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

NO: BHE/PW/PUR/TENDHE-STG+MMS/764

RECEIPT OF EQUIPMENT / MATERIAL AT SITE,UNLOADING ,INSPECTION, VERIFICATION, REPORTING SHORTAGES / DAMAGES, STORAGE, UP-KEEPING DURING STORAGE, COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD; TRANSPORTATION TO SITE; ERECTION, TESTING & ASSISTANCE FOR COMMISSIONING, TRIAL OPERATION OF SURFACE CONDENSER, STEAM TURBINE, GENERATOR, PIPING, PUMPS & AUXILIARIES INCLUDING ELECTRICAL AND CONTROL & INSTRUMENTATION EQUIPMENTS / COMPONENTS, APPLICATION OF THERMAL INSULATION, FINAL PAINTING, ASSISTANCE FOR PG TEST ETC. AND HANDING OVER OF 2X20 MW STG SET

AT

TENDAHO NEW SUGAR FACTORY PROJECT

AFAR REGIONAL STATE

ETHIOPIA

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-764**)
NIL	Notice Inviting Tender	12	(Part of **Vol-IA-764**)
I-A	Technical Conditions of Contract	117	Vol-IA-764
I-B	Special Conditions of Contract	47	Vol-IBCD-764
I-C	General Conditions of Contract	29	(Part of Vol-IBCD-764)
I-D	Forms & Procedures	69	(Part of Vol-IBCD-764)
II	Price Bid Specification	3	Volume-II-764

Tender Specification Issue Details

Tender Specification No: BHE/PW/PUR/TENDHE-STG+MMS/764

RECEIPT OF EQUIPMENT / MATERIAL AT SITE, ,UNLOADING ,INSPECTION, VERIFICATION, REPORTING SHORTAGES / DAMAGES, STORAGE, UP-KEEPING DURING STORAGE, COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD; TRANSPORTATION TO SITE; ERECTION, TESTING & ASSISTANCE FOR COMMISSIONING, TRIAL OPERATION OF SURFACE CONDENSER, STEAM TURBINE, GENERATOR, PIPING, PUMPS & AUXILIARIES INCLUDING ELECTRICAL AND CONTROL & INSTRUMENTATION EQUIPMENTS / COMPONENTS, APPLICATION OF THERMAL INSULATION, FINAL PAINTING, ASSISTANCE FOR PG TEST ETC. AND HANDING OVER OF 2X20 MW STG SET

AT

TENDAHO NEW SUGAR FACTORY PROJECT

AFAR REGIONAL STATE

ETHIOPIA

EARNEST MONEY DEPOSIT: Refer Notice Inviting Tender

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

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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 :

764

NOTICE INVITING TENDER

Bharat Heavy Electricals Limited

Ref: BHE/PW/PUR/TENDHE-STG+MMS/764 Date: 29/09/2010

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 **Indian/Ethiopian** 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/TENDHE-STG+MMS/764**	
ii	**Broad Scope of job**	RECEIPT OF EQUIPMENT / MATERIAL AT SITE, ,UNLOADING ,INSPECTION, VERIFICATION, REPORTING SHORTAGES / DAMAGES, STORAGE, UP-KEEPING DURING STORAGE, COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD; TRANSPORTATION TO SITE; ERECTION, TESTING & ASSISTANCE FOR COMMISSIONING, TRIAL OPERATION OF SURFACE CONDENSER, STEAM TURBINE, GENERATOR, PIPING, PUMPS & AUXILIARIES INCLUDING ELECTRICAL AND CONTROL & INSTRUMENTATION EQUIPMENTS / COMPONENTS, APPLICATION OF THERMAL INSULATION, FINAL PAINTING, ASSISTANCE FOR PG TEST ETC. AND HANDING OVER OF **2X20 MW STG SET AT TENDAHO NEW SUGAR FACTORY , AFAR REGIONAL STATE, ETHIOPIA**	
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 : 29 /09/ 2010***	*Applicable*

		Closes: 18/10/2010 , Time :16.00 Hrs IST **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 : 19/10/2010 , Time :15.00Hrs IST** **Place : BHEL PSWR, Nagpur** Tenders being submitted through representative shall be handed over to any of the following BHEL officials after making entry/registration at the reception: RK Ranade/ Manager (Purchase) PratishGee Varghese/Engineer(Purchase) Priyanka Desabaktula/Engineer(Purchase)	*Applicable*
vi	**OPENING OF TENDER**	***1 hour (IST) 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**	**Rupees 2,00,000/- (Indian Rupees Two Lakhs only) OR 71332 ETHIOPIAN BIRR** *Ethiopian bidders can submit their EMD/Cost of documents of requisite amount at BHEL TBG Ethiopia office at the following address:* *House No 2109 (Near Embassy of Somalia) Kabile: 02, Bole Sub City, Addis Ababa, Ethiopia*	*Applicable*
viii	**COST OF TENDER**	***Indian Rupees 2000/- OR 714 Ethiopian Birr***	*Applicable*
ix	**LAST DATE FOR SEEKING CLARIFICATION**	*Date: At least 3 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

AGM (PUR)

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 EQUIPMENT / MATERIAL AT SITE, ,UNLOADING ,INSPECTION, VERIFICATION, REPORTING SHORTAGES / DAMAGES, STORAGE, UP-KEEPING DURING STORAGE, COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD; TRANSPORTATION TO SITE; ERECTION, TESTING & ASSISTANCE FOR COMMISSIONING, TRIAL OPERATION OF SURFACE CONDENSER, STEAM TURBINE, GENERATOR, PIPING, PUMPS & AUXILIARIES INCLUDING ELECTRICAL AND CONTROL & INSTRUMENTATION EQUIPMENTS / COMPONENTS, APPLICATION OF THERMAL INSULATION, FINAL PAINTING, ASSISTANCE FOR PG TEST ETC. AND HANDING OVER OF 2X20 MW STG SET AT TENDAHO NEW SUGAR FACTORY , AFAR REGIONAL STATE, ETHIOPIA**
TENDER NO	**BHE/PW/PUR/TENDHE-STG+MMS/764**

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	**NOT APPLICABLE**	
B	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT	**Shall be applicable for Bid Evaluation after 1st Jan 2011**	
C	**TECHNICAL** Bidder must fulfill the Qualifying Requirements as under in order to be considered as technically qualified for this Tendering process **C.1)** Bidder must have, in last seven years as on 31/08/2010, executed Erection, Testing and Commissioning (Upto Synchronization of the Unit or beyond) of One set of Steam Turbine /Gas Turbine of 2 MW or higher rating. **OR** **C.2)** Bidder should have been Techno Commercially Qualified for E&C works of One Steam Turbine of 20 MW or higher rated unit by any of the Power Sector Region/Unit/division of BHEL, in the last 3(Three) years as on 31/08/2010 **OR** **C.3)** Bidder should be empanelled with BHEL-PSWR for M-TG-1 or M-TG-2 or M-TG-3 category		
D	**Financial**		

1	**TURNOVER** Bidders must have achieved an average annual financial turnover (Audited) of **Indian Rupees 15.6 Million** 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 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	**NOT APPLICABLE**	
	Explanatory Notes for QR 'A' 1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as given above along with all annexures 2. For the purpose of evaluation of QR, Turn-over figures in Ethiopian Birr shall be converted into Indian Rupees @ Rs 2.80380 Per Ethiopian Birr 3. ** In case the closure of Financial Year of Ethiopian Companies is other than 31st March, then the turnover shall be considered with respect to the Financial year of the respective companies		

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	Not Applicable	Not Applicable
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

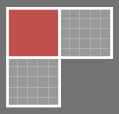
DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

764

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC)
CONTENTS

	Project Information
1.1	**INTROUCTION** Tendaho Sugar Factory, Ethiopia on behalf of Government of Federal Democratic Republic of Ethiopia having its principal place of business at P. O Box 2574 , Salfaz Building (in front of Atlas Hotel), Cape Verde Road, Addis Ababa, Ethiopia, intended to install new Sugar Factory with designed cane crushing capacity of 26,000 tons per hour at Tendaho. M/s Tendaho Sugar Factory have engaged M/s Overseas Infrastructure Alliance (India) Pvt Ltd having its principal place of Business at 1205, Surya Kiran Building, 19, Kasturba Gandhi Marg, New Delhi – 110001 as their EPC contractor. M/s Overseas Infrastructure Alliance (India) Pvt Ltd have awarded job of Design, Manufacture, Supply to Port Djibouti, transport to the site (Tendaho Sugar Factory), Store, Erection of mechanical and electrical equipment, train employers personnel, commissioning, testing and handover Power Generation Plant of capacity 2x20MW STG to Bharat Heavy Electrical Limited having its Head Office at BHEL House, Siri Fort, New Delhi – 110049 (India)
1.2	**CLIMATIC CONDITIONS** 1) Maximum ambient Temperature . : $+45^{o}$ Centigrade 2) Minimum ambient Temperature. : $+17^{o}$ Centigrade 3) Relative Humidity range : 96 % Max & 37 % Min. 4) Rainy season : July to October 5) Average rainfall : 235 mm 6) Height above Mean Sea level : 350 m

2.0 SCOPE OF WORK

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

A **MATERIAL MANAGEMENT AT SITE.**

B **ERECTION, TESTING AND COMMISSIONING OF STG AT SITE**

2.0 DETAIL SCOPE OF WORK

PART A : MATERIAL MANAGEMENT

Receipt of equipment / material at site, ,Unloading ,Inspection, Verification, reporting shortages / damages, Storage, Up-keeping during storage, preservation and handing over of components of , steam turbine & auxiliaries, turbo-generator & auxiliaries, electrical systems, controls and instrumentation of TG packages, insulation, components & equipment of various other items and providing services for materials management for 2x20 MW STG set at Tendaho New Sugar Factory , Afar Regional State, Ethiopia.

2.01 BROAD SCOPE OF WORK

The scope of work of this section of tender specification of material handling and materials management services for for 2x20 MW STG set at Tendaho New Sugar Factory , Afar Regional State, Ethiopia shall broadly be as under:

- Receipt and unloading of various components (as detailed later in this tender specification) **including heavy and over-dimensional consignments** (e.g. turbine assemblies & sub-assemblies etc) directly from truck/trailers, by suitable crane or by jack and sleeper method (all to be arranged by the contractor), including levelling of the unloading area and attendant work.

- BHEL will despatch the materials by road transport on door delivery basis up to the project premise. Contractor shall receive all such consignments and unload in the storage area.

- **Preliminary verification** of materials at the time of unloading from road transport vehicle or while receiving consignments from transporters' godown - as the case may be, reporting immediately the discrepancies like damages and shortages.
- **Detailed verification** of materials with reference to packing list and loading advice slip after unpacking of boxes & crates; repacking, where called for, after detailed verification; preparation of receipt inspection reports (RIR).
- **Stacking and storing** at BHEL open storage yard/ covered stores/ closed & semi-closed sheds in TENDAHO project, submission of stacking / storing records.
- **Preservation** of the materials in accordance with BHEL's preservation manual or BHEL supplier's manual as applicable, else as per BHEL's instructions.
- **General cleaning, grass cutting and upkeep of storage yard, covered and semi-closed stores sheds** within the quoted rates for unloading, verification and stacking.
- **Providing Materials Management** Services (refer Volume-IA Part II Technical specifications, Chapter –II Material Management).
- **Re-handling and restacking** of materials as and when called for by BHEL. This also includes excess/redundant/ scrap materials returned to stores by BHEL's erection contractors.
- **Handling and loading of outgoing materials** those are to be sent to other destinations.

2.02 Systems & Packages in scope of work.

2.02.1 Components of the following major systems are to be handled under this contract:

1. Steam Turbine & Auxiliaries:
2. Oil Supply System:
3. Surface Condenser:
4. Steam Jet Air Ejector:

5. Gland steam Condenser
6. ST Oil Cooler.
7. Generator and Auxiliaries.
8. STG Air Coolers.
9. Control & Instrumentation for STG & Integral portion.
10. TG Package Control.
11. Balance of plant piping & Equipment.
12. Balance of plant Equipment – Mechanical
13. Balance of plant Equipment –Electrical
14. Balance of Plant Equipment – Control & instrumentation

2.03 Some major heavy single consignments (wt. wise):

SN	Description	Approx wt of single assembly
01	Steam Turbine	47 MT
02	Surface Condenser	38 MT
03	Steam Jet Air Ejector	7 MT
04	Generator package	57 MT
05	EOT Crane 70/20 T	70 MT

Approx quantum of material will be **around 1,200 MT** for the entire scope of work.

PART B : ERECTION, TESTING AND COMMISSIONING (Detail Scope As Per Volume I A Part II Technical spefication CHAPTER –III : Steam Turbine & Generator Works)

Receipt of materials from BHEL/Customer stores/storage yard, handling at stores/storage yard, site of work, transportation between stores and site of work, erection, testing, commissioning, final painting and handing over of steam turbine, turbo-generator , condenser, STG integral piping, etc. with associated equipments for 2x20 MW STG set at Tendaho New Sugar Factory , Afar Regional State, Ethiopia.

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

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

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

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

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

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

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

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

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

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

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

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

11) Erection of Electrical motorized & control valves

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

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

The work shall conform to dimensions and tolerances specified in the various drawings/documents of BHEL which will be provided during various stage of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings/documents or other stipulations due to contractor's fault, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies and recoveries will be effected from the contractor's bills towards expenditure incurred including departmental overheads of BHEL.

2.11 IMPORTANT INFORMATION

i. **Indian bidders, Ethiopian local bidders shall be eligible to participate in this tender.**

ii. **The tender document shall be hosted in BHEL web page (www.bhel.com) and bidders are requested to download the complete tender specification. In case bidders are unable to download the tender specifications from BHEL web page, on specific request from vendors, BHEL will send the total tender specification by e-mail.**

iii. **Bidder should ensure that their complete offer in hard copy should reach to BHEL- Nagpur office on or before due date & time mentioned in NIT. Late tender shall not be accepted in any circumstances.**

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

v. **Offer shall be submitted by bidders in ENGLISH Language only. Also any correspondence shall be in English Language.**

vi. **All the bidders shall quote the price in Ethiopian Birrs(ETB) only in Price Bid**

vii. **Evaluation of prices shall be done in Ethiopian Birr.**

viii. **Work order shall also be placed in Ethiopian Birr only.**

ix. **Slab for the rates of Security Deposit as given in Clause 1.10.1 of Volume I C 'General Conditions of Contract' may suitably be converted into ETB @ Rs 2.80380 per ETB**

x. **Ethiopian bidders can submit their EMD/Cost of documents of requisite amount at BHEL TBG Ethiopia office at the following address:**

House No 2109 (Near Embassy of Somalia) Kabile: 02, Bole Sub City, Addis Ababa, Ethiopia

xi. **Wherever the BG (Bank Guarantee) is required to be submitted as per tender specifications , the following procedure is to be adopted by bidder**

- **For Indian Bidders- Vendors are advised to obtain BG from any of the BHEL consortium banks (Which will be informed later)**

- **For Ethiopian Bidders - The BG may be accepted from Foreign Bank at the sole discretion of BHEL, provided the BG is duly endorsed by any of the BHEL consortium banks (Which will be informed later)**

- **The BG through any other Indian Nationalized Bank (Not BHEL consortium banks) shall be at the sole discretion of BHEL**

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**			
a	Open space for labour colony (as per availability)	Yes		Location will be finalized after joint survey with owner. However the approximate distance of labour colony from plant is 3KM.
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity For construction purposes 3 Phase** of Voltage 415/440 V **(to be specified whether chargeable or free)**			FREE

a	Single point source	Yes		At a distance of 75 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 (to be specified whether chargeable or free)**	**yes**		FREE (to the extent possible)
a	Single point source	Yes		At a available distance from site (Distance may vary up to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc**	Yes		FREE (to the extent possible)
a	Single point source	Yes		At a available distance from site (Distance may vary up to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	**WATER SUPPLY**			

3.3.1	**For construction purposes: (to be specified whether chargeable or free)**			FREE
a	Making the water available at single point	Yes		Water shall be given at one point / 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**	**yes**		FREE at one point
a	Making the water available at single point	Yes		
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3. At the construction site / area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	

d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Telephone, fax, internet, intranet, e-mail etc		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**			**Not Required**
3.7.0	**Demobilization of all the above facilities**		**YES**	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

Sl.No	**Description** **PART II** **3.9.0 ERECTION FACILITIES**	**Scope / to be taken care by**		*Remarks*
		BHEL	**Bidder**	
3.9.1	Engineering works for construction:			NOT APPLICABLE
a	Providing the erection/constructions drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes	Yes	In consultation 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			NOT APPLICABLE
d	Shipping lists etc for reference and planning the activities			NOT APPLICABLE
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL

Sl.No	Description **PART II** **3.9.0 ERECTION FACILITIES**	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
g	Weekly erection schedules based on Sl No. e		Yes	In consultation with BHEL
h	Daily erection / work plan based on Sl No. g		Yes	In consultation with BHEL
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			NOT APPLICABLE
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself			NOT APPLICABLE
L	Arranging the materials required for preassembly			NOT APPLICABLE

A: TOOL & PLANTS FOR E&C RELATED WORKS:

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

B: MEASURING AND MONITORING DEVISES (MMD):

AS PER REQUIREMENT TO BE FINALIZED AT SITE, SHALL MEET THE REQUIREMENTS AS PER FIELD QUALITY PLAN AND OTHER ERECTION, TESTING RELATED ACTIVITIES.

NOTE:

1. ALL THE TOOLS AND PLANTS REQUIRED FOR THIS SCOPE OF WORK, EXCEPT THE TOOLS & PLANTS PROVIDED BY BHEL ARE TO BE ARRANGED BY THE CONTRACTOR WITHIN THE QUOTED RATES. THE LIST IS SUGGESTIVE IN NATURE. ANY ADDITIONAL T & P REQUIRED TO BE ARRANGED BY THE CONTRACTOR.

2. IF ABOVE MENTIONED T&P ARE NOT DEPLOYED IN SPECIFIED TIME BHEL WILL CHARGE TO CONTRACTOR CURRENT LOCAL MARKET RATE + 30 % OVERHEADS FOR NON AVAILABILITY OF T&P or levy a day wise penalty for non deployment for delayed deployment.

3. IF WORK GETS DELAYED DUE TO NON AVAILABILITY OF T&P, BHEL RESERVES THE RIGHT TO GET THE WORK DONE AT THE RISK AND COST OF CONTRACTOR WITHOUT PREJUDICE TO RIGHTS OF BHEL AS IN GCC

4. THIS LIST IS NEITHER EXHAUSTIVE NOR LIMITING. QUANTITIES INDICATED ABOVE ARE ONLY THE MINIMUM REQUIRED. CONTRACTOR SHALL DEPLOY ALL NECESSARY T&P TO MEET THE SCHEDULES & AS PRESCRIBED BY BHEL

5. NO CLAIM WHATSOVER WILL BE ENTERTAINED ON THIS ACCOUNT.

BHEL WILL NOT PROVIDE ANY T & P's FOR THIS WORK

6.1 MOBILIZATION, TIME SCHEDULE, CONTRACT PERIOD AND GRACE PERIOD

6.1.1

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

6.1.2

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

The activities for erection, testing etc. shall be started as per directions of construction manager of BHEL. Contractor shall mobilize further resources as per requirement to commence the work of Material Management services, erection, testing etc. of TG and auxiliaries and progressively augment the resources to match schedule of the project.

6.1.3

COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

A) For Materials Management

Unloading of first consignment from the first shipment at Tendaho site shall be recognised as "start of Material Management work period"

B) For Erection and Commissioning

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

Based on the availability of civil foundations and materials from manufacturing units contractor may have to advance the start of erection after getting clearance from Construction Manager.

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

SCHEDULE FOR STG WORKS:

Sl No	Milestone Description	Schedule Date	
		Unit-1	Unit-2
1	Site Office opening & mobilisation	within shortest possible time of issue of fax letter of intent to commence the works as directed by BHEL	---
2	Supply commencement from factory		
3	Condenser Erection Start	one week from mobilization	after a gap of 2 months
4	Turbine Erection Start	One month from mobilization	after a gap of 2 months
5	Oil Flushing	four months from mobilization	after a gap of 2 months
7	Rolling & Synchronisation	4.5 months from mobilization	after a gap of 2 months
8	Trial Run & Handing over	five months from mobilization	after a gap of 2 months

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

6.1.4

TOTAL CONTRACT DURATION (for both Units)

The total contract period for completion of entire work shall be **07 (Seven)** months from the date of start of Contract period.

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

The contractor shall reach site and establish his site office and mobilize to commence the work as per directions of BHEL engineer. Mutually agreed programme shall be drawn by

the contractor primarily to achieve the schedules as above, taking into account available and anticipated materials inflow, and other inputs. These may have to be further fine tuned with shorter duration programmes as the case may be.

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

6.2 DEFINITION OF WORK COMPLETION

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

7.1 Currency of Payment:

For Ethiopian Bidders:

Entire payment shall be made in Ethiopian Birr (ETB) as per terms of payment in Chapter 7.

For Indian Bidders:

Indian bidders can avail a maximum of 50% of every running bill in Indian Rupees (INR) or US $ and Remaining amount shall be paid in Ethiopian Birr (ETB).
Work order shall be released in ETB only and for the purpose of payment in INR or US $, applicable ETB shall be converted into INR or US $ as per prevailing exchange rate.

7.2 Stages of Progressive Pro-Rata Payments

7.2.1 MATERIAL MANAGEMENT AND STG ERECTION WORKS

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

a) Erection and Commissioning
i Material Management at site (Say - M)
ii Erection and Commissioning of STG and BOP packages (Say - E)

i.e. Total Price(T) = M + E = 100%

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

a) Erection & Commissioning
i Material management at site M = 10% of Total Price (T)
ii Erection and Commissioning of STG and BOP packages E = 90% of Total Price (T)

7.2.1.3 Progressive payment for Material Handling and Material Management service at Site (= M as derived under para 7.2.1.2)

Progressive payment for Material Handling and Material Management service at Site shall be made over a period of 7 months (7 months contract period) on certification of BHEL

Engineer. The amount may be a lump sum amount every month or can be as per schedule mutually agreed at site.

I) 55% of rate shall be paid as soon as the materials are unloaded, and verified as per Lorry Way Bill subject to furnishing following information along with the bill.

A. Shortage report/ open delivery taken w.r.t. Lorry Way Bill, if any and acceptance thereof by transporters.
B. Proof of the claim lodged with transporters in respect of above shortage / open delivery.
C. Material management forms duly filled and certified by BHEL engineer.

II) 45% of the rate shall be paid after the materials are duly verified as per packing list / loading advice slip after opening the packages / boxes / crates where ever necessary, repacking after verification, stacking, preparation of necessary records of inspection and location of stacking etc. Wherever necessary. Payment will be released on submission of information as per materials management forms by the contractor immediately after verification of materials and certified by BHEL engineers. The requisite proforma would be supplied by site engineer. Normally, it is expected that the time lag between receipt of material and verification be kept at barest minimum possible.

7.2.1.5 Progressive payment for Erection and Commissioning of STG (= E as derived under para 7.2.1.2)

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

Break up for Erection and Commissioning (For part – B)

2x20 MW TENDAHO STG (Ethiopia)

Total value **Birr (=M+E)**

E&C **Birr (=E)**

A.

Broad Break up for Erection and Commissioning (For part –B)

Sl. No.	Description	% of 'E'	% For each unit		Remarks
			Unit-1	Unit-2	
1	Surface Condenser	10	5	5	
2	Steam Turbine	16	8	8	
3	Turbo Alternator	12	6	6	
4	Pumps and auxiliaries	6	3	3	
5	Piping	12	6	6	
6	Piping from Utility boiler to turbine	6	3	3	
7	Insulation, Cladding	4	2	2	
8	BOP (E &C)	8	4	4	
9	Electrical, Control & Instrumentation Sys etc	16	8	8	
10	Commissioning	10	5	5	
	Grand Total (Each unit)	100	**50**	**50**	
	Grand Total (Both units)		**100**		

B Detail Billing Break up

Sl. No.	Description	% of 'E'	% For each unit		Remarks
			Unit-1	Unit-2	
1	**Surface Condenser and Deaerator (10%)**				
1.1	Chipping & Preparation of foundation	1	0.5	0.5	
1.2	Placement of condenser	5	2.5	2.5	
1.3	Assembly and welding of hot-well	1	0.5	0.5	
1.4	Erection & Welding of top connecting piece.	1	0.5	0.5	

1.5	Placement of S.S. bellows	1	0.5	0.5	
1.6	Condenser neck welding	1	0.5	0.5	
	Sub total of 1.0	**10**	**5**	**5**	
2	**Turbine (16%)**				
2.1	Preparation of foundation, matching, placement and levelling of sole plates/foundation plates.	2	1	1	
2.2	Placement of turbine on foundation	6	3	3	
2.3	Levelling and cantering of turbine on foundation	2	1	1	
2.4	Grouting of turbine base plates/frame	2	1	1	
2.5	Alignment of Turbine & Gear Box	1	0.5	0.5	
2.6	Couplings of turbine & Gear Box	1	0.5	0.5	
2.7	Erection of Turbo-visory instruments	1	0.5	0.5	
2.8	Final boxing up of bearings pedestals	1	0.5	0.5	
	Sub Total 2.0	**16**	**8**	**8**	
3	**Turbo Generator (12%)**				
3.1	Preparation of foundation, matching, placement and levelling of sole plates/foundation plates.	2	1	1	
3.2	Placement of Generator on foundation	3	1.5	1.5	

3.3	Levelling & centering of Generator on foundation	2	1	1	
3.4	Alignment of Generator rotor & Gear box	2	1	1	
3.5	Grouting of Generator foundation base plates/ base frame.	1	0.5	0.5	
3.6	Box up of Generator bearings.	1	0.5	0.5	
3.7	Erection of Generator air coolers	1	0.5	0.5	
	Sub Total 3.0	**12**	**6**	**6**	
4	**Pumps and auxiliaries (6%)**				
4.1	Placement of lube oil pumps.	1	0.5	0.5	
4.2	Placement of lube oil coolers	0.25	0.125	0.125	
4.3	Placement of oil centrifuge.	0.5	0.25	0.25	
4.4	Placement of duplex oil filter, oil accumulators	0.5	0.25	0.25	
4.5	Placement of Main lube oil tank	0.25	0.125	0.125	
4.6	Placement of Overhead lube oil tank.	0.25	0.125	0.125	
4.7	Main oil pump, Aux oil pump, emergency oil pump, jacking oil pump	2	1	1	
4.8	Placement of Gland Steam Condenser	0.5	0.25	0.25	
4.9	Placement of Condensate Extraction Pumps	0.5	0.25	0.25	

4.10	Placement of Steam Jet Air Ejector	0.25	0.125	0.125	
	Sub Total of 4.0	**6**	**3**	**3**	
5	**Piping (12%)**				
5.1	Erection and welding of Condensate piping from condenser Hot well upto CEP to Boiler	2	1	1	
5.2	Erection and welding of CEP re-circulation piping	0.5	0.25	0.25	
5.3	Erection & welding of Aux Steam piping	1	0.5	0.5	
5.4	Control oil piping, jacking oil piping	0.5	0.25	0.25	
5.5	Erection & welding of Extraction piping from Turbine to battery limit	1	0.5	0.5	
5.6	Gland steam leak off piping	0.2	0.1	0.1	
5.7	Erection and welding Turbine drains piping	2	1	1	
5.8	Erection and welding of bearing cooling water piping	1	0.5	0.5	
5.9	Erection and welding of bearing cooling water return piping	0.6	0.3	0.3	
5.1	Erection and welding of exhaust hood spray piping from CEP discharge to turbine	0.2	0.1	0.1	
5.11	Erection and welding of Compressed air piping	1	0.5	0.5	
5.12	Erection and welding of Lube oil piping around lube oil tank, oil coolers, duplex filters.	2	1	1	

	Sub Total 5.0	**12**	**6**	**6**	
6	**Piping from Utility boiler to turbine(6%)**	6	3	3	
	Sub Total 6.0	**6**	**3**	**3**	
7	**Insulation, Cladding (4%)**				
7.1	Insulation & Cladding of Aux steam piping	1	0.5	0.5	
7.2	Turbine insulation	1	0.5	0.5	
7.3	Turbine integral piping insulation	1	0.5	0.5	
7.4	Insulation & Cladding of Turbine system piping	1	0.5	0.5	
	Sub Total 7.0	**4**	**2**	**2**	
8	**BOP (E &C) - (8%)**				
8.1	Cold water tank	1	0.5	0.5	
8.2	EOT Crane and hoists	3	1.5	1.5	
8.3	MISC Equipments	4	2	2	
	Sub Total 8.0	**8**	**4**	**4**	
9	**Electrical, Control & Instrumentation System etc (16%)**				
9.1	LV Switch gear and MCC	1	0.5	0.5	
9.2	11KV Switch gear, Breaker panel etc	1	0.5	0.5	
9.3	110V DC Battery & Battery Charger	1	0.5	0.5	
9.4	Man Machine Interface	1.5	0.75	0.75	
9.5	Distributed Digital control system	2	1	1	
9.6	HT, LT and Control Cabling	4	2	2	
9.7	Cable trays and supports	3	1.5	1.5	
9.8	Electronic Governor for Turbine	0.5	0.25	0.25	

9.9	Neutral grounding resistors, CTs	0.5	0.25	0.25	
9.10	Placement of Generator relay & Control panels and DAVR panels	0.5	0.25	0.25	
9.11	Erection of field Junction Boxes	0.5	0.25	0.25	
9.12	Erection of Field instruments	0.5	0.25	0.25	
	Sub Total 9.0	**16**	**8**	**8**	
10	**Commissioning (10%)**				
10.1	Oil flushing	2	1	1	
10.2	Barring Gear operation	2	1	1	
10.3	CEP Commng	1	0.5	0.5	
10.4	BFP Commng	1	0.5	0.5	
10.5	Rolling & Synchronization	2	1	1	
10.6	Trial operation completion	2	1	1	
	Sub Total 10.0	**10**	**5**	**5**	
	Grand Total (Each unit)		**50**	**50**	
	Grand Total (Both units)	**100**	**100**		

TAXES & OTHER DUTIES

8.1. **The rate quoted by bidders should be inclusive of all Taxes & Duties and BHEL will not reimburse any amount on account of Taxes & Duties. Wherever tax exemptions/concessions are allowed to the bidder, the same may be availed by the bidder without attracting any financial implication on BHEL. However, if as per the Ethiopian/ Indian laws, BHEL can avail set off against any tax or duty paid by the bidder, the bidder shall provide necessary documents to BHEL to avail such set off.**

8.2 All the taxes, duties applicable in Ethiopia (Except for personnel Income tax) shall be reimbursed by BHEL on submission of relevant documents.

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

9.(A) Steam Turbine & Auxiliaries:

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

9.(B) Oil Supply System:

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

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

9.(C) Surface Condenser:

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

9.(D) Steam Jet Air Ejector:

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

9.(E) Gland steam Condenser:

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

9.(F) ST Oil Cooler :

1. Vertical 2x100% capacity ST Oil cooler.
2. Coolers with carbon steel shell, water box etc and Admiralty Brass tubes.
3. Manually operated 3 – way change over valve.
4. Primer coating on outer surfaces
5. Accessories like vent and drain valves etc.
6.

9.(G) Generator and Auxiliaries:

1. Closed circuit air cooled generator consisting of stator with output leads (3 phase + 3 neutral) taken out from the sides of the m/c, Rotor suitable for overhang BLE, Bearings , base frame, built in RTDs ,space heaters, Bottom mounted air to water coolers (CACW) with n+1)cooler elements.
2. Over hang brush- less exciter with PMG
3. Phase segregated bus duct (25M on phase side and 6 M on neutral side) housing CT's PT''s, LA & SP. Extra charge for busduct requirement above the specified length on per meter basis.
4. Neutral Grounding Resistor to limit the fault current to 100A for 30 sec with motorized isolator.
5. Generator conventional control, metering & synchronizing panel with auto-synchronizer and multifunctional micro processor based numerical relay panel with protections for generator.
6. Interconnecting control cables for connection between Generator and generator control and relay panels (length considered is 100m. unit length applicable beyond this length).

9.(H) STG Air Coolers :

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

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

1. Scope :-
   - 1.1 Electronic Governor for control of Turbine speed, Load, inlet stem pressure, extraction pressure.
   - 1.2 Dual Channel Turbine Shaft Vibration and Axial Displacement Monitoring system (TSI rack) which includes proximity type probes, proximeters and extension cables for the following
     a) Shaft vibration at turbine front bearing.
     b) Shaft vibrations at turbine rear bearing.
     c) Shaft vibrations at Generator front bearing.
     d) Shaft vibration at Generator rear bearing.
     e) Shaft vibration at Gear box high speed shaft.
     f) Shaft vibration at Gearbox low speed shaft.
     g) Turbine Axial displacement Key phasor for turbine shaft.
2. Primary instruments to realise the turbine auxiliaries interlock and protections for the following drives in DCS.

a) Main oil pump.
b) Auxiliary oil pump.
c) Emergency lube oil pump.
d) Jacking oil pump.
e) Oil Vapour Extraction fan.
f) Turning gear.

3. Field Instruments (for STG Integral Portion):

3.1 Bearing thermo-elements for monitoring Bearing Metal Temperature for following (monitoring in DCS)

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

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

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

9.(J) TG Package Control:

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

1. Turbine controls (for STG and Auxiliaries) comprising of :

a) Electronic system cabinets: 1 set of 3 panels – per TG

(Catering to TG integral)

- Electro hydraulic turbine control catering to speed control, load/frequency control, inlet pressure control, extraction pressure control, wanders extraction pressure control.
- Turbine protection, including separate over speed trip (2 of 3).
- Steam turbine integral interlock and protection.

b) Electronic system cabinets : one suite of panels – per TG

(Control catering to STG-BOP / regenerative cycle as below)

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

c) Common system for both turbines : one suite of 2 panels

(Catering to common control system for 2 turbines as below)

1. Cooling tower consisting of
    - Level control, level alarms
    - CW Pump control – 4 nos.
    - ACW pump controls – 4 nos.
    - CW makes up pump control – 2 nos.
    - De-superheaters spray water booster pump control- 2 nos.
    - Inst air compressor monitoring (control in local panel) – 2 nos.
2. Electrical controls

(Approximate I/O Count: DI = 150 Nos DO = 60 Nos.
AI = 20 NOS.)

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

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

2. Instrumentation / cable for TG package comprising of : 2set.
   - ST on base instrument to Field JBs.
   - Instrument of ST auxiliaries to field JBs.
   - Field JBs of TG to Electronic system cubicles.
3. Digital Automatic Voltage Regulator for: 2 nos.
   (Brush less excitation of generator (1 auto 1 manual configuration)

(9.K) Balance of plant piping & Equipment. :

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

(9.L) Balance of plant Equipment – Mechanical.

1. COOLING WATER SYSTEM
   a. Main cooling water pumps with drive motor for condenser.
   b. Auxiliary cooling water pumps.
   c. CT make –up water pumps .
   d. RCC cooling tower with 3 cells.

2. CONDENSATE SYSTEM
   a. CEPs – 2 nos for each unit.

3. COMPRESSED AIR SYSTEM
   a. Reciprocating Air compressors (2W +1S)
   b. Air drlers.
   c. Air receiver.

4. MAINTENANCE EQUIPMENT
   a. EOT crane 70/20T

b. Hoist for CW Pumps
c. Hoist for reciprocating compressors.

5. PIPING
a. Piping,valves and fittings, insulation and supports for BOP + integral piping

(9.M) Balance of plant Equipment –Electrical

S.no.	Description	Qty
1.	HT(11kV) VCB switchgear consisting of Generator breaker panels ,copper bus bars ; breaker ratings 3000Amps, fault rating 26.24 kA for 1 sec.	2 nos
2	LV (400V) switchgear : STG MCC 400V, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	2 set
3	LV (400V) switchgear : BOP MCC 400V, 1250A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution for CWP's, compressors, etc BOP load	1 set
4	110V DC System : 110V DC battery system consisting of 110V, 55cells, 400Ah lead acid tubular battery bank and FC + FCBC thyristorised battery charger and other standard maintenance accessories.	1 set
5	110V DC distribution board with Cu bus bars, 25kA for 1 sec, with MCCB incomers & MCB outgoing feeders in non-draw out fixed type execution, and DC starters for DC ELOP	1 set
6	HT(11 KV) Cu conductor XLPE armoured cable with cable kits (Maximum cable distance between Generator & HT swgr considered 50 mtrs)	1 set
7	Weather Proof sheet steel Local control push button stations with/without ammeters	1 lot
8	LT power 1.1kV, PVC/XLPE insulation, Cu conductor armoured cable & cable accessories	1 set
9	LT control 1.1kV, PVC/FRLS insulation, Cu conductor armoured cables & accessories	1 set

10	Above ground earthing material for equipment grounding (GI strip min 120sqmm)	1 set

(9.N) Balance of Plant Equipment – Control & instrumentation

S.no	Description	Qty
1.	Pressure, temp, level & flow for monitoring -MS Steam line -Condenser level -CEP discharge header upto Dearator Hot well inlet -Desuperheater spray water booster line upto desuprheaters -Cooling water line from cooling tower to condenser & return -IP (8 BAR) & LP (2.8 BAR) Extraction line -pressure, temp, flow monitoring	1 lot
2.	Signal ,RTD & Thermocouple cable up to field JB for BOP Scope	1 sets
3	Instrument hook up material for BOP Instruments	1 sets
4	Desuperheaters: - Desuperheater to IP steam extraction (8 bar) – 3 nos - Desuperheater to LP steam process (2.3 bar) – 3 nos - Aux steam PRDS – 1 no	1 lot
5	Control valve for with pnematic positioner & I/P converter : 1.Condenser level control- 1 no 2.condenser min. recirculation – 1 no 3.Pressure , contol for aux steam for steam ejector,GSC, D'rator. – 1 no 4.Desuperheater spray control valve – As required	1 sets

Annexure-II A: Tentative Weight Details and Dimensions of Major Equipments

SL	DESCRIPTION	PKG.SIZE(MM)	GR.WT IN MT	REMARK
A	**Steam Turbine & Auxiliaries**:			
1	Steam turbine	L5500 x B4000 x H4000	47	
2	Gear Box	L2000 x B2100 x H2200	11	
B	**Oil Supply System Aux,Pumps and other Auxiliaries :**			
1	Lube oil tank	L3450 x B2500 x H2500	4.65	
2	Over head tank	2625(Diameter) x H2100	2	
3	L.O.P	L2200 x B920 x H800	1.2	
4	E.O.P	L2000 x B750 x H700	0.7	
5	J.O.P	L1000 x B800 x H700	0.2	
6	Filter	L1700 x B800 x H1700	0.41	
7	Centrifuge	L1500 x B1250 xH1100	1.4	
8	Accumulator	L1000 x B500 x H2275	0.585	
C	**Surface Condenser**:	L7300 x B3000 x H3500	38	
D	**Steam Jet Air Ejector:**	L6000 x B1900 x H2300	7.1(EACH)	2 nos.
E	**Gland steam Condenser:**	Dia 406 x L 2500	1.4	1 No
F	**ST Oil Cooler :**	Dia 750 x L 3500	4.1(each)	2 nos.
G	**Generator and Auxiliaries:**			
1	Generator package	L6500 x B3100 x H3150	50.6	
2	Air cooler duct	L6000 x B1700 x H2400	6.1	
3	Air cooler elements (6 nos)	L3000 x B670 x H630	5.1	
4	Foundation items	loose items	7	
5	Generator control panel	L1000 x B1000 x H2355	1	
6	Generator Relay panel	L1000 x B1000 x H2355	1.5	
7	Bus duct	L35000 x B1400 x H400	7	
8	NGE Cubicle	L1500 x B2500 x H1500	2	
9	PT . SP Cubicle	L2500 x B2000 x H2800	3	
H	**ST Generator Air Cooler**	L4200 x W620 x H 440	0.96 (each)	6 nos

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

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

AA. LOCAL / FIELD MOUNTED INSTRUMENTS AND DEVICES:.

Sl.No.	ITEM DESCRIPTION	ERECTION QTY (Nos)	CALIBRATION QTY (Nos)	REMARKS
1.	Pressure gauges.	26	40	Refer documents: TD900223 TD900984 TD901093 TD801296 IN901019
2.	Pressure switches	22	31	
3.	Differential pressure indicator	1	1	
4.	Differential pressure switches	1	1	
5.	Temperature Gauges	14	19	
6.	Thermocouple(K-type)	6	6	
7.	Bearing thermo elements(RTD 3 WIRE PT-100)	14	14	
8.	RTD	2	2	
9.	Thermo wells	35	35	
10.	Level gauges	3	3	
11.	Smart pressure Transmitter	13	13	
12.	Diffl pressure Transmitter	4	4	
13.	Level switches	3	3	
14.	Vibration, Axial displacement and speed probes	22	22	
15.	proximitors	16	16	
16.	Safety relief valve	1	1	
17.	Control valves(with I/P converter, position transmitter and limit switches)	4	4	
19.	Solenoid valves	1	6	

Sl.No.	ITEM DESCRIPTION	ERECTION QTY (Nos)	CALIBRATION QTY (Nos)	REMARKS
20.	***Panel mounted instruments***			
	TURBOVISORY MONITORING RACK	1	1	Bently Nevada 3500 series

BB. PANELS AND CUBICLES:

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

CC .FABRICATION,ERECTION OF STRUCTURE STEEL:

Sl.No.	ITEM DESCRIPTION	LENGTH (meters)	QTY.	REMARKS
a.	CHANNEL100x50mm, 1700mm	10		REF DOC: TD501614
b.	ANGLE50x50x 6mm, 1550mm	30		
c.	SHEET 4mm THICK (400 x120mm)	60		
d.	PLATE 10mm thick (375 x 770mm)	10		

DD. PROCESS IMPULSE TUBING AND PNEUMATIC TUBING FITTINGS

Sl.No.	ITEM DESCRIPTION	QTY(MTS)	REMARKS
1.	CS PIPE 21.3 x 3.73	400	REFER DOCUMENT: TD501614 & TD301058
2.	Cr-Mo PIPE 21.3 x 3.73	550	
3.	SS TUBE 12.7 x 2.1.	400	
4.	SS PIPE 60.3 x 2.8	100	
5.	SS PIPE 6.35 x 0.9	60	
6.	SS PIPE 21.3 x 2.8	30	

EE. LOOP CHECKING:

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

FF. SCOPE OF WORK OF C&I ERECTION COTRACTOR

NOTES:

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

10.(J) TG Package Control:

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

10.(K) PIPE QUANTITIES:

S.No	Description
a	66 bar (a) pressure steam line - complete piping with all valves from steam distribution header to turbine inlet.
b	8 bar (a) steam line - 50 meters of pipe outside power house from 2.6 bar(a) header including stop valves, desuperheater and 8 bar(a) header.
c	2.6 bar (a) steam - 50 meters of pipe outside power house from 2.6 bar (a) header including stop valve, desuperheater and 2.6 bar(a) header.
d	0.14 bar (a) pressure steam piping
e	Tappings fro H.P line to inlet of ejectors.
f	Tapping for H.P. line to gland sealing and from gland sealing to gland condenser outlet.
g	H.P pipe line from steam distribution header to inlet of turbine.
h	M.P pipeline from turbine uncontrolled extraction to M.P header
i	L.P pipiline from turbine controlled extraction to L.P header
j	M.P header
k	LP header
l	Condensate piping
m	De- superheating water piping.
n	Compressed air piping
o	Bearing cooling water piping
p	Turbo -alternator condenser cooling water piping.
q	General usage water

r	Drain water

10.(L) Balance of plant Equipment – Mechanical:

SL.No	Equipment Description	Qty	Dimension each	Unit Weight each	Total weight
		No	LxBxH (m)	Tons	Tons
1	**Cooling water system**				
a.	Main cooling water pumps with drive motor for Condenser	4	4.0 x 1.5 x 1.5	2	8
b.	Auxiliary ooling water pumps	2	2.0 x 1.0 x 1.0	2	4
c.	CT make - up water pumps	2	1.5 x 1.0 x 1.0	1.5	3
e.	RCC Cooling tower with 3 cells	1	45.0 x 20.0 x 14.0	1	
2	**Condensate system**				
a.	CEPs -2 nos for each Unit	4	0.6 x 0.6 x 4.5	2	8
3	**Compressed Air system**				
a.	Reciprocating Air compressors(2 W+1 S)	3	3.5 x 2.0 x 3.5	6	18
b.	Air driers	2	2.5 x 3.0 x 1.5	2	4
c.	Air receiver	1	Dia 1.5 x 4.0	0.5	0.5
4	**Maintenance Equipment**				
a.	EOT Crane 70/20 T	1	TG Hall span 27 m;Length of TG Hall 43 m(after assembly at site)		70
b	Hoist for CW pumps	1			5
c	Hoist for Reciprocating Compressors	1			5
5	**Piping**				
6	Piping, Valves and fittings,insulation and supports for BOP + integral piping				

Note:

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

10.(M) Balance of Plant Equipment Electrical:

Annexure-II A: Tentative Weight Details and Dimensions of Major Equipments

SNo	Description	Unit Weight in kg	Dimension (LxDxH) mm	Make	Qty	Remarks
1.	HT(11kV) switchgear consisting of two VCB type breaker panels (2 Generator incomers with PT), copper bus bars ; breaker ratings 1600Amps, bus rating 1600Amps, fault rating 31.5kA for 0.5 sec.	1200k.g. per Panel	2460wx2355dx 2700h; 3500kgs	**	1 set	Erection and Commissioning by PSR
	LV (400V) switchgear : Common MCC 400V(for two STG sets, BOP TG hall loads), 2000A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	900k.g. per Panel	13710wX1350dX 2460h;	**	1 set	Erection and Commissioning by PSR Total wt: 13500 kg
	LV (380V) switchgear : BOP &CWMCC 400V(for BOP loads inclusive of CW system loads, MCC located at CT pump house), 2000A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	900 k.g. per Panel	12240wx1710dx 2460h;	**	1 set	Erection and Commissioning by PSR Total wt:11700 kg
	LV (380V) switchgear : 110VDCDB (for DC loads), 2000A, 50Hz,50kA for 1 sec cu bus bars with microprocessor based protection relays for incomers in single front modular panels execution	900 k.g. per Panel	4050wx510dx 2460h;	**	1 set	Erection and Commissioning by PSR Total wt: 4500 kg
2.	110V DC System : 110V DC battery system consisting of 110V, 55cells, 2500Ah lead acid tubular battery bank with battery racks and other standard maintenance accessories.	.	4000lx800dx1750 h; 12500kgs	**	1 set	Each cell wt 200kgs approx.

3.	110V DC System : 110V DC battery charger system consisting of SCR type dual FCBC (off line boost charger) 600A charger , DC distribution board with Cu bus bars, 10kA for 1 sec, with MCCB incomers & 15nos. MCB outgoing feeders in non-draw out fixed type execution, and DC starters for DC ELOP	.	5600wx900dx 2400h; 4500kgs	**	1 set	
4.	Weather Proof sheet steel Local control push button stations with/without ammeters		180x300x125; 5.0kg per unit	**	1 lot	

LT POWER CABLE PACKAGE

Sl. No.	Cable Description	Cable Type	Length in Mtrs.	Make	Unit Weight
1.	1.1KV Armoured Cu. Conductor XLPE/PVC Insulated, FRLS outer sheathed.	3CX2.5 sq.mm	2000	**	525 kg/km
2.	1.1KV Armoured Cu. Conductor XLPE/PVC Insulated, FRLS outer sheathed.	3CX16 sq.mm	4000	**	1112 kg/km
3.	1.1KV Armoured Cu. Conductor XLPE XLPE/PVC Insulated, FRLS outer sheathed.	3CX50 sq.mm	2500	**	2272 kg/km
4.	1.1KV Armoured Cu. Conductor XLPE XLPE/PVC Insulated, FRLS outer sheathed.	3CX95 sq.mm	1000	**	4092 kg/km
5.	1.1KV Armoured Cu. Conductor XLPE XLPE/PVC Insulated, FRLS outer sheathed.	4CX2.5 sq.mm	3000	**	620 kg/km
6.	1.1KV Un-armoured Cu. Conductor XLPE/PVC Insulated, FRLS outer sheathed.	4CX4 sq.mm	3000	**	641 kg/km
7.	1.1KV Un-armoured Cu. Conductor XLPE/PVC Insulated, FRLS outer sheathed.	3CX185 sq.mm	4000	**	7713 kg/km

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Annexure-II A: Tentative Weight Details and Dimensions of Major Equipments

CONTROL & SIGNAL CABLES PACKAGE

Sl. No.	Cable Description	Cable Type	Length in Mtrs.	Make	Unit Wt.
1.	1.1kV CU PVC Insulated FRLS Outer Sheathed.	3C x 2.5 Sq. mm	5000	**	500 kg/km
2.	1.1kV CU PVC Insulated FRLS Outer Sheathed.	7C x 1.5 / 2.5 Sq. mm	2000	**	800 kg/km
3.	1.1kV CU PVC Insulated FRLS Outer Sheathed.	12C x 1.5 / 2.5 Sq. mm	2000	**	1000 kg/km
4.	1.1kV CU PVC Insulated FRLS Outer Sheathed.	16C x 1.5 / 2.5 Sq.mm	2500	**	1200 kg/km
5.	1.1kV CU PVC Insulated FRLS Outer Sheathed.	10CX2.5 sq.mm cu	10000	**	900 kg/km

Note:
1. The Cable glands are double compression type made of Nickel plated brass.
2. Cable lugs are of tinned copper suitable for termination of different cross sections of HT/LT/ Control cables. Lugs for power cables shall be of compression type whereas control/signal cables shall be of crimping type.

PRE FABRICATED CABLE TRAYS AND ACCESSORIES

Sl. No.	Description	Quantity	Make	Unit Wt. (kg)
1.	Ladder type cable tray, W=600mm.	500	**	10
2.	Ladder type cable tray, W=300mm.	1500	**	10
3.	Horizontal TEE of 450mm bending radius with coupler plates for Ladder Type Cable tray, w=300mm	10	**	40
4.	Horizontal TEE of 900mm bending radius with coupler plates for Ladder Type Cable tray, w=600mm	5	**	40
5.	Horizontal Elbow of 600mm bending radius with coupler plates for Ladder Type Cable tray, w=300mm	5	**	20
6.	Vertical Elbow – Up of 600mm bending radius with coupler plates for Ladder Type Cable tray, w=300mm	10	**	25
7.	Vertical Elbow – Down of 600mm bending	5	**	

	radius with coupler plates for Ladder Type Cable tray, w=300mm			25
8.	Horizontal Cross of 600mm bending radius with coupler plates for Ladder Type Cable tray, w=300mm	3	**	55
9.	Perforated type cable tray, w=150mm.	750	**	10
10.	Perforated type cable tray, w=50mm.	500	**	5
11.	Cover for Perforated type Cable Tray, W=50mm	300	**	5
12.	Horizontal TEE of 600mm bending radius with coupler plates for Perforated Type Cable tray, w=300mm	5	**	10
13.	Horizontal TEE of 900mm bending radius with coupler plates for Perforated Type Cable tray, w=600mm	5	**	30
14.	Horizontal Elbow of 600mm bending radius with coupler plates for Perforated Type Cable tray, w=300mm	5	**	7.5
15.	Horizontal Elbow of 900mm bending radius with coupler plates for Perforated Type Cable tray, w=600mm	3	**	20
16.	Vertical Elbow – Up of 600mm bending radius with coupler plates for Perforated Type Cable tray, w=300mm	5	**	7.5

STRUCTURAL STEELS

Sl.no	Description	Quantity (K.gs)	Unit Wt. per kG (kg)
1.	ISMC 100x50x6 mm Channels	500	9.2
2.	ISA 50x50x6 mm Runner angles	1200	4.5

Note:

1. These materials are supplied for site to make supports for cable trays (in the buried RCC trenches, Overhead tray arrangement on pipe racks and Cable Tray arrangement in Cellars & other arrangements as applicable for the project. Also these are required for making of frames for PB stations and junction boxes as per the project requirements.
2. All steel structure used for electrical installation shall be painted with one coat of Red Oxide Zinc Chromate Primer of approved shade for indoor installations.

PLANT EARTHING MATERIALS

Sl. No	Description	Quantity (in mtrs)	Make	Remarks
1.	50 x 6 mm Cu Strip	3500	**	For above ground equipment earthing.
2.	1cx120sqmm PVC Cu cable	2500	**	---do---
3.	1cx50sqmm PVC Cu cable	3500		---do---
4.	1cx35sqmm PVC Cu cable	5000		---do---
5.	1cx6sqmm PVC Cu cable	8000		---do---

10.(N)Balance of Plant Equipment – Control & nstrumentation:

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

Sl. No.	Item Description	Applicability (Note1)	Quantity	Remarks
1	Cable Glands (Non –ex proof), Double compression, Ni coated brass/SS.			
	Size- ½" (Weight:200gm/item)	Y	500	
	Size- ¾" (Weight:300gm/item)	Y	300	
	Size-1" (Weight:400gm/item)	Y	300	
	Size-1-1/4" (Weight:500gm/item)	Y	200	
	Size- 1-1/2" (Weight:650gm/item)	N	400	
	Size- 2" (Weight:800gm/item)	N	200	
2	Cable Glands (Ex- proof)), Double compression, Ni coated brass/SS.			
	Size- ½" (Weight:400gm/item)	Y	-	
	Size- ¾" (Weight:600gm/item)	Y	-	
	Size-1" (Weight:700gm/item)	Y	-	
	Size-1-1/4" (Weight:850gm/item)	Y	-	
	Size- 1-1/2" (Weight:950gm/item)	N	-	
	Size- 2" (Weight:1100gm/item)	N	-	
3	Tinned Cable Lugs at both ends			
	Size- for 0.5 mm2 cable (Weight:50gm/item)	Y	3000	
	Size- for 1 mm2 cable (Weight:75gm/item)	N	2000	
	Size- for 1.5 mm2 cable (Weight:100gm/item)	Y	4000	
	Size- for 2.5 mm2 cable (Weight:200gm/item)	Y	2500	
4.	PVC Cable Gland shrouds (covers) (Weight:20gm/item)	Y	As per cable glands	
5	Cable ferruling numbers & characters (Weight:2gm/item)	Y	As required	
6.	Name plates/Tag plates with tying/fixing material for cable's both end & filed instruments (Weight:300gm/item)	Y	1500	@ 100 meters per run of cable
7	Cable Markers (Weight:2gm/item)	Y	10000	@ 100 meters per run of cable
8	Cable Supporting channels/angles (MS) with clamps, from JB to instrument (Weight:4Kg/meter)	Y	500	@25 meters from JB to each inst.
9	2" GI pipe for transmitter and JB mounting (Weight:3Kg/1.5 meter)	Y	1200 Mts	@1.5 meter per transmitter
	2" Pipe Caps (Weight:300gm/item)		500	
	2" GI pipe Elbow (Weight:500gm/item)		500	

10	MS angle iron- 50x50x6 mm for panel base frame & its site fabrication (Weight:4.5Kg/meter)	Y	10 Mts/Panel	As per no of panels
11	MS angle iron- 50x50x6 mm for JB mounting & its site fabrication (Weight:4.5Kg/meter)	Y	4mts/JB	For 30 JB's
12	Impulse line supporting clamps for			@ interval of ¼ meter.
	Pipe-3/4" (Weight:300gm/item)	Y	3000	
	Pipe-1/2" (Weight:200gm/item)	Y	3000	
	Tube-1/4" (Weight:100gm/item)	Y	1500	
13	Laminated JB Terminal Drawing	Y	Qty same as JB's	@ 2 copies per JB
14	Sheet 2mm TH for Canopy for transmitters, MS (Weight:5Kg/meter)	Y	30m x 1m	
15	Gusset Plates (6mm TH) 200mm x 80mm, MS (Weight:6Kg/meter)	Y	1000	
16	Base Plates (6mm TH) 250mm x 250mm, MS (Weight:9Kg/meter)	Y	500	
17	Sheet 2mm TH for Canopy for transmitters, MS (Weight:5Kg/meter)	Y	30m x 1m	
18	40x40x4 mm Angle, MS (Weight:3.5Kg/meter)	Y	500m	
19	35x35x4 mm Angle, MS (Weight:3Kg/meter)	Y	500m	
20	100x50 mm Channel, MS (Weight:5Kg/meter)	Y	100m	
21	6mm TH plate, MS (Weight:2Kg/meter)	Y	20m x 20m	
22	50 x 6 mm Flat, MS (Weight:4Kg/meter)	Y	100m	
23	Nuts & Bolts, Clamps (Weight:100Kgs)	Y	3500	
24	Cable Fastening Material (Weight:20Kgs)	Y	2000	

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

2.1 Instrumentation Package

S No.	Description	Qty
1	Control valves (Approx weight 80 kgs/valve)	20
2	Desuperheaters (Approx weight 100 kgs/item)	5
3	Turbine Bypass system(Approx weight 130 kgs/item)	2

Annexure-II A: Tentative Weight Details and Dimensions of Major Equipments

4	Pressure Safety valves (Approx weight 75 kgs/valve)	8
5	Thermal Safety valves (Approx weight 75 kgs/valve)	6
6	Flow orifice plates (Approx weight 80 kgs/item)	10
7	Flow nozzles (Approx weight 80 kgs/item)	8
8	Mass flow meters (Weight:5Kg/item)	-
9	Pressure gauges (Weight:1.5Kg/item)	40
10	Pressure transmitters (Weight:7Kg/item)	30
11	Pressure switches (Weight:5Kg/ item)	20
12	Diff. pressure gauges (Weight:5Kg/ item)	10
13	Diff. pressure transmitters (Weight:7Kg/ item)	25
14	Diff. pressure switches (Weight:5Kg/ item)	10
15	Temperature gauges (Weight:1Kg/ item)	40
16	RTDs (Weight:2Kg/ item)	15
17	Thermo couples (Weight:2Kg/ item)	20
18	Level gauges (Weight:15Kg/ item)	20
19	Level transmitters (Displacer Type) (Weight:5Kg/ item)	10
20	Level switches (Weight:3Kg/ item)	20
21	Annubars (Weight:30Kg/ item)	3
22	Handheld Calibrator (Weight:750gm/ item)	2
23	Instrument canopies (Weight:10Kg/ item r)	300
24	Erection material for above items	
	(i) ~~needle/~~ globe valve (Weight:2Kg/ item)	150
	(ii)comp & con. Fittings (Weight:300Kgs)	LOT
	(iii) condensing chambers (Weight:2Kg/ item)	50
	(iv) Syphon (Weight:1Kg/ item)	40
	(v) 5 way manifolds (Weight:500gm/item)	25
	(vi) Air filter regulators (Weight:2Kg/ item)	20
	(vii) Thermowells (Weight:1Kg/ item)	70
25	Impulse pipes &tubes for impulse connection for instrument hookup	
	(i) SS tube 12.7 x 2.1 mm (Weight:200gm/meter)	600m
	(ii) SS tube 6.35 x 0.9 mm (Weight:100gm/meter)	200m
	(iii) ERW / SAW Steel tube 60.8 x 3.65 (NB 50) (Weight:500gm/meter)	1200m
	(iv) SS pipe 33.4 x 3.4 mm (Weight:750gm/meter)	500m
	(v) SS pipe 21.3 x 3.7 mm (Weight:500gm/meter)	200m
	(vi) SS pipe 6 x 1 mm (Weight:1000gm/meter)	200m
26	STRL Steel (Std Quality)	
	(i) Strl ST equal angle 50 x 50 x 6 (Weight:4.5Kg/meter)	300 Nos
	(ii) Strl St channel 100 x 50 (Weight:2Kg/meter)	200 Nos
	(iii) Strel St PL 6 (Weight:2Kg/meter)	50 Nos

2.2 Cables Package

S No.	Description	Qty
1	**Signal Cables**	
	1P x 1.5 sq.mm,Individual & Overall shielded (Weight:500gm/meter)	6000m
	1T x1.5 sq.mm,Individual & Overall shielded (Weight:500gm/meter)	4000m
	1P x 16 AWG Cr-Al Extension (Weight:500gm/meter)	4000m
2	**Junction Boxes**	
	60 terminals, weather proof (Weight:60Kg/item)	50No's

2.3 Analysers Package

Erection & Commissioning of analyzers is in Erection Contractor scope.

S No.	Description	Qty
1	CONDUCTIVITY ANALYZERS	1 SET
2	PH ANALYZERS (Weight:30Kgs)	1 SET
3	DISSOLVED OXYGEN ANALYZERS	1 SET

3.0 DCS Package

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

NOTE:

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

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

WEIGHT DETAILS		
Sl.No.	**EQUIPMENT / PACKAGE**	**APPROX. WT. FOR BOTH UNITS (in MT)**
A	**Steam Turbine & Auxiliaries**:	116
B	**Oil Supply System Aux,Pumps and other Auxiliaries :**	23
C	**Surface Condenser**:	76
D	**Steam Jet Air Ejector:**	28.4
E	**Gland steam Condenser:**	2.8
F	**ST Oil Cooler :**	16.4
G	**Generator and Auxiliaries:**	167
H	**STG Air Coolers :**	11.52
I	**Control & Instrumentation for STG & Integral portion :**	
J	**TG Package Control**:	43
K	**Piping**	400
L	**Balance of plant Equipment – Mechanical**	140
M	**Balance of plant Equipment –Electrical**	83
N	**Balance of Plant Equipment – Control & instrumentation**	75
	TOTAL	**1182.12**
	Rounded of:	**1200.00**

INSULATION SCHEDULE

IG090

TENDAHO SUGAR FACTORY (2X20 MW STG)(INTEGRAL + BOP)

PIPING

WO : 1019408208/108512

SL NO	LINE	OPER TEMP DegC	PIPE SIZE in	INS THK mm	PIPE LEN m	ELBOW LR	ELBOW SR	ELBOW 45	EQ TEE	END CAP	FL	BL FL	SQ FL	VI	NI	TEMP STUB	RD SIZE1 in	RD SIZE2 in	RD TEE	REDU CER	VALVE SIZE in	VALVE
1	**GLAND STEAM**																					
1	1 1/2"-AS-21F-001	350	1.5	65	12	6			3								1.5	1		6	1.5	1
			1	60	12	4			1		2						1	.5		3	1	1
			.5	60	3																.5	1
2	4"-GS-11K-002	350	4	90	18	6			2	1						2	4	2		1	4	1
			2	75	1												2	1.5		1	.5	3
			1.5	65	1																	
			1	60	1									2								
			.5	60	6									3								
3	4"-GS-11K-003	350	4	90	6	3			2													
4	4"-GS-11K-004	350	4	90	9	3																
5	1"-GS-11K-005	350	1	60	12	6			3					1							1	1
6	2"-GS-11K-006	350	2	75	18	5			2	1											2	1
2	**CHIMNEY STEAM**																					
1	3"-GS-11K-007	338	3	90	6	2					2						4	3		1		
			2	75	1	1											3	2		1		
2	3"-GS-11K-008	338	3	90	12	3					2						4	3		1		
3	4"-GS-11K-009	338	4	90	12	5			1							1					4	1

INSULATION SCHEDULE

IG090

TENDAHO SUGAR FACTORY (2X20 MW STG)(INTEGRAL + BOP)

PIPING

WO : 1019408208/108512

SL NO	LINE	OPER TEMP DegC	PIPE SIZE in	INS THK mm	PIPE LEN m	ELBOW LR	ELBOW SR	ELBOW 45	EQ TEE	END CAP	FL	BL FL	SQ FL	VI	NI	TEMP STUB	RD SIZE1 in	RD SIZE2 in	RD TEE	REDU CER	VALVE SIZE in	VALVE
4	4"-GS-11K-010	338	4	90	18	5			1								1	.5		2	4	1
			1	60	15	6			2					4							.5	4
			.5	60	6																	
5	4"-GS-11K-011	338	4	90	18	5			1												.5	2
			.5	60	1																	
3	**STEAM DRAIN**																					
1	1"-DR-13K-001	470	1	115	18	5			3								1	.5		1	1	4
2	1"-DR-11K-002	425	1	90	18	5			3								1	.5		1	1	1
3	1"-DR-11K-003	350	1	60	18	5			1								1	.5		1	1	1
4	1"-DR-11K-004	280	1	60	18	5			1								1	.5		1	1	1
5	1"-DR-11K-005	170	1	40	18	5			1								1	.5		1	1	1
6	1"-DR-11K-006	350	1	60	18	5			1								1	.5		1	1	1
7	1"-DR-11K-007	350	1	60	18	5			1								1	.5		1	1	1
4	**VACUUM BREAKER**																					
1	3"-VA-11A-001	100	3	40	12	3															3	1
5	**MAIN STEAM PIPING**																					
1	16"-MS-00-1100-54C-IH	515	16	200	10												16	10		1	1	2
			1	115	3																	

INSULATION SCHEDULE

IG090

TENDAHO SUGAR FACTORY (2X20 MW STG)(INTEGRAL + BOP)

PIPING

WO : 1019408208/108512

SL NO	LINE	OPER TEMP DegC	PIPE SIZE in	INS THK mm	PIPE LEN m	ELBOW LR	ELBOW SR	ELBOW 45	EQ TEE	END CAP	FL	BL FL	SQ FL	VI	NI	TEMP STUB	RD SIZE1 in	RD SIZE2 in	RD TEE	REDU CER	VALVE SIZE in	VALVE
2	10"-MS-01-1101-54C-IH	515	10	175	30	6											10	8		1	2	4
			8	175	3					1							1.5	1		2	1	10
			2	150	15	4																
			1.5	150	36	10																
			1	115	6	2																
6	**EXTRACTION PIPING**																					
1	6"-BP-01-1115-13C-IH	450	6	150	12	3											6	4		1		
			4	125	1												6	3		1		
			3	125	1																	
2	8"-EX-01-1102-33C-IH	480	8	175	30	6		1	1								8	4		2		
			4	150	1																	
3	8"-EX-01-1104-21C-IH	390	8	125	90	15			2								8	6		4		
			6	115	6					1												
4	30"-EX-01-1117-11C-IH	235	30	95	96	6				1							20	14		2	1.5	2
			20	90	30	4		2														
			14	75	1																	
			12	75	3					1												
			1.5	50	6																	

7	**BFP DISCHARGE PIPING**																						
1	2"-DS-00-1102-51C-IH	115	2	40	45	4			3								2	1.5		1			
			1.5	40	1												2	1		1			
			1	25	1																		
			.5	25	1																		
2	1"-DS-01-1118-51C-IH	115	1	25	48	10			13												1	15	
3	1 1/2"-DS-01-1120-51C-IH	115	1.5	40	12	4											1.5	1		2	1.5	3	
			1	25	1																		
8	**AUXILIARY STEAM PIPING**																						
1	1 1/2"-AS-01-1108-54C-IH	510	1.5	150	12	3											1.5	1		1	1.5	3	
			1	115	12	2															1	2	
2	2"-AS-01-1109-23C-IH	480	3	150	3	1											3	2		2	2	1	
			2	150	6	4											2	1		2	1	2	
			1	115	6																		
3	3"-AS-01-1113-21C-IH	360	3	100	12	2				1							3	1.5		1	1	3	
			1.5	90	20	5																	
			1	90	12	2																	

INSULATION VOLUME ESTIMATION SHEET

IG090
1019408208/108512570

TENDAHO SUGAR FACTORY (2X20 MW STG)(INTEGRAL + BOP)

PIPE SIZE (in)	PIPE OD (mm)	INSULATION THICKNESS (mm)	PIPE LENGTH (m)	INSULATION VOLUME (Cu.m)	JACKETING AREA (Sq.m)
30	762	95	107.16	27.42	320.62
20	508	90	37.01	6.26	80.03
16	406.4	200	10.41	3.97	26.38
14	355.6	75	1	.1	1.59
12	323.9	75	3.16	.3	4.71
10	273.1	175	34.13	8.41	66.84
8	219.1	175	37.24	8.07	66.61
8	219.1	125	99.28	13.42	146.37
6	168.3	150	13.53	2.04	19.91
6	168.3	115	6.08	.62	7.61
4	114.3	90	90.67	5.25	83.84
4	114.3	125	1	.09	1.14
4	114.3	150	1	.12	1.3
3	88.9	90	19.32	.97	16.33
3	88.9	150	3.39	.38	4.14
3	88.9	100	12.55	.75	11.39
3	88.9	125	1	.08	1.07
3	88.9	40	12.9	.2	6.84
2	60.3	75	21.3	.68	14.08
2	60.3	150	23.16	2.29	26.23
2	60.3	40	45.96	.58	20.27
1	33.4	60	116.24	2.01	56.03
1	33.4	40	18.57	.17	6.62
1	33.4	90	31.13	1.08	20.88
1	33.4	25	52.94	.24	13.87

INSULATION VOLUME ESTIMATION SHEET

IG090

1019408208/108512570

TENDAHO SUGAR FACTORY (2X20 MW STG)(INTEGRAL + BOP)

PIPE SIZE (in)	PIPE OD (mm)	INSULATION THICKNESS (mm)	PIPE LENGTH (m)	INSULATION VOLUME (Cu.m)	JACKETING AREA (Sq.m)
1	33.4	115	47.89	2.55	39.66
1.5	21.3	65	13.59	.24	6.47
1.5	21.3	50	6.13	.07	2.34
.5	21.3	60	16.64	.25	7.38
.5	21.3	25	1	0	.22
1.5	21.3	150	48.9	3.95	49.38
1.5	21.3	40	13.43	.1	4.27
1.5	21.3	90	20.25	.64	12.81

TOTAL INSULATION VOLUME (Cu. m)	**93.3**	**55.65**	PIPE SIZE <= 14"
		37.65	PIPE SIZE >= 16"
TOTAL JACKETING AREA (Sq. m) :	**1147.23**	**713.9**	PIPE SIZE < 12"
		433.33	PIPE SIZE >= 12" & <=36"
			PIPE SIZE > 36"

NOTE:

12.1. Above schedule of insulation & scope mentioned in tentative only. Entire works have to be completed as per BHEL drawings/documents and site engineers instruction.

12.2. For mentioned Insulation thickness, it will be in multiple layers depending of standard thickness of mattress. Same shall be carried at site as drawings & BHEL site engineers instruction.

13.1 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.

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

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

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

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

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

13.7 EMPLOYMENT OF WORKERS , WORKING TIME ETC.

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

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

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

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

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

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

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

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

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

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

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

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

14.A.0 GENERAL REQUIREMENT:

14.A..1 THE INTENT OF SPECIFICATION IS TO PROVIDE MATERIAL HANDLING AND MATERIALS MANAGEMENT SERVICES ACCORDING TO THE MOST MODERN AND PROVEN TECHNIQUES AND CODES. THE OMISSION OF SPECIFIC REFERENCE TO ANY METHOD, EQUIPMENT OR MATERIALS NECESSARY FOR PROPER AND EFFICIENT UNLOADING, TRANSPORTATION, VERIFICATION, STACKING & PRESERVATION ETC SHALL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF PROVIDING SUCH FACILITIES TO COMPLETE THE WORK WITHOUT ANY EXTRA COMPENSATION.

14.A..2 THE WORK SHALL BE EXECUTED UNDER USUAL CONDITIONS AFFECTING MAJOR THERMAL POWER PROJECTS IN AN EXISTING POWER PLANT AND IN CONJUNCTION WITH NUMEROUS OTHER OPERATIONS AT SITE. THE CONTRACTOR AND HIS PERSONNEL SHALL COOPERATE WITH PERSONNEL OF CUSTOMER'S CONTRACTORS, COORDINATING HIS WORK WITH OTHERS AND PROCEED IN A MANNER THAT SHALL NOT DELAY OR HINDER THE PROGRESS OF WORK AS A WHOLE.

14.A..3 ALL NECESSARY CERTIFICATES AND LICENSES REQUIRED TO CARRY OUT THIS WORK ARE TO BE ARRANGED BY THE CONTRACTOR EXPEDITIOUSLY.

14.A..4 ALL CRANES, TRANSPORT EQUIPMENTS, HANDLING EQUIPMENT, TOOLS, TACKLES, FIXTURES, EQUIPMENT, MANPOWER, SUPERVISORS/ENGINEERS, CONSUMABLES ETC REQUIRED FOR THIS SCOPE OF WORK SHALL BE PROVIDED BY THE CONTRACTOR.

14.A..5 ALL EXPENDITURE INCLUDING TAXES AND INCIDENTALS IN THIS CONNECTION WILL HAVE TO BE BORNE BY THE CONTRACTOR UNLESS OTHERWISE SPECIFIED IN THE RELEVANT CLAUSES ELSEWHERE IN THESE SPECIFICATIONS. THE CONTRACTOR'S QUOTED RATES SHALL INCLUDE ALL SUCH CONTINGENCIES. IN THIS CONNECTION REFER RELEVANT CLAUSE OF GENERAL CONDITIONS OF CONTRACT.

14.A..6 THE CONTRACTOR SHALL PERFORM ALL REQUIRED SERVICES WHICH MAY NOT BE SPECIFIED HEREIN BUT NEVERTHELESS REQUIRED FOR THE COMPLETION OF WORK WITHIN QUOTED RATES.

14.A..7 THE DISTANCES INDICATED IN THESE SPECIFICATIONS ARE ONLY APPROXIMATE. HOWEVER, THE TENDERERS SHOULD ASSESS THE VARIOUS DISTANCES AND SITE CONDITIONS BY VISITING SITE BEFORE SUBMITTING THEIR OFFER. NO ADDITIONAL/EXTRA CLAIMS FOR ANY VARIATION IN THIS REGARD WILL BE ENTERTAINED.

14.A..8 CONTRACTOR SHALL ARRANGE FOR CUTTING AND REMOVAL OF VEGETATION GROWTH/GRASS ETC IN THE STORAGE YARD AS AND WHEN CALLED FOR BY BHEL AS

INCIDENTAL TO WORK. BHEL WILL TAKE APPROPRIATE ACTION AT THE RISK & COST OF THE CONTRACTOR IN CASE OF FAILURE IN THIS REGARD.

14.A..9 IF THE CONTRACTOR OR HIS WORKMEN OR EMPLOYEES BREAK, DEFACE, INJURE OR DESTROY ANY PART OF A BUILDING, ROAD, KERBS, FENCE, ENCLOSURES, WATER PIPES, CABLES, DRAINS, ELECTRIC OR TELEPHONE POSTS OR WIRES, TREES OR ANY OTHER PROPERTY OR TO ANY PART OF ERECTED EQUIPMENTS, STORED COMPONENTS ETC. WITHIN THE PROJECT PREMISES OR OUTSIDE THE CONTRACTOR SHALL MAKE THE SAME GOOD AT HIS OWN EXPENSES.

14. B.0 MATERIAL HANDLING AND MATERIAL MANAGEMENT OF MATERIALS RECEIVED BY ROAD

14.B.1 MAJORITY OF CONSIGNMENTS SHALL REACH SITE DIRECTLY FOR DELIVERY. HOWEVER A GOOD NUMBER OF CONSIGNMENTS SHALL BE BOOKED ON GODOWN DELIVERY BASIS OR DOOR DELIVERY AGAINST CONSIGNEE COPY BASIS, THE PROCEDURE OF MATERIAL COLLECTION SHALL BE ADOPTED AS DETAILED IN RELAVENT CHAPTER

14.B.2 IT WILL BE RESPONSIBILITY OF THE CONTRACTOR TO KEEP IN TOUCH WITH OFFICIALS OF BHEL REGARDING ADVANCE INFORMATION ABOUT ARRIVAL OF CONSIGNMENTS. THE CONTRACTOR SHALL COLLECT LORRY WAY BILLS OR OTHER SUCH DESPATCH DOCUMENTS.

14.B.3 THE CONTRACTOR SHALL REMAIN IN REGULAR CONTACT WITH THE CONCERNED TRANSPORTERS OR BASED ON THE DESPATCH DETAILS OBTAINED AS STATED ABOVE AND MAKE ALL NECESSARY ARRANGEMENTS FOR COLLECTION / RECEIPT OF THE CONSIGNMENT AS APPLICABLE. CONTRACTOR SHALL TAKE ADVANCE ACTION TO DEPLOY ALL NECESSARY RESOURCES FOR LOCAL TRANSPORTATION, HANDLING AND UNLOADING OF THE ANTICIPATED CONSIGNMENTS SO AS TO ENSURE NO LOSS OF TIME UPON ARRIVAL OF THE CONSIGNMENTS.

14.B.4 DETENTION CHARGES/DEMURRAGE ETC, WHICH RESULT DUE TO CONTRACTOR'S FAULT, SHALL BE RECOVERED FROM THE BILL PAYMENT DUE TO THE CONTRACTOR.

14.B.5 IT WOULD BE RESPONSIBILITY OF THE CONTRACTOR TO EXAMINE THE PACKAGES, CONSIGNMENTS ETC. IMMEDIATELY ON ARRIVAL AND BRING TO THE NOTICE OF BHEL AUTHORITIES REGARDING LOSS/DAMAGE/SHORTAGE/DISCREPANCY, IF ANY, OBSERVED IN THE CONSIGNMENTS BEFORE TAKING DELIVERY OF THE SAME.

14.B.6 ANY DISCREPANCY/SHORTAGE/DAMAGE FOUND IN THE CONSIGNMENT AFTER TAKING CLEAN DELIVERY FROM THE CARRIERS SHALL BE THE RESPONSIBILITY OF CONTRACTOR AND THE RESULTANT LOSS TO BHEL ON SUCH ACCOUNT SHALL BE RECOVERABLE FROM THE CONTRACTOR.

14.B.7 CONSIGNMENTS ARE EXPECTED TO ARRIVE DURING ANY TIME OF THE DAY, AND COUNT DOWN FOR DETENTION/DEMMURAGE/WHARFAGE CHARGES IS LIABLE TO START IMMEDIATELY. UNLOADING OF SUCH CONSIGNMENTS MAY BE NECESSITATED EVEN IN THE NIGHT OR ROUND THE CLOCK. CONTRACTOR SHALL ARRANGE TO DEPLOY HIS RESOURCES IMMEDIATELY AND CONTINUE ROUND THE CLOCK ON SUCH OCCASIONS WITHOUT ANY ADDITIONAL COST TO BHEL. CONTRACTOR SHALL ARRANGE ALL NECESSARY RESOURCES INCLUDING SPOT LIGHTING FOR WORKING AT NIGHT. THE CONTRACTOR SHALL SIMILARLY UNLOAD CONSIGNMENTS ARRIVING ON WEEKLY OFF DAYS AND HOLIDAYS.

14.B.8 UNLOADING AT STORAGE AREA/WORK SITE, STACKING AND RESTACKING IF NECESSITY ARISES, OF ALL MATERIALS INCLUDING HEAVY/SOPHISTICATED EQUIPMENTS LIKE HEAVY MOTORS, HEAVY BEARING PEDESTALS, ELECTRICAL PANELS AND TG EQUIPMENT LIKE HEAVY TURBINE COMPONENTS, PUMPS, PANELS, ETC. SHALL BE DONE AS PER STORAGE AND PRESERVATION MANUAL OF RELEVANT EQUIPMENT/COMPONENTS OF BHEL AND/OR AS PER DIRECTIONS OF BHEL ENGINEER.

14.B.9 THE CONTRACTOR SHALL VERIFY THE CONSIGNMENTS IN DETAIL **WITHIN 12 DAYS OF RECEIPT AND REPORT THE DISCREPANCIES IN PRESCRIBED FORMATS NOT LATER THAN 14TH DAY**. ANY LOSS ON ACCOUNT OF DELAYED REPORTING SHALL BE RECOVERABLE FROM CONTRACTORS BILL/ANY PAYMENT DUE. CONTRACTOR SHALL ARRANGE ALL FACILITIES TO OPEN PACKAGES - WHERE REQUIRED IN THE PRESENCE OF BHEL ENGINEER, VERIFY THE CONTENTS, REPACK WHEREVER AND WHENEVER CALLED FOR AND PROPERLY STACK THEM AS PER STORAGE MANUAL OR/AND AS MAY BE DIRECTED BY BHEL.

14.B.10 THE MATERIAL SHALL BE SO STACKED THAT IT SHOULD FACILITATE EASY IDENTIFICATION, RETRIEVAL AND HANDLING FOR ISSUE AS AND WHEN NEED ARISES.

14.B.11 PRE-DEFINED IDENTIFICATION SYSTEM OF THE LOCATIONS OF OPEN STORAGE YARD, SEMI-CLOSED SHED, AND COVERED STORES AS WELL AS STORAGE RACKS HAS TO BE DESIGNED BY THE CONTRACTOR WITH THE APPROVAL OF BHEL. CONTRACTOR SHALL PUT UP PROMINENT IDENTIFICATION BOARDS OF SEGMENTAL LOCATIONS (FOR OPEN AND SEMI-CLOSED STORES) OR INSCRIPTION (ON THE STORAGE RACKS) WITH CLEAR VISIBILITY FROM A DISTANCE. CONTRACTOR SHALL ALSO ARRANGE

TO DISPLAY PLOT PLAN AT REGULAR INTERVALS IN THE COVERED/SEMI-CLOSED/OPEN STORAGE. THE CONTRACTOR SHALL ARRANGE PROPER DISPLAYS/SIGNS FOR VARIOUS REQUIREMENTS AS PER INSTRUCTIONS OF BHEL.

14.B.12 THE CONTRACTOR SHALL EXECUTE THE WORK IN A PROFESSIONAL MANNER. THE STORES SHALL BE HANDLED WITH DUE CARE AND DILIGENCE. THE CONTRACTOR AT HIS RISK AND COST SHALL MAKE GOOD ANY LOSS TO BHEL DUE TO CONTRACTOR'S LAPSE.

14.B.13 FOR ALL CONSIGNMENTS, OBSERVATIONS REGARDING LOSS/DAMAGE/SHORTAGE/ DISCREPANCY IS TO BE RECORDED IN APPROPRIATE DOCUMENT AND INFORMED TO BHEL. IN CASE IT BECOMES NECESSARY TO TAKE '**OPEN DELIVERY'** FROM THE AUTHORITIES, CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR TAKING OPEN DELIVERIES. ALL EXPENSES CONNECTED THEREWITH SHALL BE TO THE ACCOUNT OF CONTRACTOR. ANY LOSS THAT ACCRUES TO BHEL ON ACCOUNT OF SUCH FAILURES SHALL BE DEBITED TO THE CONTRACTOR AND RECOVERY EFFECTED FROM HIS RUNNING BILLS.

14.B.14 HANDLING HEAVIER CONSIGNMENTS: CONTRACTOR SHALL SUBMIT PLAN OF HANDLING OF ALL HEAVY COMPONENTS TO BHEL WELL IN ADVANCE AND OBTAIN PRIOR APPROVAL BEFORE UNLOADING AND STACKING.

14.B.15 SINCE THIS CONTRACT IS INTENDED TO BE A COMPLETE PACKAGE FROM MATERIAL RECEIPT THROUGH ISSUE/TRANSACTIONS RIGHT UPTO MATERIAL RECONCILIATION, FULL RESPONSIBILITY W.R.T THE PROPER UPKEEP OF FACILITIES E.G. COMPUTERS, STATIONARY ITEMS; ENSURING BEFITTING DISCIPLINE AMONG THE STORE ASSISTANTS/STAFF UNDER ITS CONTROL AND ACCOUNTING OF MATERIALS ON STOCK SHALL REST WITH THE CONTRACTOR AT ALL TIMES.

IN THE REMOTE POSSIBILITY OF ANY UNTRACEABLE MATERIAL, CUSTOMARILY BHEL HAS TO PROCESS THE INSURANCE CLAIM. TO KICK OFF SUCH CLAIM, THE CONTRACTOR SHALL RENDER ALL NECESSARY ASSISTANCE INCLUDING AUGMENTATION OF DOCUMENTS (FIR ETC) WITHIN THE QUOTED PRICE AS MAY BE REQUIRED FOR REALIZATION OF THE INSURANCE CLAIM.

14.B.16 THE CONTRACTOR UNDER THIS CONTRACT SHALL COMPLETE INDUCTION OF FOLLOWING CATEGORIES OF RESOURCES WITHIN THE QUOTED RATES, TO ENSURE ESTABLISHMENT OF PROPER **MATERIALS MANAGEMENT** AT THE PROJECT SITE.

14.C.0 RESPONSIBILITIES OF THE CONTRACTOR: -

14.C.(1) RECEIPT & ISSUE :

SCOPE INCLUDES EXECUTION OF VARIOUS ACTIVITIES AS FOLLOWS:

(I) RECEIPT, UNLOADING, CARRYING OUT RECEIPT INSPECTION, DETAILED VERIFICATION, STACKING AND REGULAR STOCK VERIFICATION OF PROJECT MATERIALS AT SITE.

(II) PREPARING VARIOUS REPORTS AT APPROPRIATE STAGES AND REPORTING DAMAGE/LOSS DURING RECEIPT AS WELL AS STORAGE AND ANY OTHER ASSOCIATED RESPONSIBILITY AS ASSIGNED BY BHEL FROM TIME TO TIME. RESPONSIBILITY SHALL INCLUDE THE FOLLOWING ACTIVITIES:

a. EXAMINATION OF INCOMING CONSIGNMENTS TO DETECT ANY LOSS OR SHORTAGE OR OUTWARD DAMAGE AND RECORDING IT ON THE LR/LWB BEFORE MAKING ACKNOWLEDGEMENT OF IT'S RECEIPT FROM THE TRANSPORTER AND SIMULTANEOUSLY OBTAINING ENDORSEMENT OF THE VEHICLE DRIVER ON THE SAME.

b. REPORTING SUCH DISCREPANCY TO BHEL IMMEDIATELY ON RECEIPT OF CONSIGNMENT.

c. ASSISTING BHEL IN LODGING INSURANCE CLAIMS IN RESPECT OF LOSS/DAMAGE AS STATED ABOVE.

(III) ISSUE OF MATERIALS TO ERECTION DEPARTMENT OF AGENCY, PRESERVATION OF STACKED MATERIALS, RE-STACKING/RE-HANDLING AS NECESSARY, PROGRESSIVE AND FINAL RECONCILIATION WITH BHEL AND PREPARATION OF NECESSARY DOCUMENT/ RECORD IN RESPECT OF THESE ACTIVITIES.

(IV) RETURN OF EXCESS/DEFECTIVE MATERIALS BY VARIOUS ERECTION CONTRACTORS OF BHEL.

(V) LOADING AND DISPATCH OF OUTGOING MATERIALS.

EXPECTED MINIMUM QUALITY OF SERVICE

CONTRACTOR SHALL RENDER THE SERVICES BY ENSURING DEPLOYMENT OF REQUISITE PERSONNEL WITH ADEQUATE EDUCATIONAL QUALIFICATION OF ENGINEERING/TECHNICAL BACKGROUND, HAVING THOROUGH EXPERIENCE IN RELATED FIELD TO ENABLE UNDERSTANDING THE INTRICACIES OF AND SPECIAL REQUIREMENTS INVOLVED IN HANDLING OF PROJECT MATERIALS, INCONSISTENCIES AND UNCERTAINTIES ASSOCIATED WITH IN/OUT FLOW OF MATERIALS, PROJECT ACTIVITIES AT ODD HOURS & HOLIDAYS AND IRREGULAR WORKING HOURS. CONTRACTOR SHALL ENSURE PROMPT AND TIMELY AVAILABILITY OF SUCH SERVICES.

14.C.(1) PRESERVATION OF COMPONENTS: -

CONTRACTOR SHALL ARRANGE FOR PRESERVATION OF COMPONENTS AS PER BHEL'S STORAGE AND PRESERVATION MANUAL AND/OR AS PER INSTRUCTIONS OF BHEL ENGINEERS.

ONE OR MORE OF FOLLOWING METHODS SHALL BE ADOPTED FOR PRESERVATION.

1) COATING WITH PRESERVATIVE PAINTS/LUBRICANT/INHIBITORS

2) CAPPING/WRAPPING/COVERING

3) FILLING/IMMERSION IN OIL/CHEMICALS ETC

4) PERIODIC CHECKS/MAINTAINING REQUIRED NITROGEN PRESSURE IN TANKS OF TRANSFORMERS; BHEL WILL PROVIDE THE NITROGEN GAS FOR THE SAME. HOWEVER CONTRACTOR SHALL HANDLE THE CYLINDERS AT STORES, TRANSPORT TO POINT OF USE, FIT-UP REFILLS AND RETURN EMPTY CYLINDERS TO BHEL STORES.

5) HT MOTORS

FOR PRESERVATION OF HT MOTORS, SPACE HEATERS HAVE TO BE KEPT ENERGIZED TO AVOID INGRESS OF MOISTURE. INSULATION RESISTANCE HAS TO BE MEASURED AND RECORDED AT SPECIFIED INTERVALS TILL THESE ARE ISSUED FOR ERECTION. BHEL WILL PROVIDE NECESSARY CABLES, SWITCHES ETC. FOR THIS, HOWEVER CONTRACTOR SHALL INSTALL, OPERATE AND MAINTAIN THE SAME.

CONTRACTOR SHALL ARRANGE ALL PRESERVATIVES LIKE PRESERVATIVE OIL, LUBRICANTS, CHEMICALS, INHIBITORS, CAPS ETC EXCEPT PRIMERS & PAINTS AND PROVIDE RED OXIDE ZINC CHROMATE (ROZC) PRIMER CONFORMING TO INTERNATIONAL STANDARDS

IN THE PROCESS THE IDENTIFICATION MARKS, COMPONENT/MATERIAL CODES, MATCH MARKS MAY HAVE TO BE REPAINTED. THIS WORK AFTER PRESERVATION COMPONENTS ARE TO BE STACKED PROPERLY, PERIODICAL REPORTS ON THE PRESERVATION CARRIED OUT SHOULD BE SUBMITTED TO BHEL IN THE PRESCRIBED FORMATS.

14.C.(3) RECORD KEEPING :–

CONTRACTOR SHALL PREPARE, MAINTAIN AND UPDATE VARIOUS MM RECORDS, ASSOCIATED WITH MATERIALS MANAGEMENT OPERATION OF BHEL AT PROJECT SITE. TWO SYSTEMS OF RECORD KEEPING/CAPTURING INFORMATION & DATA AT VARIOUS STAGES ARE IN VOGUE VIZ.

i. MANUAL LEDGERS & RECORDS.

SOME OF THESE RECORDS ARE MASTER SHIPPING/PACKING LIST, LR/RR REGISTER, DAYBOOK REGISTER, STOCK REGISTER, RECORDS OF ISSUES TO & RETURN OF MATERIALS IN RESPECT OF VARIOUS ERECTION SUBCONTRACTORS, INSURANCE CLAIM RECORDS, PERIODICAL STATUS REPORTS IN VARIOUS FORMATS COVERING DESIRED ASPECTS AND OUTPUT INFORMATION AS PER BHEL/CLIENT'S REQUIREMENT.
CONTRACTOR WILL PROVIDE NECESSARY HARDWARE, SOFTWARE & STATIONARY ETC. AND SHALL TAKE UTMOST CARE TO ENSURE THAT THESE PROPERTIES AND RECORDS ARE PROTECTED FROM ANY DAMAGE OR LOSS. BHEL WILL RECOVER THE COST OF SUCH PROPERTY / EXPENSES OF RESTORATION FROM THE CONTRACTOR WITH 30% OVERHEAD CHARGES IN CASE OF ANY LOSS/DAMAGE ATTRIBUTABLE TO NEGLIGENCE/FAILURE ON CONTRACTOR'S PART.

RE-SHIFTING AND RE-STACKING: OWING TO SEVERAL PROJECT REQUIREMENTS, MANY COMPONENETS MAY HAVE TO BE SHIFTED FROM ORIGINALLY STACKED LOCATIONS TO ELSEWHERE WITHIN THE PROJECT PREMISES FOR THE LEAD DISTANCE NOT EXCEEDING 0.5 KMS. THIS MAY INVOLVE LOADING OF SUCH MATERIAL ONTO A VEHICLE MOVING TO A NEW LOCATION AND UNLOADING/STACKING INCLUDING PROPER INSCRIPTION OF IDENTIFICATION MARKS IF NEEDED. LIST OF ITEMS DULY CERTIFIED BY BHEL OFFICIAL, SHIFTED, UPDATED STOCK RECORDS ABOUT CHANGE IN LOCATION ETC SHALL BE PREPARED/SUBMITTED ALONG WITH THE MONTHLY BILLS

14.D.(1) **RE-STACKING/RE-ARRANGING:** OVER A PERIOD OF TIME RESTACKING/REARRANGING OF THE MATERIALS STACKED EARLIER MAY ARISE DUE TO VARIOUS REASONS. THE HANDLING OF SUCH ITEMS WILL ALSO BE IN THE SCOPE OF THIS CONTRACT. THE RESTACKING/ RE-HANDLING MAY BE NECESSITATED FOR ANY EQUIPMENT/ MATERIALS COVERED WITHIN THIS WORK SPECIFICATION. CONTRACTOR SHALL DEPLOY NECESSARY RESOURCES LIKE MANPOWER, T&P, EQUIPMENTS ETC TO CARRY OUT THIS EXERCISE INCLUDING PROPER INSCRIPTION OF IDENTIFICATION MARKS IF NEEDED. LIST OF ITEMS DULY CERTIFIED BY BHEL OFFICIAL, RESTACKED, UPDATED STOCK RECORDS ABOUT CHANGE IN LOCATION ETC SHALL BE PREPARED/SUBMITTED ALONG WITH THE MONTHLY BILLS

RESTACKING AND REARRANGING SHALL BE APPLICABLE FOR MATERIALS RETURNED BY BHEL'S ERECTION CONTRACTORS ALSO.

14.E INCOMING MATERIALS (SMALLS)

14.E.(1) EVEN THOUGH MAJORITY OF CONSIGNMENTS SHALL REACH SITE DIRECTLY FOR DELIVERY. A GOOD NUMBER OF CONSIGNMENTS SHALL BE BOOKED ON GODOWNS DELIVERY/ DOOR DELIVERY BASIS AGAINST ORIGINAL CONSIGNEE COPY BASIS, THE PROCEDURE OF MATERIAL COLLECTION SHALL BE ADOPTED AS DETAILED HERE BELOW:

14.E.(2) CONTRACTOR SHALL KEEP IN TOUCH WITH OFFICIALS OF BHEL REGARDING ADVANCE INFORMATION ABOUT ARRIVAL OF CONSIGNMENTS. THE CONTRACTOR SHALL COLLECT ORIGINAL LRs/RRs/LORRY WAY BILLS OR OTHER SUCH DISPATCH DOCUMENTS

14.E.(3) THE CONTRACTOR SHALL REMAIN IN REGULAR CONTACT WITH THE CONCERNED TRANSPORTERS BASED ON THE DISPATCH DOCUMENTS OBTAINED AS STATED ABOVE AND MAKE ALL NECESSARY ARRANGEMENTS FOR COLLECTION / RECEIPT OF THE CONSIGNMENT AS APPLICABLE. CONTRACTOR SHALL TAKE ADVANCE ACTION TO DEPLOY ALL NECESSARY RESOURCES FOR LOCAL TRANSPORTATION, HANDLING AND UNLOADING OF THE ANTICIPATED CONSIGNMENTS SO AS TO ENSURE NO LOSS OF TIME UPON ARRIVAL OF THE CONSIGNMENTS. LOADING AT TRANSPORTERS GODOWN, LOCAL TRANSPORT UP TO BHEL/ CLIENT'S STORES/ SITE AND UNLOADING AT STORES/STORAGE YARD/SITE, VERIFICATION AND STACKING SHALL ALSO BE IN THE SCOPE OF CONTRACT.

14.E.(4) DETENTION CHARGES/ DEMURRAGE ETC., WHICH RESULT DUE TO CONTRACTOR'S FAULT, SHALL BE RECOVERED FROM THE BILL PAYMENT DUE TO THE CONTRACTOR.

14.E.(5) FOR THE MATERIALS RECEIVED BY ROAD AND THE CONSIGNMENTS (INCOMING SMALLS) RECEIVED FROM TRANSPORTERS GODOWN/S SHALL BE THE CONTRACTOR'S RESPONSIBILITY

14.F SUPERVISION/SECRETARIAL SERVICES :-

WORKING LEVEL SUPERVISION OF EACH WORK SPOT SHALL BE IN THE SCOPE OF CONTRACTOR UNDER REGULAR MATERIAL HANDLING WORK. ON THE OTHER HAND, SUPERVISORY SERVICES UNDER MM SERVICES SHALL BE AT ONE LEVEL HIGHER THAN WORKING LEVEL SUPERVISION BEING DONE AS CONTRACTOR'S RESPONSIBILITY TOWARDS MATERIAL HANDLING WORK. BHEL REQUIRES THAT THESE SERVICES SHALL BE TO OVERSEE AND MONITOR THE VARIOUS OPERATIONS/ACTIVITIES OF MATERIAL HANDLING PROCESS. MM SUPERVISORY SERVICES SHALL ENSURE SETTING BROAD GUIDELINES TO THE WORKING LEVEL SUPERVISORS, MONITORING PROGRESS OF OVERALL PLAN VIS-À-VIS IMPLEMENTATION, PROPER AND PROMPT TRACEABILITY OF STOCK IN THE STORES, IDENTIFICATION OF CORRECTIVE & PREVENTIVE ACTIONS IN MATERIAL HANDLING & STORAGE WORK AND IMPLEMENTATION OF A SYSTEMATIC PROCESS TO FINALLY ENSURE ACHIEVEMENT OF THE PROJECT SCHEDULE.

15.0 The scope of work under this Tender Specification is further detailed in following clauses:

15.i 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.

15.ii The terminal points decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done. Tentative list of terminal points for E&C is given at **37.0 to 37.9 of this Chapter**

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

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

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

15.vi 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.

15.vii 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.

15.viii 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.

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

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

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

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

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

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

15.xv All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments/ components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc, as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

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

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

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

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

15.xix Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by contractor most expeditiously. No claim for extra payment for such work will be entertained.

15.A.0 COLLECTION & RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

15.A.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.

15.A.2 The contractor shall return all parts, materials, and consumables etc. Remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost of parts/materials used in excess or misused, with departmental charges.

15.A.3 Transportation of lube oil, gas cylinders etc. from stores, is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to

customer/BHEL stores is the responsibility of contractor. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores.

15.B PREPARATION OF FOUNDATIONS AND GROUTING OF EQUIPMENTS

15.B.1 Building foundations and other necessary civil works for supporting structures, equipments etc Will be provided by BHEL. The dimensional accuracy, axes, elevation, levels etc, with reference to benchmarks of foundations and anchor bolt pits have to be checked and logged. Adjustments of foundation level, dressing and chipping of foundation surfaces of all equipments as per BHEL engineer's instructions, should be done by the contractor as part of the work. Dressing and chipping of foundations to the extent of 25mm for achieving proper levels is within the scope of work.

15.B.2 All minor foundations and anchor points/arrangements required for installing erection equipments and winches etc are in the scope of contractor.

15.B.3 Contractor shall carry out scrapping and blue matching of embedded plates/ packers of rotating equipments. Chipping and the bedding of concrete surfaces, fine dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of this work. Scrapping, chipping and matching shall be done so as to achieve prescribed percentage of contact.

15.B.4 Contractor shall provide the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates/steel sheets at site to meet site requirement. Contractor shall cut and prepare and finish the packers and shims by suitably. Machining of the packers wherever necessary, will be arranged by contractor.

15.B.5 Complete grouting of equipments, including anchor/foundation bolts, beneath base, base hollows etc, as may be applicable, is included in the scope of contractor. Arranging all labour, building materials including cement, ordinary Portland as well as quick setting – free flow - non-shrink grouts (e.g. Conbextra GP1 / GP2), form work, shuttering, and any other requirements is in the contractor's scope. Contractor shall obtain approval of BHEL for cement (ordinary as-well-as quick setting) prior to use. Cleaning of foundation surfaces, pocket holes and anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods, are within the scope of this specification/work.

15.B.6 The quick-setting-non-shrink-free-flow special grout mix shall be purchased only from the following BHEL approved vendors:

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

15.B.7 In order to ensure the quality, the major grouting of equipments using any of above grout mixes shall essential be done as per the recommendations of supplier with regard to grout preparation and use of machinery etc under the supervision of the respective supplier. In case supervision services from above suppliers is required then same shall be arranged by contractor at his own cost. However, the contractor shall ensure readiness of equipment for grouting in all respect before such a service is requisitioned and the duration is not prolonged unduly. Contractor shall consult BHEL engineer before deciding upon the vendor for the above.

15.B.8 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.

15.B.9 BHEL will provide only shims and packer plates (either machined or plain) which are received from BHEL's manufacturing plants and go as permanent part of the equipment. Additional packer plates and shims if required will have to be prepared by the contractor out of steel plates, steel sheets to meet site requirements. Necessary steel plates for this purpose shall be arranged by contractor .

15.B.10 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.

15.C.0 EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS

15.C.1 Filling of lubricants for steam turbine, Turbo-Generator and other rotating auxiliaries for purpose of oil flushing, **initial fill up** and subsequent topping up during various stages of work shall be arranged by contractor.

15.C.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.

15.C.3 Cleaning, servicing, lubrication of actuators, pumps, headers, governing system, ESV, Control valves and other valves, tanks, vessels etc. During erection and commissioning stages is in the scope of work. However, gaskets / packing's / lubricants for replacement is in the scope of contractor.

15.C.4 All equipment shall be preserved and protected periodically before and after erection as per advice of BHEL engineer. The journals of steam turbine rotors, generator rotor, motors and other rotating machines shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.

15.C.5 Trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment.

15.C.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.

15.C.7 All racks or assembled units like governing rack, seal oil unit, gas unit, seal oil valve rack, etc supplied from manufacturing units will be tested by contractor at site. This may require transportation, filling of oil, water etc in these racks for carrying out testing of these racks. Defects noticed during testing of these racks will have to be rectified by the contractor free of charges. Further, any pipeline / flanges / fittings not found assembled properly, the same have to be rectified / corrected by the contractor free of charges.

15.D.0 PIPING INSTALLATION

15.D.1 The work on piping systems (Air, Water, Oil, Steam etc.) will include fabrication, laying, edge preparation, fixing & welding of the elbows/fittings/ valves etc On the line, fixing & adjustment of supports/angles shock absorbers and carrying out all other activities/work to complete the erection and also carrying out all pre-commissioning/commissioning operations mentioned in the specification as per BHEL engineers instructions and/or as per approved drawings/documents.

15.D.2 Fittings like bends tees, elbows, reducers, flanges etc, will be supplied as loose items which shall be matched with the corresponding piping. Bends of tube size up to OD 150mm will have to be fabricated at site at no extra cost.

15.D.3 All pipes & tubes shall be sent from units in commercially available lengths. Certain adjustments in length may be necessary while erecting pipelines. The contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges both for High Pressure & Low Pressure (IBR & Non-IBR) pipes and adopting specified heat treatment procedure at no extra cost.

15.D.4 Minor adjustments like removal of ovality in pipes and opening and closing of the bends of pipe by process of heat or correction of any other method approved by BHEL engineer to suit the layout, with specified heat treatment procedure, are in the scope of work.

15.D.5 Flame cutting of piping, where required shall be done as per BHEL engineers instructions.

15.D.6 All drains/ vents/ relief/ escape/ safety valve piping to various tanks/ sewage/ drain canal/ flash box / sump / atmosphere etc From the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.

15.D.7 Connection (either flanged/bolted or welded) of piping to the terminal points/equipments etc Is in the scope of work even though such terminal point/equipment may not form part of this work. All NDE including radiography of joints so made, post-weld-heat-treatment if any, is also within the scope of work/specification. Terminal points works of various piping schemes with customer lines and other contractor's lines. The terminal points work is inclusive of cutting of existing lines, edge preparation, welding/blanking and hook up work.

15.D.8 Erection, Welding & UT/radiography test of BHEL supplied flow nozzles in
15.D.9 customer terminal / tapping points is the part of scope of works. Same will be carried out as per BHEL engineer's instruction at site and shall be binding on Contractor.

15.D.10 Drilling, welding of stubs for drains, vents, instrument tapping points, Welding of attachments for supports etc is part of the work. No additional payment is envisaged for this work .

15.D.11 Erection and installation of Motorised valves & Control Valves shall be treated as part of piping work. No separate rate on this account will be payable.

15.E CONDENSER INSTALLATION

15.E.1 The Surface type condenser weighing about **38 MT** will be dispatched in assembled condition along with tubes. However the other parts like hot well, level instruments Stand & surge pipes, Collar/sleeve pipe, top connecting piece, Stainless steel bellows, foundation parts, air extraction pipes, etc will be sent loose. The assembled condenser is to be handled at site including unloading from the trailer, transportation to site of work, Lifting, positioning & placement on foundation in TG hall by contractor using his own required capacity crane/ suitable arrangement. Assembly and welding of other loose parts like hot-well, collar/sleeve, SS bellows, Stand/Surge pipes, top connecting pipe to turbine exhaust hood counter flange shall be carried out at site. Welding of top connecting pipe to counter flange of turbine exhaust hood will be carried out after final alignment and leveling of turbine, & as per the sequential welding procedure.

15.E.2 It will require cleaning of water side surface, opening of manhole/water box covers & retighten the same after replacement of packing/gaskets, carry out hydraulic test & water fill test on steam side and water side space. All above shall be carried by contractor including attending the leakages (if any) as part of work under this tender specification.

15.E.3 All water side surfaces of water chambers shall be painted only after completion of work and water fill test/ hydro test. Welding & Interfacing of Condenser cooling water connection from customer terminal point will be decided by BHEL Engineer at site and shall be binding on contractor.

15.E.4 For surface preparation, the water boxes etc., may have to be sand/shot blasted to remove all traces of shop coat of primer. The specified primer & protective paint as specified (quality and final dry film thickness) in erection documents shall be applied. Primer and paint shall be provided by the contractor.

15.E.5 Work of painting of condenser surfaces in various area and at various stages of work are specified elsewhere in these specifications.

15.F.0 Generator Installation

15.F.1 Generator along with Rotor, Stator, bearings and brush-less exciter weighing about 51 MT will be dispatched from BHEL Manufacturing Unit in assembled condition. Contractor shall have to carry out further works like unloading, local transportation up to foundation, handling, Lifting, positioning & placement of the generator on foundation in TG hall and further erection, testing & commissioning activities. Other associated items of generator like Air coolers, Line & Neutral side terminal Boxes, Base plates, NGR & Cubicles, AVR panel & other Control/Relay & metering panels and synchronising panels will be supplied loose separately.

15. G.0 Steam Turbine Installation

15.G.1 Steam Turbine along with Casing, Rotor, Bearings, Base frame (permanent) and connected bearing lube oil pipe drain/supply header total weighing **47 MT** will be dispatched in assembled condition, but EOT crane in Power House building is only of 70 MT capacity. In order to make use of EOT crane for lifting of Steam Turbine, contractor may have to dismantle the upper outer casing of assembled turbine. The stud bolts and nuts are to be removed and tightened back by using Bolt Heating machine. Contractor shall carry out this job by using his own T&P (Bolt heating machine shall be provided by BHEL) and fabricate suitable temporary fixture/supports by providing required quantity Steel materials like ISMB beam/angles sections to keep steam turbine on this temporary supports/fixture and re-assemble the turbine on permanent base frame after their lifting and placement on foundation. Contractor shall take utmost care to dismantle, fabricate temporary support/fixture and re-assemble the Steam Turbine and all these works shall be the part of scope of erection. Contractor shall have to

carry out further works like handling, Lifting, positioning & placement of the Steam Turbine on foundation in TG hall and further erection, testing & commissioning works.

15.G.2 Speed reduction Gear Box weighing 8MT approx shall be supplied separately. , Foundation parts / base plates shall be supplied loose. Contractor has to align the Turbine and Generator with Speed reduction Gear Box.

15.G.3 Turbo-visory instruments like proximitors/probes and other associated items/auxiliaries will be sent loose separately. Contractor shall carry out erection, assembly, providing protective flexible conduit as required for such instruments like proximitors/probes, RTDS etc and testing.

15.H.0 Other Rotating Machines Installation

15.H.1 All rotating machinery and equipments shall be cleaned, lubricated, checked for their smooth rotation, if necessary, by dismantling and re-fitting before erection. If in the opinion of BHEL engineer, the equipment is to be checked for clearances, tolerances at any stage of the work or during testing, pre-commissioning, facilities for dismantling, cleaning, lubricating and re-fitting shall be provided by the contractor. All rotating machines shaft shall be rotated periodically to avoid bowing of shafts.

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

15.H.3 Forced lube oil systems of motors and/or rotating equipments form the part of work under this specification

15.H.4 Performance of hydro test of oil coolers and Air coolers of rotating machines, if any, is included in the scope of work.

15.H.5 During charging of system if any leakage is found in HP/LP Heaters, Drain Cooler, Oil cooler, Air cooler, same shall be attended by contractor. BHEL will provide necessary gaskets etc.

15.H.6 Certain rotating machinery after, initial runs and commissioning of the equipment, may have to be hot aligned.

15.H.7 Protective lubricant coats/fill provided on the critical area of equipments have to removed at appropriate stage and regular lubricants, after removal/cleaning of protective coat/fill, as per specifications should be filled/applied. Cleaning/flushing agents/oils will be provided by BHEL.

15.H.8 After initial trial of rotating equipments, control and power cabling for motors and other equipments/instrumentation may have to be disconnected for checking alignment and re-setting / re-alignment / hot-alignment. Contractor will have to arrange labour for disconnecting control and

power cabling as per BHEL engineer's instructions and clearance and reconnect the control and power cabling after re-alignment, quoted tonnage rate shall be inclusive of the above.

15.H.9 Even though rotating machines may be grouted to foundation using non-shrink grout mix, blue matching of packer plates/shims with foundation/between packers/equipment base should be done wherever instructed by BHEL engineer.

15.H.10 Vital clearances of shop assembled rotating machines should be checked at site and adjusted if required.

15.I.0 EOT Crane and Hoists

15.I.1 One number EOT crane of capacity 70MT / 20MT shall be erected, tested and commissioned in Power House Building for handling and maintenance of STG and auxiliaries. The span of the TG hall is 27 meters and the length is 43 meters. EOT package includes main hoist , Aux hoist , gantry rack rails, end carriage, crab, platform, hoisting rope, brakes, motors, helical gear boxes, pendent switches, power cables, limit switches, panels etc. The EOT crane shall cater the need of both STG.

15.I.2 One number Hoist for handling of CW pumps and one number for handling reciprocating compressor each weighing approximately 5 MT, are to be erected, tested and commissioned in CW pump house and Compressor house respectively. CW pump house and Compressor house is common for both the units.

15.J.0 Condensate system

15.J.1 Condensate system consists of Condensate Extraction pumps with drive motor (2 sets) per unit.

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

15.J.2 Associated piping for Condensate system is to be erected and tested as stated under the piping head.

15.1.0 Electrical, Control & Instrumentation

15.1 Installation of Panels .

A. Electrical control panels, electronic control panels, analyzer panels and transmitter racks/enclosure are normally supplied in suit of either one/two/three or loose shipping sections with integral base frame or loose base frame. These panels may have to be installed as stand alone or in group consisting of number of panels in each row, depending upon the plant layout

and foundation arrangement. Panels under the scope of this works are Distributed Control Logic system based.

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

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

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

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

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

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

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

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

15.2 Structural Steel Fabrication And Installation

A Structural steel material like MS angles, channels, beams, flats, plates etc will be supplied in running meter and the same shall be used and fabricate for panel base frame, cable tray

supports, canopies for instruments/panels/ drives/JB's/push buttons etc, instrument/junction box frames, impulse pipe/ instrument air pipe supports and instruments etc as part of scope of work. No separate payment will be made for these woks.

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

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

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

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

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

15.3 Laying Of Pipes/Tubes (Impulse Pipe)

A Installation of impulse pipe of CS/AS/SS material shall include cleaning, air flushing, cutting to length from the running meter, edge preparation, cold bending, welding of sockets/ reducers/ tee/ cross/ isolating valves/union nut and nipples/tail pieces etc, mounting of SS/AS/CS three/five valve manifolds and compression fittings, condensate pot/equalizing vessel, providing supports, clamping, conducting leak test/hydraulic pressure test, painting and other accessories as per instrument hook-up diagram. Piping works shall involve either arc or TIG welding.

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

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

15.4 Instrument & Service Air Piping (GI Pipe)

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

15.5 Copper Tubing/Pipe/SS Tube

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

15.6 Cable Trays/Cable Ducts

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

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

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

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

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

15.7 **Cable Laying (Control / Instrumentation Shielded Cables / Triad Cable / Plug-In Cables / UTP Cables For Ethernet N/W / Armoured / Un-**

Armoured, Single / Multi-Core, PVC / HR PVC / FRLS / Teflon / XLP Insulation)

A Cable laying will include:

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

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

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

D Copper tinned lugs of various type (pin, ring, fork, snap-on), PVC cable ties, PVC ferrules, PVC buttons and tapes, cable identification tag of metallic, clamping and dressing material with hardware, PVC sleeves etc Shall be supplied by the contractor within the quoted rate for cable laying. The quality of material shall be got approved from BHEL engineer prior to their procurement. BHEL shall provide cable gland & cable lugs above 4 sq.mm size.

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

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

G Wherever cable ducts/tray, conduits pass through fire barriers such as walls, floors etc, the openings/ passage shall be sealed using fireproof/ weatherproof sealing compound. Similarly cable entry in panels, MCC/LT/HT breakers, instruments, electrical actuators etc are also required to be sealed. These shall be done as per the specifications of BHEL. Required consumable shall be provided by contractor as scope of work.

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

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

J **Terminations**:

The types of cable terminations are as detailed below:

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

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

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

15.8 **Field Instrumentation**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

15.11 **Calibration, Testing & Commissioning**

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

A **Calibration**

1. Verification of instruments for range, type etc; with respect to instrument schedule, data sheet or system document.
2. Codification of instruments as per system tag numbers
3. Calibration/adjustment of instrument as per system requirement/set values.
4. Providing head correction in case of pressure measuring instruments.
5. Verification of installation of instruments for range, type, tag number as per physical location of process point as per process, instrumentation diagram.
6. Checking and ensuring the proper functioning of instruments.
7. All the recorders shall be made functional with proper chart movement and ink marking.
8. Preparation of calibration certificates and erection commissioning protocols.

B **Erection**

1. Drawing materials from stores, verification, inspection as per shipping list, drawings and documents.
2. Preservation, upkeep, safe custody of the erected equipments till handing over.
3. Verification of installation as per drawing and document for the correctness of cabling, JB's, impulse pipe, various field device, panels, instruments etc
4. Continuity check & IR value of cables.

5. Verification of correction of cable termination with respect to instrument, electrical hook-up diagram, panel interconnection diagram, JB schedule.
6. Checking earthing of the equipments and cable shield wire continuity.
7. Energizing the functional group control panels and field devices.
8. Flushing of impulse pipe before making the instruments process connections through.
9. Any leakage damages to impulse pipe, field device connections, air connections etc shall be fully attended by contractor.

C **Testing & Commissioning**

1. Checking/verification of binary/analogue input and output signal from field and panel and up to recording/indicating instrument/MMI monitors.
2. Adjustment, testing, calibration of pneumatic drive (control valve, trip valve, power cylinder for gate/dampers etc), electrical actuator operated valve/gate/dampers of other functional elements.
3. Checking and operating electrical/pneumatic drive through functional group panel, remote control desk, PMS/MMI, CRT operation and repeatability and smooth operation to be checked.
4. Checking the interlock, protection and alarm for various processes by stimulation of field devices/process changes.
5. Functional check of sub-loop control, sub group control and auto loop and fine-tuning.
6. Adjustment of limit switches/feed back position transmitter checking the LS of actuator for correct position indication and repeatability shall be ensured.
7. Motor IR value measurement, bearing/winding RTD checking, checking the ht load connector, providing assistance for trial run of motor which includes monitoring temperature rise winding/bearing during trial run.
8. Contractor shall prepare calibration/testing report/protocols.
9. During trial run of various systems, the performance of any instrument found erratic, un-satisfactory are required re-adjustment, re-calibration etc. Contractor shall attend to the defects.
10. Observing and checking the performance of the various devices on load/process variation. any deficiencies/defect noticed during the variable load conditions, the same shall be attended promptly.
11. Observe the proper functioning of sub-group/sub-loop control.
12. Check the operation of various control in manual /auto mode for smooth functioning.

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

15.12 BHEL's Customer will arrange the clearances/approval from Statutory Authorities at site including payment of all fees for the works under this tender specifications. Other assistance/drawings and documents as required to enable the customer to obtain the such clearance/approval shall be provided by contractor as part of scope of work. In case these inspections have to be repeated due to default/fault of the contractor and fees have to be paid again, the contractor has to bear the charges.

15.13 Insulation

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

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

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

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

D) Aluminium / GI sheet cladding by fabrication of aluminium/GI sheets to the sizes and shapes specified in drawings, beading, swaging, bevelling of sheets, crowning the sheets, if necessary, fixing the same to supports, over wool insulation with screws / retainers as specified in BHEL drawings or as instructed by BHEL engineer.

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

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

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

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

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

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

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

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

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

15.14 Final Painting

15.14.1 Supply

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

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

15.14.2 Paint application

Application of primer and final paints is in the scope of the contractor. Required T&P, consumables, manpower, supervision is to be arranged by the contractor. Paint specification / grades, Colour shades, colour coding (colour bands, name of equipments / lines, flow-direction arrow, inscription etc.) for identification and specification of various equipments & pipelines shall be as decided by BHEL/ Customer at site.
Dry film thickness of the primer coat shall not be less than 35 microns.

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

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

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

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

The primer shall be compatible with the final paint schedule.

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

15.15 Welding, Heat-Treatment, Radiography and Other Non-Destructive Testing

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

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

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

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

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

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

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

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

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

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

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

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

M) Radiography work of welds connected with this contract shall be arranged by the contractor including provision of services of technician and necessary equipment and consumables like isotope camera, x-ray/gamma ray films, chemicals etc, and necessary labour required such as riggers, helpers, etc, to assist the technician for carrying out the radiography work and making other arrangements such as providing scaffolding, approaches, platform lighting arrangements, etc, at their cost and the work has to be arranged as per the instruction of BHEL. It may please be noted that invariably the radiography work will be carried out after the normal working hours and close of other site activities only.

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

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

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

Q) Wherever required, surface preparation, like smooth grinding of welded area, prior to radiography shall be done as specified. It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all this into account in his offer.

R) **Socket Welding** :

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

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

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

U) The portion of work coming under purview of Boiler inspectorate (e.g. Welding, heat treatment of HP joints) has to be executed as per the latest version of Boiler Regulations and amendments thereof. BHEL will furnish relevent documents for piping & fittings and further approvals of Boiler inspectorate / Statutory Authorities for pre-assembly & erection and other works shall be taken by contractor.

15.16 Testing, Pre-Commissioning, Commissioning and PG Test

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

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

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

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

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

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

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

15.16.8 BHEL will provide oil for flushing, fresh oil for filling & topping, up to trail operation completion. Receipt & handling at store/storage yard and taking the delivery of flushed oil, fresh oil barrels from stores/storage yard for entire operations of flushing, filling & topping up, returning of flushed oil, fresh oil empty/unused/partly used barrels etc. to BHEL Stores after completion of operations shall be the part the scope of work. No separate payment on this account will be made. Similarly, for various pre-commissioning/

commissioning activities / processes mentioned in various clauses, transport of chemicals from BHEL/ customer's stores, charging of chemicals into the system and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of the contractor.

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

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

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

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

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

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

15.16.14 Commissioning activities will continue till the completion of trial run/PG test for erection works. During this period contractor shall make available the services of separate dedicated labour-force comprising of suitable skilled and semi/un-skilled hands along with necessary tools and plants, consumables etc

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

15.16.16

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

15.16.17

Assistance for PG Test

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

15.17 General

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

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

15.18 General Responsibility of the Contractor

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

15.18.2 Preservation & Protection of Components

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

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

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

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

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

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

15.19 Common Requirements

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

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

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

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

15.19.5 Welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow metering & measurement devices, and control valves to be provided on TG & its auxiliaries, integral & external pipe lines covered within the scope of this specification, will also be the responsibility of the contractor and shall be done as per the instructions of BHEL site engineer. The installation of all the above items will be contractor's responsibility even if the :

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

II. Items are supplied by an agency other than BHEL.

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

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

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

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

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

15.20 BHEL's Customer will arrange the clearances/approval from Electrical Inspectorates and other Statutory Authorities at site including payment of all fees for the works under this tender specifications. Other assistance/drawings and documents as required to enable the customer to obtain the such clearance/approval shall be provided by contractor as part of scope of work. In case these inspections have to be repeated due to default/fault of the contractor and fees have to be paid again, the contractor has to bear the charges.

15.21 List of Terminal Points

15.21.1 **STEAM**

S.no	Description	Terminal point
1.0	**Steam**	
1.1	66 bar (a) presure steam	Complete piping with all valves from steam distribution header to turbine inlet is in scope of contractor. Refer drawing No. 2FD -932 Refer drawing No. 5BN-846
1.2	8 bar (a) steam	50 meters of pipe outside power house shall be provided, from 8 bar(a) header including stop valve, desuperheater and and 8 bar(a) header. Refer drawing No. 5BH-846

1.3	2.6 bar (a) Steam	50 meters of pipe outside power house shall be provided, from 2.6 bar(a) header including stop valve, desuperheater and and 2.6 bar(a) header. Refer drawing No. 5BH-846
1.4	Steam for air ejectors	Tapping from HP line to inlet of the ejector included in the supply.
1.5	Gland sealing piping	Tapping for HP line to gland sealing and from gland sealing to gland condenser outlet included.
1.6	Steam at any other pressure	Steam of any other pressure for turbo alternator use if required, completely in contractors scope of supply.

15.21.2 ELECTRICAL

2.0	**Electrical**	
2.1	Generated Power	At the outgoing terminals of HT (11kv) generator circuit breakers for further hook up/evacuation by purchaser (only stand alone Generator breaker panels are offered as specified in Tender specification)
2.2	HT Power	At the terminals of HT motors (CW pumps motors) for feeding power from purchaser HT swithc board (6.6kv) to HT motors/drives 94 nos cooling water pumps, etc.)
2.3	LT power (normal & emergency)	At the incomers feeders terminal of LT 415V MCC switch boards (STG mcc'S & BOP MCC)hook up from purchaser's PCC/MCC (Redundant incomer FDRSFdrs foreach STG mcc AND bop MCC of 1250 amps (min rating) will be provided at Purchasers's PCC/PMCC).
2.4	For control system ;	At the terminal of the stand alone marshalling panel (by bidder0 for interface to DCS system by purchaser.
2.5	Earthing system	At the nearest earthing points/risers for hook up to purchaser's underground earthing system.

2.6	DC Power supply	No TP
2.7	AC UPS power supply	At consumer points

15.21.3

MECHANICAL(Cold/Hot Water)

3.0	**Cold/ Hot Water**	
3.1	Make-up water	From employer's main water tank to cooling tower with pumps, piping is included in the scope.
3.2	Cooling water for condenser,air and oilcooler	Complete system with pumps,piping and fittins is included in the scope

15.21.4 **MECHANICAL (Condensate)**

4.0	**Condensate**	
4.1	Condensate from turbine condenser	At the inlet to Boiler hot well (atmospheric tank) at 8 M elevation and is at 100 M fromm STG hall

15.21.5 **MECHANICAL (De -Super heating water)**

5.0	**De -Super heating water**	
5.1	De- super heating water for 8 and 2.6 bar (a) extraction steam	Tapping from feed water piping located at 8 m from ground level

15.21.6 **MECHANICAL (Drains)**

6.0	**Drains**	
6.1	Drains from bearing cooling water fit for re-circulation	Contractor shall collect all drains to Empolyer's tank installed preferably 1.5 m above ground level outside power house building. Outlet flange on above tank shall be terminal point for contractor.

6.2	Drains for once through use water	Contractor shall collect all drains to Empolyer's tank installed preferably 1.5 m above ground level outside power house building. Outlet flange on above tank shall be terminal point for contractor.

15.21.7 **MECHANICAL (Lubricating and control oil)**

7.0	**Lubricating and control oil**	
7.1	Lubricating and control oil	First fill of all oils & lubricants included in scope. All piping from contractor's main oil tank to inlet of consumption points.

15.21.8 C& I **(Instrumentation and controls)**

8.0	**Instrumentation and controls**	
	Instrumentation :	within BHEL battery limit
	MS Steam :	within BHEL piping supply scope
	IP Steam :	within BHEL piping supply scope
	LP Steam:	within BHEL piping supply scope
	Condensate :	At Dearator inlet

15.21.9 **MECHANICAL (Safety valves exhaust and vents)**

9.0	**Safety valves exhaust and vents**	
9.1	Steam	Vents to be terminated to safe elevation and to outside the building.
9.2	Air	To safe elevation above respective equipment

1. MECHANICAL DRAWINGS

a. Layout of Power House
b. Turbine intergral steam flow P&I diagram.
c. Steam Flow P&I diagram
d. Condensate flow P&I diagram
e. Lube oil P&I diagram
f. Jacking oil scheme
g. TSI scheme

DRAWINGS WERE UPLOADED IN CORRIGENDUM-01