembly shall be done. The pipe laying shall be carried out from the available terminal point/points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required settings to be ensured as per requirement.

4.5 CONDENSER INSTALLATION

4.5.1
The condenser will be despatched in loose parts mainly comprising of bottom plates, dome valves, front and rear water chamber, front and rear water boxes, side walls, hot well, spring elements, support plates, air extraction pipes, baffles, stiffening rods and pipes etc. The condenser is to be assembled at site in position by welding the different parts. Condenser tubing and tube expansion (roller expansion) is to be done at site by the contractor, after taking due care to clean all the tube holes. After final alignment and levelling of turbine exhaust and condenser, the same has to be welded to the exhaust position of LP exhaust as per the sequential welding procedure. Condenser Tubes are Welded austenitic Stainless Steel Gr.304 material.

4.5.2
Before insertion of tubes, the contractor shall clean the holes in the tube plates and tube support plates to remove paint, corrosion spots, oxide scales etc. Usage of suitable cleaning agent may also be required which has to be supplied by the contractor.

4.5.3
The tubes shall be expanded using an Automatic Electronic Torque Controlled Tube Expanding unit or Pneumatic Tube Expander. Tube expansion shall be checked with dial bore

gauge. The total set up including tube expanders and tube cutting tools etc. for carrying out the complete condenser tube expansion works shall be provided by the contractor.

4.5.4
The contractor shall carry out the condenser neck welding with LP cylinder exhaust hood only after final installation of LP casing. Neck welding shall be subjected to specified non-destructive testing.

4.5.5
The hydrostatic testing of steam space and hydraulic testing of water space up to the terminal point after assembly of water boxes are also included in the scope.

4.5.6
Work of painting of condenser surfaces in various area and at various stages of work are specified elsewhere in these specifications.

4.6 GENERATOR INSTALLATION

4.6.1 GENERATOR STATOR

The Generator Stator, weighing 182 Metric Tonnes (approx.), will be delivered to site on a special trailer. Scope of contractor shall be keeping liaison and follow up with transporter and extend the necessary support as required for approach/accessibility, filling of ditches, levelling etc for marching till unloading and placement of Generator Stator to required foundation/elevation. Contractor shall plan all his activities / operation so as to avoid the delay in unloading and releasing the transporter's Carrier trailer. For any demurrage Charges by Transporter / Customer on account of delay in Handling, Unloading from Trailer after arrival at site shall be the responsibility of Contractor. The all above complete works of receipt from trailer, unloading, shifting/placement to required foundation /elevation of Generator Stator is the part of scope of work under this contract.

4.6.2
The Generator Stator shall be lifted and placed by the contractor with the help of Two numbers of Customer EOT Crane (Each of Capacity 130 MT) in tandem operation and Lifting Beam in TG hall building. The Lifting beam/ slings and EOT cranes will be provided by BHEL/Customer free of hire charges. Contractor shall have to collect the Lifting Beam/Slings from BHEL/Customer stores/storage yard, transport to site of work, assemble and provide necessary assistance and services as required for making the EOT cranes interconnections till proving the successful tandem operation and detaching/disconnecting after successful completion of Generator Stator lifting and placement on required foundation. Contractor shall also collect, transport and carry out the assembly & dis-assembly of Generator Stator Lifting beam/slings and return to BHEL/Customer storage yard/stores as per BHEL Engineers instruction after completion of work.

4.7 HANDLING OF HEAVIER EQUIPMENTS

Heavy and voluminous Equipments/consignments like HP Turbine module, IP Turbine modul), LP Rotor, LP turbine (Inner outer & Inner Inner) Lower half casing, LP turbine (Inner outer) Upper half casing, Generator rotor, HP Heaters & LP Heater, Deaerator Sections, DG set, Workshop equipments etc. along with other Equipments shall be handled carefully. Contractor shall have to arrange his own Tools & Tackles, Trailer of suitable capacity including additional suitable capacity lifting Crane and any other arrangement required to handle right from collection of materials from BHEL/Customer store yards/stores, transportation to

site of works and erection & their placement on respective elevation/foundation. BHEL Shall not provide any T&P other than those specified for the specific work as per Appendix-IV and other relevant clauses of tender specification.

4.8 DEAERATOR INSTALLATION

4.8.1
BHEL will provide suitable crane (as available at site) for lifting and placement of Deaerator & FST Sections free of hire charges for scope and services / responsibilities as enumerated in relevant **Appendix**. Contractor shall arrange any other T&P as required.

4.8.2
Erection of Permanent approach platform and ladders etc for De-aerator and FST is in the scope of work. The structural steel and other members will be supplied in random length/size & will have to be cut to required size and profile as incidental to work.

4.9 HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS

4.9.1
Contractor shall carry out the following tests required to complete the erection and commissioning of the TG Set:

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

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

4.9.2
Contractor shall lay all necessary temporary piping, welding, supports, install pumps, valves, pressure gauges, electric cables and switches etc, required for the Hydro test, Air leak test, Chemical cleaning, Steam blowing etc.. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting above tests will be done by the contractor. No separate payment shall be made for this purpose.

4.9.3
All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.

4.9.4
Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by contractor. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

4.9.5
Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

4.9.6
While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions. Blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some-times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor.

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

4.10 PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING

4.10.1
Commissioning of the TG equipments with associated Aux. and other Equipments with auxiliaries shall involve the following tests and activities of the equipments erected :

(a) Trial run of Boiler Feed Pumps, CEP, Booster Pump, CW Pumps etc and other pumps/equipments like Misc. pumps, Misc. Cranes & Hoists, Workshop equipments, Lab Equipments etc. and other various rotating machineries / pumps as per tender specification.
(b) Trial run of motors/ drives for various auxiliaries.
(c) Hydraulic Test, Chemical Cleaning, Oil flushing of lube oil system, Governing oil system/Control oil system, Seal oil System, Air cleaning/blowing of pipelines, closed systems, Tanks and Vessels.
(d) Flushing of all pipelines by air/oil/water/Chemicals/steam as the case may be.
(e) Servicing of all valves, Hydraulic Power cylinders, ESV, HP & LP Bypass valves, CRHNRV and fittings.
(f) Manual/mechanical cleaning of Oil tanks, Deaerator, FST, Suction Strainers / Filter elements of CEP, BFP, Booster Pump, CW Pumps, Misc. Pumps, Misc. Cranes & Hoists, Workshop equipments, Lab Equipments etc., Plate Heat Exchangers and other various equipments & tanks /vessels erected by the contractor. This may have to be repeated several times during the commissioning process.
(g) Chemical cleaning of piping systems, Deaerator and FST as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components like deaerator spray nozzles, gauges, instruments etc. as instructed by BHEL during this process.
(h) Putting turbine on barring gear.
(i) Rolling and synchronisation.
(j) Full load operation.
(k) Trial operation

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

4.10.2

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

4.10.3
The contractor shall provide necessary assistance to facilitate/enable electrical and instrumentation testing and commissioning of equipments under this scope of work, to BHEL and their Testing & Commissioning agency.

4.10.4
The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor.

4.10.5
In case any malfunctioning and / or defect is found during tests / trial runs such as loose components, undue noise or vibrations, strain on connected equipments etc. The contractor shall immediately attend to these defects/ malfunctioning and take necessary corrective measures. If any readjustment and realignments are necessary, the same shall be done as per BHEL engineer's instructions, free of cost.

4.10.6
Cleaning of Lube oil tank etc. by sand blasting or other methods as per instructions of BHEL engineer before and after oil flushing is responsibility of contractor.

4.10.7
The contractor shall associate for initial and subsequent fillings of gas in generator gas system as and when required till unit is handed over to Customer.

4.10.8
The contractor shall carry out air tightness test on generator gas cooling system to the satisfaction of BHEL engineer.

4.10.9
Replacing/changing mechanical/other seals of equipment, pumps etc. during commissioning stage is within the scope of work.

4.10.10
During the stages of commissioning, and till Unit is handed over, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to the contractor, will be governed by clauses 13.1 to 13.8 of the specification. The parts to be replaced shall however, be provided by BHEL free of cost.

4.10.11
During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned units are taken over by the customer.

4.10.12
In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, strain on connected equipment etc., The contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment or realignment is necessary, same shall be done as per BHEL engineer's instruction.

4.10.13
The pre-commissioning activities will start prior to Lube oil, Governing/ Control oil flushing, Seal Oil of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need specialised gangs including electricians, Instrument Technicians, Fitters, in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilisation of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required.

4.10.14
Contractor shall cut open works if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over, without any extra payment.

4.10.15
After the start of commercial operation of machine, commissioning activities will continue. It shall be the responsibility of contractor to provide following manpower along with supervisor as part of commissioning assistance for a period of three months.

1) Supervisor	2 Nos.
2) Pipe fitter/Millwright fitter	2 Nos.
3) welder	2 Nos.
4) Rigger	2 Nos.

5) Electrician/instrument technician 1 No. each
6) unskilled worker 6 Nos.

4.10.16
The above figures shows only minimum required over and above labour required for completing pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand.

4.10.17
It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL commissioning engineers.

4.10.18
During commissioning, opening of valves, changing of gaskets, checking, realigning of rotating and other equipment, attending to leakages in piping, tanks etc. and adjustments of erected equipment may arise. Valves shall be serviced and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions.

4.10.19
It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specifications, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.

4.11 WELDING AND HEAT TREATMENT

4.11.1
Removal of welding slag and burrs by hand files, with brushes and/or flexible grinders will be carried out simultaneously.

4.11.2
On all steam, oil, instrument, gas, air (Instrument air/services air) piping, DM water piping etc. both TIG welding and subsequent arc welding or total TIG welding process is to be adopted as instructed by BHEL engineer.

4.11.3
All weld joints on piping shall be ground / filed / dressed on completion of welding and before NDE as per instructions BHEL engineer.

4.11.4

The Contractor shall procure all electrodes and filler wires of approved quality / brand as per the standards and specifications of BHEL and instruction of BHEL Engineer.

4.11.5
Contractor should purchase the electrodes as per the recommendations of BHEL engineer, welding manual, welding schedule and other relevant documents. The electrodes shall be purchased only from BHEL approved manufacturers.

4.11.6
The purchase of electrodes shall be accompanied by proper test certificate and these certificates should be submitted regularly for the scrutiny of BHEL engineer.

4.11.7
All electrodes shall be stored in a clean dry area. The storage room shall be of permanent nature and damp proof, and the room shall be exclusively meant for storage of welding electrodes and filler wires. Excepting for a vent in the top, it is not preferred to have any other opening like windows or ventilators. The temperature inside the room has to be kept in the range of 8-10^{0}c above atmospheric temperature and humidity should be less than 50&. This is to be accomplished by using electric heaters or infrared lamps. The storage room must be provided with hygrometer and thermometer. Temperature and humidity are to be monitored regularly. 15-20 holders, welding cables, connecting cables to equipments and other welding accessories including temporary electrical connection from construction power point to individual equipment like winches, hoisting equipment, welding generators, transformers, heat treatment equipment and other construction equipment shall be arranged by contractor.

4.11.8
All racks and other items used for storage of electrodes shall be of steel and not of wood.

4.11.9
All electrodes soon after purchase shall be offered for inspection to the BHEL engineer. Contractor shall be strictly prohibited from using electrodes not inspected/approved by BHEL engineer.

4.11.10
All welding consumables shall be issued to the welders only by authorised person who is controlled by contractor's welding engineer. The necessary baking requirements are to be ensured by Contractor's welding engineer.

4.11.11
All welders shall be tested and approved by BHEL engineer/customer before they are actually engaged on work though they may possess the requisite certificate. BHEL reserves the right to reject any welder without assigning any reasons. Statutory requirements like IBR approval for welders are to be complied with before starting of the work. If required, the welders may have to undergo Procedure Qualification test also. The decision of BHEL Engineer will be final in this regard.

4.11.12
All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor. However for initial testing of welders the test will be provided by BHEL. However, If deployed welders fails in initial testing due to lack of experience OR frequent testing of new welders, due to non-availability/non-deployment of earlier qualified/tested welders, it shall be the responsibility of Contractor to provide necessary test plates at his cost for above testing.

4.11.13
BHEL engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which, in the opinion of BHEL engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The fact that the welders have passed the test does not relieve the contractor from his contractual obligations to check the

performance of the welders. Contractor shall submit a monthly performance record of all welders.

4.11.14
All welded joints shall be subject to acceptance by BHEL engineer whose decision will be final and binding.

4.11.15
Pre-heating and stress relieving before and after welding are part of erection work and shall be performed by the contractor in accordance with instructions of BHEL engineer. Contractor has to arrange for the recorders along with accessories and suitable technicians for heat treatment purpose. The temperature recorders and thermocouples shall be duly calibrated. During preheat and stress relieving operations the temperature shall be measured as per the instructions of BHEL engineers by thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL.

4.11.16
For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using battery operated portable thermocouple attachment unit and not by manual arc welding. Contractor shall arrange sufficient number of thermocouple attachment units.

4.11.17
Wherever necessary, contractor should provide temperature indicator/temperature recorder as required by BHEL engineer for measuring preheat temperature for welding or for controlling temperature of metal for hot correction etc. Decision of BHEL engineer on method and of checking preheat temperature or controlling temperature for hot correction and welding shall be final and binding on contractor.

4.11.18
Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The contractor shall make all necessary arrangements including labour required for the same as per directions of BHEL.

4.11.19
Heat treatment requirements shall be as per the Welding Schedules of BHEL

4.11.20
For weld joints of heavy structural items like beams, I-sections, if heat treatment is required, the same shall be carried out as part of the work.

4.11.21
Checking effectiveness of stress relieving by hardness tests (either by Poldi Hardness Tester or other approved test methods as per BHEL engineer's instruction) including necessary testing equipments is within the scope of the work/specification.

4.11.22
TIG welding process is to be used for all root pass welds in pipes. Subsequent welding after root pass can be carried out by manual metal arc welding with basic coated electrodes. For the pipe of thickness less than 6mm, the entire welding has to be carried out by TIG welding. However, BHEL site engineer will have the option of changing the method adopted. For manual arc welding shall be done as per weaving technique and the width of weaving shall not exceed 1.5 times of the dia of the electrodes.

4.11.23
Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensions and with respect to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage shall depend on piping system as specified by BHEL engineer.

4.11.24
Joint fit up will be a stage for inspection.

4.11.25
All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

4.12 RADIOGRAPHY

4.12.1
Radiographic inspection of welds shall be arranged by the contractor including all consumables like isotope camera, x-ray film, chemicals etc. Scaffolding and approaches for taking radiographs.

The contractor shall provide the necessary skilled technician and labourers for taking the radiographs. While taking radiographs, the contractor has to use proper penetrameter/ image quality indicators as instructed by the BHEL engineer. All the processed and accepted films will be the property of BHEL. In this regard, the contractor has to adhere to the safety rules/regulations laid by BARC authorities from time to time. It may please be noted that invariably the radiographic work will be carried after the normal working hours.

4.12.2
Contractor shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/code requirement. The defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance/rejection of the joints will be final and binding on the contractor.

4.12.3
Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if defect persists after first repair, as per radiograph, carrying out repairs and radiography shall be repeated till joint is made acceptable in case, the joint is not repairable, the same shall have to be cut and repaired at contractor's cost. Decision of BHEL engineer in all these matters is final and binding on the contractor.

4.12.4
100% radiography of weld joints of certain piping have to be carried out as per BHEL standards/drawings/specification.

4.12.5
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. Necessary trained personnel shall be deployed for this purpose.

4.13 ACID CLEANING / ALKALI FLUSHING / STEAM BLOWING / OIL FLUSHING ETC.

4.13.1

Contractor shall lay temporary pipelines with fittings and accessories and also erect/commission pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing etc. of piping and other equipments including **providing the Chemical Cleaning / flushing Pumps / equipments etc. (refer clause 5.2.5 of T.S.)** which are within the scope of work and also systems in which equipments and piping erected by contractor form a part of the scope of work.

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

4.13.2

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

4.13.3

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

4.13.4

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

4.13.5

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

4.13.6

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

4.13.7

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

4.13.8

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

4.13.9

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

4.13.10
For chemical cleaning of system which consist of equipment/piping erected by the contractor and also equipment/piping erected by other contractors of BHEL/customer's contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilised by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decisions on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on the contractor.

4.13.11
Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL. No separate payment on this account shall be entertained.

4.13.12
After acid cleaning/pickling of lubricating system (including oil piping of lube oil system, Seal oil system, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems, HP/LP Bypass systems etc. as per instructions of BHEL Engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc. before and after oil flushing is the responsibility of the contractor.

4.13.13
For full welding of structures, tanks and piping etc., only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.

4.13.14
Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load.

4.14 ELECTRICAL AND INSTRUMENTATION

4.14.1
Contractor shall mount all flow indicators, centrifugal/speed switches of motors, accumulators, pressure regulators, etc which are received loose and which are to be erected/mounted at site on air lines, water lines, oil lines, HP/LP Bypass system, steam lines, auxiliaries and firemen floor and other operating floors on boiler/power house and other equipments. These are to be mounted during erection for finalising routing/position etc. They are to be dismantled after completion of erection work and handed over to BHEL for calibration. After calibration, these instruments shall be remounted by the contractor in their respective positions just before commissioning.

4.14.2
Certain instrumentation like, pressure gauges, power cylinders, flow meters, valve actuators, flow indicators, etc are received in assembled condition as integral part of equipments. Contractor shall dismantle such equipment at an appropriate stage under the instruction of BHEL and hand them over to BHEL for calibration and storage. Contractor shall re-erect them in position just before commissioning of the equipment.

4.14.3

Seal welding of Thermowells, plugs before Hydro test of equipments and piping systems is also within the scope of this work/specification. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld Thermowells after Hydro test/steam blowing of lines.

4.14.4
Providing necessary engineer/supervisors/technicians/electricians as required by BHEL engineer for drying out the LT/HT motors is within the scope of the work. Job includes testing the motor for finding out PI & IR values and making necessary cabling connection for heating for dry out from the nearest source of supply and maintaining and controlling the temperature till the IR and PI values are achieved as per standards. However, BHEL will provide necessary motorised insulation testers for this purpose. The contractor shall provide necessary power cables and other tools and consumables for the above works free of charges. Before undertaking dry out/trial run of HT motors, the end shields and covers shall be opened on both the ends of the motor for inspection, cleaning and greasing of bearings.

4.14.5
Welding of all Thermowells, draft, pressure and temperature instrumentation points, and all other instrumentation points on piping, and auxiliaries is within the scope of this work.

4.14.6
All the HT Motors shall be preserved with space heaters on, and provided with proper cover till the commissioning of the motors.

4.14.7
Mount instrumentation on turbine, generator and exciter and auxiliaries which are integral part and main equipments and render necessary services for their commissioning.

4.15 GENERAL

4.15.1
During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer.

4.15.2
Welding/threading of GI instrument air / Service air piping as specified in drawing / documents and instruction of BHEL engineer shall be carried out as part of scope of work.

4.15.3
No temporary supports should be welded on to the piping.

4.15.4
Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. The contractor shall provide this facility till the commissioning and handing over of the equipment to the customer. The contractor shall also carry out preservative and touch up painting on equipments covered under this specification stored at stores/storage yard.

4.15.5
Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor.

4.15.6
The contractor shall return to BHEL the excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (VEE), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.

4.15.7
All suitable access/approach platform for valves/ isolating/throttling devices/equipments at suitable location/elevations shall be carried by contractor as per instruction of BHEL Engineer as part of scope of work.

4.16 PG TEST TAPPING POINTS

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

4.16.1
All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.

4.16.2
All Measuring and Monitoring Devices (MMD) used for the work in scope of this tender specifications, shall be calibrated by the accredited agencies who are approved by BHEL or calibration tractability is established upto National Physical Laboratory.

4.16.3
Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis.

4.17 SPECIFIC INCLUSIONS

4.17.1
All terminal connections for equipment & piping covered in this specification.

4.17.2
Impulse/pneumatic piping between customer's battery limit and equipments.

4.17.3

Servicing and assembly of control valves/regulating valves, fixing of filter elements/strainers & steam blowing & blanking devices in LP bypass, M.S. Strainer, HRH Strainer & and blanking of LP bypass, ESV & IV System, for hydro test, steam blowing etc is the part of scope of work.

4.17.4
Erection, commissioning and testing of HP/LP Bypass system valves and Cold Re-heat Non-return valve with respective oil system and accessories are included under the scope of tender specification. Erection HP Bypass valve and CRH NRV shall involve installation of valves on temporary supports to provide reference/connection of HP Bypass and CRH Critical piping which will be erected by other agency, dismantle the valves/ remove valve internals & fix steam blowing devices (as advised by BHEL Engineer at site) to make Steam blowing connection and install the valves permanently/re-fix the internals on permanent supports for final connection. Oil system shall require erection of tanks, Motors, Power Cylinder, oil piping, oil flushing of system etc. till final commissioning and handing of system. All above are under the scope of contractor. BHEL shall provide oil for flushing and initial fill, topping up free of charges. Contractor shall collect the oil barrels from BHEL stores/storage yard and return the empty container/left over oil barrels (flushed oil / fresh oil) to BHEL stores after completion of work.

4.17.5
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.

4.17.6
Complete control fluid system of both HP and LP Bypass System is included in this specification. Associated assistance for commissioning like lube oil flushing, filling and topping up of lube oil etc shall be part of the work.

4.17.7
Assembly and Installation of Strainer Elements of MS and HRH system is within the scope of work. Cleaning of these strainer elements during trial operation of machine is also covered under this scope.

4.17.8

Erection and welding of Impulse piping from various equipments & pipings tapping point to root valve.

4.17.9

Chipping of foundation, placement, erection, alignment, commissioning, grouting, mounting of equipment mount instruments and other fittings of BHEL (PEM bought out items) supplied Packages like Misc. Crane & Hoists, Misc. Pumps, Workshop Equipments, Lab Equipments, Plate Heat Exchangers DG sets and other Tanks & Vessels etc. & other packages are in scope of the work. **Erection and commissioning of these Equipments/Pumps & Packages will be required to complete to meet the commissioning schedule/ milestone activities of other areas like Boiler, CW Systems, DM water treatment plant, Ash Handling Plant, Service water requirement, fuel oil handling plant etc. Contractor shall plan and complete erection & commissioning of these equipments on priority as per decision of BHEL Engineer/customer requirement. Details of such systems are furnished in relevant Appendix.**

4.17.10

TWO Sets (1 set per unit) of DIESEL GENERATING SET (EACH SET OF 1500 KVA(1200 KW), & 415 V,COMPRISING OF:)

i) DIESEL SET (2X1500 KVA (1200 KW), EACH STATIC WT.23000 KGS & SIZE 6000X2600X3500 MM)(ASSEMBLED WITH ENGINE, ALTERNATOR, RADIATOR, BASE FRAME ETC.)

a. EXHAUST STACK (STEEL) : 2SETS EACH HAVING HEIGHT 30 METERS AND WEIGHT 10 MT

iii) FUEL TANKS-2 NOS. EACH OF CAPACITY 990 LITRES & SIZE (1000X1000X1000MM.)

iv) DG ROOM SIZE-14X15X7 MTRS. (FOR ACOUSTIC TREATMENT) .

v) AMF DG CONTROL PANEL – 2 NOS. EACH OF SIZE -2100X900X600 & WT. 1200 KG.

vi) AUX. DISTRIBUTION BOARD –2 Nos. EACH OF SIZE- 2450X430X600 & WT. 900 KG.

vii) LOCAL PUSH BUTTON STATIONS –16 NOS.

viii) POWER CABLE OF 25 NOS. OF CABLE OF SIZE 1CX630 SQMM (7 CABLE PER PHASE AND 4 CABLES FOR NEUTRAL AND SET OF CONTROL CABLES – 2 SETS

ix) BATTERY AND BATTERY CHARGER WITH PANEL:

a) 24 V BATTERY WITH 360 AH – BATTERY CHARGER FOR STARTING- 2NOS.

b) 24 V BATTERY WITH 180 AH – BATTERY CHARGER FOR CONTROL SUPPLY - 2NOS.

c) LEAD ACID BATTERIES: LOT.

d) SET OF CABLES, CABLE TRAYS, STRUCTURAL MATERIALS, LUBE OIL SYSTEM, FUEL OIL SYSTEM, RADIATOR COOLING WATER SYSTEM, CHARGER AIR SYSTEM. ETC.

e) EXHAUST CHIMENY ETC.

All ABOVE WILL BE SUPPLIED LOOSE AND WILL BE ASSEMBLED / ERECTED INCLUDING WELDING ETC AT SITE AS PER REQUIREMENT.

DG SET ROOM (COMMON, SIZE-11500X15000X6500), WILL REQUIRE ACOUSTIC TREATMENT. THE MATERIAL WILL BE SUPPLIED BY EQUIPEMENT SUPPLIER AND **APPLICATION & TREATMENT OF DG SET ROOM WILL BE CARRIED OUT BY ERECTION CONTRACTOR UNDER THIS SPECIFICATION AS PART OF SCOPE OF WORK AS PER RELEVANT DRAWINGS & DOCUMENTS UNDER THE SUPERVISION OF SUPPLIER'S REPRENTATIVE.**

4.17.11

MISC. CRANES AND HOSTS (EOT CRANES, ELECTRICAL HOISTS, CHAIN PULLEY BLOCKS ETC.) LIFTING EQUIPMENTS ALONG WITH ASSOCIATED ARE UNDER THE SCOPE OF THIS TENDER SPECIFICATION. THESE EQUIPMENTS HAVE TO BE INSTALLED AT DIFFERENT LOCATIONS AND ELEVATIONS. THESE SCOPE OF WORKS IN THIS REGARD SHALL INCLUDE THE FOLLOWING:-

1) HANDLING AT STORES & STORAGE YARD & TAKING OVER DELIVERY FROM BHEL OF COMPONENTS OF THE CRANES & OTHER LIFTING EQUIPMENTS AND TEST LOAD ETC.
2) TRANSPORTATION TO SITE OF WORK INCLUDING VIA PRE-ASSEMBLY YARD, IF NEEDED.
3) PRE-ERECTION CHECKS, PRE-ASSEMBLY IF NEEDED.
4) ERECTION, ALIGNMENT, WELDING, BOLTING, FASTENING OF ALL COMPONENTS OF THE CRANES/LIFTING EQUIPMENTS INCLUDING ELECTRIC BUS BARDS/TRAILING CABLES, PENDANTS ETC.
5) DRY RUN TEST AT NO LOAD.
6) LOAD TESTS AT DIFFERENT LOADS AS ADVISED BY BHEL AT SITE.
7) OVER LOAD TEST AT DESIGNATED LOAD AS REQUIRED.
8) RETURN OF SURPLUS COMPONENTS, TEST LOADS ETC TO BHEL STORES WITH DUE RECONCILIATION.
9) PRIORITY OF E&C OF THESE EQUIPMENTS SHALL BE AS PER INSTRUCTION AND PRIORITY OF BHEL AT SITE AND DECISION OF BHEL SITE INCHARGE AT SITE SHALL BE FINAL AND BINDING ON CONTRACTOR.

4.17.11

The delivery of Lab Equipments will be taken from BHEL stores and will installed in lab, handed over to customer as per instruction of BHEL Engineer. For some of the equipments civil work for foundation fixing etc. as required with reference to relevant procedure shall also be carried out by contractor as scope of work. As such no commissioning work is involved, however demonstration will be carried by equipment supplier. Any manpower assistance required during demonstration shall be provided by contractor.

4.17.12

The Workshop Equipments will be taken from BHEL stores/storage yard. Most of the equipments will be supplied in assembled, however some the small aux., components will come loose. The workshop equipments will installed, aligned including fixing on foundation and involving civil works like grouting of foundation bolts, fixing levelling packers etc as per drawing and instruction of BHEL Engineer at site. The scope of these equipments shall cover the commissioning and trial operation completion. Some of the equipments / items

will be handed over to customer. All above shall be carried out as part of scope of work.

4.17.13

Most of the Misc. Pumps will be supplied as skid mount. However the ACW Pumps, CCCW Pumps will be supplied loose. The other instruments/fittings will be supplied loose. Delivery these will be taken from BHEL stores/storage yard and will be assembled/installed at different locations as per drawing and instruction of BHEL Engineer at site. The work involved is preservation, assembly, installation, erection, alignment, foundation grouting, fixing of loose items, filling of lubricants, greasing, commissioning, no load/ load trial run of motors & pumps. All the works shall be carried our as part of scope of work.

4.17.14 WELD FIT-UP AND WELD JOINT PROTECTIVE PAINT, COMPONENT PRESERVATIVE PAINTING ETC.

1) All protective paints for the protection of weld joint fit-ups, application of primers on finished weld joints are in the scope of contractor.

2) Two coats of steam washable paints shall be applied on steam side of LP turbine and condenser components, as advised by BHEL. The steam washable paints, primer and thinner will be supplied by BHEL free. However, arrangements for surface preparation and paint application like sand/shot-blasting, consumables like surface cleaning agents, paint brush, brush cleanser, labour and necessary tools and plants are in the scope of contractor.

3) All site weld joints falling in steam side shall be painted with two coats of steam washable paint.

4) The water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter two coats of Epoxide priming paint followed by two/three coats of high build black coal tar epoxy (e.g., "Apcodur CP684" of Asian Paints **or equivalent from any other BHEL/Customer approved manufacturer**). Contractor shall submit manufacturer's batch test certificate / test certificate from BHEL/MSEB approved laboratory for the primers and paints. Prior approval of BHEL for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing, number of coats may be applied and method of application shall be as recommended by the paint manufacturer. **Contractor shall arrange required paints & primers and other consumables for above works.**

5) All water side surfaces of water chambers including tube plate shall be thoroughly surface prepared and painted. Required primer & paints and other consumables for condenser water box and tube plates shall be provided by Contractor.

6) After the successful completion of hydraulic testing, the interior surfaces of the water boxes, main tube plates shall be painted with suitable anticorrosive paints as per special procedures laid down by BHEL. Required necessary paints along with primers and other consumables shall be arranged by Contractor.

7) Prior to hydraulic testing of water side of condenser, interior surfaces of water boxes shall be painted.

8) After completion of tubing and tube side hydro test, all water side surfaces of water chambers including tube plate shall be painted.

9) Preservation of all components/equipments during various stages of erection, commissioning till handing over is in the contractor's scope. All prescribed methods of surface cleaning prior to application of preservative paint shall be followed by the contractor. **Contractor has to arrange all primer and paints, and other consumables like wire brush, painting brush required for this work.**

10) Condenser internal components/parts/surfaces have to be surface protected with steam washable paint as per BHEL standards.

4.18 – INSTALLATION (ERECTION, TESTING AND COMMISSIONING) SUPERVISION SERVICES

The Contractor shall extend various Installation Supervision Services to BHEL site establishment as specified and explained in the following clauses. These Installation Supervision 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 indicate the price of these services in terms of percentage impact on their sealed Price Bid. Format for indicating the impact (as percentage) is furnished herewith.

4.18.1 DETAILS OF MAJOR PRODUCT AREAS REQUIRING INSTALLATION SERVICES (ERECTION, TESTING AND COMMISSIONING)

The Contractor shall provide to BHEL Installation supervision services for the installation of various equipments/components/assemblies/sub-assemblies/parts etc. **This service shall be available to BHEL irrespective of Terminal points of Erection Testing and Commissioning work covered under this tender. BHEL may use these services in any OR all of the Two units of this project at its discretion. The service categories are:**

1. TG and Auxiliaries – 1 Service point per unit
2. Condenser & Aux. etc.- 1 Service point per unit
3. Rotating machines etc.- 1 Service point per unit
4. Piping, Welding & NDT- 1 Service points progressively

4.18.2 Scope of Installation Supervision Services

4.18.2.a

The Contractor under this contract shall provide services towards Installation Supervision as per instructions of BHEL Engineer for the relevant product system assigned as above for the time being and shall broadly include the following responsibilities:

- Studying the relevant drawings, documents etc. of concerned product/ system
- Draw out periodical plans with the Engineers/Supervisors of the Contractor deployed for direct on the job supervision.
- Check with the Stores the receipt of required materials for the current plan and for the period ahead as may be directed.
- Check the materials for correctness and soundness and ensure proper stacking, storage, preservation of materials brought to site for erection, refer and implement concerned documents in this regard.
- Ensure proper handling of materials during all site activities.
- Assist contractor in tracing of materials wherever required and as instructed
- Study, understand and implement the Erection, testing & commissioning Procedures/manuals requirements as applicable. Seek guidance of BHEL Engineer wherever required.
- Study the relevant Field Quality Plans and understand requirements of quality checks especially with regard to Customer Check Points.
- Carry out all Erection, Testing and commissioning activities as planned/ instructed.
- Carry out all field checks along with contractor.
- Ensure implementation of safety instructions.
- Carry out all necessary and instructed Non Destructive Examinations/ Tests.
- Verify Daily/ periodical reports and maintain Progress Registers
- Ensure filling of all Protocols/ Log sheets/ Check Lists etc
- Ensure material re-conciliation with contractor regularly.

4.18.2.b Expected minimum quality of service

Contractor shall render the Installation Supervisory Services by ensuring deployment of requisite personnel with adequate educational qualification in engineering and possessing valid and current certificates wherever applicable e.g. NDE services, having thorough field experience to enable understanding the intricacies of and special requirements involved in Erection, Testing and Commissioning of Projects, taking care of inconsistencies and uncertainties associated with flow of project activities till beyond normal working hours & on holidays and irregular working hours. Contractor shall ensure prompt and timely availability of such services as and when required by BHEL.

4.18.3 Parameters and Quantification of Installation Supervision Services, Periodic Monitoring

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For the purpose of delivery of the aforesaid Installation Supervision Services & progressive monthly billing by the Contractor and release of payment thereof by BHEL, there shall be an action plan jointly agreed by BHEL and Contractor. This action plan shall be drawn at the beginning of each quarter/each month/any convenient number of months as per actual project need. The plan shall detail the following aspects.

- Plan period (number of months planned).
- List of activities/targets to be carried out/achieved by the Contractor under the scope of these Installation Supervision services in the defined plan period.
- Identification of necessary resources to be deployed by the Contractor for delivery of the planned activities/targets in the defined plan period.
- Deciding on the break up of the assigned amount towards Installation Supervision Services in the plan period for the purpose of monthly billing by contractor and payment by BHEL.

4.18.4 Price and Stage Payment

Contractor shall include the price for rendering complete Installation Supervision Services in the various item rates as appearing in the Rate Schedule of Price Bid. **Contractor shall not quote any separate item rate/price for Installation Supervision Services in the Rate Schedule**.

For further details of progressive payment and final payable amounts, please refer clause no. 12.1.2 of Sectioon-12 (SPECIAL CONDITIONS OF CONTRACT).

4.18.5 Deficient/Unsatisfactory Installation Supervision Services & Not Rendering Installation Supervision Services

4.18.5.1

Contractor shall render the Installation Supervision Services as per the jointly agreed plan and parameters thereof as described in "Parameters and Quantification of Installation Supervision Services". In case the contractor fails in delivering/rendering these services partly or totally, either qualitatively or quantitatively in the concerned Plan Period, BHEL will take the following recourse.

- Deficient/Unsatisfactory Services:

  In case the level/quality of Installation Supervision Services is found not in compliance with the plan (either in terms of deficiency in quality or quantity or both, with regard to the mutually agreed/identified resources), BHEL will communicate the same to the Contractor on record. Contractor shall immediately

take corrective action to eradicate the complaint. BHEL will not make any payments for such period / number of days when services are found deficient/ unsatisfactory. Payment will be made for the period /number of days of satisfactory services on pro-rata basis as per the following formula.

$P = P_a \times D_s / D_m$, where

P = Amount Payable for rendering the Installation Supervision service satisfactorily in a billing month.

P_a = Amount **assigned** towards the Installation Supervision service for the concerned month as per agreed plan.

D_s = Number of equivalent days including Sundays and BHEL Holidays of **satisfactory** services in the particular billing month.

D_m = Total Number of days including Sundays and BHEL Holidays in the particular **billing month**.

In addition to no payment for the unsatisfactory/deficient services period, a penalty @ 5% applied on the pro-rata amount of the deficient period i.e. 5% of ($P_a - P$) will be levied on the contractor. This penalty will be recovered from the Running Account Bill of the same month.

4.18.5.2 Not Rendering the Services at all

In the event, the contractor fails to render a particular service during the month (either part of the month or full) BHEL will not make any payment towards that service for such period. Additionally, a penalty @ 15% will be levied as under.

For no service in the entire month:	15% of the total monthly assigned amount.
For no services during part of the month:	15% of the pro-rata amount for the defaulting period as per formula given earlier here.

4.18.6 Irrevocable Penalty and Disallowed Amount

It shall be specifically noted that the payment disallowed for deficient or nil service in a particular month and/or Penalties levied on similar ground, shall not be considered for release in any subsequent month even if the contractor takes corrective action in the later stage.

4.19 EXLUSIONS

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

A) All cable connections except those specified as scope of work.

B) Measuring instruments, monitoring, relaying, protection and signalling equipments other than those supplied with the equipments by / on behalf of BHEL and which have been indicated as scope of work.

C) Erection, testing and commissioning of electrical panels and starting resistors for DC JOP, DC EOP pumps, Seal oil system

D) Electrical testing of motors, turbo-generator. However erection these will be under the scope of this tender specification.

E) Impulse piping and fittings from the tapping points of various equipment root valves other than those specified as scope of work.

F) Copper tubing work.

G) Civil works to the extent not specifically provided for in this tender.

H) Thermal insulation of Turbine, ESV, IV, CRHNRV, HP & LP Bypass valves, integral piping and external piping/regenerating piping system.

I) Supply of materials for temporary piping (pipe, valve, structural steel etc.) required for hydraulic test, chemical cleaning, flushing or steam/air blowing of the pipelines.

J) Supply of chemicals and lube oil for pre-commissioning and commissioning activities.

K) Final painting.

SECTION-5

SPECIAL CONDITIONS OF CONTRACT

5.0 OBLIGATIONS OF THE CONTRACTOR (TOOLS, TACKLES, CONSUMABLES ETC.)

5.1 ACCOMMODATION, DRINKING WATER & LOCAL TRSNPORTATION FOR LABOUR / OTHER EMPLOYEES

BHEL/Client will be providing only the space for labour colony. Contractor shall make his own arrangements for accommodation with necessary facilities such as drinking water, sanitation and lighting etc for his workmen and the staff. The electricity for labour accommodation shall be on chargeable basis on the prevailing rate basis. taxes, duties, levies over and above the rates etc shall also be born by the contractor. Also, the contractor has to make his own arrangement for transportation of his workmen and other employees. BHEL/client shall not provide any facility in this regard.

5.2 TOOLS AND TACKLES, MEASURING AND MONITORING DEVICES:

5.2.1

The contractor shall provide all (in addition to those in BHEL scope) required tools and plants, monitoring and measuring devices (MMD) and handling & transportation equipments for the scope of work covered under these specifications. contractor has to provide suitable cranes for material handling at BHEL/client's stores/storage yard. BHEL's crane will not be available for this purpose other than specified. please refer relevant A**ppendix** for the list of T&P being provided by BHEL free of charges on sharing basis.

5.2.2

Contractor has to provide spanners of all sizes, Bolt stretching devices etc. as required for satisfactorily carrying out the complete erection / commissioning works. No spanners will be provided by BHEL to the contractor.

5.2.3

Contractor has to arrange slings of all sizes for completing the works covered under these specifications except the special slings for Generator Stator Lifting/Handling, which will be provided by BHEL free of charges on returnable basis.

5.2.4

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. The indicative list of major T&P to be arranged by the contractor has been furnished in relevant appendix. Contractor shall also mobilize all other T&P as necessary for timely and satisfactory completion of the work in scope.

5.2.5

BHEL shall not provide any Chemical Cleaning /Flushing pump / equipment as required for Chemical cleaning/flushing of piping and related equipments / system. These Chemical pumps of suitable capacity along with motor starter, cables etc. will be provided contractor as part of scope of work. Contractor shall arrange / provide all Chemical cleaning

arrangements as per requirement and instructions of BHEL engineer without any delay/time lapse.

5.2.6
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.

5.2.7
Complete set of hydraulic jacks of 50 tonnes and 100 tonnes capacity shall be arranged by the contractor for use during erection and commissioning of Turbine. Also, hydraulic jacks of 100 tonnes and 63 tonnes capacity along with long high pressure hoses of suitable length for Generator erection and alignment shall be arranged by the contractor. These jacks shall of internationally reputed make, highly reliable and maintained in excellent working condition. They shall be tested for safe working before deploying in actual work. These jacks shall not be permitted for use anywhere other than Steam Turbine / Generator area.

5.2.8
All jack bolts that are required during erection for carrying out roll-check etc. will have to be arranged by the contractor. No jack bolts will be provided by BHEL.

5.2.9
Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.

5.2.10
In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternative arrangement at the risk and cost of the contractor.

5.2.11
The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Contractor shall obtain prior approval of BHEL for all the T&P before deploying in actual work. The movement of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility. The necessary test certificates for Equipments to be submitted.

5.2.12
Normally, use of welding generators only is permitted for welding. The use of welding transformers will be subject to specific and prior approval of BHEL Engineer.

5.2.13
The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of Measuring & Monitoring Devices (MMD). 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. All calibration shall be traceable to national or international standards.

5.2.14

BHEL T&P will be issued in basic assembled condition; contractor shall transport these T&P to & fro between BHEL stores and site. Additional loose components/ sub-assemblies / attachments as and when necessary, will be issued by BHEL, to & fro movement between BHEL stores and site of such items shall also be done by the contractor. Assembly of such additional loose components/sub-assemblies/ attachments is in contractor's scope. Any boom reduction/ extension of BHEL cranes for contractor's use and restoration to previous state or as directed by BHEL shall be the contractor's responsibility. Contractor shall provide all enabling services with tools and tackles for assembly/dismantling and boom extension/reduction as above.

5.3 CONSUMABLES

5.3.1

The contractor shall provide all consumables required for carrying out the work covered under these specifications excepting those which are specifically indicated as BHEL scope.

TG Special Consumables like Hylomar / Golden Hermetite / Stag-B / Molykote/ Anabond compounds / Rubber fixing compounds etc. will have to be arranged by the contractor.

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 PRIMERS & PAINTS

BHEL will provide paint & primer for only the specified areas herein; all other requirements are in contractor's scope.

5.3.4

Consumables for BHEL supplied equipments (Cranes, T&P etc.)

Refer relevant clause of SECTION – 7 SPECIAL CONDITIONS OF CONTRACT in this regard.

5.4 WELDING ELECTRODES, TIG WELDING FILLER WIRES AND GASES

5.4.1

Contractor, at his cost shall arrange all the required welding electrodes including the filler wires / TIG wires etc. as required and 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 before the actual use of the welding consumables.

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

Gases like Argon, Oxygen and Acetylene etc. that are required for erection related activities shall be arranged by the contractor at his cost.

5.4.3
Nitrogen gas it required for preservation during chemical cleaning process of piping system, will be arranged by BHEL free of charges. Contractor shall arrange necessary connector, Nipple, Regulator, Header and piping for usage of such Gas from Cylinders.

5.5 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 within the project premises as per the availability of space.

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, BHEL will arrange to remove and expenditure thereof including overhead expenses (presently @30%) will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.6 AREA LIGHTING

5.6.1
Contractor shall arrange adequate floodlights, hand lamps and area lighting. Contractor shall use his own materials like cables, fuses, switchboards etc. BHEL/client will not provide anything in this regard.

5.7 CONSTRUCTION POWER & WATER

5.7.1
Construction power (three phase, 415v / 440v, 200 amps, 4-wire) will be provided at one point near the site approximately 500 Meters from erection site free of charge. However all taxes, duties, levies, charges etc, as applicable, shall also be born by the contractor. Presently no such charges are applicable. Accordingly, required energy meter, all cables, fuses, distribution boards, switches, switchboards, bus bars, earthing arrangements, protection devices e.g. ELCB, if any, and any other installation as specified by Statutory Authority, Client in this regard, for drawl of construction power shall be arranged by the contractor. Obtaining approvals, payment of necessary fees, duties etc towards the clearance of such installations, if any, prior to these 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.

5.7.5
The Contractor at his own cost shall arrange water for Construction purpose as well as drinking water. Customer/BHEL shall not provided any facility in this regards.

5.7.6
BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply. Contractor shall take suitable insurance policy for such accidental loss/ damages.

5.8 RESPONSIBILITIES WITH REGARD TO LABOUR EMPLOYMENT ETC.

5.8.1
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.

TAXES, DUTIES, LEVIES

5.9

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

5.9.1

The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

5.9.2 Service Tax & Cess on Service Tax

Service Tax and Cess on Service Tax as applicable on output Services are excluded from contractor's scope; therefore contractor's price/rates shall be **exclusive** of Service Tax and Cess on Output Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and deposit the same with the concerned tax authorities, such applicable amount will be paid by BHEL. Contractor shall submit to BHEL documentary evidence of Service Tax registration and remittance record of such tax immediately after depositing the tax with concerned authorities. Contractor shall obtain prior written consent from BHEL before billing the amount towards such taxes.

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 and Service Tax paid on Input Services that are used for providing the output services can be taken credit of against the Service Tax payable on output services. However BHEL may opt for availing the abatement provision in which case cenvat credit may not be available on input duty.

5.9.3 VAT/WCT

As regards Sales Tax on transfer of property in goods involved in Works Contract applicable as per local laws, the price quoted by the contractor shall be **exclusive** of the same. Where such taxes are required to be paid by the contractor, this will be reimbursed on production of proof of payment made to the authorities by the Contractor. In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. The contractor has to take all necessary steps to **minimize tax on input goods** by purchasing the materials from any registered dealer of the concerned state only. In case contractor opts for composition, it will be with the prior express consent of BHEL. Deduction of tax at source shall be made as per the provisions of law unless otherwise found exempted. In case tax is deducted at source as per the provisions of law, this is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made unless specifically agreed to.

5.9.4 Modalities of Tax Incidence on BHEL

Wherever the relevant tax laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL will have the right to adopt the

appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor.

5.9.5 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 UBMISSION OF PERIODICAL REPORTS

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

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

BHEL at site will suggest formats for these reports.

5.11

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 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 permit for working beyond normal working hours.

5.12 SOCIAL WELFARE ACTIVITIES

BHEL is alive to discharge of corporate social responsibilities during its business operations. In a humble way, BHEL through its business partners would like to contribute to welfare of the society nearby the project site. Some measures in this direction as follows, which shall be fulfilled by the contractor.

(i) Tree Plantation (500 saplings)

(ii) Digging & providing bore well with hand pump for drinking water-1 No.

(iii) Installing solar street lamps-2 Nos.

(iv) Providing bench and desk set for sitting arrangement of fifty students in a local school.

(v) Any other similar measure that may come up later on.

In this regard, Construction Manager BHEL will constitute a co-ordination committee of BHEL and various agencies working for BHEL. Mutually agreed responsibilities assigned to each by this co-ordination committee from time to time shall be discharged by the respective agencies.

SECTION-6
SPECIAL CONDITIONS OF CONTRACT

6.0 CONTRACTOR'S OBLIGATION IN REGARD TO EMPLOYMENT OF SUPERVISORY STAFF AND WORKMEN

6.1

The contractor shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him. Contractor should furnish a tentative deployment plan of his manpower as required vide relevant Appendix. Also the actual deployment will be so as to satisfy the erection and commissioning targets set by BHEL.

6.2

It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.

6.3

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

6.4

The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.

6.5

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

6.6

If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost.

6.7 SITE ORGANISATION

The contractor shall provide adequate staffing in the following areas in addition to the staffing requirements of execution as instructed/informed by BHEL:

- Overall Planning, Monitoring & Control
- Materials Management
- Condenser & Auxiliaries.
- Turbine & Auxiliaries.
- Generator & Auxiliaries.

- Pumps & Auxiliaries.
- Piping.
- Misc. Equipments
- Quality Control and Quality Assurance
- Safety, Fire & Security
- Industrial Relations and fulfillment of Labour Laws and other statutory obligations.

Contractor shall furnish an organisation chart indication the staffing pattern for the above functions. Contractor shall provide the names and details of Engineers/supervisor at the time of mobilisation to BHEL as per the proposed organisation chart.

SECTION-7

SPECIAL CONDITIONS OF CONTRACT

7.0 OBLIGATIONS OF BHEL

7.1 FACILITIES TO BE PROVIDED BY BHEL

7.1.1 Space for site office / stores

Refer section-5 in this regard.

7.1.2 Construction Power & Water

Refer Section-5 in this regard.

7.1.3 Other materials and consumables:

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

7.1.4 TEST MATERIALS (PLATES & PIPES)

BHEL will provide suitable plates and pipes free of cost only for site test of welders including IBR welders before their deployment. . Contractor shall prepare the required test pieces from such raw materials and shall arrange all destructive and non-destructive examinations of test blanks / pieces as scope of work. Responsibilities with regard to deployment of IBR welders and meeting the stipulations shall be the responsibility of contractor.

7.2 FILLER WIRE FOR TIG WELDING

BHEL will not provide any filler wire/TIG wires etc. and all these shall be arranged by contractor at his cost.

However Filler wires for Re-generative piping system only will be provided by BHEL free of charges proportionately to the extent as received from manufacturing unit. Any other additional quantity of filler wires as required to complete the work shall be supplied by contractor as part of scope of work.

7.3 EQUIPMENTS – TOOLS & PLANTS

BHEL will make available only those T&P that are listed in relevant **Appendix** free of charge. All other required T&P shall be arranged by the contractor. Further details are as under:

7.3.1 CRANES TO BE PROVIDED BY BHEL

7.3.1.1

BHEL will make available on shareable basis, free of hire charges, services of equipments & T&P indicated in relevant Appendix. As most of the equipments will be in the custody of BHEL and have to be shared among other contractors, the requirements shall be indicated to BHEL sufficiently in advance and finalise allotment of the same. It may be noted that the contractor has to deploy all necessary tools & plants to suit the activity schedules given by BHEL/ Customer. T&P being supplied by BHEL are only to supplement the resources deployed by the contractor.

7.3.1.2

Contractor shall lay necessary sleeper beds, backfilling of approaches wherever necessary for safe movement of the cranes as directed by BHEL. The contractor shall arrange necessary sleepers for this. Contractor shall transport the equipments and components/sub assemblies/attachments of BHEL equipments to & fro between BHEL stores and site.

7.3.1.3

BHEL Cranes issued will be in basic assembled condition. Any alteration/addition like boom reduction/extension, assembly of components/sub-assemblies needed for modulating the capacity/ reach/other features of cranes and restoration to the state as directed by BHEL shall be the contractor's responsibility.

7.3.1.4
The day-to-day upkeep and running maintenance like filling / topping up of lubricants, changing filters etc, of BHEL cranes shall be the responsibility of the contractor. Spares if any, required in normal course will be provided by BHEL. Major breakdowns will be attended to by BHEL. The cranes provided by BHEL will be withdrawn for regular and capital maintenance as per the respective schedule of maintenance. As far as possible such schedules will be intimated to the contractor in advance and may be adjusted depending on the work requirements at site. However no claim whatsoever will be entertained on account of non-availability of cranes.

7.3.1.5
Contractor shall provide the fuel for Crane being provided for FST sections and Deaerator lifting. Operators for the cranes hired by BHEL will be provided by the crane hiring agency of BHEL.

7.3.1.6
Where the services of the cranes provided by BHEL are to be shared by other agencies/ contractors of BHEL, the contractor's responsibilities defined above will also be apportioned accordingly to the beneficiary agency. Working arrangements in this regard will be done at site by BHEL engineer and in any case his decision shall be final and binding.

7.3.1.7

Contractor shall be responsible for complete operation of EOT crane along with providing the operator, day today operation/maintenance, general cleanliness and holding/supporting the supply cables etc. provided by the contractor as per requirement.

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

7.3.1.8

For the purpose handling and lifting of Generator Stator in TG hall two EOT crane with lifting beam will be provided by BHEL/Customer. The two EOT cranes have work in tandem operation. Contractor shall provide necessary assistance and services as required for making the EOT cranes interconnections till proving the successful tandem operation and detaching/disconnecting after successful completion of Generator Stator lifting and placement on required foundation. Contractor shall also collect, transport and carry out the assembly & dis-assembly of Generator Stator Lifting beam and return to customer/BHEL stores after use.

7.4 OTHER T&P

7.4.1

The responsibilities of contractor defined above for BHEL cranes shall also be applicable, mutates-mutandis, in respect of other tool & plants provided by BHEL.

7.4.2

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

7.4.3

Lubricants like engine oil, Cadmium compound, hydraulic oil, gear oil, grease etc for BHEL's T&P including cranes will be provided by BHEL free of charge. Similarly filters for cranes will be provided free of charge by BHEL. All other consumables like cotton waste, cleaning agents etc shall be in the contractor's scope.

7.4.4

BHEL engineer will inspect all the tools and plants issued to contractor periodically. In case contractor fails to make good, the damages caused, BHEL will do the same at contractor's cost. The tools and tackles will be issued only to persons nominated by the contractor.

7.4.5

Required temporary structural steel, pipes & fittings, valves for conducting hydraulic test, chemical cleaning / steam blowing / oil flushing / acid cleaning etc shall be provided by BHEL on returnable basis.

7.5 CHEMICALS, GASES AND LUBRICANTS FOR PRE-COMMISSIONING AND COMMISSIONING

7.5.1

All lubricants/Lube oil and chemicals required for testing, chemical cleaning, acid cleaning, oil/chemical/gas flushing required for testing, pre-commissioning & commissioning upto trial operation of equipments/unit will be provided by BHEL. Flushed/fresh oil for flushing of lube oil/governing/control oil system and filling with day today topping, Carbon-dioxide & Hydrogen gas for purging and filling in Turbo-generator will also be supplied by BHEL. Contractor shall arrange for taking delivery and loading of all such consumables from BHEL/ Customer Stores/ yard, transportation to site of work and unloading thereon, filling in the system and return the used lube oil, balance quantity of consumables etc, to BHEL stores duly reconciled for quantity.

SECTION-8

SPECIAL CONDITIONS OF CONTRACT

8.0 INSPECTION / QUALITY ASSURANCE / QUALITY CONTROL/ STATUTORY INSPECTION

8.1

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

8.2

Preparation of quality assurance log sheets and protocols with customer's engineers, welding logs and other quality control and quality assurance documentation as per BHEL Engineer's instructions, is within the scope of work/specification.

The protocols between contractor and customer/BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

8.3

A daily log book should be maintained by every supervisor/engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centring / levelling readings and inspection details of various equipments etc.

8.4

The performance of HP welders will be reviewed from time to time as per BHEL / IBR standards, High pressure welder's performance record shall be furnished periodically. Corrective action as informed by BHEL shall be taken in respect to those welders not conforming to these standards. This may include removal /discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately.

High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. Will be documented in welding log as per BHEL Engineer's instructions.

Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc. Shall also be maintained as per BHEL engineer's instructions.

Record of heat treatments performed shall be maintained as prescribed by BHEL. Similarly, performance report of all welders shall be furnished for scrutiny of BHEL Engineer.

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 and monitoring devices (MMD) required for completion of work satisfactorily. These MMD shall conform to jb requirement in respect of measurement range, accuracy level and any other standard specification.

8.7

The MMD deployed by the contractor shall, at all stages of works, have valid and current calibration certificate. The calibration of these MMD shall be got done from the agencies accredited/approved by BHEL/Client. Copy calibration certificate 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 specification of BHEL regarding storage of these MMD.

8.8

Re-work necessitated on account of usage 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 the loss of time.

8.9

In the course of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. Such instruments whenever necessary, will be provided by BHEL, on returnable basis, on specific authorisation by BHEL Engineer.

8.10

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

8.11

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 unit/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 free of cost.

8.12.2

Any modifications suggested by BHEL FES and QA Engineers team shall be carried out. Claims of contractor, if any, shall be dealt as per clause 13.1 to 13.8, provided such modifications have not arisen for reasons attributable to the contractor.

13 .STATUTORY INSPECTION.

8.13.1

The scope includes getting the approvals from the statutory authorities (like Boiler Inspector, Factory Inspector, Electrical Inspector, P.F. Commissioner, Labour Commissioner and any other Authority connected to this project work). This includes arranging for inspection visits of Statutorily Authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for pressure parts /IBR material parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc. and following up the matter with them. Contractor shall also make all arrangements for offering the products/systems for inspection at location, as applicable to the concerned Authority.

8.13.2

The contractor shall pay all fees connected with testing his welders / men / workers and testing, inspection, calibrating of his MMD instrument and T&P equipments.

8.13.3

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

8.13.4

Refer clause No.2.8.5 of SECTION-2 OF GENERAL CONDITIONS OF CONTRACT for BHEL's responsibility with regard to payment of Inspection fee of Boiler Inspectorate.

8.13.5

Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR, for which he should register himself with CIB of state concerned. Contractor should be aware of the latest IBR regulations and Electricity act, including the amendments thereof.

8.14

The quality management system of BHEL, Power Sector – Western Region (PSWR) has already been certified and accredited with ISO 9001:9002 standards in this regard. The basic philosophy of the Quality Management System is to define the organisational 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, and maintain the relative 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

Introduction:-

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 authorised 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 sign board giving the following information and display it near the 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 authorised 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 authorised 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 authorised 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 energised 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 authorised 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 guard rails, covers or protective devices unless authorised 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 authorised persons holding relevant license will drive and operate site plant and equipments eg cranes, dumpers, excavators, transport vehicles etc

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

9.2.1.16 Gas cylinders shall be handled and stored as per Gas Cylinder 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 authorised 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**

9.2.1.15.1 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 mobilisation 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.

9.2.1.15.2 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 aiders shall be included in the emergency response team. Contractor employees and workmen are encouraged to participate in first aid training programmes whenever organised 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 focussed

- Issue of approved Personnel Protective Equipment
- Verification that the PPEs 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 co nvenient 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 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 objective s for their minimisation. 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 advise

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 neutralised 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 preventi on 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 authorised 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
BHEL Engineers shall carry out inspections regularly by the contractors and on activities, facilities, equipment and documentation, to cover the following aspects.

- Compliance with procedures and systems
- Availability, condition and use of PPEs
- 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 Co-ordinator 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 Extinguisher	To check pressure and any defect	User / Safety Coordinator	Daily Every month
4	Lifting equipment/tacles	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**:

SN	Violation of Safety Norm	Fine (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 Insulate d Property.	200/-
10.	Not Removing Small Scrap From Platforms	200/-
11.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	200/-
12.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
13.	Improper Earthing Of Electrical T&P	500/-
14.	Accident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
15.	Fatal Accident/Accidents Resulting in total loss in Earning Capacity	1,00,000/- per victim

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be 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 recognise the safety performance of the contractor may be considered by BHEL after completion of the job.

9.9
Memorandum of Understanding

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

Memorandum of Understanding

BHEL, PSWR 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 authorised 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 No	YEAR	Amd upto	DESCRIPTION
IS 11833	1986		DRY POWDER FIRE EXTINGUISHERS FOR METAL FIRES
IS 11972	1987		CODE OF PRACTICE FOR SAFETY PRECAUTION TO BE TAKEN WHEN ENTERING A SEWARAGE SYSTEM
IS 1287	1986		ELECTRIC TOASTER
IS 13063	1991		STRUCTURAL SAFETY OF BUILDINGS ON SHALLOW FOUNDATIONS ON ROCKS
IS 13385	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE WHEEL MOUNTED WATER TYPE (GAS CARTRIDGES)
IS 13386	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE MECHANICAL FOAM TYPE
IS 13415	1992		CODE OF SAFETY FOR PROTECTIVE BARRIERS IN AND AROUND BUILDINGS
IS 13416	1992		RECOMMENDATIONS FOR PREVENTIVE MEASURES AGAINST HAZARDS AT WORKING PLACE PART 1 TO PART 5
IS 13430	1992		CODE OF PRACTICE FOR SAFETY DURING ADDITIONAL CONSTRUCTION AND ALTERATION TO EXISTING BUILDINGS
IS 13849	1993		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CONSTANT PRESSURE)
IS 1446	1985		CLASSIFICATION OF DANGEROUS GOODS (FIRST REVISION)
IS 1476	1979		REFRIGERATORS
IS 1641	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): GENERAL PRINCIPLES OF FIRE GRADING AND CLASSIFICATION
IS 1642	1989		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS- DETAILS OF CONSTRUCTION
IS 1643	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): EXPOSURE HAZARD
IS 1646	1997		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): ELECTRICAL INSTALLATIONS
IS 1904	1986		CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF FOUNDATIONS IN SOIL
IS 1905	1987		STRUCTURAL SAFETY OF BUILDINGS MASONARY WALLS
IS 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 No	YEAR	Amd upto	DESCRIPTION
IS 2878	1986		FIRE EXTINGUISHERS CARBON DIOXIDE TYPE (PORTABLE AND TROLLEY MOUNTED)
IS 2925	1984		SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS
IS 3016	1982		CODE OF PRACTICE FOR FIRE PRECAUTIONS IN WELDING AND CUTTING OPERATIONS - FIRST REVISION
IS 3315	1974		DESERT COOLERS
IS 3521	1989		INDUSTRIAL SAFETY BELTS AND HARNESS
IS 368	1983		IMMERSION WATER HEATERS
IS 3696	1991		SAFETY CODE OF SCAFFOLDS AND LADDERS PART 1 TO 2
IS 3737	1996		LEATHER SAFETY BOOTS FOR WORKERS IN HEAVY METAL INDUSTRIES
IS 374	1979		CEILING FANS INCLUDING REGULATORS
IS 3764	1992		EXCAVATION WORK – CODE OF SAFETY
IS 3786	1983		METHOD FOR COMPUTATION OF FREQUENCY AND SEVERITY RATES FOR INDUSTRIAL INJURIES AND CLASSIFICATION OF INDUSTRIAL ACCIDENTS
IS 3935	1966		CODE OF PRACTICE FOR COMPOSITE CONSTRUCTION
IS 4014	1967		CODE OF PRACTICE FOR STEEL TUBULAR SCAFFOLDING
IS 4081	1986		SAFETY CODE FOR BLASTING AND RELATED DRILLING OPERATIONS
IS 4082	1977	1996	STACKING AND STORAGE OF CONSTRUCTION MATERIALS AND COMPONENTS AT SITE
IS 4130	1991		DEMOLITION OF BUILDINGS – CODE OF SAFETY PART 1 TO 2
IS 4138	1977		SAFETY CODE FOR WORKING IN COMPRESSED AIR (FIRST REVISION)
IS 4155	1966		GLOSSARY OF TERMS RELATING TO CHEMICAL AND RADIATION HAZARDS AND HAZARDOUS CHEMICALS
IS 4209	1967		CODE OF SAFETY FOR CHEMICAL LABORATORY
IS 4250	1980		FOOD MIXERS
IS 4262	1967		CODE OF SAFETY FOR SULFURIC ACID
IS 4756	1978		SAFETY CODE FOR TUNNELING WORK
IS 4912	1978		SAFETY REQUIREMENTS FOR FLOOR AND WALL OPENINGS, RAILINGS AND TOE BOARDS
IS 5121	1969		SAFETY CODE FOR PILING AND OTHER DEEP FOUNDATIONS
IS 5182	1969	1982	METHODS FOR MEASUREMENT OF AIR POLLUTION
IS 5184	1969		CODE OF SAFETY FOR HYDROFLUORIC ACID
IS 5216	1982	2000	RECOMMENDATIONS ON SAFETY PROCEDURES AND PRACTICE IN ELECTRICAL WORK PART I AND II

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

IS No	YEAR	Amd upto	DESCRIPTION
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 tenderers, 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 contract 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. Evaluation of offer will be done by BHEL on Total Price of the Rate Schedule.

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 case.

SECTION-11
SPECIAL CONDITIONS OF CONTRACT
TIME SCHEDULE, MOBILIZATION, PROGRESS MONITORING, OVER RUN, VARIATION ETC.

11.1 TIME SCHEDULE & MOBILIZATION

11.1.1 INITIAL MOBILIZATION AND TENTATIVE SCHEDULE

Contractor shall reach site, make his site establishment and be ready to commence the work within two weeks from the date of fax Letter of Intent or as per directions of construction manager of BHEL.

The contractor has to subsequently augment his resources in such a manner that the entire work is completed to achieve the following **tentative** schedule:

ACTIVITY	TENTATIVE SCHEDULE OF COMPLETION FOR UNIT No.1 #
Turbine Box up	6th month
Completion of Oil Flushing completion	8th month
Barring Gear	9.5 month
Synchronisation & Coal firing	10th month
Completion of all facilities	13th month

- INDICATES THE NO. OF MONTHS FROM THE START OF CONTRACT PERIOD.

 # Schedule of completion of Unit # 2 activities will be at a phase difference of 3 months after unit #1.

11.1.2

In order to meet above schedule and other intermediate targets/activities as set by BHEL Engineer In charge at site, to meet customer requirements/project schedule, contractor shall arrange all necessary resources and work force in consultation with BHEL engineer at site to under take works parallely in all fronts as made available to contractor.

11.1.3

Contractor shall specifically note that there is likely to be some delay in supplies of materials / release of work fronts / other reasons. Contractor shall have to work round the clock on such critical activities as a part of catch up programme to meet the project requirement to the extent possible and shall also provide required resources as part of scope of work.

11.1.4 **Start of Contract Period and Duration.**

The total contract period for completion of entire work shall be **16 (Sixteen) months** from the start of erection. Erection of the first major equipment, as identified by BHEL site-in-charge, on its permanent location/ foundation shall be reckoned as the start of contract

period. Small components like packer plates, insert plates, etc. will not be considered for this purpose.

However the contractor shall have to mobilize his resources earlier than the start of contract period for preparatory work like taking over and chipping of foundations, blue matching and grouting of packer plates etc.

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

11.1.3.1 Grace Period

Grace period of 3 **(Three) months** beyond the contract period of **16 (Sixteen)** months is provided for this contract. However, all milestone events as per actual requirement of project schedule shall have to be achieved by the contractor without taking recourse to the Grace Period.

11.2 Progress Monitoring, Contract Extension and Over Run

11.2.1 Progress Monitoring

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

11.2.2 Ascertaining and Establishing the Reasons for Shortfall

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

11.2.2.1

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

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

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

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

11.3 Contract Extension

11.3.1
If the completion of work as detailed in these specification gets delayed beyond the end of contract period and grace period then depending on the balance work left out, BHEL at its discretion may extend the contract.

11.3.2
A joint programme shall be drawn for the work to be completed during the extended contract period. Review of the program and record of shortfall as describe vide clause 11.2.2 shall be done during the extended period. The overrun charges will be paid in proportion to the achievement of the respective month vis-à-vis the plan for the month (for assessing the performance, the agreed plan shall be reduced by shortfall attributable to the BHEL). BHEL may disallow contractor's claim for over run charges, if the monthly programme as mentioned here not made by him.

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

11.4 Overrun Compensation

If the contract is extended beyond the contract (including grace) period for any reason other than those attributable to the contractor or force majeure conditions, the contractor will be compensated by payment of overrun charges at the rate of **Rs.50,000/- (Rupees fifty thousand only) per month.** Overrun compensation will be paid for the extension attributable to BHEL only. No overrun compensation will be payable for the extension on account of reasons attributable to contractor and / or force majeure conditions.

11.5 Price Variation

Agreed price/rate shall remain firm through out the contract period including grace period and extended period thereof. No price variation/adjustment shall be applicable for this contract and clause No.2.15 of General Conditions of Contract shall not be applicable.

11.6 Contract Variations

11.6.1 Variation In Weight

Weight of various equipments, quantities of various items of work covered under these specifications, & indicated in relevant Appendices for TG Equipments, TG Integral piping along with other equipments like Flash Tanks, vessels, Pumps, DG sets etc with associated Aux, the price accepted shall remain unchanged and be applicable without any variation.

For External piping/Regenerating piping system the accepted item rate shall remain firm for any upward or downward variation in quantities up to plus/minus 30%. Applicable rates for quantities beyond these limits for the External piping/Regenerating piping system will be mutually discussed and decided.

For Equipments/systems, pumps, tanks, workshop equipments, lab equipments, misc. Pumps, plate heat exchangers, misc. Cranes and hoist etc. Common / applicable for both the units, the accepted rate shall remain firm for any variation in weight and payment will be made for actual weight erected & commissioned.

11.7 Interest Bearing Recoverable Advance

Interest bearing (@ 12% per annum interest on monthly reducing balance basis) recoverable advance limited to 5% of the contract value may be paid by BHEL at its discretion depending on the merit of the case against receipt & acceptance of bank guarantee from the contractor for the amount sought. This Bank Guarantee (BG) shall be valid at least for one year or the recovery duration. In case recovery of dues does not get completed within the aforesaid BG validity period, the Contractor must renew the validity of BG or submit fresh BG for the outstanding amount and remaining recovery period. BHEL is entitled to make recovery of the entire outstanding amount in case the Contractor fails to comply with the BG requirement as above.

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

11.8 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

12.0 TERMS OF PAYMENT

12.0.1
The contractor should submit his monthly on account bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas from the 25 of previous calendar month to 24th of the current month.

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

12.0.3
Release of payment in each running bill will be restricted to 95% of the value of work admitted, as per the percentage break-up for the stage of work completion stipulated vide clauses hereinafter.
The 5% thus remaining shall be on account of workmanship guarantee of work executed. The same will be released after co mpletion of the guarantee period of 12 months from the date of completion of entire work as certified by BHEL engineer. However, this amount may be released earlier on receipt and acceptance of bank guarantee (BG) of equal amount in BHEL's prescribed format. The BG shall be valid at least for one-year period and renewed if necessary to cover the entire Defect Liability period and an additional six months of claim period.

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

12.1 STAGES OF PROGRESSIVE PRO-RATA PAYMENTS

The progressive pro-rata payment will be released based on accepted price/item rates in following manner:

(A) Progressive payment for erection, testing and commission (95% of the total contract value as per the break up given hereinafter under the clause 12.1.1)

(B) Progressive payment for providing **installation supervision services** (5% of the total contract value as per the details given hereinafter under the clause 12.1.2)

12.1.1 TG with TG Auxiliaries and associated equipments, Integral piping, pumps with aux. tanks, vessels , DG sets etc. (scope as per**"AA**"), External piping/Re-generative piping with associated valves, components/items, fitting, supports etc. (scope as per '**BB**") and Equipments/systems, pumps, tanks, workshop equipments, lab equipments, misc. pumps, plate heat exchangers, misc. cranes and hoist etc. common for both the units (scope as per **"CC**") - {SL.No. (A) above}

Considering 95% of the accepted price/item rates as 100% for various items/activities of work under these specifications will be released, based on certified completion by BHEL Engineer, as pro-rata progressive payment as per the stage break up given hereafter:

(A) FOR Sl. No. 01 OF RATE SCHEDULE: – TG with TG Aux. and associated Equipments, Integral Piping, Pumps with Aux., Tanks, Vessels, DG Set .

SN	Description	%
1.0	**CONDENSER (20%)**	
1.1	Preparation of foundation	1.0
1.2	Placement, alignment, assembly and welding of bottom plate segments, hot well, NDT and spring elements placement	2.0
1.3	Assembly and positioning of water chamber, water boxes, side plates, bottom plates, welding and NDT	2.0
1.4	Assembly, alignment and welding & NDT of tube support plates and internals like baffle plates, air evacuation pipes etc.	3.0
1.5	Assembly, welding & NDT of dome walls and dome stiffeners, extraction piping and steam throw device etc.	3.0
1.6	Insertion, expansion, end milling of condenser tubes	4.0
1.7	Hydro test of steam and water side	2.0
1.8	Welding of condenser neck joint and NDT& completion of balance works	2.0
1.9	Assy. and Erection R.E. Joints	1.o
	Total of 1.0	**20%**
2.0	**TURBINE (20 %)**	
2.1	Placement, alignment and grouting of base plates of LPC and bearing pedestals	1.5
2.2	Placement and alignment of LP outer casing bottom portion and centre guide keys	1.0
2.3	Placement of LP rotor and alignment with inner casing and checking of blade clearance	1.5
2.4	Assembly, alignment & welding of LP Outer Casing upper half.	1.0
2.5	Placement of IP Turbine, lowering of IP Rotor on bearings and checking of clearances, couplin g etc.	1.0
2.6	Placement of HP Turbine, lowering of HP Rotor on bearings and checking of clearances, coupling etc.	1.0

SN	Description checking of clearances, coupling etc.	%
2.7	Boxing up of LP inner-inner & inner- outer and roll check	2.0
2.9	Alignment of all Rotors including reaming, honing and fixing of coupling bolts	2.0
2.10	Assembly of regulation system	1.0
2.11	Installation of ESV, IV, HP & LPBP Valves, CRH NRV, MS Strainers (internals), HRH strainers (internals)	2.0
2.12	Erection, alignment and welding of cross around piping	2.0
2.13	Final box-up of LP turbine	2.0
2.14	Completion of Turbo-visory works	1.0
2.15	Final boxing up of Pedestals after Oil Flushing completion	1.0
	Total of 2.0	**20%**
3.0	**TURBO GENERATOR (15%)**	
3.1	Preparation of foundation, levelling, matching and grouting of foundation plates	1.0
3.2	Unloading of stator from Railway wagon, shifting and placing of stator on foundation.	2.0
3.3	Levelling, centring and alignment of Stator	1.0
3.4	Testing of Hydrogen Coolers and insertion	1.0
3.5	Rotor Insertion and lowering on bearings.	1.0
3.6	Checking the run out, alignment of Generator Rotor, LP Turbine Rotor, Exciter rotor and grouting.	2.0
3.7	Reaming, Honing of coupling holes and fixing of coupling bolts of LP-Gen and Gen.-Exciter Rotors.	2.0
3.8	Boxing up of Generator and assembly of Hydrogen Seals	1.5
3.9	Erection of Excitation equipments & Alignment of Gen.-Exciter Rotors including Swing check and completion of balance works.	1.5
3.10	Final gas tightness test of Stator with complete system	2.0
	Total of 3.0	**15%**

SN	Description	%
4.0	**PUMPS AND AUXILIARIES (20 %)**	
4.1	**Erection / Testing of Boiler Feed Pumps.** **Erection / Testing of Motor Driven BFP- 3Nos.** (A) Foundation chipping, blue matching of foundation and levelling, centring of grillage/foundation frame and bolt grouting. (B) Placement of feed pump, booster pump, motor, hydraulic coupling and preliminary alignment. (C) Grouting of grillage/ foundation and final alignment of BFP, BP, Motor and HC (D) Erection of lube Oil piping, working oil coolers & other balance piping like mechanical seal water coolers with piping etc, Erection of panel/racks and oil flushing of oil piping.	5.0
4.2	Erection & Testing of Condensate Extraction Pumps- 2Nos.	2.0
4.3	Erection & Testing of Cooling Water Pumps-2 Nos.	2.0
4.4	Erection and Testing of Lube oil pumps, oil centrifuge, Main oil tank, Coolers, Duplex Filter and other related equipments / Items including with fittings etc.	2.0
4.5	Erection and testing of Vacuum Pumps	1.0
4.6	Erection and Testing of Seal oil and Gas System units / racks / equipments.	1.0
4.7	Erection of HP & LP heaters with standpipes and fittings.	1.5
4.8	Erection of Gland Steam Condenser, Drain cooler with fittings.	0.5
4.9	Erection of De-aerator, Feed Storage Tank and associated approach platform with ladders etc.	2.0
4.10	Erection of Tanks & Vessels like HP & LP Flash Tanks, Unit Flash Tank/Vessel with fittings.	1.0
4.11	Erection of DG set with associated accessories with fittings including electrical items and acoustic treatment etc.	1.0
4.12	Erection of Misc. / other Auxiliaries	1.0
	Total of 4.0	**20 %**
5.0	**INTEGRAL PIPING (15 %)**	
5.1	Lube. Oil and Jacking Oil Piping	2.5

5.2	Control oil / Governing oil Piping for ESV's, IV's, LPBP Valves, CRHNRV's etc.	1.5
5.3	HP Bypass valves oil system with aux., Nitrogen filling system, Piping and fittings (as per PGMAs 22-100, 22-101, 22-600, 22-601, 22-701, 22-889, 22-988 etc.)	1.0
5.4	Seal Steam Piping	2.0
5.5	Turbine Drainage Piping	2.0
5.6	Condensate Spray Piping	1.5
5.7	Generator Seal Oil Piping	2.0
5.8	Generator Gas Piping	1.0
5.9	Miscellaneous and Other Piping	1.5
	Total of 5.0	**15%**
6.0	**ASSISTANCE FOR COMMISSIONING (10%)**	
6.1	Oil Flushing of lube. Oil, Jacking oil system, seal oil and Governing oil system	1.0
6.2	Commissioning of Boiler Feed Pumps	1.5
6.3	Commissioning of Condensate Extraction Pumps.	1.5
6.4	Commissioning of Condenser Vacuum Pumps.	1.0
6.5	Steam Blowing and Barring gear	1.0
6.6	Commissioning of CW pumps.	1.0
6.7	Steam rolling and over-speed test	1.0
6.8	Synchronisation	1.0
6.9	Completion of Trial Operation and related works of PG test	1.0
	Total of 6.0	**10%**

(B) FOR Sl. No. 02 (A&B) OF RATE SCHEDULE: External/Re-generating piping (Carbon Steel, Stainless steel & Alloy Steel) with valves, supports and fittings (Excluding TG Integral Piping).

Sl.No.	Part of Activity Completed	Percentage Of Accepted Item Rates (C.S. S.S & A.S.)

Sl.No.	Part of Activity Completed	Percentage Of Accepted Item Rates (C.S. S.S & A.S.)
A	Transport to work site & Erection / Placement in position	35%
B	Alignment, Fit-up & Welding	40%
C	NDT	5%
D	Post weld Heat Treatment	5%
E	Hydraulic Test of Pipeline	5%
F	Chemical Cleaning of Pipeline	2%
G	Steam Blowing of pipeline	3%
H	Synchronization	2%
I	Trial Operation Completion	2%
J	Completion of work related to PG Test and handing over.	1%
	Total	100%

(C) FOR Sl. No. 03 OF RATE SCHEDULE:- Equipments/systems, pumps, Tanks, Workshop Equipments, Lab Equipments, Misc. Pumps, Plate Heat Exchangers, Misc. Cranes and Hoist etc.- Common / applicable for both units:

1. 35 % on Erection and assembly of equipments with fittings.
2. 35 % Alignment of equipments and welding of applicable piping.
3. 10% on completion grouting of foundation bolts/packers/frame and supporting of applicable piping.
4. 10 % on commissioning / Charging of system.
5. 5 % completion of trial run operation.
6. 5% on completion of work related to PG test & handing over.

12.1.2 STAGE-WISE BREAK UP FOR PRO-RATA PROGRESSIVE PAYMENT FOR VARIOUS INSTALLATION SUPERVISION SERVICES –{SL.NO. (B) ABOVE}

For the purpose of payments to the contractor, 5% of the contract value shall be assigned as the amount payable towards installation supervision services.

For the purpose of release of progressive payments, month-wise break up for each of the above services will be jointly worked out by BHEL and the contractor at site at the time of start of work. This will be dynamically and regularly reviewed every

month/quarter or mutually agreed periodicity and shall be re-set based on expected requirement of services keeping in view relevant aspects. On all the issues as above, BHEL engineer's decision shall be final & binding.

These services are to be rendered even during extended period (the contract extension may be due to any reason) without any additional payment/ compensation. The periodical review of monthly billing/payment break up shall take this aspect in consideration. Progressive payment for the service rendered will be made on certification of BHEL accordingly.

12.2 PAYMENT FOR WORK COMPLETED

12.2.1

The contractor should submit his on account bills with all the details required by BHEL on 26th of every month covering progress of work in all respects and areas up to 24th day of the same month.

12.2.2

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

12.2.3

On receipt of the bill, joint measurement and checking of the work done will be carried out by the concerned BHEL engineer as per clause 2.6 of General Conditions of the Contract and break-up given vide clause 12.0. It shall be final and binding on the contractor.

12.2.4

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

SECTION-13

SPECIAL CONDITIONS OF CONTRACT

13.1

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

13.2
However, BHEL may consider for payment as extra on man-day basis, for such of those activities detailed in clause 13.1 which require more than 100 man-hours and such payment will be regulated by the terms, conditions and stipulations contained in the clauses contained hereinafter. It may be specifically noted that the decision of BHEL as to whether such payment is due shall be final and binding on the contractor.

13.3
Extra works should be done by a separately identifiable gang, without affecting routine activities. Daily log sheets in the proforma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered / entertained in the absence of the said supporting documents i.e. Daily man-hour log sheets. It may, however, be noted that signing of log sheets by BHEL engineer does not mean the acceptance of such works as payable extra works.

13.4
Such extra works arising out of transit, storage and erection damages, payment, if found due, will be regulated as per section-14.

13.5
BHEL retains the right to award or not to award any of the major repair / rework / modification / rectification / fabrication works as defined above to the contractor, at their discretion without assigning any reason for the same.

13.6
It shall be noted that all extra works that arise on account of the contractor's fault, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

13.7
After eligibility of extra works is established and finally accepted by BHEL engineer / designer, payment will be released on competent authority's approval at the following rate:

Man-day rate for eligible extra works
Single average man day rate for 8 working hours, including overtime if any, other site expenses and incidentals, including supervision, consumables, tools and tackles, Plant & Machinery, Construction Equipment etc. will be **Rs.320/-** (Rupees three hundred twenty only).

No payment will be made if an item of work lasts less than 100 manhours.

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.

14.2.10
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.

14.2.11
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/Client has obtained project insurance policy and CPM Policy

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 EARNEST MONEY DEPOSIT & SECURITY DEPOSIT

15.1 EARNEST MONEY DEPOSIT:

Earnest Money Deposit for this tender will be Rs. 2,00,000/- (Rupees two lacs only).

One time EMD will also be Rs. 2 lacs.

EMD shall be deposited in cash (as permissible under income tax act), pay order or demand draft (payable at Nagpur in favour of 'Bharat Heavy Electricals Limited') only. **No other form of EMD remittance shall be acceptable to BHEL.**

15.1.1 EMD by the tenderer will be forfeited as per tender documents if

i) After opening the tender, the tenderer revokes his tender within the validity period or increases his earlier quoted rates.

ii) The tenderer does not commence the work within the period as per loi / contract. In case the LOI / contract is silent in this regard then within 15 days after award of contract.

15.1.2 EMD shall not carry any interest.

15.2 Security Deposit

15.2.1 Security Deposit should be remitted by the successful tenderer. The rate of security deposit will be as below:

Sn	Contract value	Security deposit amount
1	Up to Rs. 10 lakhs	10% of contract value
2	Above Rs. 10 lakhs upto Rs. 50 lakhs	1 lakh + 7.5% of the contract value exceeding rs. 10 lakhs.
3	Above Rs. 50 lakhs	Rs 4 lakhs + 5% of the contract value exceeding rs. 50 lakhs.

The Security Deposit shall be remitted <u>before start of the work</u> by the contractor in the manner specified as follows.

15.2.2 Security Deposit may be furnished in any one of the following forms

i) Cash (as permissible under the income tax act)

ii) Pay order, demand draft in favour of BHEL.

Iii) Local cheques of scheduled banks, subject to realization.

Iv) Securities available from Post Offices such as National Savings Certificates, Kisan Vikas Patras etc.

(Certificates should be held in the name of contractor furnishing the security and duly pledged in favour of BHEL and discharged on the back).

V) Bank Guarantee from scheduled banks / public financial institutions as defined in the companies act subject to a **maximum of 50%** of the total security deposit value. The balance 50% has to be remitted either by cash or in the other form of security. The bank guarantee format should have the approval of BHEL.

VI) Fixed deposit receipt issued by scheduled banks / public financial institutions as defined in the companies act. The FDR should be in the name of the contractor, a/c BHEL, duly discharged on the back.

VII) Security deposit can also be recovered at the rate of 10% from the running bills. However in such cases at least 50% of the security deposit should be remitted (either by cash/DD or BG **for maximum 50%** of total SD) before start of the work and the balance 50% may be recovered from the running bills.

VIII) EMD of the successful tenderer, excepting One Time EMD, shall be converted and adjusted against the security deposit or specific request by the contractor.

IX) The Security Deposit shall not carry any interest.

Note: acceptance of security deposit against sl. No. (iv) and (vi) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

15.3

Security deposit shall not be refunded to the contractor except in accordance with the terms of the contract.

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

(AA) TG WITH TG AUXILIARIES AND ASSOCIATED EQUIPMENTS, INTEGRAL PIPING, PUMPS WITH AUX. TANKS, VESSELS , DG SETS ETC. PER UNIT:

A) STEAM TURBINE

1. Steam Turbine consists of 3 cylinders (HP/IP/LP) including the following :

   a. Sole / Base Plates & Foundation Holding Bolts.

   b. Bearing P edestals.

   c. ESV & CV, IV & CV, LPBP Valves with EHA & Suspensions, LP BP water injection valves, HP & LP Bypass valves with Oil System equipments and oil piping.

   d. Steam Strainer Housing & Strainer Elements for Main Steam & Re-heat Steam Lines.

   e. Hydraulic Turning Gear.

   f. Electro – Hydraulic Governing System backed up with Hydro mechanical system.

   g. Governing Racks, LP By pass racks and solenoid & Test valve racks.

   h. Cross around Piping between IP & LP casing.

   i. Blanking Device / Fixtures for ESV, IV, LPBP, CRH NRV etc., for hydraulic testing and steam blowing.

   j. Extraction Steam pipeline from LP turbine to condenser dome wall.

3. Lube Oil system and Control oil / Governing oil system consists of piping, Oil tanks, injector assy., Oil Centrifuge, AOP, JOP and EOP with starter panels, Leak & Dirty Oil Tank with pumps, Duplex filter and oil vapour fans, Central Lube. Oil System and other auxiliaries.

B) TURBO-GENERATOR :

1. Hydrogen cooled main Generator consists of the following.

   a. Stator

   b. Rotor wit rotor insertion device.

   c. Dry air blower system

   d. End Shields & Bearing

   e. Brush Gear

   f. Generator Covers

   g. Generator accessories

   h. Seal Oil System with Seal Oil Unit-I & II and other associated items.

   i. H2 cooling system with Hydrogen distributor and other associated items.

   j. H_2 /Co2/N2 Gas system

   k. Other Accessories.

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR / PER UNIT

C) HEAT EXCHANGERS.

1. Condenser, mainly comprising of the following parts.
   a. Bottom Plate
   b. Turbine end & Generator end Side Plates.
   c. Dome walls
   d. Front & Rear water chambers with tube plates
   e. Support plates.
   f. Hot Well
   g. Spring Elements and supports
   h. Steam Throw Device
   i. Air Extraction Pipe and Baffle.
   j. Stiffening Pipes, Rods & Slabs
   k. Instruments & Fittings, loose parts etc.
   l. Condenser tubes (Stainless Steel)
   m. Condenser R.E. Joints : Please check whether these valves have been covered in CW piping contractor scope also. If yes, delete from TG contractor scope.

D. PUMPS WITH AUXILIARIES, TANKS, VESSELS, DG SETS ETC.

1. Gland Steam Condenser with attachments, fan exhausters & fittings.
2. LP Heaters 1, 2 & 3 with attachments and fittings
3. HP Heater 5 & 6 with attachments and fittings.
4. Drain Cooler with fittings.
5. De-aerator & Feed Storage Tanks (in Three Section) with attachments, fittings and platform.
8. Turbine Oil Coolers
9. Seal Oil Coolers.
10. Hydrogen Coolers.
11. **Boiler Feed Pumps – Three sets : Each Comprises of:**
    a. Boiler feed pump with tubing.
    b. Booster pump with base plates & tubing.
    c. Hydraulic coupling.
    d. BFP Motor.
    e. BFP Base plate.
    f. Hydraulic coupling stool.

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LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

g. Lube oil cooler for Hydraulic Coupling.

h. Working oil cooler for H.C.

i. Hydraulic coupling pipes & Accessories.

j. Re-circulation valves.

k. Suction Strainers for BFP.

l. Local gauge racks for BFP.

m. Lube Oil Cooling system, Seal water cooling system and other accessories for pumps.

n. Suction Strainer for Booster Pumps

12. Condensate Extraction Pumps- Two sets :Each comprises of

a) Condensate Extraction Pump assembly.

b) Foundation frame.

c) Canister.

d) Basket type suction strainer.

e) Local gauge rack.

f) CEP Motor.

13. Cooling Water Pumps – Two sets : Each comprises of

a) Suction casing

b) Impeller casing assy.

c) Pump casing assy.

d) Impeller assy.

e) Element-1 assy.

f) Element-2 assy.

g) Element-3 assy.

h) Discharge Elbow assy.

i) Motor stool assy.

j) Inter foundation ring

k) Thrust block assy.

l) Shafts

m) Thrust bearing

n) Connecting coupling

o) Counter flange

p) Motor

q) Hardware & Miscellaneous items

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR / PER UNIT

14. Flash Tanks & Vessels :

Sl.NO	DESCRIPTION	PACKAGE SIZE in (mm) of each	WT.IN KG/ITEM
1.	HP Drain Flash Tank – 1x2 No. (1 No. per unit, total 2 Nos.)	2650x3000x3950.	2x5000
2.	LP Drain Flash Tank - 1x2 No. (1 No. per unit, total 2 Nos.)	1950x2200x2550	2x3000
3.	Unit Flash Tank – 1x2 No. (1 No. per unit, total 2 Nos.)	1250x1350x2300	2x1000
		Total Weight	**2x9000**

15. DIESEL GENERATING SETS: 1 SET PER UNIT (TOTAL 2 SETS FOR BOTH THE UNITS) (EACH SET OF 1500 KVA(1200 KW), & 415 V,COMPRISING OF:

a) DIESEL GENERATOR SETS (2X1500 KVA (1200 KW), EACH STATIC WT.23000 KGS & SIZE 6000X2600X3500 MM)(ASSEMBLED WITH ENGINE, ALTERNATOR, RADIATOR, BASE FRAME ETC.)

b) EXHAUST STACK (STEEL) : 2 SETS EACH HAVING HEIGHT 30 METERS AND WEIGHT 10 MT

c) FUEL TANKS-2 NOS. EACH OF CAPACITY 990 LITRES & SIZE 1000X1000X1000MM.

d) DG ROOM SIZE-14X15X7 MTRS. (FOR ACOUSTIC TREATMENT) .

e) AMF DG CONTROL PANEL – 2 NOS. EACH OF SIZE -2100X900X600 & WT. 1200 KG.

f) AUX. DISTRIBUTION BOARD –2 Nos. EACH OF SIZE- 2450X430X600 & WT. 900 KG.

g) LOCAL PUSH BUTTON STATIO NS –16 NOS.

h) POWER CABLE OF 25 NOS. OF CABLE OF SIZE 1CX630 SQMM (7 CABLE PER PHASE AND 4 CABLES FOR NEUTRAL AND SET OF CONTROL CABLES – 2 SETS

i) BATTERY AND BATTERY CHARGER WITH PANEL:

a) 24 V BATTERY WITH 360 AH – BATTERY CHARGER FOR STARTING- 2NOS.

b) 24 V BATTERY WITH 180 AH – BATTERY CHARGER FOR CONTROL SUPPLY - 2NOS.

c) LEAD ACID BATTERIES: LOT.

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

j) SET OF CABLES, CABLE TRAYS, STRUCTURAL MATERIALS, LUBE OIL SYSTEM, FUEL OIL SYSTEM, RADIATOR COOLING WATER SYSTEM, CHARGER AIR SYSTEM. ETC.

k) ACOUSTICS TREATMENT OF DG SET ROOM (COMMON, SIZE-11500X15000X6500) (ACOUSTIC TREATMENT MATERIAL SUPPLY FROM EQUIPEMENT SUPPLIER AND APPLICATION & TREATMENT BY **ERECTION CONTRACTOR UNDER THIS SPECIFICATION AS PER RELEVANT DRAWINGS & DOCUMENTS.**

l) EXHAUST CHIMNEY.

16. BOUGHT OUT ITEMS (BHEL HARDWAR Scope)

1. Turbine Integral Piping (along with Hangers & Supports, Valves and fittings, AS Part of TG INTEGRAL PIPING) Consisting of :

a. Lube Oil Piping.
b. LP Governing Oil system (EHI) with piping.
c. Seal Oil Piping.
d. Gland Seal Piping
e. Equipment Drains & Vent
f. Cross Around Piping.
g. Gas & Air System Piping.
h. Condensate Spray Piping
i. Turbine Water Drainage Piping
j. Other Misc. system Piping etc.,

2. Other equipments / items PER UNIT (AS Part of Main TG, TG Integral and PUMPS WITH AUXILIARIES, TANKS, VESSELS, DG SETS ETC.) Consisting of:

a. Condenser Air Evacuation Vacuum Pumps-2 sets
b. H2 Cylinders-120 Nos.
c. Co2 Cylinders –63 Nos.
d. N2 Cylinders-5 Nos.
e. Vapour Exhausters-2 sets
f. Motorised temperature Control Valve with actuator – 1 set.
g. Duplex Gas Drier- complete set.
h. Lifting Beam and slings for Generator Stator – 1 set
k. Welded Austenitic S.S. Tubes Gr.304 for Condenser – lot
l. Air Exhauster with motor for GSC Air Exhauster – 2 sets
m. Lifting Beam – 1 set

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

n. Jacking oil pump with Motor- 2 sets (1 set DC & 1 set AC)

o. Aux. oil pump & Emergency oil Pump with Motor- 3 sets (2sets AC & 1 Set DC).

p. Duplex filers for Lube oil & Jacking oil pump with Motor – set for each.

q. Butter fly valves – 1 lot.

r. Three way temperature Control valves – 1 set.

s. Double three way valve –1 set.

t. NRV with Al. flap – 2 sets.

u. Pressure limit valve – 1 set.

v. Oil purification unit (Oil centrifuge) - 2 sets

w. Oil Vapour Exhauster – 2 sets.

x. Lead Diaphragm – 2 set.

y. Spay Nozzles – lot.

z. Dirt Catcher – 1 set.

aa. Dampers – lot.

bb. Variable Load Spring Cages – lot.

cc. Flexible Bends – lot.

dd. Vacuum Breaker Valve Assy. Along with solenoid valve- 1 set.

ee. Turbine oil & Control fluid- lot

ff. Dry Air preservation system.—1 set

gg. Flow Nozzle for PG Test – lot

hh. Through Port Gate Valves-lot

ii. Spring Loaded NRV'- lot

kk. LP Governing oil systems – 1 set.

ll. Bypass Stop Valve & Control Valve with EHA – set.

mm. Gear Pump (Lube oil Re-circulation) – 1 set.

nn. Hydraulic Accumulators with filling & Gauge device- 1 set.

oo. Seal Steam & Leakage Steam Control Valve with Actuator- 1 set.

pp. Seal Oil Vapour Exhauster.

3. List of TG Integral piping Schemes applicable:

1. (A) TG Integral Piping:

a) Seal Steam piping.

b) Condensate Spray piping.

c) Lube oil piping (Lube oil, Jacking oil etc).

d) Control/ Governing oil piping.

e) Turbine drainage piping

f) Cooling water piping.

g) Seal oil system piping.

h) Generator Gas system piping.

i) LP turbine extractions to condenser.

1 (B) HP Bypass valve with complete oil system (under PG-22).

(BB) EXTERNAL PIPING/RE-GENERATIVE PIPING WITH ASSOCIATED VALVES, COMPONENTS/ITEMS, FITTING, SUPPORTS ETC. PER UNIT:

1. External /Regenerative System Piping:

j) HRH From Interceptor valve to Turbine (PGMA-80-311)

k) LPBP valve upstream & Downstream (PGMA-80-312)

l) HPBP calve to CRH piping (PGMA-80-321)

m) Extraction Steam to LP Heater-1 (PGMA-80-330)

n) Extraction Steam to LP Heater-2 (PGMA-80-331)

o) Extraction Steam to LP Heater-3 (PGMA-80-332)

p) Extraction Steam to Deaerating Heater (PGMA-80-335)

q) Extraction Steam to HP Heater-1 (PGMA-80-336)

r) Extraction Steam to HP Heater-2 (PGMA-80-337)

s) Unlisted SV Exhausts –TG Scope (PGMA 80-375)

t) HP Heater Vents – TG Scope (PGMA 80-381)

u) LP Heater Vents (PGMA 80-382)

v) Vent from Unlisted PPG/Equipment to Condenser (PGMA 80-385)

w) Condensate Pump vents (PGMA 80-387)

x) Condensate Air Evacuation Piping (PGMA 80-388)

y) Turbine Washing Steam (PGMA 80-398)

z) Condensate Suction (PGMA 80-400)

aa) CD from Pump to LPH-1/DC inlet TEE & Recir. (PGMA 80-401)

bb) CD from LPH-1/DC inlet TEE to TG TP (PGMA 80-402)

cc) Condensate For sealing of Vacuum (PGMA 80- 407)

dd) Condensate Dump from Header (PGMS 80-408)

ee) Condensate / Make up to Condenser (PGMA 80-411).

ff) Condensate Transfer (PGMA 80-412)

gg) Unlisted Condensate (PGMA 80-413)

hh) Condenser Drain (PGMA 80-440)

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

ii) Gland Steam Cooler Drains (PGMA 80-442)

jj) LP Heater-1 to Condenser (PGMA 80-443)

kk) LP Heater-2/3/4/5 Drains & Drip Pump Incl. (PGMA 80-444)

ll) HP Heater Drains (PGMA 80-447)

mm) TG Cycle piping Drains & Vents (PGMA 80-449)

nn) Lube oil piping system (PGMA 80-673)

oo) Sub-delivery valves for Light up (PGMA 80-901, as applicable)

pp) H & S for Light up Steam lines (PGMA 80-921, as applicable)

qq) H & S for Light up – Non Steam lines (PGMA 80-922, as applicable)

rr) H & S for Steam Blowing (PGMA 80-923, as applicable)

ss) H & S for Synchronisation- Steam Lines (PGMA 80-924)

tt) H & S for Steam Blowing –Non Steam lines (PGMA 80-925)

uu) H & S for LP Piping (PGMA 80-933)

vv) **DM Equipment cooling Line (PGMA 80-xxx, STAINLESS STEEL**)

ww) Other valves /NRVs & QCNRVs as supplied for TG equipments and applicable scope of piping under this tender specification (PGMA 80-913 etc.)

xx) LP Chemical Dosing system (Hydrazine dosing, Ammonia dosing, NaOH dosing each 1 No. per unit)

yy) Steam Traps

zz) Air Traps

aaa) Flow elements/Flow nozzles.

bbb) ME Bellows

ccc) Aux. PRDS

(CC) EQUIPMENTS/SYSTEMS, PUMPS, TANKS, WORKSHOP EQUIPMENTS, LAB EQUIPMENTS, MISC. PUMPS, PLATE HEAT EXCHANGERS, MISC. CRANES AND HOIST ETC. COMMON / APPLICANBLE FOR BOTH THE UNITS (SUPPLIED FROM PEM/BHOPAL AND RELATED VENDORS):

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
1.	DM CW Tank (15 CU M each)-2 Nos. (1 Nos. per unit)	2500x3000x2500	2x5,500
2.	Portable Water Tank (25 CU M each)-1 No.	5000x2500x3000	7,000
3.	Workshop Equipments		

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LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
3.1	Lathe-1 No.	Swing over bed -300 mm, distance between centres-8000mm, suitable for handling shafts upto 65 mm, 4 jaws complete with coolant system	13,000
3.2	Vertical Turret Lath-1 No.	Turning Dia. 1500 mm, 3 jaws complete with coolant system	21,000
3.3	Universal Milling Machine-1 No.	Size of table-1600 mm x 300 mm, complete with coolant system	5,000
3.4	Column Drilling Machine-1 No.	Drilling Capacity in mild steel –40 mm, Table size-500mmx630mm, Vertical travel/stroke of spindle-280 mm (min.)	2,000
3.5	Pedestal Grinder-1 No.	Two wheel type, size of grinding wheel-200 mm dia	1,000
3.6	Hydraulic Press-1 No.	100 Tonnes Hydraulic Press (Box type construction)	7,000
3.7	Electric (AC) Arc welding machine – 2 Nos.	Complete sets with cable etc.	2x500
3.8	Oxy Acetylene Gas welding/brazing machine-1 No.	Complete sets with torch etc.	100
3.9	Hand Grinders (capacity-100 mm each) - 4 Nos.		4x100
3.10	Storage cabinets (size 500x500x1500mm each)- 2 Nos.		2x1,000
3.11	Storage cabinets (size 500x500x1500mm each)- 1 No.		1,000

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LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
	500x500x1500mm each)- 1 No.		
4.	**MISC. CRANES AND HOISTS**		
4.1	**Under Sling EOT Cranes.**		
4.1.1	Single Girder under Sling EOT crane for Air Compressor Building -1 No.	Capacity 7.5 MT, Span-11 M, Height of lift -4.5 M, Bay length-24 M	5,000
4.1.2	Single Girder under Sling EOT crane for Fire Water pump house -1 No.	Capacity 3.0 MT, Span-7 M, Height of lift -4.5 M, Bay length -24 M	2,500
4.1.3	Single Girder under Sling EOT crane for Workshop Building -1 No.	Capacity 5.0 MT, Span-15 M, Height of lift -5 M, Bay length -40 M	7,500
4.2	**Electric Hoists**		
4.2.1	Electric Hoist for diesel Generator Building -2 Nos.	Capacity 5 MT, Lift-6 M, Elevation of bottom of monorail-7 M, Runway length-13 M	2x500
4.3	**Chain Pulley Blocks:**		
4.3.1	Chain Pulley Block for administrative building Elevator Machine Room -1 No.	Capacity 3 MT, Lift-8 M, Bay length -10 M	150
4.3.2	Chain Pulley Block for Service Building Elevator Machine Room -1 No.	Capacity 3 MT, Lift-8 M, Bay length -10 M	150
4.3.3	Chain Pulley Block for CW Pump Area -2 Nos.	Capacity 3 MT, Lift-6 M, Elevation of Bottom of monorail-7 M, Bay length -24 M	2x150
4.3.4	Chain Pulley Block for ACW Pump Area – 1 No.	Capacity 2 MT, Lift-3 M, Elevation of Bottom of monorail-3.8 M, Bay length -10 M	100

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
4.3.5	Chain Pulley Block for DMCW Pump Area – 1 No.	Capacity 2 MT, Lift-4 M, Elevation of Bottom of monorail-3.8 M, Bay length-10 M	100
4.3.6	Chain Pulley Block for Heat Exchangers Area – 1 No.	Capacity 2 MT, Lift-4 M, Elevation of Bottom of monorail-3.8 M, Bay length-10 M	100
4.3.7	Chain Pulley Block for Raw Water Pump House – 1 No.	Capacity 2 MT, Lift-4.5 M, Elevation of Bottom of monorail-5.8 M, Bay length-20 M	100
5.	**Plate Heat Exchangers- 4Nos. (2 units per unit)**	Each of size-H-2776XL-3950XW-1370 mm and weight-8000 kg	4x8,000
6.	**Misc. Pumps**		
6.1	ACW Pumps (Horizontal)- 4 Nos. (2 Nos. per unit) in TG hall	Each of size-H-1500XL-3560XW-1200 mm and weight-3000 kg	4x3,000
6.2	CCCW Pumps (Horizontal)- 4 Nos. (2 Nos. per unit) in TG hall	Each of size-H-2000XL-4560XW-1500 mm and weight-4500 kg	4x4,500
6.3	Plant M/U Pumps (Horizontal)- 2 Nos. Near Raw water tank	Each of size-H-1000XL-1985XW-900 mm and weight-1200 kg	2x1,200
6.4	Boiler Fill Pumps (Horizontal)- 2 Nos.	Each of size-H-1100XL-2500XW-700 mm and weight-1500 kg	2x1,500
6.5	DM M/U Pumps (Horizontal)- 2 Nos.	Each of size-H-1200XL-1700XW-650 mm and weight-1000 kg	2x1,000
6.6	Cond. Trf. Pumps (HT)- 2 Nos.	Each of size-H-1200XL-1700XW-650 mm and weight-1000 kg	2x1,000

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
6.7	Ash Water Pumps M/U Pumps (HT)- 2 Nos. Near Raw water tank	Each of size-H-1100XL-2500XW -1000 mm and weight-1800 kg	2x1,800
6.8	Service Water Pumps (HT)-1, 2 Nos.	Each of size-H-1250XL-2000XW -700 mm and weight-1100 kg	2x1,100
6.9	Service Water Pumps (HT)-2, 2 Nos.	Each of size-H-1000XL-2000XW -800 mm and weight-1100 kg	2x1,300
6.10	APH Wash Pumps (HT) - 2 Nos.	Each of size-H-1000XL-2000XW -800 mm and weight-1100 kg	2x1,300
6.11	ACW Filling Pumps (VT)- 2 Nos.	Each weight-8000 kg	2x8,000
6.12	Portable Water Pumps (VT)- 2 Nos.	Each weight-1500 kg	2x1,500
7.	**Chemical Lab Equipments (Mechanical)**		
7.1	**Equipment for Water Analysis**	**Tentative weight**	100
7.1.1	Conductivity meter-mains operated – 2 Nos.		
7.1.2	Conductivity meter-Portable-2 Nos.		
7.1.3	Jar test apparatus-1 No.		
7.1.4 7.1.5	Turbidity meter-2 Nos. PH Meter –Mains operated – 2 Nos.		
7.1.6	PH Meter Portable – 2 Nos.		
7.1.7	Spectrophotometer UB-Visible – 1 No.		
7.1.8	Sample Cooler – 1 No.		
7.1.9	Dissolved Oxygen Meter– 1 No.		

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
7.1.10	Flame Photometer (Elico)– 1 No.		
7.1.11	Selective Ion Analyser – 1 No.		
7.2	**Equipment for Coal Analysis.**	**Tentative weight**	100
7.2.1	Bomb calorimeter – 2 Nos.		
7.2.2	Balance analytical single pan- 1No.		
7.2.3	Balance top loading- 2 Nos.		
7.2.4	Balance ordinary- 2 Nos.		
7.2.5	Coal sample riffler – 1 No.		
7.2.6	Furnace for determination of volatile matter – 1 No.		
7.2.7	Furnace muffle – 2 Nos.		
7.2.8 7.2.9	Jaw crusher and double roll crusher- 1 No. Laboratory plate mill- 1 No.		
7.2.10	Raymond mini mill – 1 No.		
7.2.11	Rotap Sieve shaker & wet sieve shaker – 1 No.		
7.2.12	Set of sieves for sieve analysis for coal- 2 Nos.		
7.3	**Equipment for Meteorology, Ambient Air, Flue Gas & Gas Analysis**	**Tentative weight**	50
7.3.1	Orsat apparatus – 6 Nos.		
7.3.2	Portable flue gas analyser – 1 No.		
7.3.3	Stack monitoring kit – 2 Nos.		
7.3.4	High volume sampler – 3 Nos.		

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
7.4	**Equipment for Oil Analysis**	**Tentative weight**	50
7.4.1	Centrifuge with flame proof motor – 1 No.		
7.4.2	Dean & Stark apparatus along with heating mantle – 2 Nos.		
7.4.3 7.4.4	Flash point apparatus – 1 No. Moisture analyser – 1 No.		
7.4.5	Viscometer and furol tips – 1 No.		
8.	**General Laboratory Items**	**Tentative weight**	300
8.1	Analytical balance –1 No.		
8.2	B.O.D. Incubator – 1 No.		
8.3	Dew point apparatus – 1 No.		
8.4	Assmann Psychrometer, long stem- 1 No.		
8.5	Fortins Barometer – 1 No.		
8.6	Hot air drier – 2 No		
8.7	Hot Plate – 2 Nos.		
8.8	Heating Mantles – 2 Nos.		
8.9 8.10	Magnetic Stirrer Cum hot plate – 2 Nos. Density Hydrometer, all ranges – 2Nos.		
8.11	Hydrometer (Direct reading type) – 12 Nos.		
8.12	Hygrometer and LPG Cylinder with burner- 1 No.		
8.13	Membrane filter holder assy.- 4 Nos.		

APPENDIX – I

LIST OF TENTATIVE EQUIPMENTS / COMPONENTS TO BE ERECTED BY THE CONTRACTOR/PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
	Nos.		
8.14 8.15	Microscope – 1 No. Oven for heating – 2 Nos.		
8.16	Refrigerator (300 Litres)- 3 Nos.		
8.17	Specific gravity bottles(10 & 25 ml)- 10 Nos.		
8.18	Stop watch – 1 No.		
8.19	Thermostat bath or constant temperature bath – 1 No.		
8.20	Thermometers (ranges, 10to 50, 10 to 110, 0 to 150 and 0 -360 Degree Celcius)- 6 Nos.		
8.21	Water bath – 1 No.		
8.22	Wet & dry bulb Hygrometers – 2 Nos.		
8.23	Vacuum Pump – 2 Nos.		
8.24	Calculator (Portable) – 2 Nos.	**Total Weight**	**190500**

NOTE :

1. The information furnished in this section is only a description regarding the item to be erected by the contractor. BHEL reserves the right of adding or excluding any components / items / system according to the site requirements / customer requirements to complete various system in all respects.
2. Any other systems / components, quantities which are the integral to equipment supplied by the manufacturing unit also to be erected and commissioned by the contractor within the quoted / accepted rate / lump sum value.
3. The dimensions, weight, quantity for "(CC) equipments/systems, pumps, tanks, workshop equipments, lab equipments, misc. Pumps, plate heat exchangers, misc. Cranes and hoist etc. Common / applicable for both the units (supplied from PEM / BHOPAL and related vendors)" are tentative and contractor shall

erect and commission as per supplied at site. The payment will be made as per accepted item rate for actual weight erected and commissioned.

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

(AA) FOR TG WITH TG AUXILIARIES AND ASSOCIATED EQUIPMENTS, INTEGRAL PIPING, PUMPS WITH AUX. TANKS, VESSELS , DG SET ETC. PER UNIT:

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
A.	**STEAM TURBINE:**		
1.	HP TURBINE	5060x3100x2900	56100
2.	HP INLET ASSY.	450X450X200	45
3.	HP EXHAUST ASSY.	1625X1335X675	1190
4.	HPT RELATED PARTS	1000X1000X500	190
5.	FRONT BEARING PEDESTAL	2950X2600X1600	12280
6.	PARTS OF FRONT BEARING	1800X1700X1000	600
7.	PARTS OF FRONT BEARING PEDESTAL	SUITABLE PACKAGE	115
8.	VALVE SUPPORT FOR HP OVERHAUL	1000X1000X400	800
9.	COMPENENTS OF ASSY. FIXTURE FOR HPT	3800X2500X1200	6864
10.	COMPENENTS OF ASSY. FIXTURE FOR HPT	3800X2100X900	1800
11.	COMPENENTS OF ASSY. FIXTURE FOR HPT	3300X2100X1210	3352
12.	COMPENENTS OF ASSY. FIXTURE FOR HPT	5010X4000X120	3356
13.	EMERGENCY GOVERNOR	400X400X500	76
14.	HYDRAULIC TURNING GEAR	1400X1400X1200	1000
15.	STEAM BLOWING & TEST DEVICE	2900X2100X1140	3160
16.	GLAND STEAM VALVE WITH ACT.	1750X1400X850	500
17.	ESV & CV CASING WITH VALVES	2850X2600X1900	2X8515
18.	ESV SERVO MOTOR WITH L.S.V MTG.	2100X1350X1250	2X1662
19.	LIMIT SWITCH MTG. TEST VALVES	2100X1350X1250	2X1900
20.	CONTROL VALVES SERVO MOTORS	2000X1500X1500	2X1900
21.	IP TURBINE	5750x3800x4070	58175
22.	I.P. TURBINE PARTS	700X700X500	285
23.	I.P. INLET PIPE ASSY	3700X2200X1900	7130
24.	HP-IP BEARING PEDESTAL ASSY.	4080X2005X2126	13275
25.	HP-IP BEARING PEDESTAL PARTS	1000X600X600	388
26.	HP-IP BEARING PEDESTAL PARTS	500X200X150	37
27.	AUX. OF IP TURBINE	1050X480X550	390
28.	AUX. OF IP TURBINE	1100X500X650	2X204
29.	SUSPENSION OF VALVE (IV)	3500X1500X700	2X2700
30.	ASSY DEVICE FOR VALVES	920X1000X450	213
31.	I.P. CONTROL VALVE SERVOMOTORS	2000X1300X1350	2X1880
32.	IV & CV CASING WITH VALVES	3790x3450x2565	2X18696
33.	FRAME FOR SUSPENSION (IV)	SUITABLE PACKAGE	2X765
34.	LOOSE ITEMS OF FRAME FOR SUSPENSION	600X450X250	300
35.	SOLE PLATE PEDESTAL ASSY.	3400X1200X800	2510
36.	BASE PLATE ASSEMBLY	4500X1400X1200	4500
37.	BASE PLATE ASSEMBLY	2300X1250X600	2560
38.	BASE PLATE LP CASING	2300X2075X981	2680
39.	LP ROTOR	6200x3010x2920	56572

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
40.	LP OUTER CASING PARTS	7060X1480X2760	2X8085
41.	LPC OUTER CASING PARTS	4570X3230X980	2X2500
42.	COMPONENTS OF LP CASING UPPER PART	3500X300X300	495
43.	LP OUTER CASING PATRS	3450 X 1000X1100	900
44.	ASSEMBLY DEVICES	900X700X550	180
45.	AUX. OF LP TURBINE	3000X1300X1000	2100
46.	AUX. OF LP TURBINE	2000X1000X1825	2X1142
47.	LP JOINT COVERING	2300X1800X940	1235
48.	ASSY. TOOLS	1900X1000X890	500
49.	CAP (SPRING SUPPORT)	825X500X400	2X400
50.	CAP (COMPEN.ASSY)	3240X1740X1340	3400
51.	CAP (COMPEN.ASSY)	3240X1740X1340	2X3512
52.	CAP (OBLIQUE REDUCER ASSY)	1400X1400X1200	800
53.	CAP (MIDDLE BEND ASSY)	1550X1550X1300	670
54.	CAP (COMPLEN. ASSY)	3240X1740X1340	3512
55.	CAP (MAN-HOLE ASSY)	1500X1600X1100	2X750
56.	CAP (MITRE BEND ASSY)	1550X1550X1300	2X670
57.	CAP (PIPE ASSY)	2000X1100X1200	645
58.	CAP (MITRE BEND ASSY)	1550X1550X1300	670
59.	LONGITUDINAL GIRDER (LEFT & RIGHT)	6800X1820X1570	2X15182
60.	LP FRONT WALL (TS & GS)	6820X3750X910	2X10053
61.	LP SHAFT SEALING FRONT	1800X1700X740	2X2260
62.	LP SHAFT SEAL COMPENSATOR ASSY (TS)	1440X1420X520	2X1456
63.	LP CASING ASSY (FATRENERS)	1800X1700X740	2653
64.	LP CASING ASSY (PARTS)	3760X2060X860	4900
65.	LP CASING ASSY (PARTS)	450X450X250	140
66.	EXTRACTION PIPE LINE (LPC)	1600X1000X750	520
67.	EXTRACTION PIPE LINE (LPC)	3100X1350X750	670
68.	EXTRACTION PIPE LINE (LPC)	2400X1350X850	1004
69.	EXTRACTION PIPE LINE (LPC)	3300X1100X700	2X725
70.	EXTRACTION PIPE LINE (LPC)	2700X1200X750	585
71.	EXTRACTION PIPE LINE (LPC)	1100X850X850	315
72.	EXTRACTION PIPE LINE (LPC)	2700X1750X1100	730
73.	EXTRACTION PIPE LINE (LPC)	1550X1450X900	538
74.	EXTRACTION PIPE LINE (LPC)	2000X600X600	345
75.	EXTRACTION PIPE LINE (LPC)	2600X2000X1400	1330
76.	INNER GUIDE PLATE OF DIFFUSER (TS & GS)	2600X2400X1000	2X2134
77.	DIFFUSER (TS & GS)	4880X1730X2340	2X3640
78.	LP- GEN. PEDESTAL ASSY	3220X2285X2075	10200
79.	IP- LP PEDESTAL ASSY	3700X1860X2100	14600
80.	LP INNER OUTER CASING (U/H)	6720X3150X2325	21750
81.	LP INNER OUTER CASING (L/H) & LP INNER INNER CASING (L/H)	6750X3500X2325	30907
82.	LP INNER CASING ASSY (FASTENERS)	1800X1700X740	1760
83.	LP INNER-INNER CASING (U/H) PARTIAL	4000X1570X2000	11722
84.	STEAM INLET PIPE (LPT)	2700X1300X900	840
85.	BEARING PEDESTAL PARTS	1000X700X700	850

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
86.	STUD HEATING DEVICE & BREACHNUT HEATING DEVICE	1500X1200X250	315
87.	CRH NRV WITH SERVOMOTOR	3100X3040X2410	5860
88.	STEAM BLOWING DEVICE CRH NRV	2000X1000X500	973
89.	GOVERNING CONTROL RACK ASSY	4700X1900X3300	4510
90.	LPBY PASS VALVE SUSPENSION	2900X1200X300	650
91.	FRAME FOR SUSPENSION FOR LPBP	1700X1500X360	343
92.	FRAME FOR SUSPENSION FOR LPBP	1700X1500X360	323
93.	FRAME FOR SUSPENSION FOR LPBP	300X300X300	90
94.	OIL FLUSHING & PRESSURE TEST DEVICE	750X400X550	130
95.	MAIN OIL TANK & NOZZLE ARGMNT.ASSY.	6180x 3260 x 2650	9981
96.	MAIN OIL TANK & NOZZLE ARGMNT.ASSY.	4200 x 1200 x 900	402
97.	INJECTION FOR SUCTION PIPE NB350	3300X1750X1210	1029
98.	INJECTION FOR SUCTION PIPE NB400	3500X750X750	922
99.	OIL S TRIPPER	600X600X850	133
100.	OIL STRINERS	2050X1200X1410	568
101.	VARIABLE ORIFICES THROTTLE VALVE	1000X500X250	115
102.	LEAKAGE OIL TANK	1000X1000X3000	515
103.	WASTE OIL TANK	1000X1000X3000	515
104.	OIL STRAINERS	2050X1200X1410	568
105.	CHANGE OVER VALVE	500X400X200	49
106.	ATT. SOLENOID VALVES	600X300X300	90
107.	TURBINE INTRUMENT RACKS	2750X1000X800	858
108.	TURBINE INTRUMENT RACKS	2300X750X750	765
109.	HOUSING FOR MS STRINER	1700X1025X900	3000
110.	HOUSING FOR MS STRINER	1725X1250X730	3000
111.	STEAM STRINER ASSY DEVICE	SUITABLE PACKAGE	652
112.	HOUSING FOR HRH STEM STRINERS	2200X1450X1100	2X3500
113.	MAIN STEAM STRAINER	1100X700X350	2X374
114.	HRH STRAINER	1600X1450X750	2X485
115.	STEAM STRAINER HOUSING GASKET	700X700X300	50
116.	STEAM STRAINER HOUSING BLANKING DEVICE ARRNMT.	1800X1650X1140	2945
117.	COMPENSATOR	600X600X900	50
118.	TOOLS AND PACKING DEVICES	1750X1200X980	684
B:	**GENERATOR :**		
1.	FOUNDATION ITEMS OF GEN.	32895X760X840	3908
2.	FOUNDATION ITEMS OF GEN.	5800X1120X520	2509
3.	STATOR	7530x4000x4247	182000
4.	ROTOR	10550x1560x1660	47742
5.	END SHIELD LOWER HALF (TE)	3515X1155X1950	5693
6.	END SHIELD LOWER HALF (EE)	3515X1155X1950	5693
7.	END SHIELD UPPER HALF (EE)	3515X1155X1950	5315
8.	END SHIELD UPPER HALF (TE)	3515X1155X1950	5315
9.	GENERATOR COVERS	4150X1450X1050	931

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
10	H.V. BUSHING	2000x950x600	950
11	LOOSE ITEMS OF WOUND STATOR	800X750X750	550
12	GENERATOR ACCESSORIES	1240X1240X1040	817
13	GENERATOR ACCESSORIES	2140X1140X840	1586
14	GAS BAFFLE RING, INSERT COVER	3360X3160X1340	2940
15	BEARING SHELLS	1100X835X950	953
16	SEAL RINGS	600x600 x200	73
17	DEVICE FOR ROTOR INSERTION	2240X940X1220	1023
18	ERECTION DEVICES	2550X1180X1140	1067
19	ERTECTION ROPES	1800X1450X200	210
20	DRY AIR BLOWER	1350X1250X800	190
21	TERMINAL CONNECTORS	1840X660X400	506
22	SLIP RING SHAFT ASSY.	2540X1110X1200	2155
23	SLIP RING COVER & SEALING WALL	2540X2390X2750	3484
24	ACCESSORIES OF SLIP RING SHAFT	2600X2300X500	1435
25	BED PLATE, BEARING & BRUSHGEAR	2200X1820X1675	3393
26	SEAL OIL STORAGE TANK	3500X1300X1280	1460
27	H2 DISTRIBUTER	3480X1540X440	1150
28	CO2 DISTRIBUTER	2770X1240X440	247
29	SEAL OIL UNIT -I	3550X2900X3700	9160
30	SEAL OIL UNIT -II	3610X2040X1850	3263
31	COOLER RACK ASSY FOR EXCITER	3000X1800X1100	1551
32	GAS UNIT	2550X1790X2560	1150
33	LIQUID DETECTOR RACK	1700X900X1800	450
34	LOOSE VALVES	2000X1000X1000	959
35	LOOSE INSTRUMENTS	1000X1000X500	80
36	CO2 VAPURISER	1520X640X840	225
37	GEN. PIPING	6650X1250X1200	6374
38	GEN. PIPING	6150X1500X1200	1926
39	GEN. PIPING	1900X1500X600	1752
40	CONSUMABLES FOR FOUNDATION ITEMS	7520X4200X4770	15
41	CONSUMABLES	500X600X300	45
42	LOOSE ITEMS	1000X600X400	30
43	LOOSE ITEMS	1000X800X400	90
C:	**HEAT EXCHANGERS** **I) CONDENSER**		
1.	HOTWELL (FRONT HALF)	11200x1900x1200	6913
2.	HOTWELL (REAR HALF)	11200x1900x1200	5000
3.	BOTTOM PLATE	7150x3450x625	2x6793
4.	BOTTOM PLATE	7150x3850x625	8296
5.	BOTTOM PLATE	7150x3850x625	5100
6.	MIDDLE BOTTOM	1900x700x300	271
7.	CONDENSER SUPPRT	1750X1000X1250	4X3650
8.	CONDENSER SUPPRT	1600X950X950	2X4775
9.	WATER CHAMBER (LHS)	5224X3610X360	2X6150
10.	WATER CHAMBER (RHS)	5224X3610X360	2X6150

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
11.	FRONT WATER BOX (G.S.)	5950X3610X2485	15867
12.	FRONT WATER BOX (T.S.)	5950X3610X2485	15867
13.	REAR WATER BOX (GEN. SIDE)	4760X3610X2025	9576
14.	REAR WATER BOX (TUR. SIDE)	4760X3610X2025	9576
15.	SIDE WALL (TUR. SIDE)	5246X2480X16	1105
16.	SIDE WALL (TUR. SIDE)	5246X2480X16	3X1645
17	SIDE WALL (TUR. SIDE)	5246X1670X16	1080
18.	SIDE WALL (TUR. SIDE)	1000X350X250	200
19.	SIDE WALL (TUR. SIDE)	1000X200X150	550
20.	SIDE WALL (GEN.END)	5248X1705X16	1105
21.	SIDE WALL (GEN.END)	5248X2480X16	3X1645
22.	SIDE WALL (GEN.END)	5248X1670X16	1080
23.	SIDE WALL (GEN.END)	1000X350X250	200
24.	SIDE WALL (GEN.END)	5850X200X150	550
25.	SHELL INTERNAL DETAILS	3650X850X625	4X4780
26.	SHELL INTERNAL DETAILS	1000X750X350	600
27.	SHELL INTERNAL DETAILS	3700X850X350	4600
28.	AIR EXTRACTION PIPING	5460X990X410	1200
29.	SHELL INTERNAL DETAILS	4700X3426X348	7X5400
30.	SHELL INTERNAL DETAILS	5500X940X630	8300
31.	SHELL INTERNAL DETAILS	4440X260X100	350
32.	SHELL INTERNAL DETAILS	3000X1500X500	4655
33.	SHELL INTERNAL DETAILS	3000X1500X500	5168
34.	LOWER DOME WALL (T.S)	11000X3950X910	8767
35.	LOWER DOME WALL (T.S)	4000X800X100	700
36.	LOWER DOME WALL (T.S)	900X300X300	270
37.	LOWER DOME WALL (G.S)	11000X3950X910	7690
38.	LOWER DOME WALL (G.S)	4000X800X100	700
39.	DOME WALL (G.S)	900X300X300	270
40.	LOWER DOME WALL (F.W.B SIDE)	7502X4046X545	6012
41.	LOWER DOME WALL (F.W.B SIDE)	6238X934X1155	1444
42.	LOWER DOME WALL (F.W.B SIDE)	1325X1150X500	550
43.	LOWER DOME WALL (R.W.B SIDE)	7550X4000X1800	6727
44.	LOWER DOME WALL (R.W.B SIDE)	6236X1134X1160	1427
45.	LOWER DOME WALL (R.W.B SIDE) LOOSE ITEMS	1300X1065X305	215
46.	DOME INTERNAL STIFFENING	6016X200X200	4X726
47.	DOME INTERNAL STIFFENING	3400X200X200	2X382
48.	DOME INTERNAL STIFFENING	1760X1480X1230	4300
49.	DOME INTERNAL STIFFENING	2380X1310X1100	4295
50.	UPPER DOME WALL (T/GEN.SIDE.)	6800X460X310	2X1083
51.	UPPER DOME WALL (F/W/B.SIDE.)	5880X1930X380	3635
52.	UPPER DOME WALL LOOSE ITEMS	5400X350X32	475
53.	UPPER DOME WALL LOOSE ITEMS	670X250X450	410
54.	UPPER DOME WALL LOOSE ITEMS	5880X1930X448	3270

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
55.	WATER BOX REMOVAL DEVICE	2500X1000X750	2600
56.	WATER BOX REMOVAL DEVICE	2000X1500X500	2135
57.	FRAME	1840X840X230	2X650
58.	STEAM THROW DEVICE	1000X800X800	2X870
59.	CONDENSER LOOSE ITEMS	850X250X250	30
60.	CONDENSER LOOSE ITEMS	2900X956X406	380
61.	CONDENSER LOOSE ITEMS	1000X500X500	275
62.	CONDENSER LOOSE ITEMS	1000X800X800	1450
63.	CONDENSER LOOSE ITEMS	600X320X200	6
64.	CONDENSER LOOSE ITEMS	3300X250X200	2X200
65.	STAND PIPE No.1	2750X420X400	60
66.	CONDENSER STAND PIPE	3150X350X330	284
67.	STAND PIPE No.2	2750X420X390	62
68.	CONDENSER SPRING SUPPRTS-2X28 Nos.)	--	17545
69.	CONDENSER SS TUBES (OD 28.575 MMX 0.889 MM TH.-296 Nos. AND OD 28.575 MMX 0.7112 MM TH.-15368 Nos.)	SUITABLE BOXES	87000
70.	CONDENSER INLET R.E. JOINTS- 2NOS.	5365X2800X3200	2X19000
71.	CONDENSER OUTLET R.E. JOINTS- 2NOS.	2950X2800X3700	2X17000
C:	**HEAT EXCHANGERS** **II) HEATERS & COOLERS**		
1.	HP HEATER 5	2300x1500x10100	31000
2.	HP HEATER 6	2300x1500x11550	40000
3.	LP HEATER 1	11600x1250x1750	12050
4.	GLAND STEAM CONDENSER	1015X1180X1400	785
5.	GLAND STEAM CONDENSER LOOSE ITMS	SUITABLE PACKAGE	360
6.	LPH SUPPORT STRUCTURE	SUITABLE PACKAGE	2566+ 2448
7.	LPH-1 LOOSE ITEMS	SUITABLE PACKAGE	400
8.	LPH-1 STAND PIPE	2200X700X500	50
9.	LP HEATER 2	11000x1250x1850	11150
10.	LPH-2 LOOSE ITEMS	SUITABLE PACKAGE	500
11.	LPH-2 STAND PIPE	2200X700X500	100
12.	LP HEATER- 3	11000x1200x1850	11200
13.	LPH-3 LOOSE ITEMS	SUITABLE PACKAGE	285
14.	LPH-3 STAND PIPE	2200X700X350	100
15.	DRAIN COOLER	4650x1000x1250	3500
16.	DRAIN COOLER LOOSE ITEMS	SUITABLE PACKAGE	150

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

SN	DESCRIPTION	PACKAGE SIZE IN MM	GROSS WT. IN KG.
17.	TURBINE OIL COOLERS –2 NOS.	4650x1650x1980	2x7600
18.	T O C LOOSE ITEMS	750X500X200	80
19.	T O C LOOSE ITEMS	800X600X600	60
20.	HYDROGEN COOLERS - 4 NOS.	8150X830X700	4X2400
21.	HYDROGEN COOLER ITEMS	400X200X250	250
22.	COOLER RACK ASSMBLY FOR EXCITER	3000X1800X1100	1551
C:	**HEAT EXCHANGER III) FST & DEAERATOR**		
1.	FST – SECTION-I	8900X4000X4300	18500
2	FST SECTION-II	9300X4000X4300	19500
3.	FST SECTION-III	8900X4000X4300	18500
4.	DEAERATOR HEADER	9300X2400X2800	16000
5.	DEAERATOR LOOSE ITEMS STAND PIPE, SAFETY RELIEF VALVES, SPOOL PIECE ETC	LOT	1000
6.	DEAERATOR PLATFORM CARBON STEEL SCTRUCTURALS IN SECTIONS	LOT	8000

D- PUMPS WITH AUX, TANKS & VESSELS, DG SET ETC. PER UNIT

(I) DETAILS OF BOILER FEED PUMP PACAKGES PER UNIT

Sl. No.	Description	Qty	Each Size in mm	Total wt. In Kg.
1.	BFP skid (Pump assly. + Base plate+Tubing+seal coolers)	3	2250x1000x1050	3x5770
2.	Booster Pump Skid(Pump assly. + Base plate+ Tubing)	3	1650x1200x950	3x2511
3.	Hydraulic Coupling assly. and accessories	3 sets	1800x1700x1800	3x3560
4.	Hydraulic Coupling working oil cooler.	3	3700x1500x500	3x1475
5.	Hydraulic Coupling lube oil cooler .	3	3100x1300x450	3x775
6.	Hydraulic Coupling loose items	3	Loose for 3 sets	3x710
7.	Suction Strainer for BP	3	1200x1150x1400	3x800
8.	Suction strainer for BFP	3	900x800x1100	3x460
9.	BFP Re-circulation Valve	3	1800x550x1400	3x350
10.	Local Gauge Board racks with instruments	3	2200x300x1800	3x650

	instruments			
11.	Loose items	1 set	loose	3x2449
12.	Motor tubing	3	4000x3000x3000	3x15000
			Total wt.	**103530**

(II) DETAILS OF CONDENSATE EXTRACTION PUMPS PER UNIT

SN	Description	Qty.	Dimensions (mm)	Weight (Kg.)
1.	Condensate Extraction Pump Assembly	2	10000x1700x1800	2x6150
2.	Canister	2	7600x1300x1300	2x2700
3.	CEP Foundation Ring	2	1600x1600x300	2x580
4.	CEP suction Strainer	2	1600x1600x1700	2x1350
5.	Local Gauge Board Rack	1	2000x300x1800	1x300
6.	Loose items	2 sets	Loose	2x210
7.	CEP Motors	2	2020x1810x1150	2x4000
			Total Wt.	**30280**

(III) DETAILS OF COOLING WATER PUMPS PER UNIT

Sl. No.	Description	Qty	Each Size in mm	Total wt. In Kg.
1.	Suction casing	2	2100x2100x950	2x950
2.	Impeller casing Assy.	2	1700x1700x450	2x700
3.	Pump casing Assy.	2	1700x1700x1100	2x2200
4.	Impeller Assy.	2	1350x1350x400	2x485
5.	Element –1 Assy.	2	1550x1550x1600	2x975
6.	Element –2 Assy.	2	1900x1900x1600	2x1300
7.	Element –3 Assy.	2	1950x1950x2200	2x1825
8.	Discharge Elbow Assy.	2	2700x2700x2650	2x7500
9.	Motor Stool Assy.	2	2050x2050x1600	2x2350
10.	Inner Foundation Ring	2	3200x3200x300	2x1990

11.	Thrust Block Assy.	2	1500x650x350	2x350
12.	Shafts (Each shaft consists of 3 sections)	2 sets	525x525x 3500	2x1200
13.	Thrust Bearing	2	850x850x800	2x800
14.	Connecting Coupling	2	350x350x850	2x200
15.	Counter Flange	2	2050x2050x75	2x480
16.	Hardware & Misc. items	2 sets	1000x1000x1000	2x500
17.	Motor	2	3500x3000x4500	2x20000
			Total wt.	**87610**

IV- Flash Tanks & Vessels FOR TWO UNITS

Sl.NO	DESCRIPTION	PACKAGE SIZE in (mm) of each	WT.IN KG/ITEM
1.	HP Drain Flash Tank – 1x2 No.(1No. per unit, total 2 Nos.)	2650x3000x3950.	2x5000
2.	LP Drain Flash Tank - 1x2 No.(1No. per unit, total 2 Nos.)	1950x2200x2550	2x3000
3.	Unit Flash Tank – 1x2 No.(1No. per unit, total 2 Nos.)	1250x1350x2300	2x1000
		Total Weight	**2x9000**

V. DIESEL GENERATING SETS: 1 SET PER UNIT (TOTAL2 SETS FOR BOTH THE UNITS) (EACH SET OF 1500 KVA(1200 KW EACH), & 415 V,COMPRISING OF:)

i) DIESEL GENERATOR SETS (2X1500 KVA , 200 KW EACH), EACH STATIC WT.23000 KGS & SIZE 6000X2600X3500 MM)(ASSEMBLED WITH ENGINE, ALTERNATOR, RADIATOR, BASE FRAME ETC.)

ii. EXHAUST STACK (STEEL) : 2SETS EACH HAVING HEIGHT 30 METERS AND WEIGHT 10 MT

iii) FUEL TANKS-2 NOS. EACH OF CAPACITY 990 LITRES & SIZE (1000X1000X1000MM.)

iv) DG ROOM SIZE-14X15X7 MTRS. (FOR ACOUSTIC TREATMENT) .

v) AMF DG CONTROL PANEL – 2 NOS. EACH OF SIZE -2100X900X600 & WT. 1200 KG.

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

vi) AUX. DISTRIBUTION BOARD –2 Nos. EACH OF SIZE- 2450X430X600 & WT. 900 KG.

vii) LOCAL PUSH BUTTON STATIONS –16 NOS.

viii) POWER CABLE OF 25 NOS. OF CABLE OF SIZE 1CX630 SQMM (7 CABLE PER PHASE AND 4 CABLES FOR NEUTRAL AND SET OF CONTROL CABLES – 2 SETS

ix) BATTERY AND BATTERY CHARGER WITH PANEL:

a) 24 V BATTERY WITH 360 AH – BATTERY CHARGER FOR STARTING- 2NOS.

b) 24 V BATTERY WITH 180 AH – BATTERY CHARGER FOR CONTROL SUPPLY - 2NOS.

c) LEAD ACID BATTERIES: LOT.

d) SET OF CABLES, CABLE TRAYS, STRUCTURAL MATERIALS , LUBE OIL SYSTEM, FUEL OIL SYSTEM, RADIATOR COOLING WATER SYSTEM, CHARGER AIR SYSTEM. ETC.

e) ACOUSTICS TREATMENT OF DG SET ROOM (COMMON, SIZE- 11500X15000X6500) (ACOUSTIC TREATMENT MATERIAL SUPPLY FROM EQUIPEMENT SUPPLIER AND APPLICATION & TREATMENT BY **ERECTION CONTRACTOR UNDER THIS SPECIFICATION AS PER RELEVANT DRAWINGS & DOCUMENTS.**

f) EXHAUST CHIMNEY.

E. BOUGHT OUT ITEMS (BHEL HARDWAR SCOPE)

(I) TG-INTEGRAL PIPING

a. For Turbine (C.S. & A.S.) - 46.0 MT

b. For Generator (CS & A.S.) for seal oil, Gas system etc. – 13.0 MT

(II) Bought out Equipments –340 MT

(BB) FOR EXTERNAL PIPING/RE-GENERATIVE PIPING WITH ASSOCIATED VALVES, COMPONENTS/ ITEMS, FITTING, SUPPORTS ETC. PER UNIT:

Sl. No.	PGMA	DESCRIPTION	WT. IN KG	IBR
1	80-311	HRH From Interceptor valve to Turbine.	11,700	I
2	80-312	LPBP Valve Upstream & Downstream	28,900	I
3	80-321	HPBP Valve to CRH Piping	5,200	I
4	80-330	Extraction Steam to LP Heater-1	6,800	I
5	80-331	Extraction Steam to LP Heater-2	3,400	I

6	80-332	Extraction Steam to LP Heater-3	4,600	I
7	80-335	Extraction Steam to Deaerating Heater	12,900	I
8	80-336	Extraction Steam to HP Heater-1	2,900	I
9	80-337	Extraction Steam to HP Heater-2	1,600	I
10	80-373	Aux. Steam Header SV Exhaust	1,200	N
11	80-375	Unlisted SV Exhausts –TG Scope	4,600	N
12	80-381	HP Heater Vents – TG Scope	900	N
13	80-382	LP Heater Vents	1,500	N
14	80-385	Vent from Unlisted PPG/Equipment to Condenser	2,300	N
15	80-387	Condensate Pump vents	1,100	N
16	80-388	Condensate Air Evacuation Piping	3,300	N
17	80-398	Turbine Washing Steam	3,700	I
18	80-400	Condensate Suction	3,200	N
19	80-401	CD from Pump to LPH-1/DC inlet TEE & Recir.	10,000	N
20	80-402	CD from LPH-1/DC inlet TEE to TG TP	6,300	N
21	80-407	Condensate For sealing of Vacuum	1,300	N
22	80-408	Condensate Dump from Header	2,200	N
23	80-411	Condensate / Make up to Condenser	2,000	N
24	80-412	Condensate Transfer	6,000	N
25	80-413	Unlisted Condensate	1,100	N
26	80-440	Condenser Drains	200	N
27	80-442	Gland Steam Cooler Drains	300	N
28	80-443	LP Heater-1 to Condenser	1,500	N
29	80-444	LP Heater-2/3/4/5 Drains & Drip Pump Incl.	3,000	N
30	80-447	HP Heater Drains	9,200	N
31	80-449	TG Cycle piping Drains & Vents	7,300	N

33	80-901	Sub-delivery valves for Light up	500	N
34	80-921	H & S for Light up– Steam Line	500	N
35	80-922	H & S for Light up– Non Steam lines	8,000	N
36	80-923	H & S for Steam Blowing	3,000	N
37	80-924	H & S for Synchronisation- Steam Lines	2,000	N
38	80-925	H & S for Steam Blowing–Non Steam lines	3,000	N
39	80-933	H & S for LP Piping	500	N
40	81-415	Test Thermowells	As received from mfg. unit	N
41	80-913 80-919 and other valves	Root valves, Extraction line QCNRVs	50,000	
42		Chemical dosing systems (Ammonia dosing skid-1set per unit), Steam Traps, ME Bellows, Aux. PRDS etc	4,300	
43	**80-XXX**	**DM Water Piping (Stainless Steel)**	**13000**	
		TOTAL WEIGHT	**235,000**	

(CC) EQUIPMENTS/SYSTEMS, PUMPS, TANKS, WORKSHOP EQUIPMENTS, LAB EQUIPMENTS, MISC. PUMPS, PLATE HEAT EXCHANGERS, MISC. CRANES AND HOIST ETC. COMMON / APPLICANBLE FOR BOTH THE UNITS (SUPPLIED FROM PEM/BHOPAL AND RELATED VENDORS):

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
1.	DM CW Tank (15 CU M each)-2 Nos. (1 Nos. per unit)	2500x3000x2500	2x5,500
2.	Portable Water Tank (25 CU M each)-1 No.	5000x2500x3000	7,000

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
3.	**Workshop Equipments**		
3.1	Lathe-1 No.	Swing over bed -300 mm, distance between centres-8000mm, suitable for handling shafts upto 65 mm, 4 jaws complete with coolant system	13,000
3.2	Vertical Turret Lath-1 No.	Turning Dia. 1500 mm, 3 jaws complete with coolant system	21,000
3.3	Universal Milling Machine-1 No.	Size of table-1600 mm x 300 mm, complete with coolant system	5,000
3.4	Column Drilling Machine-1 No.	Drilling Capacity in mild steel –40 mm, Table size-500mmx630mm, Vertical travel/stroke of spindle-280 mm (min.)	2,000
3.5	Pedestal Grinder-1 No.	Two wheel type, size of grinding wheel-200 mm dia	1,000
3.6	Hydraulic Press-1 No.	100 Tonnes Hydraulic Press (Box type construction)	7,000
3.7	Electric (AC) Arc welding machine – 2 Nos.	Complete sets with cable etc.	2x500
3.8	Oxy Acetylene Gas welding/brazing machine-1 No.	Complete sets with torch etc.	100
3.9	Hand Grinders (capacity-100 mm each) - 4 Nos.		4x100
3.10	Storage cabinets (size 500x500x1500mm each)- 2 Nos.		2x1,000
3.11	Storage cabinets (size 500x500x1500mm each)- 1 No.		1,000

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
	500x500x1500mm each)- 1 No.		
4.	**MISC. CRANES AND HOISTS**		
4.1	**Under Sling EOT Cranes.**		
4.1.1	Single Girder under Sling EOT crane for Air Compressor Building -1 No.	Capacity 7.5 MT, Span-11 M, Height of lift -4.5 M, Bay length-24 M	5,000
4.1.2	Single Girder under Sling EOT crane for Fire Water pump house -1 No.	Capacity 3.0 MT, Span-7 M, Height of lift -4.5 M, Bay length -24 M	2,500
4.1.3	Single Girder under Sling EOT crane for Workshop Building -1 No.	Capacity 5.0 MT, Span-15 M, Height of lift -5 M, Bay length -40 M	7,500
4.2.	**Electric Hoists**		
4.2.1	Electric Hoist for diesel Generator Building -2 Nos.	Capacity 5 MT, Lift-6 M, Elevation of bottom of monorail-7 M, Runway length-13 M	2x500
4.3.	**Chain Pulley Blocks:**		
4.3.1	Chain Pulley Block for administrative building Elevator Machine Room -1 No.	Capacity 3 MT, Lift-8 M, Bay length -10 M	150
4.3.2	Chain Pulley Block for Service Building Elevator Machine Room -1 No.	Capacity 3 MT, Lift-8 M, Bay length -10 M	150
4.3.3	Chain Pulley Block for CW Pump Area -2 Nos.	Capacity 3 MT, Lift-6 M, Elevation of Bottom of monorail-7 M, Bay length -24 M	2x150
4.3.4	Chain Pulley Block for ACW Pump Area – 1 No.	Capacity 2 MT, Lift-3 M, Elevation of Bottom of monorail-3.8 M, Bay length -10 M	100
4.3.5	Chain Pulley Block for DMCW Pump Area – 1 No.	Capacity 2 MT, Lift-4 M, Elevation of Bottom of monorail-3.8 M, Bay	100

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
		of monorail-3.8 M, Bay length-10 M	
4.3.6	Chain Pulley Block for Heat Exchangers Area – 1 No.	Capacity 2 MT, Lift-4 M, Elevation of Bottom of monorail-3.8 M, Bay length-10 M	100
4.3.7	Chain Pulley Block for Raw Water Pump House – 1 No.	Capacity 2 MT, Lift-4.5 M, Elevation of Bottom of monorail-5.8 M, Bay length-20 M	100
5.	**Plate Heat Exchangers- 4Nos. (2 units per unit)**	Each of size-H-2776XL-3950XW-1370 mm and weight-8000 kg	4x8,000
6.	**Misc. Pumps**		
6.1	ACW Pumps (Horizontal)- 4 Nos. (2 Nos. per unit) in TG hall	Each of size-H-1500XL-3560XW-1200 mm and weight-3000 kg	4x3,000
6.2	CCCW Pumps (Horizontal)- 4 Nos. (2 Nos. per unit) in TG hall	Each of size-H-2000XL-4560XW-1500 mm and weight-4500 kg	4x4,500
6.3	Plant M/U Pumps (Horizontal)- 2 Nos. Near Raw water tank	Each of size-H-1000XL-1985XW-900 mm and weight-1200 kg	2x1,200
6.4	Boiler Fill Pumps (Horizontal)- 2 Nos.	Each of size-H-1100XL-2500XW-700 mm and weight-1500 kg	2x1,500
6.5	DM M/U Pumps (Horizontal)- 2 Nos.	Each of size-H-1200XL-1700XW-650 mm and weight-1000 kg	2x1,000
6.6	Cond. Trf. Pumps (HT)- 2 Nos.	Each of size-H-1200XL-1700XW-650 mm and weight-1000 kg	2x1,000
6.7	Ash Water Pumps M/U Pumps (HT)- 2 Nos. Near Raw water tank	Each of size-H-1100XL-2500XW-1000 mm and weight-1800 kg	2x1,800
6.8	Service Water Pumps (HT)-1, 2 Nos.	Each of size-H-1250XL-2000XW-700 mm and	2x1,100

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
	Nos.	2000XW-700 mm and weight-1100 kg	
6.9	Service Water Pumps (HT)-2, 2 Nos.	Each of size-H-1000XL-2000XW-800 mm and weight-1100 kg	2x1,300
6.10	APH Wash Pumps (HT) - 2 Nos.	Each of size-H-1000XL-2000XW-800 mm and weight-1100 kg	2x1,300
6.11	ACW Filling Pumps (VT)- 2 Nos.	Each weight-8000 kg	2x8,000
6.12	Portable Water Pumps (VT)- 2 Nos.	Each weight-1500 kg	2x1,500
7	**Chemical Lab Equipments (Mechanical)**		
7.1	**Equipment for Water Analysis**	**Tentative weight**	100
7.1.1	Conductivity meter-mains operated – 2 Nos.		
7.1.2	Conductivity meter-Portable-2 Nos.		
7.1.3	Jar test apparatus-1 No.		
7.1.4	Turbidity meter-2 Nos.		
7.1.5	PH Meter –Mains operated – 2 Nos.		
7.1.6 7.1.7	PH Meter Portable – 2 Nos. Spectrophotometer UB-Visible – 1 No.		
7.1.8	Sample Cooler – 1 No.		
7.1.9	Dissolved Oxygen Meter– 1 No.		
7.1.10	Flame Photometer (Elico)– 1 No.		
7.1.11	Selective Ion Analyser – 1 No.		
7.2 7.2.1	**Equipment for Coal Analysis.** Bomb calorimeter – 2 Nos.	**Tentative weight**	100

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
7.2.2	Balance analytical single pan- 1No.		
7.2.3 7.2.4	Balance top loading- 2 Nos. Balance ordinary- 2 Nos.		
7.2.5	Coal sample riffler – 1 No.		
7.2.6	Furnace for determination of volatile matter – 1 No.		
7.2.7	Furnace muffle – 2 Nos.		
7.2.8	Jaw crusher and double roll crusher- 1 No.		
7.2.9	Laboratory plate mill- 1 No.		
7.2.10	Raymond mini mill – 1 No.		
7.2.11	Rotap Sieve shaker & wet sieve shaker – 1 No.		
7.2.12	Set of sieves for sieve analysis for coal- 2 Nos.		
7.3	**Equipment for Meteorology, Ambient Air, Flue Gas & Gas Analysis**	**Tentative weight**	50
7.3.1	Orsat apparatus – 6 Nos.		
7.3.2	Portable flue gas analyser – 1 No.		
7.3.3	Stack monitoring kit – 2 Nos.		
7.3.4	High volume sampler – 3 Nos.		
7.4	**Equipment for Oil Analysis**	**Tentative weight**	50
7.4.1	Centrifuge with flame proof motor – 1 No.		
7.4.2	Dean & Stark apparatus along with heating mantle – 2 Nos.		
7.4.3	Flash point apparatus – 1 No.		

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
7.4.4	Moisture analyser – 1 No.		
7.4.5	Viscometer and furol tips – 1 No.		
8.	**General Laboratory Items**	**Tentative weight**	300
8.1	Analytical balance –1 No.		
8.2	B.O.D. Incubator – 1 No.		
8.3	Dew point apparatus – 1 No.		
8.4	Assmann Psychrometer, long stem- 1 No.		
8.5	Fortins Barometer – 1 No.		
8.6	Hot air drier – 2 No		
8.7	Hot Plate – 2 Nos.		
8.8	Heating Mantles – 2 Nos.		
8.9	Magnetic Stirrer Cum hot plate – 2 Nos.		
8.10	Density Hydrometer, all ranges – 2Nos.		
8.11	Hydrometer (Direct reading type) – 12 Nos.		
8.12	Hygrometer and LPG Cylinder with burner- 1 No.		
8.13	Membrane filter holder assy.- 4 Nos.		
8.14	Microscope – 1 No.		
8.15	Oven for heating – 2 Nos.		
8.16	Refrigerator (300 Litres)- 3 Nos.		
8.17	Specific gravity bottles (10 & 25 ml)- 10 Nos.		
8.18	Stop watch – 1 No.		

APPENDIX – II

LIST OF PACKAGES, ODC DETAILS, WEIGHTS ETC. PER UNIT

Sl.NO	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
8.19 8.20	Thermostat bath or constant temperature bath – 1 No. Thermometers (ranges, 10to 50, 10 to 110, 0 to 150 and 0 -360 Degree Celcius)- 6 Nos.		
8.21	Water bath – 1 No.		
8.22	Wet & dry bulb Hygrometers – 2 Nos.		
8.23	Vacuum Pump – 2 Nos.		
8.24	Calculator (Portable) – 2 Nos.	**Total Weight (SAY 190 MT)**	**190500**

NOTE :

1. The list is tentative and has been given to enable the contractor to study the nature of work to be done in this contract. There may be variation in size, weight etc. and no claim, whatsoever, will be entertained on account of this by BHEL.
2. Some of the packages may be sent in parts to suit the site condition / transportation, the same is to be assembled at site without any extra cost, likewise the package may be assembled together and send as a single assy. Contractor may have to dismantle and erect or, erect as single assembly as per the instruction of BHEL Engineers without any extra cost.

APPENDIX – III

TENTATIVE WEIGHT SCHEDULE / PER UNIT

Sl.No.	EQUIPMENT / PACKAGE	APPROX. WT. (in MT)
A.	STEAM TURBINE & AUX. PER UNIT	591.98
B.	TURBO GENERATOR & AUX. PER UNIT	310.37
C.	CONDENSER WITH AUX,	380.00
D.	HEATERS, DEAERATORS ETC. (HEAT EXCHANGERS) PER UNIT	220.00
E.	BOILER FEED PUMPS & AUX. PER UNIT	103.53
F.	CONDENSATE EXTRACTION PUMPS & AUX. PER UNIT	30.28
G.	COOLING WATER PUMPS & AUX PER UNIT	87.61
H.	FLASH TANK & VESSELS PER UNIT	9.0
J.	DG SET WITH AUX. PER UNIT	40.0
K.	TG INTEGRAL PIPING PER UNIT	59.00
	HP BYPASS VALVES WITH OIL SYSTEM PER UNIT	3.66
L.	BOUGHT OUT ITEMS (BHEL Haridwar Scope)+GEN.AUX. PER UNIT	253.00
	TOTAL WT.	**2088.43**

(M) EXTERNAL / RE-GENERATIVE PIPING SYSTEM WITH RELATED PEM BOUGHT OUT ITEMS PER UNIT

(i) Carbon steel & Alloy Steel Piping PER Unit-222 MT

(ii) Stainless Steel Piping PER Unit-13 MT

(N) EQUIPMENTS / SYSTEMS COMMON FOR TWO UNITS – 190.0 MT

NOTE :

2. The weight indicated above is approximate and there may be a variation in weight of equipment / package. No claim, whatsoever, will be entertained by BHEL on account of variation in weight & quantities in respect of TG Equipments, TG Integral piping along with other equipments like Flash Tanks, vessels, Pumps, DG sets etc.

3. For External piping/Regenerating piping system with related PEM items as per above under **Sl.“ (M)** the accepted item rate shall remain firm for any upward or downward variation in quantities up to plus/minus 30%. Applicable rates for quantities beyond these limits for the External piping/Regenerating piping system will be mutually discussed and decided.

4. For any variation in weight of Equipments/systems, pumps, tanks, workshop equipments, lab equipments, misc. Pumps, plate heat exchangers, misc. Cranes and hoist etc. Common / applicable for both the units as mentioned above under **Sl. “N**”, the accepted item rate shall remain firm and payment will be made for actual weight erected & commissioned.

APPENDIX – IV

LIST OF T&P TO BE PROVIDED BY BHEL FREE OF HIRE CHARGES ON SHARING BASIS

SN	DESCRIPTION & CAPACITY OF T&P	QUANTITY	PURPOSE
01	EOT CRANE IN TG HALL 130/30 MT CAPACITY	02 No	EOT CRAE FOR HANDLING AND ERECTION WITHIN TG HALL.
02	100T/150 T CRANE	AS AVAILABLE	FOR LIFTING & PLACEMENT DEAERATOR AND FST SECTIONS.

NOTE:

1. Complete operation of EOT crane along with providing the operator, day today operation/maintenance, general cleanliness, attending of gear box leakages etc., applying caladium Compound on slings and holding/supporting the supply cables etc. provided by the contractor as per requirement.

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

3. BHEL will provide free of charges the suitable available crane with operator for lifting and placement of De-aerator and FST sections near the TG building area to place them at suitable location / elevation of equipment foundation depending accessibility and approachability. The fuel for same shall be provided by contractor. For effective utilisation of crane, contractor shall plan his activities to carry out the work in minimum possible duration. In case of accessibility and approachability limitations of crane to place the FST sections and Deaerator on required foundation, the Contractor shall make necessary temporary platform / approach including providing the materials as per requirement as part of scope of work.

4. As all above BHEL cranes will be shared with other agencies /contractors of BHEL. The requirement of crane shall be planned well in advance with indenting procedure in consultation/ direction of BHEL engineer at site and with allocation of crane shall be as decided by BHEL engineer and his decision shall be binding on contractor.

5. Contractor shall have provide the sleepers/filling materials and manpower assistance for levelling of ground, filling of ditches/uneven approaches etc. as

required for safe marching, smooth operation & movement of above BHEL cranes provided to contractor.

6. Any boom reduction/ extension of BHEL cranes for contractor's use and restoration to previous state or as directed by BHEL shall be the contractor's responsibility. Contractor shall provide all enabling services with tools and tackles for assembly/dismantling and boom extension/reduction as above.

APPENDIX –V

MAJOR TOOLS AND PLANTS & MMD TO BE DEPLOYED BY THE CONTRACTOR

A: TOOL & PLANTS

SL.NO.	DESCRIPTION	QUANTITY
01.	CRANES (OF SUITABLE CAPACITY)	AS PER REQUIREMENT
02.	TRAILER WITH HORSE (SUITABLE CAPACITY)	-DO-
03.	TRACTOR TROLLEY (SUTABLE CAPACITY)	-DO-
04.	WELDING GENERATOR SETS (SUFFICIENT QUNTITY) (ELECTRIC AS WELL DIESEL)	-DO-
05.	3- PHASE COMPLETE SET UP FOR DRAWAL OF POWER	-DO-
06.	RADIOGRAPHY ARRANGEMENT INCLUDING THE SOURCE AND FILM VIEWER	-DO-
07.	TIG WELDING SETS (SUFFICIENT QUNTITY)	-DO-
08.	STRESS RELIEVING EQUIPMENTWITH TEMPERATURE RECORDERS	-DO-
09.	ELECRTRICAL BAKING OVEN – BIG	-DO-
10.	ELECTRODE BAKING OVEN-- PORTABLE	-DO-
11.	MIXER FOR GROUTING OF EQUIPMENT FOUNDATIONS	-DO-
12.	VACUUM CLEANER (INDUSTRIAL)	-DO-
13 .	PIPE CUTTING AND BEVELLING MACHINE	-DO-
14 .	PIPE BENDING M/C (ELECTRIC/ ELECTRO-HYDRAULIC-UPTO 4” SIZE)	-DO-
15 .	AIR COMPRESSOR 120 CFM	01 NO
16.	STEP DOWN TRANSFORMER, 230V/24V	AS PER REQUIREMENT
17.	CONDENSER TUBE EXPANDER SET	-DO-
18.	ELECTRICALLY OPERATED WINCHES 3T/5T CAP.	-DO-
19.	JACKING BOLTS / PRESSOUT BOLTS OF ALL SIZES (FOR ST. TURBINE ROLL CHECKS ETC.)	-DO-

20. HYDRAULIC JACKS OF VARIOUS CAPACITIES FOR ST. TURBINE AND GENERATOR :

- JACKS OF 100 T CAPACITY 04 NOS (WITH HAND OPERATED PUMPS)
- JACKS OF 50 T CAPACITY 04 NOS. (- DO -)
- GANG OPERATED JACKS CONSISTING OF THE FOLLOWING :
- JACKS OF 100 T CAPACITY 04 NOS (HAVING BROAD BASE ONE INCH LIFT)
- LONG HIGH PRESSURE HOSES 12 NOS.(FOR GENERATOR ALIGNMENT)

ABOVE JACKS FOR GENERATOR ALIGNMENT SHOULD HAVE SUITABLE COUPLING FOR JOINING THE TWO OR MORE HOSES TOGETHER TO GET DESIRED LENGTH OF HOSES, SHOULD HAVE HAND OPERATED PUMPS & ALSO SHOULD BE ABLE TO FIT WITH HYDRAULIC UNIT.

21 .TORQUE WRENCH 0 TO 200 N-M CAP. 01 NO.

22 .TORQE WRENCH UPTO 2000 N-M CAP. 01 NO.

23 . SLINGS FOR LP TURBINE ROTOR 01 SET

24 . SLINGS FOR HP TURBINE MODULE 01 SET

25 . SLINGS FOR GENERATOR ROTOR 01 SET

26. BOLT STRETCHING DEVICE AS PER REQUIREMENT

(FOR TURBINE & GENERATOR FDN. BOLTS)

27. LONG FEELER GAUGE SET AS PER REQUIREMENT

28. SPANNERS / EYE BOLTS (OF ALL SIZES) AS PER REQUIREMENT

29. CHEMICAL CLEANING PUMPS WITH STARTER, MOTOR, CABLES, ETC.- OF REQUIRED QUANTITY & CAPACITY) AS PER REQUIREMENT

30. Pressurising Pump for Hydraulic Testing of Pipe lines : As per requirement 450 Kg/cm2 with flow rate of 25 to 30 LPM with starter & Cables

31. Hand Operated Hydraulic Test Pump of suitable capacity. – as per requirement.

ANY OTHER MAJOR T&P REQUIRED FOR SATISFACTORY COMPLETION OF THE WORKS.

B: MEASURING AND MONITORING DEVISES (MMD):

AS PER REQUIREMENT TO BE FINALIZED AT SITE.

NOTE :

THIS ABOVE LIST IS ONLY INDICATIVE AND 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 ENGINEER AND REQUIRED FOR COMPLETION OF WORK.

APPENDIX –VI
ANALYSIS OF UNIT RATE QUOTED

SL. NO.	DESCRIPTION	% OF QUOTED RATE	REMARKS
01	SITE FACILITIES VIZ., ELECTRICITY, WATER OTHER INFRASTRUCTURE.		
02	SALARY AND WAGES + RETRENCHMENT BENEFITS		
03	CONSUMABLES		
04	T&P DEPRECIATION & MAINTENANCE		
05	ESTABLISHMENT & ADMINISTRATIVE EXPENSES		
06	OVERHEADS		
07	PROFIT		
TOTAL		100%	

SIGNATURE OF THE TENDERER

DATE:

APPENDIX –VII

FORMAT FOR MONTH-WISE MANPOWER DEPLOYMENT PLAN FOR EACH UNIT

(CATEGORY-WISE NUMBERS TO BE INDICATED FOR EACH MONTH)

SN	CATEGORY	MONTHS										
		1	2	3	4	5	6	7	8	9	10	SO ON*
01	RESIDENT ENGINEER											
02	ERECTION ENGINEERS											
03	ERECTION SUPERVISORS											
04	QUALITY ASSURANCE ENGINEER											
05	SAFETY ENGINEER											
06	MATERIALS MANAGEMENT SUPERVISORS											
07	HIGH PRESSURE WELDERS											
08	STRUCTURAL & OTHER WELDERS											
09	FITTERS											
10	CRANE OPERATOR											
11	TRUCK/TRAILER DRIVERS											
12	STORE KEEPERS											
13	ELECTRICIANS											
14	SEMISKILLED/ UNSKILLED WORKERS											
	MONTH WISE TOTAL											

*Please use additional sheets in same format for additional period.

SIGNATURE OF TENDERER

DATE:

APPENDIX –VIII

FORMAT FOR DEPLOYMENT PLAN FOR MAJOR TOOLS AND PLANTS

SL. NO.	DESCRIPTION & CAPACITY OF T&P	MONTHS										
		1	2	3	4	5	6	7	8	9	10	SO ON
01												
02 03												
04												
05												
06												
07												
08												
09												
10												

Date

Signature of Tenderer

APPENDIX – IX

CONCURRENT COMMITMENTS

SL. NO	FULL POSTAL ADRESS OF CLIENT AND NAME OF OFFICER IN-CHARGE	DESCRIPTION OF THE WORK	VALUE OF THE CONTRACT	COMMENC-EMENT DATE	SCHEDU-LED COMPLE-TION	% COMPL-TD. AS ON DATE	ANTICIPA-TED COMPLN. DATE	REMARKS

SIGNATURE OF THE TENDERER

DATE:

APPENDIX - X

DETAILS OF SIMILAR WORK DONE DURING THE LAST SEVEN YEARS

SN	FULL POSTAL ADDRESS OF CLIENT & NAME OF OFFICER IN CHARGE	DESCRIP-TION OF WORK	VALUE OF CONTRACT	DATE OF AWARD OF WORK	DATE OF COMMENCEMENT OF WORK	ACTUAL COMPLETION TIME (MONTHS)	DATE OF ACTUAL COMPLETION OF WORK	REMARKS
1								
2								
3								
4								
5								

BIDDERS SHALL ENCLOSE COPIES OF DETAILED WORK ORDER (GIVING BILL OF QUANTITIES AND SCOPE OF WORK) AND COMPLETION CERTIFICATE IN SUPPORT OF THIS STATEMENT.

DATE

SIGNATURE OF TENDERER WITH SEAL

APPENDIX-XI

FORMAT FOR MONTH-WISE MANPOWER DEPLOYMENT PLAN FOR INSTALLATION SUPERVISION SERVICES
(SERVICE CATEGORY-WISE NUMBERS TO BE INDICATED FOR EACH MONTH)

SN	SERVICE CATEGORY	MONTHS												
		1	2	3	4	5	6	7	8	9	10	11	12	SO ON*
01	TG and Auxiliaries													
02	Condenser & Aux.													
03	Rotating Machines													
04	Piping, Welding & NDT													
	Month wise Total													

* USE ADDITIONAL SHEETS TO COVER THE TOTAL CONTRACT PERIOD SO AS TO COVER THE ENTIRE CONTRACT PERIOD AND GRACE PERIOD.

DATE

SIGNATURE & SEAL OF BIDDER