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

NO: BHE/PW/PUR/BRGNI-STG/748

RECEIPT OF MATERIALS FROM STORES, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR, CONDENSER, TG INTEGRAL PIPING, HP & LP HEATERS, DEAERATOR, WITH ASSOCIATED EQUIPMENTS/TANKS/VESSELS, FST & DEAERATOR, LP BYPASS SYSTEM WITH ASSOCIATED PLATFORM, POWER CYCLE PUMPS & ASSOCIATED AUXILIARIES B.F. VALVES ETC, BOUGHT OUT ITEMS AND PEM PACKAGES ETC IN UNIT 1 TO 6 OF 6x150 MW

AT

HINDALCO

MAHAN ALUMINIUM PROJECT (6x150 MW)

BARGAWAN, DISTT: SINGROULI,

MADHYA PRADESH

VOLUME – I

CONSISTING OF:

- **Notice Inviting Tender,**
- **Volume-IA : Technical Conditions of Contract-,**
- **Volume-IB : Special conditions of Contract,**
- **Volume-IC : General conditions of Contract**
- **Volume-ID : Forms & Procedures**

Bharat Heavy Electricals Limited
(*A Government of India Undertaking*)
Power Sector - Western Region
345-Kingsway, Nagpur-440001

CONTENTS			
Volume No	Description	No. of pages	Hosted in website bhel.com as files titled
NIL	Tender Specification Issue Details	1	(Part of **Vol-IA-748**)
NIL	Notice Inviting Tender	12	(Part of **Vol-IA-748**)
I-A	Technical Conditions of Contract	70	Vol-IA-748
I-B	Special Conditions of Contract	47	Vol-IBCD-748
I-C	General Conditions of Contract	29	(Part of Vol-IBCD-748)
I-D	Forms & Procedures	54	(Part of Vol-IBCD-748)
II	Price Bid Specification	3	Vol-II-748

Tender Specification Issue Details

Tender Specification No: BHE/PW/PUR/BRGNI-STG/748

RECEIPT OF MATERIALS FROM STORES, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR, CONDENSER, TG INTEGRAL PIPING, HP & LP HEATERS, DEAERATOR, WITH ASSOCIATED EQUIPMENTS/TANKS/VESSELS, FST & DEAERATOR, LP BYPASS SYSTEM WITH ASSOCIATED PLATFORM, POWER CYCLE PUMPS & ASSOCIATED AUXILIARIES B.F. VALVES ETC, BOUGHT OUT ITEMS AND PEM PACKAGES ETC IN UNIT 1 TO 6 OF 6x150 MW

AT

HINDALCO

MAHAN ALUMINIUM PROJECT (6x150 MW)

BARGAWAN, DISTT: SINGROULI,

MADHYA PRADESH

EARNEST MONEY DEPOSIT: Refer Notice Inviting Tender

LAST DATE FOR TENDER SUBMISSION Refer Notice Inviting Tender .

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

M/s. ……

……

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

AGM (Purchase)
Place: Nagpur
Date :

748

NOTICE INVITING TENDER

Bharat Heavy Electricals Limited

Ref: BHE/PW/PUR/BRGNI-STG/748 Date: 24/07/2010

NOTICE INVITING TENDER (NIT)

NOTE: BIDDER MAY DOWNLOAD FROM WEB SITES OR PURCHASE TENDERS FROM THIS OFFICE ALSO

==========

To

Dear Sir/Madam

Sub : NOTICE INVITING TENDER

Sealed offers in two part bid system are invited from reputed & experienced bidders (meeting PRE QUALIFICATION CRITERIA as mentioned in Annexure-I) for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Following points relevant to the tender may please be noted and complied with.

1.0 Salient Features of NIT

SL NO	ISSUE	DESCRIPTION	
i	**TENDER NUMBER**	**BHE/PW/PUR/BRGNI-STG/748**	
ii	**Broad Scope of job**	RECEIPT OF MATERIALS FROM STORES, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR, CONDENSER, TG INTEGRAL PIPING, HP & LP HEATERS, DEAERATOR, WITH ASSOCIATED EQUIPMENTS/TANKS/VESSELS, FST & DEAERATOR, LP BYPASS SYSTEM WITH ASSOCIATED PLATFORM, POWER CYCLE PUMPS & ASSOCIATED AUXILIARIES B.F. VALVES ETC, BOUGHT OUT ITEMS AND PEM PACKAGES ETC IN UNIT 1 TO 6 OF 6x150 MW AT **HINDALCO** MAHAN ALUMINIUM PROJECT (6x150 MW) BARGAWAN, DISTT: SINGROULI, MADHYA PRADESH	
iii	**DETAILS OF TENDER DOCUMENT**		
a	Volume-IA	*Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc*	*Applicable*
b	Volume-IB	*Special Conditions of Contract (SCC)*	*Applicable*
c	Volume-IC	*General Conditions of Contract (GCC)*	*Applicable*
d	Volume-ID	*Forms and Procedures*	*Applicable*
e	Volume-II	*Price Schedule (Absolute value).*	*Applicable*
iv	**Issue of Tender Documents**	***1. Sale from BHEL PS Regional office at :Nagpur*** ***Start : 24 /07/ 2010*** ***Closes: 13/08/2010 , Time :16.00 Hrs***	*Applicable*

		2. From BHEL website (www.bhel.com) Tender documents can however be downloaded from website till due date of submission	
v	**DUE DATE & TIME OF OFFER SUBMISSION**	***Date : 16 /08/ 2010 , Time :15.00Hrs*** ***Place : BHEL PS Regional office at :Nagpur*** Tenders being submitted through representative shall be handed over to any of the following BHEL officials after making entry/registration at the reception: SM Borkar/ Sr Manager (Purchase) RK Ranade/ Manager (Purchase) Vivek Kamal/ Engineer(Purchase) Pratish Gee Varghese/Engineer(Purchase)	*Applicable*
vi	**OPENING OF TENDER**	***1 hours after the latest due date and time of Offer submission*** *Notes:* *(1) In case the due date of opening of tender becomes a non-working day, tenders shall be opened on next working day at the same time.* *(2) Bidder may depute representative to witness the opening of tender*	*Applicable*
vii	**EMD AMOUNT**	*Rs 2,00,000/- (Rupees Two Lakhs Only)*	*Applicable*
viii	**COST OF TENDER**	*Rs 2000/-.*	*Applicable*
ix	**LAST DATE FOR SEEKING CLARIFICATION**	*Date: Atleast 5 days before the due date of offer submission* *Along with soft version also, addressing to undersigned & to others as per contact address given below*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**	*Date : Not applicable.*	*Not applicable.*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	*Not Applicable*	*Not Applicable*
xii	**Latest updates**	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com -->Tender Notifications →View Corrigendums) **and not in the newspapers**. Bidders to keep themselves updated with all such information	

2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed & stamped on each page, as part of offer. **Rates/Price including discounts/rebates, if any, mentioned anywhere/in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**

3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Power Sector Regional HQ at Nagpur issuing the Tender, along with techno-commercial offer. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office as stated above against sl no iv of 1, on any working day;

and in such case copy of Cash receipt is to be enclosed with the Techno Commercial offer. Sale of tender Documents shall not take place on National Holidays, holidays declared by Central or State Governments and BHEL PS HQ at NAgpur, Sundays and second/ last Saturdays

4.0 Unless specifically stated otherwise, bidder shall deposit EMD through Demand Draft/Pay Order in favour of Bharat Heavy Electricals Ltd, payable at Nagpur. For other details and for 'One Time EMD' please refer General Conditions of Contract.

5.0 **Procedure for Submission of Tenders**: The Tenderers must submit their Tenders to Officer inviting Tender, as detailed below:

- PART-I consisting of 'PART-I A (Techno Commercial Bid)' & 'PART-I B (EMD/COST of TENDER)' in two separate sealed and superscribed envelopes (ENVELOPE-I & ENVELOPE-II)
- PART-II (Price Bid) – in sealed and superscribed envelope (ENVELOPE-III)

6.0 The contents for ENVELOPES and the superscription for each sealed cover/Envelope are as given below. **(All pages to be signed and stamped)**

Sl no	Description	Remarks
	Part-I A	
	ENVELOPE – I superscribed as : PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**:-	
i.	Covering letter/Offer forwarding letter of Tenderer.	
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above. **Note:** a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be placed after document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	
iii.	Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall distinctly bear the name of organization, contact ph no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/ Errata etc pertinent to this NIT.	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	If applicable
vi.	Duly filled-in annexures, formats etc as required under this Tender	

	Specification/NIT	
vii.	Notice inviting Tender (NIT)	
viii.	Volume – I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume – I B : Special Conditions of Contract (SCC)	
x.	Volume – I C : General Conditions of Contract (GCC)	
xi.	Volume – I D : Forms & Procedures	
xii.	Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item	
xiii.	Any other details preferred by bidder with proper indexing.	

	PART-I B	
	ENVELOPE – II superscribed as: PART-I (EMD/COST of TENDER) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**:-	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in this Tender **OR** Documentary evidence for 'One Time EMD' with the Power Sector Region of BHEL floating the Tender 2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)	

	PART-II	
	PRICE BID consisting of the following shall be enclosed	
	ENVELOPE-III superscribed as: PART-II (PRICE BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**	
i	Covering letter/Offer forwarding letter of Tenderer enclosed in Part-I	
ii	Volume II – PRICE BID (Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures)	

	OUTER COVER	
	ENVELOPE-IV (MAIN ENVELOPE / OUTER ENVELOPE) superscribed as: TECHNO-COMMERCIAL BID, PRICE BID & EMD TENDER NO: NAME OF WORK: PROJECT: DUE DATE OF SUBMISSION:	

	CONTAINING THE FOLLOWING:	
i	o Envelopes I o Envelopes II o Envelopes III	

SPECIAL NOTE : All documents/ annexures submitted with the offer shall be properly annexed and placed in respective places of the offer as per enclosure list mentioned in the covering letter. BHEL shall not be responsible for any missing documents.

7.0 No Deviation with respect to tender clauses and no additional clauses/ suggestions/ in Techno-commercial bid/ Price bid shall normally be considered by BHEL. Bidders are requested to positively comply with the same.

8.0 BHEL reserves the right to accept or reject any or all Offers without assigning any reasons thereof. BHEL also reserves the right to cancel the Tender wholly or partly without assigning any reason thereof. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).

9.0 Assessment of Capacity of Bidders: (Shall be applicable for Bid Evaluation after 1st Jan 2011)
Bidders capacity for executing the job under tender shall be assessed as per the following:

I. **Assigning Weightages (A) for Similar Jobs Under-Execution**: Weightages shall be worked out and assigned based on the average number of Similar Works under execution including works yet to be commenced by the agency, in the following manner:

i). Number of Similar Jobs
- a) No. of jobs in BHEL, PSER : Say 'J'
- b) No. of jobs in BHEL, PSSR : Say 'K'
- c) No. of jobs in BHEL, PSWR : Say 'L'
- d) No. of jobs in BHEL, PSNR : Say 'M'
- e) No. of jobs with other customers* : Say 'N' (*: Other than BHEL PSER, PSSR, PSWR & PSNR)
- f) Average No. of Jobs is 'P'= (J+K+L+M+N) divided by 5

ii) Weightage "A" assigned to bidders based on Average Number of jobs "P";
- a) If 'P' = 0-1, "A" will be equal to '3'
- b) If 'P' = 2-3, "A" will be equal to '2'
- c) If 'P' = 4-5, "A" will be equal to '1'
- d) If 'P' is Above 5, "A" will be equal to '0'

II. **Weightage "B" for Quarterly Performance Reports of Vendors**: This shall be based on the averages of the net weighted score obtained by the bidder for the jobs under execution (excluding works not commenced) for the quarter previous to the last quarter reckoned from the date of latest due date of submission, in all four Regions i.e BHEL PSER, PSSR, PSWR & PSNR, in the following manner.

i). Ratings by Power Sector Region:
- a) PS ER's Rating 'R**e**r' = $(X_1 + X_2 + .. + X_n)$ divided by n
- b) PS WR's Rating 'R**w**r' = $(X_1 + X_2 + .. + X_n)$ divided by n
- c) PS SR's Rating 'R**s**r' = $(X_1 + X_2 + .. + X_n)$ divided by n
- d) PS NR's Rating 'Rnr' = $(X_1 + X_2 + .. + X_n)$ divided by n
- e) **Over all Power Sector Region Rating 'R_{BHEL}'**= (R**e**r+ R**w**r+ R**s**r+ R**n**r) divided by 4

(where "X_1, X_2, X_3,…X_n" is the net weighted score obtained by the bidder as per the "Evaluation of Contractor Performance (Quarterly)" against the various contracts 'n' under execution in the respective Region).

ii) Weightage "B" assigned to bidders based on Overall Power Sector Rating **(R_{BHEL}):**

a) If **R_{BHEL}** is 80% and above, "B" will be equal to '6'
b) If **R_{BHEL}** is > 70% < 80%, "B" will be equal to '5'
c) If **R_{BHEL}** is > 60% < 70%, "B" will be equal to '4'
d) If **R_{BHEL}** is = < 60%, "B" will be equal to '0'

III. Evaluation of Bidders capacity to execute the job under tender: shall be based on the sum of scores obtained in 'A' and 'B', as below:

a) 6 or above : Considered 'Qualified' for the job under tender
b) Less than 6: Considered 'NOT Qualified' for the job under tender

IV. **Explanatory note**:

a) Similar work means Boiler or Turbine or Civil or Electrical or CI, etc irrespective of rating of Plant
b) Quarter shall be as per the quarter defined in the "Evaluation of Contractor performance (Quarterly)". For contracts where annexed Quarterly Evaluation performance was not part of the contract, 'Quarterly Performance Reports' previous to the last quarter reckoned from the date of latest due date of submission, given by the respective project site against the contract will be the basis for evaluation.

c) Vendors who are not executing any jobs presently in the Region and first timers to the Region, may be considered subject to satisfying all other tender conditions

d) 'Under execution' shall mean works in progress upto Boiler Steam Blowing (for Boiler and Auxilliaries) or Synchronisation (for all other jobs including Civil) shall be considered.

10.0 Since the job shall be executed at site**,** bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation etc before quoting for this tender. They may also consult this office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions. No additional claim shall be entertained by BHEL in future, on account of non-acquaintance of above.

11.0 For any clarification on the tender document, the bidder may seek the same in writing or through e-mail, as per specified format, within the scheduled date for seeking clarification, from the office of the undersigned. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay or any other delays. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.

12.0 BHEL may decide holding pre-bid discussion [PBD] with all intending bidders as per date indicated in the NIT. The bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Bidders shall plan their visit accordingly. The outcome of pre-bid discussion (PBD) shall also form part of tender.

13.0 In the event of any conflict between requirement of any clause of this specification/ documents/drawings/data sheets etc or requirements of different codes/standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification (whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error/missing pages/ other clerical errors in the tender

documents, noticed must be pointed out before pre-bid meeting/submission of offer, else BHEL's interpretation shall prevail.

14.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.

15.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), **if applicable**, along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation. **The names and other details of Independent External Monitor (IEM) for the subject tender is as given at point (xi) of 1 above.**

16.0 The Bidder has to satisfy the Pre Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of pre-qualification evaluation/ techno-commercial bids, approval/ acceptance of customer (as applicable), etc. and date of opening of price bids shall be intimated to only such bidders.

17.0 In case BHEL decides on a `Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorised representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of any or all Unsuccessful/Disqualified bidders under intimation to the respective bidders.

18.0 Validity of the offer shall be for **six months** from the latest due date of offer submission (including extension, if any) or specified otherwise in SCC of tender.

19.0 BHEL reserves the right to decide the successful bidder on the basis of Reverse Auction process. In such case all qualified bidders will be intimated regarding procedure/ modality for Reverse Auction process prior to Reverse Auction and price will be decided as per the rules for Reverse Auction. .

However, if reverse auction process is unsuccessful as defined in the RA rules/procedures, or for whatsoever reason, then the sealed 'PRICE BIDs' will be opened for deciding the successful bidder. BHEL's decision in this regard will be final and binding on bidder.

20.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.

21.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents.

22.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.

23.0 In case Consortium Bidding is allowed as per Pre Qualifying Requirement, then Prime Bidder and Consortium Partner shall enter into Consortium Agreement. Validity period of Consortium Agreement shall be 6 months after which the same can be re validated.

'Stand alone' bidder cannot become a '**prime bidder' or a 'consortium bidder' in a consortium bidding**. Prime bidder shall neither be a consortium partner to other prime bidder nor take any other consortium partners. However, consortium partner may enter into consortium agreement with other prime bidders. In case of non compliance, consortium bids of such Prime bidders will be rejected. .

24.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements" duly self certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.

25.0 The bidder may have to produce original document for verification if so decided by BHEL.

26.0 Order of Precedence

In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below:

a. Amendments/Clarifications/Corrigenda/Errata etc issued in respect of the tender documents by BHEL
b. Notice Inviting Tender (NIT)
c. Price Bid
d. Technical Conditions of Contract (TCC)—Volume-1A
e. Special Conditions of Contract (SCC) —Volume-1B
f. General Conditions of Contract (GCC) —Volume-1C
g. Forms and Procedures —Volume-1D

for BHARAT HEAVY ELECTRICALS LTD

(SCT)

Enclosure

01. Annexure-1: Pre Qualifying criteria.
02. Annexure-2: Check List .
03 Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	RECEIPT OF MATERIALS FROM STORES, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF STEAM TURBINE, TURBO-GENERATOR, CONDENSER, TG INTEGRAL PIPING, HP & LP HEATERS, DEAERATOR, WITH ASSOCIATED EQUIPMENTS/TANKS/VESSELS, FST & DEAERATOR, LP BYPASS SYSTEM WITH ASSOCIATED PLATFORM, POWER CYCLE PUMPS & ASSOCIATED AUXILIARIES B.F. VALVES ETC, BOUGHT OUT ITEMS AND PEM PACKAGES ETC IN UNIT 1 TO 6 OF 6x150 MW AT **HINDALCO** MAHAN ALUMINIUM PROJECT (6x150 MW) BARGAWAN, DISTT: SINGROULI, MADHYA PRADESH
TENDER NO	**BHE/PW/PUR/BRGNI-STG/748**

SL NO	PRE QUALIFICATION CRITERIA	Bidders claim in respect of fulfilling the PQR Criteria	
		Name and Description of qualifying criteria	Page no of supporting document
A	Submission of Integrity Pact duly signed (if applicable)	**NOT APPLICABLE**	
B	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)	**Shall be applicable for Bid Evaluation after 1st Jan 2011**	
C	**Technical** **c)** Bidder must have, achieved any one of the following: **c.1)** Bidder must have, in last seven years as on 30/06/2010, executed Erection, Testing and Commissioning (Upto Synchronization of the Unit or beyond) of any one of the following listed works : **c.1.1)** One set of Steam Turbine Generator of 150 MW or higher rating OR **c.1.2)** Two sets of Steam Turbine Generators of 100 MW or higher rating in a single work order. OR **c.1.3)** Three sets of Steam Turbine Generators of 70 MW or higher rating in a single work order. **c.2)** Bidder should have been Techno Commercially Qualified for E & C works of Steam Turbine Generator in any of the following jobs in a maximum of 2 tenders in last 3 years as on 30/06/2010 by any power sector region of BHEL: (a) 2 units of 500 MW or higher rated unit, OR, (b) 4 units of 190 MW or higher rated unit, OR (c) 6 units of 150 MW or higher rated unit		

	OR Bidder should be empanelled with BHEL-PSWR for M-TG-2 (Turbines rating 100 MW to 300 MW) or M-TG-3 (Turbines Rating above 300 MW) category.		
D 1	**Financial** **TURNOVER** Bidders must have achieved an average annual financial turnover (Audited) of Rs 420 Lakhs or more over last three Financial Years (FY) i.e 2007-08, 2008-2009, 2009-2010 if Annual Accounts for FY 2009-10 are audited or for 2006-2007, 2007-2008 and 2008-2009 if not audited		
2	NETWORTH Net worth of bidder based on Audited Accounts of 2009-10 (**OR** 2008-09 incase accounts for FY 09-10 has not been audited) should be higher than 50% of paid up capital in case of companies.		
3	PROFIT Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three years defined in 'D1 above based on latest Audited Accounts.		
E	Approval of Customer (if applicable) Note: Names of bidders who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval. Price bid of only those bidders shall be opened who are approved by customer.	**NOT APPLICABLE**	
F	Consortium criteria (if applicable)	**NOT APPLICABLE**	
	Explanatory Notes for QR 'A' 1. The word 'executed' means the bidder should have achieved the criteria specified in the QR even if the total contract has not been completed or closed 2. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as given above along with all annexures ~~(d) The word 'executing' means ----------~~		

BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

ANNEXURE - 2

CHECK LIST

NOTE:- Tenderers are required to fill in the following details and no column should be left blank

1	Name and Address of the Tenderer		
2	Details about type of the Firm/Company		
3	Details of Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Fax No:	
4	EMD DETAILS	DD No: Date : Bank : Amount: Please tick (√) whichever applicable:- ONE TIME EMD / ONLY FOR THIS TENDER	
		APPLICABILITY	BIDDER REPLY
5	Whether the format for compliance with **PRE QUALIFICATION CRITERIA** (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
6	Whether Audited profit and Loss Account for the last three years submitted	Applicable	YES/NO
7	Whether Copy of PAN Card submitted	Applicable	YES/NO
8	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable	YES/NO
9	Integrity Pact	Not Applicable	Not Applicable
10	Declaration by Authorised Signatory	Applicable	YES/NO
11	Whether No Deviation Certificate submitted	Applicable	YES/NO
12	Whether Declaration confirming knowledge about Site Conditions submitted	Applicable	YES/NO
13	Whether Declaration for relation in BHEL submitted	Applicable	YES/NO
14	Whether Non Disclosure Certificate submitted	Applicable	YES/NO
15	Whether Bank Account Details for E-Payment submitted	Applicable	YES/NO
16	Capacity Evaluation of Bidder for current Tender	Refer Sl 9 of NIT	
17	Tie Ups/Consortium Agreement are submitted as per format	Not Applicable	Not Applicable
18	Whether Power of Attorney for Submission of Tender/Signing Contract Agreement submitted	Applicable	YES/NO
19	Whether Analysis of Unit rates submitted	Applicable	YES/NO

NOTE : STRIKE OFF 'YES' OR 'NO', AS APPLICABLE

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

748

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CONTENTS

1.0	**Project Information**
1.1	**INTROUCTION** M/s HINDALCO has awarded the contract to BHEL to set up 6 x 150 MW units for Mahan Aluminium CPP at near Bargawan, Madhya Pradesh. The power station shall be located at the Mahan near Bargawan, Singrauli Tehsil Sidhi District in the State of Madhya Pradesh. **LOCATION:** i.) Near Bargawan, Singrauli Tehsil Sidhi District, Madhya Pradesh ii.) Nearest Town - Bargawan : 4 Km iii.) Nearest Highway NH-75E : 1 Km iv.) District HQ, Sidhi : 70 Km v.) Nearest Airport – Varanasi : 275 Km **Site Elevation :** 415 meter above MSL
1.2	**CLIMATIC CONDITIONS** i.) Nearest Meterological Station : Sidhi ii.) Annual mean daily maximum temperature : 32.5 deg C iii) Annual mean daily menimum temperature : 18.8 deg C iv.) Annual mean temperature Highest : 45.5 deg C Lowest : 2.9 deg C Extreme Highest : 48.8 deg C Extreme Lowest : 1 drg C v.) Ambient temperature : Max 50 deg C, Min 2.9 deg C vi.) Relative Humidity Annual mean Maximum : 68% Minimum : 49% vii.) Average annual mean wind speed : 3.8 km/hr viii.) Annual Average Rain fall : 1132.7 mm ix.) Predominant Wind Direction : West to East x.) Seismic Zone : Zone-III as per IS 1893 xi.) Basic Wind Speed : As per IS-875 (Part-3)

2.0 SCOPE OF WORK

The scope of work under the specification covers the 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 including cross around piping, equipments / tanks / vessels, HP & LP Heaters, deaerator with associated platform, LP bypass system, power cycle pumps with associated auxiliaries, including bought out items, PEM packages like Misc. Pumps, Condenser On load Tube Cleaning System, etc of 6 units of 150 MW STG sets

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Open space for storage(as per availability)	Yes		Location will be finalized after joint survey with owner
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Fire fighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	Open space for labour colony (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity For construction purposes** of Voltage 415/440 V			FREE
a	Single point source	Yes		At a distance of aprox. 500 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.2	**Electricity for the office, stores, canteen etc of the bidder**			FREE

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	Single point source	Yes		At a distance of aprox. 500 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc**			FREE
a	Single point source	Yes		At a distance of aprox. 1500 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	**WATER SUPPLY**			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.3.1	**For construction purposes**			FREE
a	Making the water available at single point	Yes		In case of inadequate supply / non-availability of construction water from customer, contractor shall have to arrange construction water at his own expenses .
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	**Water supply for bidder's office, stores, canteen etc**			FREE
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	**Water supply for Living Purpose**			FREE
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Telephone, fax, internet, intranet, e-mail etc		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

Sl.No	Description **PART II** **3.9.0 ERECTION FACILITIES**	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.9.1	Engineering works for construction:			
a	Providing the erection drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes	Yes	In consultaztion with BHEL
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		**YES**	″
d	Shipping lists etc for reference and planning the activities	Yes		″
e	Preparation of site erection schedules and other input requirements		Yes	″
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	″
g	Weekly erection schedules based on Sl No. e		Yes	″
h	Daily erection / work plan based on Sl No. g		Yes	″

Sl.No	Description **PART II** **3.9.0 ERECTION FACILITIES**	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
i	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	
L	Arranging the materials required for preassembly		YES	

A: TOOL & PLANTS

SN	DESCRIPTION	CAPACITY	MINIMUM QUANTITY
1	TYRE MOUNTED HYDRAULIC CRANES	8-10 T	AS PER REQUIRMENT
2	TRAILER WITH HORSE	(SUITABLE CAPACITY)	AS PER REQUIRMENT
3	TRACTOR TROLLEY	(SUTABLE CAPACITY)	AS PER REQUIRMENT
4	WELDING GENERATOR SETS (ELECTRIC AS WELL DIESEL)	SUITABLE TO WORK	AS PER REQUIRMENT
5	3- PHASE COMPLETE SET UP FOR DRAWAL OF POWER		-DO-
6	RADIOGRAPHY ARRANGEMENT INCLUDING THE SOURCE AND FILM VIEWER		-DO-
7	TIG WELDING SETS		-DO-
8	STRESS RELIEVING EQUIPMENT WITH TEMPERATURE RECORDERS		-DO-
9	ELECRTRICAL BAKING OVEN – BIG		06 No.
10	ELECTRODE BAKING OVEN-- PORTABLE		AS PER REQUIRMENT
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	06 NO
16	STEP DOWN TRANSFORMER,	230V/24V	AS PER REQUIREMENT
17	CONDENSER TUBE EXPANDER SET	ADEQUATE CAPACITY	-DO-
18	ELECTRICALLY OPERATED WINCHES	ADEQUATE CAPACITY	-DO-
19	JACKING BOLTS / PRESSOUT BOLTS OF ALL SIZES (FOR ST. TURBINE ROLL CHECKS ETC.)	ADEQUATE CAPACITY	-DO-
20	**HYDRAULIC JACKS OF VARIOUS**		**AS PER**

SN	DESCRIPTION	CAPACITY	MINIMUM QUANTITY
	CAPACITIES FOR ST. TURBINE AND GENERATOR :		**REQUIREMENT**
A	JACKS	100 T	18 NOS (WITH HAND OPERATED PUMPS)
B	JACKS	50 T	18 NOS.
21	**GANG OPERATED JACKS CONSISTING OF THE FOLLOWING :**		
A	JACKS	100 T	18 NOS (HAVING BROAD BASE ONE INCH LIFT)
B	JACKS	63 T	18 NOS (WITH 4-6 INCH LIFT , FOR GEN. END SHIELDS)
22	LONG HIGH PRESSURE HOSES		48 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. -			
23	TORQUE WRENCH	0 TO 200 N-M CAP.	12 NO.
24	TORQE WRENCH -	UPTO 2000 N-M CAP.	12 NO.
25	SLINGS FOR LP TURBINE ROTOR		12 SET
26	SLINGS FOR HP TURBINE MODULE		12 SET
27	SLINGS FOR GENERATOR ROTOR		12 SET
28	LONG FEELER GAUGE SET		AS PER REQUIREMENT
29	SPANNERS / EYE BOLTS (OF ALL SIZES)		AS PER REQUIREMENT
30	**Hand Operated Hydraulic Test Pump of suitable capacity**		AS PER REQUIREMENT
31	HYDRO TEST PUMP CAPACITY -250/450 KG/CM2		AS PER REQUIREMENT

SN	DESCRIPTION	CAPACITY	MINIMUM QUANTITY
32	ACID CLEANING PUMPS 150 TPH		12 NOS

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.

SN	DESCRIPTION & CAPACITY OF T&P	QUANTITY	PURPOSE
01	EOT CRANE IN TG HALL		FOR HANDLING AND ERECTION WITHIN TG HALL ON SHARING BASIS AS AVAILABLE AND SUBJECT TO THEIR ACCESSIBILITY AND APPROACHABILITY .
02	100T/180 T CRANE	AS AVAILABLE	FOR LIFTING & PLACEMENT DEAERATOR AND FST SECTIONS ONLY.

NOTE:

1. Customer will provide the EOTs crane, however contractor will have to provide the EOT crane operator for his operations and will carry out the day today operational maintenance, general cleanliness, attending of gear box leakages etc., applying caladium Compound on slings and holding/supporting the supply cables etc. as part of scope of work
1. EOT cranes will be used on sharing basis by other agencies working within the TG hall under the instruction of BHEL. Contractor has to plan his activities well in advance and inform BHEL engineer in charge/ Construction Manager the date of actual use.

2. BHEL will provide free of charges the suitable available crane for lifting and placement of De-aerator and FST near the TG building area to place them at suitable location / elevation of equipment foundation depending accessibility and approachability. 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 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.

3. BHEL will extend the facility free of hire charges for lifting and placement of Equipments/items in contractor's trailer in storage yard. Contractor shall plan his activities/operations as per instruction of BHEL Engineer in such a way that maximum number equipments can be handled/collected in single trip of crane to storage yard.

6.1 TIME SCHEDULE & MOBILIZATION

6.1.1 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/ Project Manager of BHEL.

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

ACTIVITY	**TENTATIVE SCHEDULE OF COMPLETION FOR FIRST UNIT (i.e. Unit-1) #**
Turbine Box up	7^{th} month
Completion of Oil Flushing completion	9^{th} month
Barring Gear Operation	11^{th} month
Steam Blowing Completion	12^{th} month
Synchronisation	12^{th} month
Trial Operation Completion	13^{th} month
Completion of all facilities including PG test related works and assistance for PG Test.	16^{th} month

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

THE PHASE DIFFERENCE BETWEEN SUCCESSIVE UNITS IS 1.5 MONTHS. COMPLETION OF ALL FACILITIES WITHIN 3 MONTHS OF TRIAL OPERATION COMPLETION OF RESPECTIVE UNITS.

6.1.2

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 concurrently in all possible fronts as made available to contractor.

6.1.3

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.

Start of Contract Period and Duration.

The total contract period for completion of entire work shall be **25 (Twenty Five) 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

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

FOR EACH STG

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
	Overall weightage for each area out of lumpsum value quoted for STG	**20%**	**18%**	**15%**	**13%**	**11%**	**7%**	**16%**	**NOT APPLICABLE**
Sl. No.	**Activity/Work Description**	**%**							
I	**PRO RATA PAYMENTS (85%)**								
1	**CONDENSER (weightage 20%)**								
1.1	PREPARATION OF FOUNDATION	2%			--			--	
1.2	PLACEMENT, ALIGNMENT, ASSEMBLY AND WELDING OF BOTTOM PLATE SEGMENTS, HOT WELL, NDT AND SPRING ELEMENTS PLACEMENT & GROUTING.	10%			--			--	
1.3	ASSEMBLY AND POSITIONING OF WATER CHAMBER, SIDE PLATES, BOTTOM PLATES, WELDING AND NDT INCLUDING HINGE ASSY	12%		--	--			--	
1.4	ASSEMBLY, ALIGNMENT AND WELDING & NDT OF TUBE SUPPORT PLATES AND INTERNALS LIKE BAFFLE PLATES, AIR EVACUATION PIPES ETC.	13%		--	--			--	
1.5	ASSEMBLY, WELDING & NDT OF DOME WALLS AND DOME STIFFENERS, EXTRACTION PIPING AND STEAM THROW DEVICE, LPH-1 SUPPORT ETC.	10%		--	--			--	
1.6	INSERTION, EXPANSION, CUTTING ETC. OF CONDENSER TUBES	15%		--	--			--	
1.9	HYDRO TEST OF STEAM AND WATER SIDE	10%		--	--			--	
1.10	WELDING OF CONDENSER NECK JOINT AND NDT& COMPLETION OF BALANCE WORKS	10%		--	--			--	
1.11	ERECTION, COMMISSIONING, LOAD TESTING OF CONDENSER WATER BOX HANDLING SYSTEM	3%		--	--			--	

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
	Subtotal for condenser	**85%**							
2	**TURBINE (18 %)**							--	
2.1	PREPARATION OF FOUNDATION, PLACEMENT, ALIGNMENT AND GROUTING OF BASE PLATES OF LPC AND BEARING PEDESTALS	--	7%		--			--	
2.2	PLACEMENT AND ALIGNMENT OF LP OUTER CASING BOTTOM PORTION AND CENTRE GUIDE KEYS	--	5%		--			--	
2.3	PLACEMENT OF LP ROTOR AND ALIGNMENT WITH INNER CASING AND CHECKING OF BLADE CLEARANCE	--	9%		--			--	
2.4	ASSEMBLY, ALIGNMENT & WELDING OF LP OUTER CASING UPPER HALF	--	9%		--			--	
2.5	PLACEMENT AND ALIGNMENT OF IP TURBINE OUTER CASING AND INNER CASING (LOWER HALVES)	--	2%		--			--	
2.6	PLACEMENT AND ALIGNMENT OF IP ROTOR WITH LOWER CASING AND BOXING UP OF INNER & OUTER CASING (UPPER HALVES) & ROLL CHECK	--	5%		--			--	
2.7	FINAL BOX UP OF IP TURBINE	--	0%		--			--	
2.8	BOXING UP OF LP INNER-INNER & INNER- OUTER AND ROLL CHECK	--	5%		--			--	
2.9	PLACEMENT OF HP TURBINE, LOWERING OF HP ROTOR ON BEARINGS AND CHECKING OF CLEARANCES, COUPLING, HP TURBINE SWING CHECKS ETC.	--	5%		--			--	
2.10	ALIGNMENT OF ALL ROTORS INCLUDING REAMING, HONING AND FIXING OF COUPLING BOLTS		9%						
2.11	ASSEMBLY OF GOVERNING SYSTEM/EQUIPMENT		5%						
2.12	INSTALLATION OF ESVS, IVS, LPBP VALVES, MS STRAINERS (INTERNALS), HRH STRAINERS (INTERNALS)	--	9%		--			--	
2.13	ERECTION, ALIGNMENT AND WELDING OF CROSS AROUND PIPING	--	5%		--			--	

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
2.14	FINAL BOX-UP OF LP TURBINE	--	5%		--			--	
2.15	ASSEMBLY AND PREPARATION OF HYDRO-TEST, STEAM BLOWING DEVICES AND NORMALISATION ETC.	--	0%		--			--	
2.16	FINAL BOXING UP OF PEDESTALS AFTER OIL FLUSHING COMPLETION	--	5%		--			--	
	Subtotal for Steam Turbine		**85%**						
3	**TURBO GENERATOR (15%)**	--		--	--			--	
3.1	PREPARATION OF FOUNDATION, LEVELLING, MATCHING AND GROUTING OF FOUNDATION PLATES	--		5%				--	
3.2	LIFTING, LEVELLING AND ALIGNMENT OF STATOR (including erection and dismantling of portal crane if used for stator lifting)			23%				--	
3.3	FIXING OF END SHIELDS ON TO FOUNDATION BEAMS	--	--	6%				--	
3.4	ROTOR INSERTION	--	--	6%				--	
3.5	BOXING UP OF GENERATOR AND ASSEMBLY OF HYDROGEN SEALS	--	--	11%				--	
3.6	ALIGNMENT OF GENERATOR ROTOR WITH LP TURBINE ROTOR, RUN-OUT CHECKS AND REAMING, HONING OF COUPLING HOLES AND FIXING OF COUPLING BOLTS	--	--	9%				--	
3.7	ERECTION OF EXCITATION EQUIPMENTS & ALIGNMENT OF GEN.-EXCITER ROTORS INCLUDING SWING CHECK AND COMPLETION OF BALANCE WORKS	--	--	10%				--	
3.8	INSTALLATION OF ENCLOSURES OF GENERATOR/EXCITER WITH ALL AUXILIARIES	--	--	5%				--	
3.9	GROUTING OF GEN BEARING PEDESTALS AND EXCITOR	--	--	5%				--	
3.1	FINAL GAS TIGHTNESS TEST OF STATOR WITH COMPLETE SYSTEM	--	--	5%				--	
	Subtotal for Generator			**85%**					
4	**PUMPS AND AUXILIARIES (13 %)**	--	--		--			--	

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
4.1	ERECTION / TESTING and commissioning OF MAIN OIL PUMP, JOP, EOP, AOP, CENTRALISED LUBE OIL PURIFICATION SYSTEM, ALONG WITH ALL AUXILLIARIES	--	--		18%			--	
4.2	ERECTION / TESTING and commissioning OF ONE MOTOR DRIVEN BFP, ALONG WITH ALL AUXILLIARIES				14%				
4.3	ERECTION / TESTING and commissioning of TWO NOS TURBINE DRIVEN BFP, ALONG WITH ALL AUXILLIARIES				30%				
4.5	ERECTION, TESTING, GROUTING ETC. OF DMCW (BOILER & TG) PUMPS	--	--	--	13%			--	
4.6	ERECTION, TESTING, GROUTING ETC. OF CONDENSATE EXTRACTION PUMPS	--	--	--	10%			--	
	Subtotal for pumps and Auxilliaries				**85%**				
5	**HEATERS AND DEAERATORS (11%)**								
5.1	ERECTION, TESTING & COMMISSIONING OF HP & LP HEATERS	--	--	--		27%		--	
5.2	ERECTION, TESTING & COMMISSIONING OF GLAND STEAM CONDENSER, DRAIN COOLERS	--	--	--		12%		--	
5.3	ERECTION, TESTING & COMMISSIONING OF DE-AERATOR, FEED STORAGE TANK AND ASSOCIATED APPROACH PLATFORM WITH LADDERS ETC.	--	--	--		46%		--	
	Subtotal FOR HEATERS AND DEAERATORS	**--**	**--**	**--**		**85%**		**--**	
6	**MISCELLANEOUS ITEMS (7%)**								
6.1	DEBRIS FILTERS, RE JOINTS, ME BELLOWS, DIRTY, CLEAN OIL TANKS, ENCLOSURES, CO2/H2 CYLIDER RACKS ETC						20%		
6.2	ACW PUMPS, RELATED ITEMS	--	--	--			10%		
6.3	ERECTION, TESTING & COMMISSIONING OF CONTROL FLUID TANK, C.F. COOLERS, C.F. PUMPS, PURIFICATION UNIT ETC.	--	--	--			9%		

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
6.4	ERECTION, TESTING & COMMISSIONING OF FLASH TANKS & FLASH VESSELS	--	--	--			8%		
6.5	ERECTION, TESTING & COMMISSIONING OF PLATE HEAT EXCHANGER PACKAGE	--	--	--			10%		
6.6	ERECTION, TESTING & COMMISSIONING OF CONDENSER ON LOAD TUBE CLEANING PACKAGE	--	--	--			12%		
6.7	ERECTION, TESTING & COMMISSIONING OF SELF CLEANING STRAINER PACKAGE	--	--	--			8%		
6.8	ERECTION, TESTING & COMMISSIONING OF MISC. HOISTS & CHAIN PULLEY BLOCKS.						8%		
	Subtotal for MISCELLANEOUS ITEMS						**85%**		
7	**INTEGRAL PIPING (16%)**	--	--	--				--	
7.1	Turbine Integral piping and Generator Integral piping consisting of Lube oil, Jacking oil, Oil vapour extraction, Seal Oil, Control oil, Seal steam, Condensate spray/Exhaust Hood spray, Turbine water drainage, Gas Piping, Primary Stator Water piping, etc including all accessories like thermowells, probes, orifices etc and hangers and supports (Erection and commissioning on prorata basis)	--	--	--				85%	
	Total for integral piping							**85%**	
8	**PIPING**								
8.1	ON PRE-ASSEMBLY WHEREVER APPLICABLE (IF NOT APPLICABLE, THIS PORTION TO BE PAID ALONG WITH PLACEMENT IN POSITION)								15%
8.2	PLACEMENT IN POSITION								20%
8.3	ALIGNMENT								15%
8.4	WELDING/BOLTING/FIXING								20%
8.5	COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT (if not applicable, then this portion to be clubbed with next activity)								5%
8.6	HANGERS & SUPPORTS ETC WHEREVER NECESSARY AS PER DRG								5%

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
8.7	HYDRAULIC TEST/PNEUMATIC TEST WHERE EVER APPLICABLE								5%
	Total for Prorata (85%)	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**
II	**STAGE/MILESTONE PAYMENTS (15%)**								
1	Boiler Light Up	0%	0%	0%	0%	0%	0%	0%	0%
2	ABO	0%	0%	0%	0%	0%	0%	0%	0%
3	Steam Blowing	0%	0%	0%	0%	0%	0%	0%	0%
4	Safety Valve Floating	0%	0%	0%	0%	0%	0%	0%	0%
5	Oil Flushing (TG)	1%	1%	1%	1%	1%	1%	1%	1%
6	Barring Gear (TG)	1%	1%	1%	1%	1%	1%	1%	1%
7	Rolling and Synchronisation	3%	3%	3%	3%	3%	3%	3%	3%
8	Coal Firing	0%	0%	0%	0%	0%	0%	0%	0%
9	Full Load	2%	2%	2%	2%	2%	2%	2%	2%
10	Trial Operation of Unit	2%	2%	2%	2%	2%	2%	2%	2%
11	Painting (including arrow marking, nomenclature, etc)	2%	2%	2%	2%	2%	2%	2%	2%
12	Area cleaning, temporary structures cutting/removal and return of scrap	1%	1%	1%	1%	1%	1%	1%	1%
13	Punch List points/pending points liquidation	1%	1%	1%	1%	1%	1%	1%	1%
14	Submission of 'As Built Drawings'								
15	Material Reconciliation	1%	1%	1%	1%	1%	1%	1%	1%
16	Completion of Contractual Obligations	1%	1%	1%	1%	1%	1%	1%	1%
	Total for Milestone/Stage payments (15%)	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**
	Total of I & II	**100 %**	**100%**	**100 %**	**100%**	**100%**	**100%**	**100 %**	**100%**

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
	Note-A: In case strand jack system for stator lifting is also included in scope of contractor, then 10% of the lumpsum value quoted/derived per unit of stg package will be paid upon lifting and placement of stator in position of respective unit, using the strand jack system. In such a case, 90% of lumpsum value quoted/derived per unit of stg package shall be considered for progressive payments as per terms of payment for the respective unit of stg package								

TAXES, DUTIES, LEVIES

8.1.0 TAXES, DUTIES, LEVIES

8.1.1

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

8.1.2 Service Tax & Cess on Service Tax

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

I. **The name, address and the registration number of the contractor,**
II. **The name and address of the party receiving taxable service,**
III. **Description, classification and value of taxable service provided and,**
IV. **The service tax payable thereon.**

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

8.1.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT) on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be **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.

8.1.4 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.

8.1.5 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.

SPECIFIC INCLUSIONS

9.1
All terminal connections for equipment & piping covered in this specification.

9.2
Impulse/pneumatic piping between customer's battery limit and equipments.

9.3
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.

9.4
Erection, commissioning and testing of 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 LP Bypass valve and CRH NRV shall involve installation of valves on temporary supports to provide reference/connection of LP 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.

9.5
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.

9.6
Complete control fluid system of 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.

9.7
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.

9.8
Erection and welding of Impulse piping from various equipments & pipings tapping point to root valve.

9.9

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. Pumps, 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.

9.10
Most of the Misc. Pumps with drive motors, base frame, fittings etc. will be supplied in loose parts/ dismantled condition as skid mount. These pumps along with drive and fittings shall be assembled at site. The 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 including providing non-shrink free flow grout mix material, 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.

These Misc. pumps will be required for erection and commissioning of other systems, pipings, equipments which will be under scope of erection of other agencies. Contractor shall carry out the installation, erection and alignment works etc. as per priority decided by BHEL Engineer at site to enable the other agencies to proceed with their work. Contractor shall carry out the welding of terminal point/interface/matching & connected flanges joints, pipe joints etc. of other system & other agencies as scope of work. The decision of BHEL Engineer shall be final and binding on contractor.

9.11

The Interconnecting piping between HP Valve & HP Overload valves which is of pipe size approx. Dia.168.3x18.3 tk. mm, Material specification-P91 & about 32 Nos. (Tentative) site weld joints is specifically included under the scope of work of this specification. Contractor shall take specific note of same and shall carry out the erection, fit-up, welding, NDT & Radiography requirement including Pre-heat treatment, post heat treatment and providing the required filler wires and welding electrodes as part of scope of work as per drawing/BHEL procedure and instruction of BHEL Engineer at site.

9.12 Consumables

9.12.1
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, ~~Grouting Materials (like free flow, quick setting~~

~~readymade grout mix, Portland Cement,)~~ other building materials, anti corrosive paints for site weld joints, Steam washable Paint & Chemical Resistant Epoxide Primer Paints & High Build Black Coltar Epoxide Paints for condenser etc. and any other routine consumables for entire works of TG, TG Aux., Pumps, Tanks, Vessels including Misc. Tanks, Misc. Pumps and other equipments under the scope etc. shall be provided by the contractor.

Primer, Paints etc.

The contractor shall provide anti corrosive paints ROZC Primer Conforming to IS:2074 for touch up painting of site weld joints & Gas cuts joints/edges, Steam washable Paint & Chemical Resistant Epoxide Primer Paints & High Build Black Coltar Epoxide Paints for Condenser Water space and Shell side space and Steam washable paint for LP side walls steam side space painting as scope of work**.**

9.13 Tools And Tackles

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.

Contractor has to arrange slings of all sizes for completing the works covered under these specifications including the special slings for Generator Stator, Steam Turbine, Generator & Turbine Rotors, HP Heaters, Turbine casings etc. Lifting/Handling

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 TG set. Also, hydraulic jacks of 100 tonnes and 50 tonnes capacity along with long high pressure hoses of suitable length for Generator and Turbine 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.

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.

10.0 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.

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.

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

B) SURFACE CONDENSER:

1. Condenser, mainly comprising of the following parts.
   a) Welded type Condenser Stainless Steel.
   b) Front & Rear Water Boxes and Water Chambers.
   c) Bottom Plate assly and Support Plate Assly.
   d) Hotwell Assly.
   e) Side wall Assly.
   f) Dome Assemblies-1,2,3 & 4
   g) Dome stiffeners and dome stiffeners plate
   h) Turbine end & Generator end Side Plates.
   i) Dome walls
   j) Front & Rear water chambers with tube plates
   k) Support plates.
   l) Hot Well
   m) Spring Elements and supports
   n) Steam Throw Device
   o) Air Extraction Pipe and Baffle.
   p) Stand pipes & Fittings, loose parts etc.

C) STEAM TURBINE:

a. Steam Turbine consists of HP/IP (Combined-module) with HP exhaust insert and LP (in dismantled condition) cylinders including the following :
b. Base plates, Anchor plates, Packers/ Packer plates & Foundation Bolts etc.
c. Bearing Pedestals.
d. LP Turbine with loose parts like LP Turbine Inner and Outer (Upper & Lower) casings with Guide wheels, LP longitudinal Girders, Diffusers, Side wall, LP Outer (Upper & Lower casings), LP Rotor and other loose parts.
e. HP/ESV, IP, HP Overload bypass with Control Valves, QCNRV, LPBP Valves, Valve actuators etc. with Oil System equipments and oil piping.

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

g. Hydraulic Turning Gear.

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

i. Governing/control Rack, HP Oil supply unit, LP By pass racks and solenoid & Test valve racks.

j. Cross around Piping between IP & LP casing, Interconnecting piping between HP valve & HP Overload valves. (The Interconnecting piping between HP Valve & HP Overload valves is of pipe size approx. Dia.168.3x18.3 tk. Mm, Material specification-P91 and about 32 Nos. (Tentative) weld joints, which are to be welded at site after following due welding procedure including Pre-heat treatment, post heat treatment and arranging the filler wires by contractor)

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

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

B) TURBO-GENERATOR :

1. Air cooled main Generator consists of the following:

a) Stator
b) Rotor with rotor insertion device.
c) Foundation items & Accessories,
d) Automatic Voltage Regulator
e) Exciter Yoke
f) CO_2 package
g) Generator accessories
h) Other Accessories.

C) TG AUX., PUMPS WITH AUXILIARIES, TANKS, VESSELS ETC.

a) Steam Jet Air Ejector (2 Sets)

b) Gland Steam Condenser with accessories / Aux., 2-sets of fan exhausters & fittings (1 Set).

c) Drain Cooler with fittings (1set).

d) LP Heaters 1, 2 & 3 with accessories and fittings (each one set).

e) HP Heater 1 & 2 with accessories and fittings (each one set).

f) De-aerator & Feed Storage Tanks (in Three Section) with accessories / Aux., fittings and platform (one set).

g) Steam Turbine Oil Coolers with accessories and fittings (Set of Two Coolers).

h) HP Governing Oil Coolers with accessories and fittings (Set of 2Nos.).

i) STG Air Coolers with, Frames, accessories and fittings (Set of Six numbers) .

j) Exciter Air Cooler with accessories and fittings (One Set)

7. Boiler Feed Pumps with associated items/components, Aux., fittings etc. – TWO Sets : Each Set Comprises of:

a. BFP Skid (Pumps Assy + Base plates, Tubing, Seal Coolers).

b. Booster pump Skid (Pump Assy. + Base plate + Tubing) .

c. Grillage

d. Hydraulic coupling Assy.

e. BFP Drive Motors with coolers.

f. Hyd. Coupling Working oil Coolers with fittings and accessories.

g. Hyd. Coupling Lube oil Coolers with fittings and accessories.

h. Hyd. Coupling loose items.

i. Booster Pump suction strainer with accessories and fittings.

j. BFP Re-circulation Valves with accessories and fittings.

k. Local Gauge Board Rack with fittings (Two Sets for one set of BFP).

l. Other related Loose items and fine fittings.

m. Integral Lube Oil Piping, Lube oil Cooling system piping, Seal water cooling system piping with Valves, Supports etc. and other accessories for pumps.

8. Condensate Extraction Pumps with associated items/components, fittings – Two sets :Each Set comprises of

a. Condensate Extraction Pump assembly with accessories & fittings.

b. Foundation frame with fittings and foundation bolts etc..

c. Canister.

d. CEP Foundation Ring.

e. CEP Suction strainer with fittings.

f. Local Gauge Board rack with fittings (one set for two set of CEPs).

g. CEP Drive Motor with fittings.

h. Loose items and integral piping of lube oil, Gland seals Cooling etc..

D) EQUIPMENTS/SYSTEMS, FLASH TANKS, MISC. TANKS, MISC. PUMPS ETC. PER UNIT (SUPPLIED FROM PEM/BHOPAL AND RELATED VENDORS):

Sl.NO	DESCRIPTION	DIMENSIONS (M)	Approx. WT.IN MT/ITEM
A	**FLASH TANKS**		
a.1	HP Drain Flash Tank	----------	2.5
a.2	LP Drain Flash Tank	----------	1.4
a.3	Atmospheric Flash Tank	----------	1
B	**MISC. TANKS**		
b.1	Clean Oil Tank, 14 Cu. m	2.5M x 2.5M x 2.8M	7.4
b.2	Dirty Oil Tank, 14 Cu. m	2.5M x 2.5M x 2.8M	7.4
b.3	Oil Unloading Vessel	2M x 1M x 0.55	0.6
b.4	Condensate Strorage Tank – 75 m^3	9.25M x 3.5(OD) x 0.016 thk	14.5
C	**MISC. PUMPS**		
c.1	Lube Oil pumps (16 nos) along with motor & simplex strainer, approx. 200 KG/pump	----------	3.2
c.2	Sump Pump	2M x 1.5M x 1.5M	0.5
D	Condenser On load Tube cleaning System **(COLTCS)**	4M x 3M x 3M	5
E	DEBRIS FILTERS	4M x 3M x 3M	5
F	LP DOSING SYSTEM		
f.1	Hydrazine Dosing System	3.5M x 2.25M x 3M	1.2
f.2	Ammonia Dosing System	3.5M x 2.25M x 3M	1.2
f.3	NaOH Dosing System	2.5M x 2.25M x 3M	1

Sl.NO	DESCRIPTION	DIMENSIONS (M)	Approx. WT.IN MT/ITEM
G	ME Bellows	---------	3
H	PEM SUPPLY VALVES AND STEAM TRAP & STRAINERS	---------	10.662
		Total Weight	**65.562**

TG INTEGRAL PIPING: Piping systems like lube oil system, Jacking Oil system, Control/Governing oil system, Turbine water drain/Extraction/ condenser vacuum system, Condensate Spray System, Seal Steam system etc. for TG Equipments and Aux. including, BFP etc. supplied from units (as an integral parts of equipments/ systems). **These piping system are excluding the Turbine Cross around piping, LP Extraction piping, Inter connecting piping between HP valve & HP overload valves which are already included in Steam Turbine weight details:**

a. Carbon steel piping with valves including QCNRVs, supports etc.=55.0 MT
b. Alloy Steel Piping with valves, Supports etc. = 5.0 MT
c. Stainless Steel piping with valves, Supports etc.=10.0 MT

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, weights, quantities for scope of works are tentative. The works for complete scope as per site, systems/schemes and drawing requirement shall be carried out within accepted lump sum price where lump sum price has been offered. Where as for scope of works where unit rate has been offered, the works shall be carried out as per site, systems and drawing requirement based on actual requirement at site and payment for such actual quantum of work executed, shall be made as per accepted applicable unit rate.

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

(A) Surface Condenser

Sl. No.	Equipment	Qty.	Overall Dimensions L x W X H (mm)	Dry Wt. / No. (Kg)	TOTAL Wt. (MT)
a.	Tubes	~ 16200	OD 23 x Thk 1 x L 10000	5.5	89.1
b.	Front Water Box Assembly	2 nos	1700 x 3300 x 4600	9500	19
c.	Rear Water Box Assembly	2 nos	1700 x 3300 x 4400	7600	15.2
d.	Front Water Chamber Assembly	2 nos	500 x 3200 x 5200	5600	11.2
e.	Rear Water Chamber Assembly	2 nos	500 x 3200 x 5200	5600	11.2
f.	Hot well Assembly	1 no	7600 x 2000 x 1200	5700	5.7
g.	Bottom Plate Assembly	2 nos	5500 x 6000 x 800	10500	21
h.	Support Plate Assembly	24 nos	W 2700 x H 4800 X Thk 12	1150	27.6
i.	Side wall Assembly	4 nos	L 8000 x H 2600 x Thk 16	5000	20
j.	Dome Assembly # 1	2 nos	L 8000 x H 3600	6800	13.6
k.	Dome Assembly # 2	2 nos	L 5000 x H 900	5400	10.8
l.	Dome Assembly # 3	2 nos	L 6300 x H 3900	9000	18
m.	Dome Assembly # 4	2 nos	L 4600 x H 2400	7600	15.2
n.	Dome Stiffeners	30 nos	Φ168.3 x Thk. 21.97 x L 6000	2900	87
o.	Dome Stiffeners plate	2 nos	Pl. 32 x 2500 x 6300	4000	8
p.	Loose Items	1 set	-	18000	18

(B) Steam Turbine

Sl. No.	Item Description	Qty.	Aprox. Dimensions L x W x H (mm)	Approx. Total Wt. (MT)
1	Combined HP-IP (K)-Module	1	6370 x 4360 x 3120	113
2	HP exhaust insert	1	1150 x 1100 x 1100	2
3	HP Valve	2	3915 x 3350 x 1300	11.6

4	HP Overload bypass valve	1	1500 x 1300 x 680	5
5	IP Valve	2	4230 x 1350 x 4360	18.6
6	Valve Actuators	9	1500 x 400 x 400	9
7	Front Bearing Pedestal (K – Turbine)	1	1700 x 2500 x 1435	11
8	Rear Bearing Pedestal (K – Turbine)	1	1600 x 3100 x 1610	11.5
9	Rear Bearing Pedestal (N – Turbine)	1	1350 x 2600 x 1430	9
10	Bearing Pedestal Loose Parts	1	1000 x 1000 x 1000	1.1
11	LP Rotor	1	5880 x 2460 x 2460	29.5
12	Upper LP Inner Casing – I	1	1400 x 2700 x 1300	6
13	Upper LP Inner Casing – II (Incl. Guide Wheels)	1	2950 x 4960 x 1500	15.5
14	Lower LP Inner Casing – II (Incl. Lower LP Inner casing – I & Guide wheels)	1	2950 x 4960 x 1720	22
15	Diffuser (LP)	2	450 x 3025 x 3025	2.8
16	LP Longitudinal girder	2	5650 x 1050 x 1210	16
17	LP Side wall	2	760 x 4960 x 2750	10.6
18	LP Outer Casing	2	2600 x 5200 x 2150	15
19	LP Turbine loose parts	1	2000 x 2000 x 2000	8
20	Cross Around Piping	2	1500 x 1200 x 962	1.8
21	Cross Around Piping	2	2750 x 1200 x 962	3
22	Cross Around Piping Loose parts	2	1000 x 1000 x 1000	1
23	LP Bypass Valve	2	850 x 1100 x 5500	6
24	LP Base plates	1	500 x 500 x 600	2.2
25	LP Extraction piping	Lot	4500 x 3000 x 3500	5.3
26	MS Steam Strainer	2	1400 x 685 x 960	3
27	HRH Steam Strainer	2	2075 x 860 x 1260	5
28	Foundation Bolts	1	4500 x 3000 x 2000	4.6
29	Interconnecting piping bet, HP Valve & HP Overload valve	2	4500 x 3000 x 3000	4

(C) Turbo – Generator

Sl. No.	Package Description	Approx. Dimensions L x B x H (mm)	Approx. Wt. (MT)
1	Generator Stator	10000 x 5000 x 4800	194.2
2	Generator Rotor	10000 x Dia. 1100	42.5
3	Accessories, Foundation Items etc	3000 x 2500 x 2500	12
4	Automatic Voltage Regulator	NA	NA
5	Exciter Yoke	2000 X 2500 x 2500	4
6	CO_2 Package	3000 x 2500 x 2500	3
7	Terminal Bushing	3000 x 2500 x 1500	4

(D) TG Aux., PUMPS WITH AUXILIARIES, TANKS, VESSELS ETC.:

Sl. No.	Item Description	Qty.	Approx. Dimensions L x W x H (mm)	Approx. Total Wt. (Tons)
1	HP Oil supply Unit	1	2900 x 1300 x 2350	3
2	Main Oil pump Assembly with A.C. Motor	2	1060 x 1000 x 1500	1.5
3	Emergency Oil pump assembly with D.C. Motor	1	1060 x 1000 x 1500	0.8
4	Emergency Oil pump assembly with A.C. Motor	1	1060 x 1000 x 1500	0.8
5	Lifting Oil pump Assembly with A.C. Motor	1	1060 x 1000 x 1700	0.75
6	Lifting Oil pump Assembly with D.C. Motor	1	1200 x 1100 x 1800	1
7	Turbine Oil purification unit	2	2200 x 2500 x 1800	2.5
8	Lube Oil Filter	1	1850 x 900 x 1675	0.5
9	Lifting Oil Filter	1	350 x 300 x 400	0.3
10	Lube Oil accumulator assembly	1	1350 x 500 x 2300	0.8
11	Centrifugal ext. fan assembly	2	400 x 400 x 650	0.2
12	Demister	1	400 x 400 x 1000	0.1

13	Lube Oil Tank	1	4500 x 2700 x 2450	7.7

Sl. No.	Equipment	Qty.	Overall Dimensions L x W X H (mm)	Dry Wt. / No. (Kg)	Approx. Total Wt. (MT)
14	Steam Jet Air Ejector				
a.	Starting Ejector	1 no	5000 x 800 x 1100	1500	1.5
b.	Main Ejector	2 nos	6000 x 1200 x 2000	4500	9
15	Gland Steam Condenser				
a.	Complete Assembly	1 no	2750 x 1300 x 1400	1400	1.4
b.	Fan & Motor	2 nos	1000 x 600 x 800	500	1
16	Spray Cum Tray Deaerator				
a.	Header	1 no	6.8 x 2800 x 2400	14000	14
b.	Feed Storage Tank	1 no	14.5 x 4200 x 4400	24000	24
17	Steam Turbine Oil Cooler				
a.	Per Cooler	2 nos	Φ 750 x H 4800	5400	10.8
18	STG Air Cooler				
a.	Per Element	6 nos	3800 x 1000 x 660	1500	9
19	Drain Cooler				
a.	Complete Assembly	1 no	Φ 410 x L 4600	1500	1.5
20	LP Heater # 1				
a.	Complete Assembly	1 no	Φ 960 x H 10000	9400	9.4
21	LP Heater # 2				
a.	Complete Assembly	1 no	Φ 960 x H 9500	8000	8
22	LP Heater # 3				
a.	Complete Assembly	1 no	Φ 960 x H 10000	9800	9.8
23	HP Heater # 5				
a.	Complete Assembly	1 no	Φ 1200 x H 11000	20000	20
24	HP Heater # 6				
a.	Complete Assembly	1 no	Φ 1200 x H 12000	22000	22

25. Boiler Feed Pumps (BFP) & Booster Pumps (BP) with associated items/components, Aux, fittings -2 sets

Sl. No.	Description of Equipment	Dimensions(mm)	Unit Weight	Total Qty.	Approx Total Weight
		L x B x H	(kg)	(Nos.)/ Unit	(MT)/ Unit
1	BFP Skid (Pump Assly. + Base Plate + tubing + Seal Coolers)	2250 x 1000 x1050	5770	2	11.540
2	BP Skid (Pump Assly. + Base Plate + tubing)	1650 x 1200 x 950	2511	2	5.022
3	Grillage	10200 x 2500 x 900	5030	2	10.060
4	Hydraulic Coupling (DD)	1800 x 1700 x 1800	3560	2	7.120
5	Hyd. Coupling W. O. Cooler (DD)	3700 x 1500 x 500	1475	2	2.950
6	Hyd. Coupling L. O. Cooler (DD)	3100 x 1300 x 450	775	2	1.550
7	Hyd. Coupling Loose Items	-----	710	2	1.420
8	Suction Strainer at BP Suction DD)	900 x 800 x 1400	800	2	1.600
9	BFP Recirculation valve (DD)	1800 x 550 x 1400	350	2	0.7
10	Local Gauge Boards with instruments (DD)	2200 x 300 x 1800	650	2	1.3
*11	Loose Items	-----	2449	2	4.898
12	Local Instrument Rack (LIR)	2000 x 650 x 2150	250 (per unit)	1	0.250
13	BFP Motors	-----	14000	2	28

26. Condensate Extraction Pumps (CEP) with associated items/components, fittings -2 sets

S.N.	Description of Equipment	Dimensions(mm)	Unit Weight	Total Qty.	Approx Total Weight
		L x B x H	(kg)	(Nos.)/ Unit	(MT)/Unit

1	CEP Assembly	ϕ 1100 x 3250	2100	2	4.2
2	Canister	ϕ 1300 x 900	510	2	1.020
3	CEP Foundation Ring	1100 x 1100 x 150	185	2	0.370
4	CEP Suction Strainer	900 x 800 x 1400	800	2	1.6
5	Local Gauge Board with Instruments (DD)	2000 x 300 x 1800	500 (per unit)	1	0.5
6	Loose Items	-----	210	2	0.420
7	Local Instrument Rack (LIR)	1300 x 900 x 2000	300 (per unit)	1	0.300
8	CEP Motors	-----	5000	2	10

27. EQUIPMENTS/SYSTEMS, FLASH TANKS, MISC. TANKS, MISC. PUMPS ETC. PER UNIT(SUPPLIED FROM PEM/BHOPAL AND RELATED VENDORS):

SN.	DESCRIPTION	DIMENSIONS	Approx. WT. IN MT
A	FLASH TANKS		
a.1	HP Drain Flash Tank with fittings & attachments – 1 No.	1.5M x 2.7M	2.5
a.2	LP Drain Flash Tank with fittings & attachments - 1 No.	1.2M x 1.8M	1.4
a.3	Atmospheric Flash Tank with fittings & attachments – 1 No.	1M x 1.5M	1
B	MISC. TANKS		
b.1	Clean Oil Tank, 14 Cu. m	2.5M x 2.5M x 2.8M	7.4
b.2	Dirty Oil Tank, 14 Cu. m	2.5M x 2.5M x 2.8M	7.4
b.3	Oil Unloading Vessel	2M x 1M x 0.55	0.6
b.4	Condensate Strorage Tank – 75 m^3	9.25M x 3.5(OD) x 0.016 thk	14.5
C	MISC. PUMPS		

SN.	DESCRIPTION	DIMENSIONS	Approx. WT. IN MT
c.1	Lube Oil pumps (16) nos alongwith motor & Simplex strainer. Approx. 200 KG/PUMP	----------	3.2
c.2	SUMP PUMP	2M x 1.5M x 1.5	0.5
D	Condenser On Load Tube Cleaning system (COLTCS) with all fittings, Piping, valves, Ball Separator, Ball recirculation skid and accessories	4M x 3M x 3M	5
E	DEBRIS FILTERS	4M x 3M x 3M	5
F	LP DOSING SYSTEM		
f.1	Hydrazine Dosing System	3.5M x 2.25M x 3M	1.2
f.2	Ammonia Dosing System	3.5M x 2.25M x 3M	1.2
f.3	NaOH Dosing System	2.5M x 2.25M x 3M	1
G	ME Bellows	---------	3
H	PEM SUPPLY VALVES AND STEAM TRAP & STRAINERS	---------	10.662
		Total Weight	**65.562**

28. TG INTEGRAL PIPING:

Piping systems like lube oil system, Jacking Oil system, Control/Governing oil system, Turbine water drain/ Extraction/ condenser vacuum system, Condensate Spray System, Seal Steam system etc. for TG Equipments and Aux. including, BFP etc. supplied from units (as an integral parts of equipments/ systems) (These piping system are excluding the Turbine Cross around piping, LP Extraction piping, Inter connecting piping between HP valve & HP overload valves which are already included in Steam Turbine weight details):

a. Carbon steel piping with valves including QCNRVs, supports etc.=55.0 MT
b. Alloy Steel Piping with valves, Supports etc. = 5.0 MT
c. Stainless Steel piping with valves, Supports etc.=10.0 MT

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Annexure-II A TENTATIVE WEIGHT DETAILS & DIMENSIONS OF EQUIPMENTS/SYSTEM (PER UNIT)

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

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, weights, quantities for scope of works are tentative. The works for complete scope as per site, systems/schemes and drawing requirement shall be carried out within accepted lump sum price where lump sum price has been offered. Where as for scope of works where unit rate has been offered, the works shall be carried out as per site, systems and drawing requirement based on actual requirement at site and payment for such actual quantum of work executed, shall be made as per accepted applicable unit rate.

SN	EQUIPMENT / PACKAGE	APPROX. WT. (MT)
(AA)	TG WITH TG AUX. AND ASSOCIATED EQUIPMENTS, INTEGRAL PIPING, PUMPS WITH AUX. TANKS, VESSELS INCLUDING FLASH TANKS, MISC. TANKS, MISC. PUMPS ETC.	
1.	Surface Condenser	390.6
2.	Steam Turbine with associated Cross around Piping, LP Extraction Piping & Interconnecting Piping between HP valves and HP Overload Valves	353.1
3.	Turbo Generator	259.7
4	TG Auxiliaries with Deaerator, FST etc.	161.35
5.	BFP,BP & CEP	94.82
6.	Equipments/Systems, Flash Tanks, Misc. Tanks, misc. Pumps etc per Unit (Supplied from PEM / BHOPAL and relative vendors)	65.562
7.	TG Integral Piping (other than Cross around piping, LP Extraction piping & Interconnecting Piping between HP Valves & HP Overload valves)	70
	TOTAL TENTAIVE WEIGHT FOR ONE UNIT	**1395.13**
	TOTAL TENTATIVE WEIGHT FOR SIX UNITS	**8370.78**

NOTE :

1. Weight of various equipments, quantities of various items of work covered under these specifications & indicated in relevant Appendices (under Sl. "AA",) for TG with TG Auxiliaries and associated Equipments, Integral piping, Pumps with Aux., Tanks, Vessels including equipments/systems, Flash Tanks, Misc. Tanks, Misc. Pumps etc. with associated Aux, the price accepted shall remain unchanged and shall be applicable without any variation.

11.0.1
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.

11.0.2
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.

11.0.3
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.

11.0.4
The Bidder shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work.

11.0.5
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.

11.0.6
All the necessary certificates and licenses required to carryout this work are to be arranged by the Contractor expeditiously at his cost.

11.0.7
The work to be carried out under the scope of these specifications covers the complete work of collection from stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, 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. Contractor may please

note that the loading of materials at storage yard/Stores in contractor's Trailer / Carriers while collecting materials will be done by material handling agency deployed by BHEL.

11.0.8
The terminal points as decided by BHEL shall be final and binding on the Contractor.

11.0.9
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.

11.0.10
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 relevant clauses of General Conditions of Contract.

11.0.11
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.

11.0.12
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.

11.0.13
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.

11.0.14
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.

11.0.15
Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

11.0.16
Contractor shall mobilise sufficient quantity of sleepers for stacking of materials in his custody.

11.0.17
The Contractor's scope of work is further described in the following clauses:

11.1 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

11.1.1
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.

11.1.2
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.

11.1.3
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.

11.2 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.

11.3.1
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.

11.3.2
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.

11.3.3
Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis.

12 PREPARATION OF FOUNDATION

12.1

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.

12.2

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

12.3

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. However the grouting materials will be supplied by the BHEL/Customer free of charge. Contractor shall have proper record and storage of Grout materials issued by customer.

12.3.1

Contractor shall avoid the wastage of Grout material on any account. For any wastage of materials i.e. usage of more than designed / certified quantity of grout materials shall be recovered form contractor as per the rate charged by Customer. Decision of BHEL engineer shall be final and binding on contractor.

12.3.2

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.

12.4

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.

12.5

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.

12.6

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.

13 EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS

13.1

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.

13.2

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.

13.3

Cleaning, servicing, lubrication of actuators, pumps, headers, governing system, ESV & IV, control valves, LP bypass, HP Overload 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.

13.4

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.

13.5

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

13.6

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.

13.7

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.

14 PIPING INSTALLATION

14.1
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, 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.**

14.2
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.

14.3
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.

14.4
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.

14.5
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.

14.6
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.

14.7
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.

14.8
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.

15 CONDENSER INSTALLATION

15.1
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, Tube 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/components. Condenser tubing and tube 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, the condenser neck to be welded with LP turbine and followed by fixing & welding of LP extraction pipes between LP turbine and Condenser. Contractor shall follow the procedure of condenser neck welding as per instruction of BHEL engineer at site. Condenser Tubes are Welded Stainless Steel material specification SA249TP 304.

15.2
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.

15.3
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.

15.4
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.

15.5
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.

15.6
Work of painting of condenser surfaces in various area and at various stages of work are specified elsewhere in these specifications.

16 GENERATOR INSTALLATION

16.1 GENERATOR STATOR

The Generator Stator, weighing 194.2 Metric Tonnes (approx.). Scope of contractor shall includes Unloading the Generator Stator near to TG Deck, collection from unloaded place, shifting/dragging/placement to the place of lifting in TG hall and lift & placement on required foundation & elevation. Customer's EOT crane will be utilised for lifting & placement of Generator Stator within TG hall and any other arrangements/T&P/attachments including Lifting Slings for lifting & placement of Generator Stator shall be provided by contractor as scope of work.

17 HANDLING OF HEAVIER EQUIPMENTS

Heavy and voluminous Equipments/consignments like HP-IP Turbine module, LP Rotor, LP turbine (Inner casing), Generator rotor, HP Heaters, Deaerator Storage Tank etc. along with other Equipments shall be handled carefully. BHEL will extend the facility of Crane free of hire charges for lifting and placement of Equipments/items in Contractor's trailer in storage yard. Contractor shall plan his activities/operations as per instruction of BHEL Engineer in such a way that maximum number equipments can be handled/collected in single trip of crane to storage yard. All other arrangements, Tools & Tackles, Trailer of suitable capacity, slings etc. 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 shall be arranged by contractor as part of scope of work. BHEL Shall not provide any T&P other than those specified for the specific work as per relevant Appendix and other relevant clauses of tender specification.

18 DEAERATOR INSTALLATION

18.1
Contractor shall arrange any other T&P as required. BHEL will provide free of hire charges the suitable crane (as available) for lifting and placement of De-aerator and FST from area/place near to TG building to place them at suitable location / elevation of equipment foundation depending accessibility and approachability of crane as enumerated in relevant Appendix. Contractor shall arrange all other T&P as required for all other works as part of scope of work. The fuel and Operator for this crane shall be provided by contractor as part pf scope of work. For effective utilisation of crane, contractor shall plan his activities so as to carry out the work in minimum possible duration. In case of any accessibility and approachability limitations of crane to place the FST 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.

18.2
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.

19 HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS

19.1

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.

19.2

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.

19.3

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.

19.4

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.

19.5

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

19.6

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.

20 PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING

20.1
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, Vacuum Pumps, Booster Pump, etc and other pumps/equipments like Misc. pumps etc. and other various rotating machineries / pumps as per tender specification.

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

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

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

(e) Servicing of all valves, Hydraulic Power cylinders, HP Valves (ESV), HP Overload Bypass valves, IP Valves, LP Bypass valves, CRHNRV and fittings.

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

(g) Chemical cleaning of piping systems, 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.

20.2
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.

20.3
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.

20.4
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.

20.5
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.

20.6
The cleaning of Lube oil tank etc. is in general by wire brush / abrasive paper etc. In case of tenacious rusting spots found if any, the same shall be cleaned thoroughly mechanically by buffing wheel etc. If manual / mechanical cleaning is not proper, the cleaning by sand blasting as per instructions of BHEL engineer before and after oil flushing is responsibility of contractor.

20.7
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.

20.8
The contractor shall carry out leak test of generator air cooling system to the satisfaction of BHEL engineer.

20.9
Replacing/changing mechanical/other seals of equipment, pumps etc. during commissioning stage is within the scope of work.

20.10
During the stages of commissioning, and till Unit is handed over, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to the contractor, will be governed by relevant

clauses of 'General Conditions of Contract'. The parts to be replaced shall however, be provided by BHEL free of cost.

20.11
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.

20.12
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.

20.13
The pre-commissioning activities will start prior to Lube oil, HP Oil supply System, Governing/ Control oil flushing etc. of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need 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.

20.14
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.

20.15
After the start of commercial operation of machine, commissioning activities will continue. It shall be the responsibility of contractor to provide following manpower along with supervisor as part of commissioning assistance for a period of three months **per Unit**.

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

20.16
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.

20.17
It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL commissioning engineers.

20.18
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.

20.19
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.

21 WELDING AND HEAT TREATMENT

21.1
Removal of welding slag and burrs by hand files, with brushes and/or flexible grinders will be carried out simultaneously.

21.2
On all steam, oil, instrument, gas, air (Instrument air/services air) piping, Cooling water 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.

21.3
All weld joints on piping shall be ground / filed / dressed on completion of welding and before NDE as per instructions BHEL engineer.

21.4

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.

21.5
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.

21.6
The purchase of electrodes shall be accompanied by proper test certificate and these certificates should be submitted regularly for the scrutiny of BHEL engineer.

21.7
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.

21.8
All racks and other items used for storage of electrodes shall be of steel and not of wood.

21.9

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.

21.10
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.

21.11
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.

21.12
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.

21.13
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.

21.14
All welded joints shall be subject to acceptance by BHEL engineer whose decision will be final and binding.

21.15
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.

21.16
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.

21.17
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.

21.18
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.

21.19
Heat treatment requirements shall be as per the Welding Schedules of BHEL

21.20
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.

21.21
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.

21.22
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.

21.23
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.

21.24
Joint fit up will be a stage for inspection.

21.25
All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

22 RADIOGRAPHY

22.1
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.

22.2
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.

22.3
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.

22.4
100% radiography of weld joints of certain piping have to be carried out as per BHEL standards/drawings/specification.

22.5
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.

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

23.1

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

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

23.2

After the chemical cleaning/Flushing 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 spec.

23.3

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

23.4

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.

23.5

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.

23.6

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.

23.7

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.

23.8
Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge should be carried out.

23.9
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.

23.10
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.

23.11
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.

23.12
After acid cleaning/pickling of lubricating system (including oil piping of lube oil system, HP Oil supply system, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems, 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.

23.13
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.

23.14
Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during

pre and post-commissioning of equipment up to full load shall be the responsibility of contractor as part of scope of work.

24 ELECTRICAL AND INSTRUMENTATION

24.1

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.

24.2

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.

24.3

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.

24.4

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.

24.5

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.

24.6

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

24.7

Mounting of instrumentation on turbine, generator and exciter and auxiliaries which are the integral part and supplied with main equipments shall be the part of scope of work and contractor shall render necessary services for their commissioning.

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

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

1) 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 provided by contractor as part of scope of work along with other like 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 as required for completion of work.

2) The Condenser water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter one coat of chemical resistant paint Epoxide priming paint and followed by two/three coats of high build black coaltar Epoxide (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 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.**

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

4) 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.

5) 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.

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

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

8) 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.**

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