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

NO: BHE/PW/PUR/BELAT-STG/752

RECEIPT OF MATERIALS FROM BHEL / CUSTOMER STORES / STORAGE YARD, HANDLING AT STORES/STORAGE YARD, SITE OF WORK, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, ASSISTANCES FOR COMMISSIONING & TRIAL OPERATION, FINAL PAINTING AND HANDING OF STEAM TURBINE, TURBO-GENERATOR (INCLUDING ITS RECEIPT FROM TRAILER, UNLOADING, HANDLING, LIFTING & PLACEMENT ON FOUNDATION), CONDENSER WITH R.E. JOINTS & BUTTERFLY VALVES, TG INTEGRAL PIPING, EXTERNAL/ REGENERATIVE PIPING INCLUDING, EQUIPMENTS / TANKS / VESSELS, HP & LP HEATERS, POWER CYCLE PUMPS WITH ASSOCIATED AUXILIARIES ETC. INCLUDING BOUGHT OUT ITEMS, PEM PACKAGES LIKE CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, COLTS, PLATE HEAT EXCHANGER, MISC. HOISTS & CHAIN PULLEY BLOCKS, SELF-CLEANING STRAINERS ETC. **OF 1X270 MW THERMAL POWER PLANT**

AT

1X270 MW THERMAL POWER PLANT, BELA

IDEAL ENERGY PROJECTS LIMITED

DISTT- NAGPUR - MAHARASTRA

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

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NIL	Notice Inviting Tender	12	(Part of **Vol-IA-752**)
I-A	Technical Conditions of Contract	90	Vol-IA-752
I-B	Special Conditions of Contract	47	Vol-IBCD-752
I-C	General Conditions of Contract	29	(Part of Vol-IBCD-752)
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II	Price Bid Specification	3	Vol-II-752

Tender Specification Issue Details

Tender Specification No: BHE/PW/PUR/BELAT-STG/752

RECEIPT OF MATERIALS FROM BHEL / CUSTOMER STORES / STORAGE YARD, HANDLING AT STORES/STORAGE YARD, SITE OF WORK, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, ASSISTANCES FOR COMMISSIONING & TRIAL OPERATION, FINAL PAINTING AND HANDING OF STEAM TURBINE, TURBO-GENERATOR (INCLUDING ITS RECEIPT FROM TRAILER, UNLOADING, HANDLING, LIFTING & PLACEMENT ON FOUNDATION), CONDENSER WITH R.E. JOINTS & BUTTERFLY VALVES, TG INTEGRAL PIPING, EXTERNAL/ REGENERATIVE PIPING INCLUDING, EQUIPMENTS / TANKS / VESSELS, HP & LP HEATERS, POWER CYCLE PUMPS WITH ASSOCIATED AUXILIARIES ETC. INCLUDING BOUGHT OUT ITEMS, PEM PACKAGES LIKE CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, COLTS, PLATE HEAT EXCHANGER, MISC. HOISTS & CHAIN PULLEY BLOCKS, SELF-CLEANING STRAINERS ETC. OF 1X270 MW THERMAL POWER PLANT

AT

1X270 MW THERMAL POWER PLANT, BELA
IDEAL ENERGY PROJECTS LIMITED
DISTT- NAGPUR - MAHARASTRA

EARNEST MONEY DEPOSIT: Refer Notice Inviting Tender

LAST DATE FOR TENDER SUBMISSION . Refer Notice Inviting Tender

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

M/s. ……

…….

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

AGM (Purchase)
Place: Nagpur
Date :

752

NOTICE INVITING TENDER

Bharat Heavy Electricals Limited

Ref: BHE/PW/PUR/BELAT-STG/752 Date: 10/08/2010

NOTICE INVITING TENDER (NIT)

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

==========

To

Dear Sir/Madam

Sub : NOTICE INVITING TENDER

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

1.0 Salient Features of NIT

SL NO	ISSUE	DESCRIPTION	
i	**TENDER NUMBER**	**BHE/PW/PUR/BELAT-STG/752**	
ii	**Broad Scope of job**	RECEIPT OF MATERIALS FROM BHEL / CUSTOMER STORES / STORAGE YARD, HANDLING AT STORES/STORAGE YARD, SITE OF WORK, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, ASSISTANCES FOR COMMISSIONING & TRIAL OPERATION, FINAL PAINTING AND HANDING OF STEAM TURBINE, TURBO-GENERATOR (INCLUDING ITS RECEIPT FROM TRAILER, UNLOADING, HANDLING, LIFTING & PLACEMENT ON FOUNDATION), CONDENSER WITH R.E. JOINTS & BUTTERFLY VALVES, TG INTEGRAL PIPING, EXTERNAL/ REGENERATIVE PIPING INCLUDING, EQUIPMENTS / TANKS / VESSELS, HP & LP HEATERS, POWER CYCLE PUMPS WITH ASSOCIATED AUXILIARIES ETC. INCLUDING BOUGHT OUT ITEMS, PEM PACKAGES LIKE CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, COLTS, PLATE HEAT EXCHANGER, MISC. HOISTS & CHAIN PULLEY BLOCKS, SELF-CLEANING STRAINERS ETC. OF 1X270 MW THERMAL POWER PLANT BELA IDEAL ENERGY PROJECTS LIMITED DISTT- NAGPUR - MAHARASTRA	
iii	**DETAILS OF TENDER DOCUMENT**		
a	Volume-IA	*Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings,*	*Applicable*

		Procedures, Bill of Quantities, Terms of payment, etc	
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 :10/08/2010*** ***Closes: 19/08/2010 , Time :16.00 Hrs*** **2. From BHEL website (www.bhel.com)** Tender documents can however be downloaded from website till due date of submission	*Applicable*
v	**DUE DATE & TIME OF OFFER SUBMISSION**	***Date : 20/08/2010 , Time :15.00Hrs*** ***Place : BHEL PS Regional office at :Nagpur*** Tenders being submitted through representative shall be handed over to any of the following BHEL officials after making entry/registration at the reception: SM Borkar/ Sr Manager (Purchase) RK Ranade/ Manager (Purchase) Vivek Kamal/ Engineer(Purchase) Pratish Gee Varghese/Engineer(Purchase)	*Applicable*
vi	**OPENING OF TENDER**	***1 hours after the latest due date and time of Offer submission*** *Notes:* *(1) In case the due date of opening of tender becomes a non-working day, tenders shall be opened on next working day at the same time.* *(2) Bidder may depute representative to witness the opening of tender*	*Applicable*
vii	**EMD AMOUNT**	*Rs 2,00,000/- (Rupees Two Lakhs Only)*	*Applicable*
viii	**COST OF TENDER**	*Rs 2000/-.*	*Applicable*
ix	**LAST DATE FOR SEEKING CLARIFICATION**	*Date: Atleast 5 days before the due date of offer submission* *Along with soft version also, addressing to undersigned & to others as per contact address given below*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**	*Date : Not applicable.*	*Not applicable.*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	*Not Applicable*	*Not Applicable*
xii	**Latest updates**	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com -->Tender Notifications →View Corrigendums) **and not in the newspapers**. Bidders to keep themselves updated with all such information	

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

3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Power Sector Regional HQ at Nagpur issuing the Tender, along with techno-commercial offer. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office as stated above against sl no iv of 1, on any working day; and in such case copy of Cash receipt is to be enclosed with the Techno Commercial offer. Sale of tender Documents shall not take place on National Holidays, holidays declared by Central or State Governments and BHEL PS HQ at NAgpur, Sundays and second/ last Saturdays

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

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

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

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

Sl no	Description	Remarks
	Part-I A	
	ENVELOPE – I superscribed as : PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**:-	
i.	Covering letter/Offer forwarding letter of Tenderer.	
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above. **Note:** a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be placed after document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	

iii.	Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall distinctly bear the name of organization, contact ph no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/ Errata etc pertinent to this NIT.	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	If applicable
vi.	Duly filled-in annexures, formats etc as required under this Tender Specification/NIT	
vii.	Notice inviting Tender (NIT)	
viii.	Volume – I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume – I B : Special Conditions of Contract (SCC)	
x.	Volume – I C : General Conditions of Contract (GCC)	
xi.	Volume – I D : Forms & Procedures	
xii.	Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item	
xiii.	Any other details preferred by bidder with proper indexing.	

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

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

	OUTER COVER	
	ENVELOPE-IV (MAIN ENVELOPE / OUTER ENVELOPE) superscribed as: TECHNO-COMMERCIAL BID, PRICE BID & EMD TENDER NO: NAME OF WORK: PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING:**	
i	o Envelopes I o Envelopes II o Envelopes III	

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

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

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

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

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

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

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

II. **Weightage "B" for Quarterly Performance Reports of Vendors**: This shall be based on the averages of the net weighted score obtained by the bidder for the jobs under execution (excluding works not

commenced) for the quarter previous to the last quarter reckoned from the date of latest due date of submission, in all four Regions i.e BHEL PSER, PSSR, PSWR & PSNR, in the following manner.

i). Ratings by Power Sector Region:

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

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

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

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

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

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

IV. **Explanatory note**:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

26.0 Order of Precedence

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

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

for BHARAT HEAVY ELECTRICALS LTD

AGM(Purchase)

Enclosure

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

ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	RECEIPT OF MATERIALS FROM BHEL / CUSTOMER STORES / STORAGE YARD, HANDLING AT STORES/STORAGE YARD, SITE OF WORK, TRANSPORTATION TO SITE OF WORK, ERECTION, TESTING, ASSISTANCES FOR COMMISSIONING & TRIAL OPERATION, FINAL PAINTING AND HANDING OF STEAM TURBINE, TURBO-GENERATOR (INCLUDING ITS RECEIPT FROM TRAILER, UNLOADING, HANDLING, LIFTING & PLACEMENT ON FOUNDATION), CONDENSER WITH R.E. JOINTS & BUTTERFLY VALVES, TG INTEGRAL PIPING, EXTERNAL/ REGENERATIVE PIPING INCLUDING, EQUIPMENTS / TANKS / VESSELS, HP & LP HEATERS, POWER CYCLE PUMPS WITH ASSOCIATED AUXILIARIES ETC. INCLUDING BOUGHT OUT ITEMS, PEM PACKAGES LIKE CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, COLTS, PLATE HEAT EXCHANGER, MISC. HOISTS & CHAIN PULLEY BLOCKS, SELF-CLEANING STRAINERS ETC. ***OF 1X270 MW THERMAL POWER PLANT*** BELA IDEAL ENERGY PROJECTS LIMITEDDISTT- NAGPUR - MAHARASTRA
TENDER NO	**BHE/PW/PUR/BELAT-STG/752**

SL NO	**PRE QUALIFICATION CRITERIA**	**Bidders claim in respect of fulfilling the PQR Criteria**	
		Name and Description of qualifying criteria	Page no of supporting document
A	Submission of Integrity Pact duly signed (if applicable)	**NOT APPLICABLE**	
B	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)	**Shall be applicable for Bid Evaluation after 1st Jan 2011**	
C	**Technical** **C)** Bidder must have, achieved any one of the following: **C.1)** Bidder must have, in last seven years as on 31/07/2010, executed Erection, Testing and Commissioning (Upto Synchronization of the Unit or beyond) of any one of the following listed works : **C.1.1)** One set of Steam Turbine Generator of 100 MW or higher rating OR **C.1.2)** Two sets of Steam Turbine Generators of 60 MW or higher rating **C.2)** Bidder should have been Techno Commercially Qualified for E&C works of one Steam Turbine Generator of 190 MW or higher rated unit by any of the Power Sector Region of BHEL, in the last 3(Three) years as on 31/07/2010 **C.3)** Bidder should be empanelled with BHEL-PSWR for M-TG-2 (Turbines rating 100 MW to 300 MW) OR M-TG-3 (Turbines Rating above 300 MW) category.		

D 1	**Financial** **TURNOVER** Bidders must have achieved an average annual financial turnover (Audited) of Rs 141 Lakhs or more over last three Financial Years (FY) i.e 2007-08, 2008-2009, 2009-2010 if Annual Accounts for FY 2009-10 are audited or for 2006-2007, 2007-2008 and 2008-2009 if not audited		
2	NETWORTH Net worth of bidder based on Audited Accounts of 2009-10 (**OR** 2008-09 incase accounts for FY 09-10 has not been audited) should be higher than 50% of paid up capital in case of companies.		
3	PROFIT Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three years defined in 'D1 above based on latest Audited Accounts.		
E	Approval of Customer 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.	**APPLICABLE**	
F	Consortium criteria (if applicable)	**NOT APPLICABLE**	
	Explanatory Notes for QR 'A' 1. The word 'executed' means the bidder should have achieved the criteria specified in the QR even if the total contract has not been completed or closed 2. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as given above along with all annexures ~~(a) The word 'executing' means ----------~~		

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

ANNEXURE - 2

CHECK LIST

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

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

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

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

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TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CONTENTS

Following Drawings/Sketches are attached at the end of VOl IA 'Technical Conditions of Contract':

- Cross Section of T.G. hall : PE-DG-328-100-M006
- T.G. Hall Equipment layout Plan at 9.0 M: PE-DG-328-100-M005
- Generator Outline: 0-139-00-01341

1.0	**Project Information**
1.1	**BACKGROUND** BHEL's Client M/s IDEAL ENERGY PROJECTS Ltd (IEPL) is installing Pulverized Coal based Power Plant at BELA Thermal Power Plant, Distt-Nagpur , Maharashtra. The said client has undertaken the installation of one power generation unit of 270 MW rating. 1. Owner M/s Ideal Energy Projects Limited 2. Owner's Consultant M/s DCPL 3. Project Title 1X270 MW TPP, BELA, Nagpur **LOCATION AND APPROACH :** 1. Location : Village – Bela, Dist- Nagpur, around 51 kms from Nagpur town, State – Maharashtra , India. 2. Address Details : **1x270 MW Thermal Power Plant** **Ideal Energy Projects Limited, Bela** **Near Purty Sugar Factory** **P.O.-Bela, Dist.- Nagpur** **Pin Code- 441 115** **Maharashtra State, India"** 3. GPS Co-ordinates : Latitude: 20º 18'16.42''N & Longitude : 79º03'17.05''E 4. Nearest Port : Mumbai 5. Nearest Air Port : Nagpur, at a distance of around 51 kms. 6. Approach Road : NH-7, at a distance of around 12 kms. from project site. 7. Railway Approach : Nearest Railway Station Borkeri …… (about 12 kms. From project site) **Meterological Data:** 1. **Ambient Air Temperature** a. Max. ambient temperature : 45Deg.C b. Min. ambient temperature : 7 Deg.C 2. **Relative Humidity**

	a. Annual mean humidity 65% 3. **Rainfall** a. Annual Average – 1000 mm b. Period :June to August 4. **Seismic data** a. Zone - Zone II as per IS: 1893-2002 5. **Wind Data** : a . Max wind velocity experienced : 169.2 kms/hr b Wind Direction : South and South west The Bidder shall visit site and get acquainted himself with the conditions prevailing at site before submission of the bid. The informations given here in under are for general guidance and shall not be contractually binding on BHEL/ Owner. All relevant site datas / informations as may be necessary shall have to be obtained /collected by the Bidder.

2.0 SCOPE OF WORK

The scope of work under the specification covers receipt of materials from BHEL / Customer stores / Storage Yard, Handling at Stores / Storage Yard, Site of work, Transportation to site of work, Erection, Testing, Assistance for Commissioning & Trial operation, Final Painting, and Handing over of Steam Turbine, Turbo-Generator (Including its receipt from Trailer, Unloading, Handling, Lifting & Placement on foundation), Condenser with R.E. Joints & Butterfly valves, TG Integral Piping, External/ Regenerative Piping, Equipments/ Tanks/ Vessels, HP & LP Haters, Power Cycle Pumps with Associated Auxiliaries etc. including Bought Out Items, PEM Packages like Central Lube Oil System, Misc. Pumps, COLTS, Plate Heat Exchangers, Misc. Hoists & Chain Pulley Blocks, Self cleaning Strainers etc. of 1X270 MW Thermal Power Plant, Ideal Energy Projects Limited, Bela, Nagpur (Maharashtra) project

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	Contractor shall obtain concerned local administrative authorities approval for const. of his field office and pay the fees and charges as may be applicable
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	
h	Local			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
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, as available near by the Project area.
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity For construction purposes** of Voltage 415/440 V			FREE
a	Single point source	Yes		At one point near the erection site
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**		Yes	
a	Single point source		Yes	

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
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**			
a	Single point source		yes	
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**			FREE
a	Making the water available at single point	Yes		In case of inadequate supply / non-availability of

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	Bidder	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	construction water from customer, contractor shall have to arrange construction water at his own expenses .
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**			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			

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

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

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

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

A: TOOL & PLANTS

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

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

- JACKS OF 100 T CAPACITY 04 NOS (WITH HAND OPERATED PUMPS)
- JACKS OF 50 T CAPACITY 04 NOS. (- DO -)
- JACKS OF 63 T CAPACITY 04 NOS. (- DO -)
- GANG OPERATED JACKS CONSISTING OF THE FOLLOWING:
- JACKS OF 100 T CAPACITY 04 NOS (HAVING BROAD BASE ONE INCH LIFT)
- LONG HIGH PRESSURE HOSES 12 NOS.(FOR GENERATOR ALIGNMENT)

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

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

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

23. SLINGS FOR LP TURBINE ROTOR 01 SET

24. SLINGS FOR HP TURBINE MODULE 01 SET

25. SLINGS FOR GENERATOR ROTOR 01 SET

26. BOLT STRETCHING DEVICE AS PER REQUIREMENT
(FOR TURBINE & GENERATOR FDN. BOLTS)

27. LONG FEELER GAUGE SET AS PER REQUIREMENT

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

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

30. Pressurising Pump for Hydraulic Testing of Pipe lines : 450 Kg/Cm2 with flow rate of 25 to 30 LPM with starter & Cables As per requirement

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

32. Strands & Jacks / Lift & Shift arrangement for Generator Stator Lifting along with Lifting slings.

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

Note:

1

BHEL shall not provide any Chemical Cleaning /Flushing pumps / equipments as required for Chemical cleaning/flushing of piping and related equipments / systems. These Chemical pumps of suitable capacity along with motor starters, cables etc. shall have to be provided by the contractor as part of scope of work. Contractor shall arrange / provide all Chemical cleaning arrangements as per requirement and instructions of BHEL engineer without any delay/time lapse.

2

Strand and Jack/Lift & Shift arrangement for lifting and placement of Generator Stator:

Contractor shall arrange complete set up of Strand and Jacks/Lift & Shift arrangements and all Tools & Tackles as required for lifting and placement of Generator Stator to its designed elevation & foundation including the services of expert execution and supervision. BHEL/Client shall not provide any Crane / Lifting Arrangements for Generator Stator handling & erection. Method for Handling of

Generator Stator and lifting & placement to required elevation and foundation is the scope of responsibility. Generator Stator shall have to be lifted & placed on designated foundation with Strand and Jacks/Lift & Shift method

Sleepers & Jack or Sand Bag & Jack or any methods/arrangement other than the one specified above for Lifting & Placement of Generator Stator will not be accepted.

3
Complete set of hydraulic jacks of 50 tonnes and 100 tonnes capacity shall be arranged by the contractor for use during erection and commissioning of Turbine. Also, hydraulic jacks of 100 tonnes and 63 tonnes capacity along with long high pressure hoses of suitable length for Generator erection and alignment shall be arranged by the contractor. These jacks shall of internationally reputed make, highly reliable and maintained in excellent working condition. They shall be tested for safe working before deploying in actual work. These jacks shall not be permitted for use anywhere other than Steam Turbine / Generator area.

4
All jack bolts that are required during erection for carrying out roll-check etc. will have to be arranged by the contractor. No jack bolts will be provided by BHEL.

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

5
Contractor has to arrange slings of all sizes for completing the works covered under these specifications including the special slings for Generator Stator Lifting/Handling.

B: MEASURING AND MONITORING DEVISES (MMD):

AS PER REQUIREMENT TO BE FINALIZED AT SITE.

NOTE :

THIS ABOVE LIST IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. QUANTITIES INDICATED ABOVE ARE ONLY THE MINIMUM REQUIRED. CONTRACTOR SHALL DEPLOY ALL NECESSARY T&P TO MEET THE SCHEDULES & AS PRESCRIBED BY BHEL ENGINEER AND REQUIRED FOR COMPLETION OF WORK.

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

SN	Description	Capacity	Remarks
1	EOT Crane in TG hall 100/25 MT capacity	01 No.	Customer EOT crane for handling and Erection between **A-B Bay of TG building**, subject to its capacity & accessibility / approachability.
2	Crawler Crane	100/120 MT (Hired)	On sharing basis for erection as per absolute decision of BHEL Engineer I/C at site subject to its availability / spareability, approachability, accessibility and capacity.
3	Crawler Crane	75 / 80 MT (Hired)	On sharing basis for erection as per absolute decision of BHEL Engineer I/C at site subject to its availability / spareability, approachability, accessibility and capacity.

Note:

1. All these cranes are to be used on sharing basis with other agencies working in the project. Contractor shall furnish his requisition for particular crane to BHEL sufficiently in advance to ensure proper planning and timely deployment. Decision of BHEL for allocation of cranes to different agencies in the project will be based on the overall interest of the project and priority of the activity. Such decision of BHEL will be binding on the contractor.

2. Contractor shall make necessary arrangements like laying of sleepers; minor earth filling & consolidation; assembly & dismantling of heavy lift attachment, boom, jib etc for movement and operation of the crane.

3. Contractor shall transport this equipment from BHEL stores, install, operate, carry out preventive as well as breakdown maintenance, dismantle after use and return to BHEL stores.

4. BHEL's cranes depending on their accessibility will also be utilised in BHEL storage yard for unloading & loading of equipments whose weight as a single equipment / single item is more than 40 MT (excluding the Generator Stator).

5. BHEL will not provide any crane / arrangement for unloading & handling of Generator Stator. Contractor shall make his complete arrangements for responsibility and carry out the liaisoning and follow up with transporters, filling of ditches/levelling etc. for marching of trailer to unload at suitable location/point of lifting near the TG building, Shifting/dragging

of Generator Stator by providing required arrangements like rails/plates/sleepers etc. (as per requirement), arranging the Strand And Jacks/Lift & Shift arrangements & their assembly /installation with expert supervision till lifting & placement of Generator, making resting Foundations/Footings to suit the installation of his Strand and Jack arrangements (as required) and Lifting & Placement of Generator Stator to required/designed foundation/elevation)

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

   EOT crane will be used on sharing basis by other agencies working within the TG hall under the instruction of BHEL Engineer In-charge. Contractor has to plan his activities well in advance and inform BHEL engineer In-charge / Construction Manager the date of actual use. Contractor shall extend the services of EOT crane operator with EOT crane for the other agencies as per instruction of BHEL Engineer In-charge at site as part of scope of work to whom, the services of EOT crane has been allotted/ recommended by BHEL Engineer In-charge.

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

   HP Heaters (Horizontal Type), LP Heaters (Horizontal Type) are to be located in B-C Bay of TG Building at their designed foundations which are at elevation of 15.8M & 09.30M respectively. The customer's EOT crane 100/25T is located in A-B Bay of TG Building and as such this EOT crane may not have direct accessibility /approachability to handle and place these equipments to their foundations. Contractor may make use of this EOT crane as per prior approval of BHEL/Customer engineer subject to its readiness and approachability to carry out lifting and placement of these equipments to nearest location by using additional platform etc. along with dragging arrangements, wherever required. Contractor shall make his own arrangement of such requirements for shifting/dragging/making additional platforms etc. to place and assembled/ install these equipments to their respective designed foundations & elevations as part of scope of work. BHEL / Customer shall not provide any additional arrangements/infrastructure for this purpose.

   Boiler feed pumps with Auxiliaries are to be installed/erection between B-C Bay of TG Building at an elevation about 00.30M. TG hall crane which is located in A-B row will not be accessible for erection and handling of these BFPs. Contractor shall make his own arrangement for placement and installation of these equipments as part of scope of work so that the progress of work is not affected.

6.1 TIME SCHEDULE & MOBILIZATION

6.1.1 INITIAL MOBILIZATION AND TENTATIVE SCHEDULE

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

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

ACTIVITY	**TENTATIVE SCHEDULE OF COMPLETION #**
Turbine Box up	10th month
Completion of Oil Flushing completion	12th month
Barring Gear	14th month
Rolling & Synchronisation	15h month
Completion of Trial Operation	17 th month
Completion of commercial operation	18th month
Completion of all facilities	20th month

 # -Indicates the No. of months from the start of contract period.

6.1.2

In order to meet above schedule and other intermediate targets/activities as set by BHEL Engineer In charge at site, to meet customer requirements/project schedule, contractor shall arrange all necessary resources and work force in consultation with BHEL engineer at site to undertake works simultaneously in all possible work fronts as made available to contractor. Contractor shall discuss for initial mobilisation to commence the Erection & Commissioning work at site with BEHL Engineer & mobilise the resources accordingly including augmenting the resources as per direction of BHEL Engineer to achieve the intermittent milestone date. Mutually agreed programme shall be drawn by the contractor primarily to achieve the schedule as aforesaid, taking into account available and anticipated materials inflow and other inputs. This may have to be further tuned with shorter duration programmes as per requirement to suit the project schedule and commitments to customer.

6.1.3

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

6.1.4 Start of Contract Period and Duration

The total contract period for completion of entire work shall be 20 **(Twenty) months** from the start of erection. Erection of the first major equipment, as identified by BHEL site-in-charge, on its permanent location/ foundation shall be reckoned as the start of contract period. Small components like packer plates, insert plates, etc. will not be considered for this purpose.

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

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

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

FOR STG

		CND (1)	TUR (2)	GEN (3)	PMP & AUX/ EQ (4)	HEATERS AND DEAERATORS (5)	MISCELLANEOUS ITEMS (6)	INTEGRAL PPG (7)	PIPING (8) ON PER MT BASIS
	Overall weightage for each area out of lumpsum value quoted for STG	**20%**	**18%**	**15%**	**13%**	**11%**	**7%**	**16%**	
Sl. No.	**Activity/Work Description**	**%**							
I	**PRO RATA PAYMENTS (85%)**								
1	**CONDENSER (weightage 20%)**								
1.1	PREPARATION OF FOUNDATION	2%			--			--	
1.2	PLACEMENT, ALIGNMENT, ASSEMBLY AND WELDING OF BOTTOM PLATE SEGMENTS, HOT WELL, NDT AND SPRING ELEMENTS PLACEMENT & GROUTING.	10%			--			--	
1.3	ASSEMBLY AND POSITIONING OF WATER CHAMBER, SIDE PLATES, BOTTOM PLATES, WELDING AND NDT INCLUDING HINGE ASSY	12%		--	--			--	
1.4	ASSEMBLY, ALIGNMENT AND WELDING & NDT OF TUBE SUPPORT PLATES AND INTERNALS LIKE BAFFLE PLATES, AIR EVACUATION PIPES ETC.	13%		--	--			--	
1.5	ASSEMBLY, WELDING & NDT OF DOME WALLS AND DOME STIFFENERS, EXTRACTION PIPING AND STEAM THROW DEVICE, LPH-1 SUPPORT ETC.	10%		--	--			--	
1.6	INSERTION, EXPANSION, CUTTING ETC. OF CONDENSER TUBES	15%		--	--			--	
1.9	HYDRO TEST OF STEAM AND WATER SIDE	10%		--	--			--	
1.10	WELDING OF CONDENSER NECK JOINT AND NDT& COMPLETION OF BALANCE WORKS	10%		--	--			--	
1.11	ERECTION, COMMISSIONING, LOAD TESTING OF CONDENSER WATER BOX HANDLING SYSTEM	3%		--	--			--	

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

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

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

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

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

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

TAXES, DUTIES, LEVIES

8.1.0 TAXES, DUTIES, LEVIES

8.1.1

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

8.1.2 Service Tax & Cess on Service Tax

Service Tax and Cess on Service Tax as applicable on output Services are excluded from contractor's scope; therefore contractor's price/rates shall be **exclusive** of Service Tax and Cess on Output Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and deposit the same with the concerned tax authorities, such applicable amount will be paid by BHEL.

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

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

All the four conditions shall be fulfilled in the invoice before release of service tax payment.
Contractor shall obtain prior written consent from BHEL before billing the amount towards such taxes.

With introduction of Cenvat Credit Rules 2004, which came into force w.e.f. 10.09.2004, Excise Duty paid on Input Goods including Capital Goods and Service Tax paid on Input Services that are used for providing the output services can be taken credit of against the Service Tax payable on output services. However BHEL may opt for availing the abatement provision in which case cenvat credit may not be available on input duty.

8.1.3 VAT (Sales Tax /WCT)

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

8.1.4 Modalities of Tax Incidence on BHEL

Wherever the relevant tax laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL will have the right to adopt the appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor.

8.1.5 New Taxes/Levies

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

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

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

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

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

9.3
Servicing and assembly of control valves/regulating valves, fixing of filter elements/strainers & steam blowing & blanking devices in LP bypass, M.S. Strainer, HRH Strainer and blanking of LP bypass, ESV & IV System, for hydro test, steam blowing etc is the part of scope of work.

9.4
Erection, commissioning and testing of LP Bypass system valves and Cold Re-heat Non-return valve with respective oil system and accessories are included under the scope of tender specification. Erection LP Bypass valves and CRH NRV shall involve installation of valves on temporary supports to provide reference/connection of LP Bypass and CRH Critical piping which will be erected by other agency, dismantle the valves/ remove valve internals & fix steam blowing devices (as advised by BHEL Engineer at site) to make Steam blowing connection and install the valves permanently/re-fix the internals on permanent supports for final connection. Oil system shall require erection of tanks, Motors, Power Cylinder, oil piping, oil flushing of system etc. till final commissioning and handing of system. All above are under the scope of contractor. BHEL shall provide oil for flushing and initial fill, topping up free of charges. Contractor shall collect the oil barrels from BHEL stores/storage yard and return the empty container/left over oil barrels (flushed oil / fresh oil) to BHEL stores after completion of work.

9.5
It may be specifically noted that it should not be construed or claimed by the contractor that with the technical specification and "exclusions and/or inclusions" detailed in this tender specification, BHEL has covered the entire scope of work and/or the details thereof to be executed by the contractor.

9.6
Complete control fluid systems of LP Bypass and Governing System are included in this specification. Associated assistance for commissioning like lube oil flushing, filling and topping up of lube oil etc shall be part of the work.

9.7
Assembly and Installation of Strainer Elements of MS and HRH system is within the scope of work. Cleaning of these strainer elements during trial operation of machine is also covered under this scope.

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

9.9

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

9.10

Misc. Hoists & chain pulley blocks etc.- lifting equipments along with associated items / fittings are under the scope of this tender specification. These equipments have to be installed at different locations and elevations. The scope of works in this regard shall include the following:-

- Handling at stores & storage yard & taking over delivery from BHEL of components of the cranes & other lifting equipments and test load etc.
- Transportation to site of work including via pre-assembly yard, if needed.
- Pre-erection checks, pre-assembly if needed.
- Erection, alignment, welding, bolting, fastening of all components of the cranes/lifting equipments including electric bus bards/trailing cables, pendants etc.
- Dry run test at no load.
- Load tests at different loads as advised by BHEL at site.
- Over load test at designated load as required.
- Return of surplus components, test loads etc to BHEL stores with due reconciliation.

Priority of erection & commissioning of these equipments shall be as per instruction and priority of BHEL at site and decision of BHEL site In-charge at site shall be final and binding on contractor.

9.12 Consumables

9.12.1

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

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

9.12.2
All consumables to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports / certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

9.12.3 PRIMERS & PAINTS
All primers and paints are in the contractor's scope unless provided otherwise in BHEL scope as free issue.

10.0 EXLUSIONS

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

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

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

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

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

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

F) Copper tubing work.

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

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

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

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

K) Final painting.

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

A) STEAM TURBINE

1. Steam Turbine consists of 3 cylinders (HP/IP/LP) including the following :
    a. Sole / Base Plates & Foundation Holding Bolts.
    b. Bearing Pedestals.
    c. ESV & CV, IV & CV, LPBP Valves with EHA & Suspensions, LP BP water injection valves, LP Bypass valves with Oil System equipments and oil piping.
    d. Steam Strainer Housing & Strainer Elements for Main Steam & Re-heat Steam Lines.
    e. Hydraulic Turning Gear.
    f. Electro – Hydraulic Governing System backed up with Hydro mechanical system.
    g. Governing Racks, LP By pass racks and solenoid & Test valve racks.
    h. Cross around Piping between IP & LP casing.
    i. Blanking Device / Fixtures for ESV, IV, LPBP, CRH NRV etc., for hydraulic testing and steam blowing.
    j. Extraction Steam pipeline from LP turbine to condenser dome wall.
2. Lube Oil system, Jacking oil system, Control oil / Governing oil system, LP Bypass Stop & Control Valve with EHA & Water injection valves including Governing oil system consists of piping, Oil tanks, injector assy., Oil Centrifuge, AOP, JOP and EOP with starter panels, Leak & Dirty Oil Tank with pumps, Duplex filter and oil vapour fans and other auxiliaries.

B) TURBO-GENERATOR :

1. Hydrogen cooled main Generator consists of the following.
    a. Stator
    b. Rotor with rotor insertion device.
    c. Dry air blower system
    d. End Shields & Bearing
    e. Brushless Exciter Set
    f. Generator Covers
    g. Generator accessories
    h. Seal Oil System with Seal Oil Units and other associated items.
    i. H_2 cooling system with Hydrogen distributor and other associated items.

j. H_2 /CO_2 Gas system

k. Liquid Detector System

l. Generator Cooler Rack Assy. For Exciter

m. Other loose items and Accessories.

C) HEAT EXCHANGERS.

1. Condenser, mainly comprising of the following parts.
   a. Bottom Plate
   b. Turbine end & Generator end Side Plates.
   c. Dome walls
   d. Front & Rear water chambers with tube plates
   e. Support plates.
   f. Hot Well
   g. Spring Elements and supports
   h. Steam Throw Device
   i. Air Extraction Pipe and Baffle.
   j. Stiffening Pipes, Rods & Slabs
   k. Instruments & Fittings, loose parts etc.
   l. Condenser tubes (Stainless Steel)
   m. Condenser R.E. Joints (Inlet & Outlet-each 2 sets)
   n. Welded Austenitic S.S. Tubes Grs.304 for Condenser-lot
   o. Condenser Butterfly Valves-(Electrical Operated, Inlet & Outlet, each 2Sets & each valve of Dia. 1800mm)

D. PUMPS WITH AUXILIARIES, TANKS, VESSELS ETC.

1. Gland Steam Condenser with attachments, fan exhausters & fittings.
2. LP Heaters 1, 2 & 3 with attachments and fittings
3. HP Heater 5 & 6 with attachments and fittings.
4. Drain Cooler with fittings.
8. Turbine Oil Coolers
9. Seal Oil Coolers.
10. Hydrogen Coolers.
11. Exciter Air Coolers
12. **Boiler Feed Pumps – Three sets : Each Comprises of:**

a. Boiler feed pump with tubing.

b. Booster pump with base plates & tubing.

c. Hydraulic coupling.

d. BFP Motor.

e. BFP Base plate.

f. Hydraulic coupling stool.

g. Lube oil cooler for Hydraulic Coupling.

h. Working oil cooler for H.C.

i. Hydraulic coupling pipes & Accessories.

j. Re-circulation valves.

k. Suction Strainers for BFP.

l. Local gauge racks for BFP.

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

n. Suction Strainer for Booster Pumps

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

a) Condensate Extraction Pump assembly.

b) Foundation frame.

c) Canister.

d) Basket type suction strainer.

e) Local gauge rack.

f) CEP Motor.

14. Condenser Air Evacuation System (Vacuum Pumps) – 2 Sets- Each weighing about in skid form with associated aux. & fittings

15. Tanks & Vessels:

Sl.NO	DESCRIPTION	PACKAGE SIZE in (mm)	WT.IN KG
1.	HP Drain Flash Tank 1 No.	4100x3000x2900.	4,600
2.	LP Drain Flash Tank - 1 No.	2900x2200x2100	3,400
3.	Unit Flash Tank – 1 No.	2500x1500x1400	1,000
4.	DM CW Tank (Cpacity-10 CuM) -1	Dia.2000x7150H	6,400

Sl.NO	DESCRIPTION	PACKAGE SIZE in (mm)	WT.IN KG
	No.		
5.	Clean Oil Tank (Capacity-60 Cu M)-1 No.	5000x4500x3000	10,200
6.	Dirty Oil Tank(Capacity-60 Cu M) -1 No.	5000x4500x3000	10,200
7.	Oil unloading Tank(Capacity-1Cu M) -1 No.	2000x1000x500	600
		Total Weight	**36,400**

17. BOUGHT OUT ITEMS (BHEL HARDWAR Scope)

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

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

2. Other equipments / items As Part of Main TG, TG Integral and PUMPS WITH AUXILIARIES, TANKS, VESSELS ETC.) Consisting of:

a. Condenser Air Evacuation Vacuum Pumps-2 sets
b. H2 Cylinders-131 Nos.
c. Co2 Cylinders –63 Nos.
d. Moisture Measuring System.
e. Vapour Exhausters-2 sets
f. Motorised temperature Control Valve with actuator – 1 set.
g. Refrigeration Gas Drier- 2 sets.

h. Sound absorbing Cover-1 set

j. Welded Austenitic S.S. Tubes Gr.304 for condenser - lot

k. Air Exhauster with motor for GSC Air Exhauster – 2 sets

l. Lifting Beam – 1 set

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

n. Aux. oil pump & Emergency oil Pumps with Motor- 2 sets (1set AC & 1 Set DC).

o. Duplex filers for Lube oil & Jacking oil pump with Motor – 1set for each.

p. Butter fly valves – 1 lot.

q. Three way temperature Control valves – 1 set.

r. Double three way valve –1 set.

s. NRV with Al. flap – 2 sets.

t. Pressure limit valve – 2 sets.

u. Oil purification unit (Oil centrifuge) - 1 set

v. Oil Vapour Exhauster – 2 sets.

w. Lead Diaphragm – 4 sets.

x. Spay Nozzles – lot.

y. Dirt Catcher – 1 set.

z. Dampers – lot.

aa. Variable Load Spring Cages – lot.

bb. Oil Purification System (Central Lube Oil System) – 1set

cc. Flexible Bends – lot.

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

ee. Turbine oil, Lube oil for other Power Cycle System Pumps & Control fluid - lots

ff. Dry Air preservation system.—1 set

gg. Flow Nozzle for PG Test – lot

hh. Through Port Gate Valves-lot

ii. Spring Loaded NRV'- lot

iii. Angle drain valves

kk. LP Bypass Stop & Control valve with EHA and Water injection valve. LP Governing oil system is High Pressure Governing oil system – 1 set.

ll. Electrical Hydraulic Actuator for Turbine Valves along with HPSU- 1 set

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

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

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

pp. Seal Oil Vapour Exhauster.

qq. TG Integral Piping with Hangers & Supports and drain valves

rr. LP Dosing System

ss. CRH NRV-1 Set

3. List of TG Integral piping Schemes applicable:

(A) TG Integral Piping:

Seal Steam piping.

Condensate Spray piping.

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

Control/ Governing oil piping.

LP Bypass Valve (high pressure) Governing System

Turbine drainage piping

Cooling water piping.

Seal oil system piping.

Generator Gas system piping.

LP turbine extractions to condenser.

1. (B) LP Bypass valve with complete High Pressure Control oil system with Stainless Steel control oil Piping, Skid etc. supplied from BHEL Hardwar vendor.

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

1. External /Regenerative System Piping:

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

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

c. LP Heater Vents (PGMA 80-382)

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

e. Condensate Pump vents (PGMA 80-387)

f. Condensate Air Evacuation Piping (PGMA 80-388)

g. Condensate Suction (PGMA 80-400)

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

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

j. Condensate For sealing of Vacuum (PGMA 80- 407)

k. Condensate Dump from Header (PGMS 80-408)

l. Unlisted Condensate (PGMA 80-413)

m. Condenser Drain (PGMA 80-440)

n. Gland Steam Cooler Drains (PGMA 80-442)

o. LP Heater-1 to Condenser (PGMA 80-443)

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

q. Deaerating Heater Over flow and Drain (PGMA 80-446)

r. HP Heater Drains (PGMA 80-447)

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

t. Manifolds for HP Flash Box & Condenser (PGMA 80-457)

u. TG Aux. Cooling Water (PGMA 80-463)

v. Main Circulation Water System (PGMA 80-468)

w. Low Pressure Dosing piping (PGMA 80-601)

x. Lube oil piping system (PGMA 80-673)

y. H & S for Light up – Non Steam lines (PGMA 80-928, as applicable)

z. H & S for Synchronisation- Steam Lines (PGMA 80-930)

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

bb. Test Thermowells (PGMA 81-415)

cc. Performance Guarantee Test materials (PGMA 81-416)

dd. Other valves /NRVs & QCNRVs as supplied for TG equipments and applicable scope of piping under this tender specification

ee. Steam Traps

ff. Air Traps

gg. Flow elements/Flow nozzles.

hh. ME Bellows

ii. Aux. PRDS

(CC) EQUIPMENTS/SYSTEMS, CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, COLTS, PLATE HEAT EXCHANGERS, MISC. HOISTS & CAHIN PULLEY BLOCKS, SELF

CLEANING STRAINERS, LP DOSING SYSTEM ETC. (SUPPLIED FROM PEM/ BHOPAL AND RELATED VENDORS):

Sl. NO.	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
1.	**Central Lube Oil System:**		
1.1	Clean oil Pump with Drive motor, Duplex Type Strainer, Pressure Gauge& DP Gauge etc.-1 Set		450
2.	**MISC. HOISTS & CHAIN PULLEY BLOCKS**		
2.1	**Electric Hoists**		
2.1.1	Electric Hoist with straight path for ACW pumps & DMCW Pumps inside the TG Hall	1No. of Capacity 3 MT	450
2.1.2	Electric Hoist with straight path for Condenser Butterfly valves	1No. of Capacity 8 MT	580
2.1.3	Electric Hoist with straight path for Vacuum Pumps	1No. of Capacity 3 MT	450
2.1.4	Electric Hoist with straight path for ESP Control room	1No. of Capacity 3 MT	450
2.2	**Chain Pulley Blocks:**		
2.2.1	Chain Pulley Block and travel trolley for DMCW Pumps (SG) inside TG hall .	1 No. of Capacity 2MT	110
2.2.2	Chain Pulley Block for Sump Pupms lifting in TG hall.	1 No. of Capacity 2MT	70
2.2.3	Chain Pulley Block for Lube Oil Barrel handling	1 No. of Capacity 1MT	50
2.2.4	Chain Pulley Block for General Maintenance	1 No. of Capacity 3MT	85
3.	**Plate Heat Exchangers** with	Each of size- L-4500XW -	2x4500

Sl. NO.	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
	associated components/ items, attachment, fittings etc.- 2 **sets.**	2000XH-3000 mm and weight-4500 kg	
5.	Self Cleaning Strainers- 2Sets	Each of size L-3000xW-1500xH-1500 & weight 2500 Kg	2x2500
6.	Condenser On Load Tube Cleaning System **(COLTS)-** 2Sets (each set weighing about-6000 Kg.	Each set comprising of (i) Ball Injection Pipes. (ii) Ball re-circulating skid (iii) Ball Separator-/Ball collector strainer- (iv) D.P. Measuring system (v) Loose items	2x6000
7.	**Misc. Pumps**		
7.1	Sump Pumps / Submersible Pumps - 4 sets		4x500
7.2	DMCW Pumps (Horizontal) & Drive Motors – 3 Sets		3x6,500
7.3	DM CW Booster Pumps (Horizontal)- 2 Sets		2x1,500
8.	**LP Chemical Dosing System**		
8.1	Hydrazine Dosing system-1 No.	2500x5250x3000	3,000
8.2	Ammonia Dosing Sysetm-1 No.	2500x5250x3000	3,000
8.3	NaOH Dosing System	2000x2000x2000	2,000
		TOTAL	**61,195**
		Weight in MT (Say 62	

Sl. NO.	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
		MT)	

NOTE :

1. The information furnished in this section is only a description regarding the item to be erected by the contractor. BHEL reserves the right of adding or excluding any components / items / system according to the site requirements / customer requirements to complete various system in all respects.
2. Any other systems / components, quantities which are the integral to equipment supplied by the manufacturing unit also to be erected and commissioned by the contractor within the quoted / accepted rate / lump sum value.
3. The dimensions, weight, quantity for "(CC) Equipments/systems, Central lube oil system, Misc. pumps, COLTS, Plate Heat Exchangers, Misc. Hoists & Chain Pulley Blocks, Self cleaning strainers, LP dosing system etc. (supplied from PEM/Bhopal and related vendors)" are tentative and contractor shall erect and commission as per supply at site.

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

S No.	DESCRIPTION	Size	Gross WT in Kgs.
A	**STEAM TURBINE**		
1	SOLE PLATE PEDESTAL ANCHOR	3400X1200X800	2,510.00
2	BASE PLATE ASSEMBLY	4500X1400X1200	4,500.00
3	BASE PLATE ASSEMBLY	2300X1250X600	2,560.00
4	BASE PLATE L.P.CASING	2300X2075X981	2,680.00
5	LP OUTER CASING PARTS	7060X1480X2760	8,085.00
6	LP OUTER CASING PARTS	7060X1480X2760	8,085.00
7	LPC OUTER CASING PARTS	4570X3230X980	2,500.00
8	LPC OUTER CASING PARTS	4570X3230X980	2,500.00
9	COMPONENTS OF LP CASING UPPER PART	3500X300X300	495.00
10	L.P OUTER CASING PARTS	3450X1000X1100	900.00
11	ASSEMBLY DEVICES	900X700X550	180.00
12	INSPECTION SHAFT FOR IPC	3300X700X700	775.00
13	VALVE SUPPORT FOR HP OVERHAUL	1000X1000X400	800.00
14	COMPONENTS OF ASSY.FIXTURE FOR HPT	3800X2500X1200	6,864.00
15	COMPONENTS OF ASSEMBLY FIXTURE OF HPT	2200X1200X850	1,800.00
16	COMPONENTS OF ASSY.FIXTURE FOR HPT	3300X1800X1210	3,352.00
17	COMPONENTS OF ASSEMBLY FIXTURE FOR H.P.TURBINE	5010X4000X120	3,356.00
18	HP-IP BREARING PEDESTAL ASSLY.	4080X2005X2126	13,275.00
19	HP/IP BRG.PED.PARTS	1000X600X600	438.00
20	HP/IP BRG.PED.PARTS	500X200X150	37.00
21	AUXILIARIES OF LP TURBINE	3000X1300X1000	2,100.00
22	AUXILIARIES OF LP TURBINE	2000X1000X1825	1,142.00
23	AUXILIARIES OF LP TURBINE	2000X1000X1825	1,142.00
24	LP JOINT COVERING	2300X1800X940	1,041.00
25	ASSEMBLY TOOLS	1900X1000X890	560.00
26	CAP(SPRING SUPPORT)	825X500X400	400.00
27	CAP(SPRING SUPPORT)	825X500X400	400.00
28	CAP (COMPEN.ASSY)	3240X1740X1340	3,316.00
29	CAP (COMPEN.ASSY)	3240X1740X1340	3,512.00
30	CAP(OBLIQUE REDUCER ASSLY)	1400X1400X1200	590.00
31	CAP (MITRE BEND ASSY)	1550X1550X1300	670.00
32	CAP (COMPEN.ASSY)	3240X1740X1340	3,512.00
33	CAP (MAN-HOLE ASSLY)	1500X1600X1100	750.00
34	(MAN-HOLE ASSLY)	1500X1600X1100	750.00
35	CAP(MITRE BEND ASSY)	1550X1550X1300	670.00
36	CAP (MITRE BEND ASSY)	1550X1550X1300	670.00
37	CAP (PIPE ASSLY)	2000X1100X1200	645.00

38	CAP (MITRE BEND ASSY)	1550X1550X1300	670.00
39	LONGITUDINAL GIRDER (LEFT)	6800X1820X1570	15,182.00
40	LONGITUDINAL GIRDER (RIGHT)	6800X1820X1570	15,182.00
41	LP FRONT WALL (TS)	6820X3750X910	10,053.00
42	LP FRONT WALL (GS)	6820X3750X910	10,053.00
43	LP SHAFT SEALING FRONT	1800X1700X740	2,260.00
44	LP SHAFT SEAL COMPENSATORASSLY.(TS)	1440X1420X520	1,456.00
45	LP SHAFT SEALING (REAR)	1800X1700X740	2,260.00
46	LP SHAFT SEAL COMPENSATORASSLY.(GS)	1440X1420X520	1,456.00
47	LP CASING ASSEMBLY (FASTENERS)	1800X1700X740	2,653.00
48	LP CASING ASSEMBLY (PARTS)	3760X2060X860	4,900.00
49	LP CASING ASSEMBLY (PARTS)	450X450X250	140.00
50	EXTRACTION PIPE LINE (LPC)	1600X1000X750	520.00
51	EXTRACTION PIPE LINE (LPC)	2700X1350X750	670.00
52	EXTRACTION PIPE LINE (LPC)	2000X1200X600	1,004.00
53	EXTRACTION PIPE LINE (LPC)	2900X1100X700	650.00
54	EXTRACTION PIPE LINE (LPC)	2900X1100X700	650.00
55	EXTRACTION PIPE LINE (LPC)	2700X1200X750	575.00
56	EXTRACTION PIPE LINE (LPC)	1100X850X850	307.00
57	EXTRACTION PIPE LINE (LPC)	2700X1750X1100	689.00
58	EXTRACTION PIPE LINE (LPC)	1550X1450X900	530.00
59	EXTRACTION PIPE LINE(LPC)	2000X600X600	366.00
60	L.P. EXTRACTION PIPE SHEATHING	2600X2000X1400	1,290.00
61	INNER GUIDE PLATE OF DIFFUSER(TS)	2600X2400X1000	2,118.00
62	INNER GUIDE PLATE OF DIFFUSER(GS)	2600X2400X1000	2,118.00
63	DIFFUSER (TS)	4880X1730X2340	3,640.00
64	DIFFUSER (GS)	4880X1730X2340	3,640.00
65	AUXILIARIES OF I.P. TURBINE	1050X480X550	390.00
66	AUXILIARIES OF I.P. TURBINE	1100X500X650	204.00
67	AUXILIARIES OF I.P. TURBINE	1100X500X650	204.00
68	LP-GEN. PEDESTAL ASSEMBLY	3220X2285X2075	10,200.00
69	IP-LP PEDESTAL ASSEMBLY	3700X1860X2100	14,600.00
70	LP INNER OUTER CASING (U/H)	6720X3150X2325	21,750.00
71	LP INNER OUTER CASING (L/H) & LP INNER INNER CASING (L/H)	6750X3500X2350	30,907.00
72	LP INNER CASING ASSY.FASTENERS	1800X1700X740	1,760.00
73	LP INNER-INNER CASING (U/H) PARTIAL	4000X1570X2000	11,722.00
74	STEAM INLET PIPE (LPT)	2700X1300X900	840.00
75	L.P. ROTOR	7210X3300X3350	62,049.00
76	BEARING PEDESTAL ARRANGT.PARTS	1800X900X800	1,100.00
77	STUD HEATING DEVICE AND BREECH NUT HEATING DEVICE.	1500X1200X250	315.00
78	GROMMET SLINGS	1500X1500X350	280.00
79	IP TURBINE	4860X3753X3210	81,679.00
80	HP TURBINE	5060X3100X2900	56,100.00

81	HP INLET ASSEMBLY	450X450X200	45.00
82	H.P.EXHAUST ASSEMBLY	1625X1335X675	1,378.00
83	HPT RELATED PARTS & EXPNMEASUREMENTS	1000X1000X500	190.00
84	HP FRONT BEARING PEDESTAL	3500X3000X2050	11,939.00
85	HP FRONT BRG. PEDESTAL PARTS	1800X1700X1000	844.00
86	I.P TURBINE PARTS	700X700X500	285.00
87	RATING, COLLABORATION AND MONOGRAM PLATES	850X550X150	50.00
88	OIL FLUSHING AND PRESSURE TEST DEVICE	750X400X550	130.00
89	SUPPORT FOR IV VALVE	1500X1000X750	410.00
90	STEAM BLOWING & HYD. TEST DEV.	2900X2100X1140	2,730.00
91	TOOLS AND PACKING DEVICES	1750X1200X980	684.00
92	ASSEMBLY DEVICE FOR VALVES	920X1000X450	213.00
93	ESV & CV CASING WITH VALVES	3000X3000X1900	9,800.00
94	ESV & CV CASING WITH VALVES	3000X3000X1900	9,800.00
95	IV & CV CASING WITH VALVES.	4500X3500X2600	21,500.00
96	IV & CV CASING WITH VALVES.	4500X3500X2600	21,500.00
97	PART OF IV & CV CASING	1500X1000X200	100.00
98	PART OF IV & CV CASING	1500X1000X200	100.00
99	INJECTOR FOR SUC. PIPE NB350	3300X1750X1210	1,029.00
100	MAIN OIL TANK & NOZZLE ARRGT.ASSY.	5180X3260X2650	9,100.00
101	MAIN OIL TANK & NOZZLE ARRANGEMENT	4200X1100X800	550.00
102	OIL STRIPPER	600X600X850	133.00
103	OIL STRAINERS	2050X1200X1410	568.00
104	VARIABLE ORIFICES THROTTLE VALVES & FLUSHING PARTS	1000X500X250	115.00
105	HOUSING FOR MS STRAINER	1700X1025X900	3,000.00
106	HOUSING FOR M.S STRAINER	1725X1250X730	3,000.00
107	STEAM STRAINER ASSEMBLY DEVICE MS & HRH	2140X1400X500	652.00
108	HOUSING FOR HRH STEAM STRAINER	2200X1450X1100	3,500.00
109	HOUSING FOR HRH STEAM STRAINER	2200X1450X1100	3,500.00
110	STEAM STRAINER (MS)	1100X700X350	374.00
111	STEAM SRAINER (HRH)	1600X1450X750	485.00
112	BLANKING ARRANGEMENT FOR MSSTRAINER HOUSING	1000X900X800	907.00
113	BLANKING ARRANGEMENT FOR HRHSTEAM STRAINER HOUSING	1600X1200X1000	2,083.00
114	STEAM STRAINER HOUSING GASKETS	700X700X300	50.00
115	COMPENSATOR	600X600X900	50.00
116	LEAKAGE OIL TANK	1000X1000X3000	515.00
117	WASTE OIL TANK	1000X1000X3000	515.00
118	INJECTOR FOR SUC. PIPE NB 400	3500X750X750	922.00
119	TURBINE INSTRUMENTS RACKS(FRAMES)	2750X1500X800	2,690.00
120	TURBINE INSTRUMENTS RACKS	2300X750X750	765.00
		Total	**582,895**
B	**HEAT EXCHANGERS (CONDENSER, HEATERS &**		

	COOLERS)		
(I)	**CONDENSER**		
1	HOTWELL	11200X1900X1200	6,913.00
2	BOTTOM PLATE(FRONT/REAR PART)	7150X3450X625	6,793.00
3	BOTTOM PLATE(FRONT/REAR PART)	7150X3450X625	6,793.00
4	BOTTOM PLATE(MIDDLE PART)	7150X3850X625	8,296.00
5	LOOSE ITEMS(BOTTOM PLATE)	1900X700X300	271.00
6	CONDENSER SUPPORT	1750X1000X1250	3,650.00
7	CONDENSER SUPPORT	1750X1000X1250	3,650.00
8	SPRING ELEMENT (COND. SUPPORT)	1750X1000X1250	3,650.00
9	SPRING ELEMENT (COND. SUPPORT)	1750X1000X1250	3,650.00
10	LOOSE ITEM (COND. SUPPORT)	1600X950X950	4,775.00
11	FRONT WATER CHAMBER (GEN.SIDE)	5224X3610X360	6,150.00
12	FRONT WATER BOX (GEN SIDE)	5950X3610X2485	15,044.00
13	FRONT WATER CHAMBER (TUR.SIDE)	5224X3610X360	6,150.00
14	FRONT WATER BOX (TUR SIDE)	5950X3610X2485	15,044.00
15	REAR WATER CHAMBER (GEN.SIDE)	5224X3610X360	6,150.00
16	REAR WATER BOX (GEN SIDE)	4760X3610X2025	9,122.00
17	REAR WATER CHAMBER (TUR.SIDE)	5224X3610X360	6,150.00
18	REAR WATER BOX (TUR SIDE)	4760X3610X2025	9,122.00
19	SIDE WALL(TUR.END)	5248X2480X80	7,120.00
20	LOOSE ITEMS(SIDE WALL-TUR.END)	5850X350X250	782.00
21	SIDE WALL(GEN.END)	5248X2480X80	7,120.00
22	LOOSE ITEMS(SIDE WALL-GEN.END)	5850X350X250	782.00
23	RODS (SHELL INTERNALS)	3650X850X625	4,780.00
24	RODS (SHELL INTERNALS)	3650X850X625	4,780.00
25	RODS (SHELL INTERNALS)	3650X850X625	4,780.00
26	RODS (SHELL INTERNALS)	3650X850X625	4,780.00
27	RODS (SHELL INTERNALS)	1000X750X350	600.00
28	RODS (SHELL INTERNALS)	3700X850X350	4,600.00
29	AIR EXTRACTION PIPING	5460X990X410	1,200.00
30	SUPPORT TUBE PLATES(SHELL INTERNALS)	4700X3426X348	5,400.00
31	SUPPORT TUBE PLATES(SHELL INTERNALS)	4700X3426X348	5,400.00
32	SUPPORT TUBE PLATES(SHELL INTERNALS)	4700X3426X348	5,400.00
33	SUPPORT TUBE PLATES(SHELL INTERNALS)	4700X3426X348	5,400.00
34	SUPPORT TUBE PLATE(SHELL INTERNALS)	4700X3426X348	5,400.00
35	SUPPORT TUBE PLATES(SHELL INTERNALS)	4700X3426X348	5,400.00
36	SUPPORT TUBE PLATES(SHELL INTERNALS)	4700X3426X348	5,400.00
37	LOOSE ITEMS (SHELL INTERNALS)	5500X940X630	7,560.00
38	LOOSE ITEMS (SHELL INTERNALS)	4440X260X100	350.00
39	LOOSE ITEMS (SHELL INTERNALS)	3000X1500X500	4,655.00
40	LOWER DOME WALL (TUR.SIDE) LOWER PART	11000X3950X910	8,767.00
41	LOWER DOME WALL (TUR.SIDE) UPPER PART	4000X800X100	700.00
42	LOOSE ITEMS (LOWER DOME WALLTUR. SIDE)	900X300X300	270.00

43	LOWER DOME WALL (GEN.SIDE)LOWER PART	11000X3950X910	7,698.00
44	LOWER DOME WALL (GEN.END)UPPER PART	4000X800X100	700.00
45	LOOSE ITEMS (LOWER DOME WALLGEN. SIDE)	900X300X300	270.00
46	LOWER DOME WALL (FWB SIDE)LOWER PART	7502X4046X545	6,012.00
47	LOWER DOME WALL (FWB SIDE)UPPER PART	6238X934X1155	1,444.00
48	LOOSE ITEMS (LOWER DOME WALL	1325X1150X500	550.00
49	LOWER DOME WALL (RWB SIDE)LOWER PART	7550X4000X1900	6,727.00
50	DOME WALL (R.W/B SIDE)	6236X1134X1160	1,427.00
51	LOOSE ITEMS (LOWER DOME WALLRWB SIDE)	1300X1065X305	215.00
52	PIPES(DOME INTERNAL STIFFENING	6016X200X200	726.00
53	PIPES(DOME INTERNAL STIFFENING	6016X200X200	726.00
54	PIPES(DOME INTERNAL STIFFENING	6016X200X200	726.00
55	PIPES(DOME INTERNAL STIFFENING	6016X200X200	726.00
56	PIPES(DOME INTERNAL STIFFENING	3400X200X200	382.00
57	PIPES(DOME INTERNAL STIFFENING	3400X200X200	382.00
58	PIPES(DOME INTERNAL STIFFENING	1760X1480X1230	4,300.00
59	DOME INTERNAL STIFFENING	2380X1310X1100	4,295.00
60	UPPER DOME WALL(TUR. SIDE)	6800X460X310	1,083.00
61	UPPER DOME WALL(GEN. SIDE)	6800X460X310	1,083.00
62	UPPER DOME WALL(FWB SIDE)	5880X1930X380	3,635.00
63	LOOSE ITEMS (UPPER DOME WALLFWB SIDE	5400X350X32	475.00
64	LOOSE ITEMS (UPPER DOME WALLFWB SIDE	670X250X450	410.00
65	UPPER DOME WALL(RWB SIDE)	5880X1930X448	3,270.00
66	LOOSE ITEMS (W/B HINGE ARRGT.)	2500X1000X750	2,600.00
67	LOOSE ITEMS (W/B HINGE ARRGT.)	2000X1500X500	2,135.00
68	FRAME (W/BOX HINGE ARRGT)	1850X840X230	650.00
69	FRAME (W/BOX HINGE ARRGT)	1840X840X230	650.00
70	STEAM THROW DEVICE	1450X900X700	1,041.00
71	STEAM THROW DEVICE	1450X900X700	1,041.00
72	LOOSE ITEMS (CONDENSER)	2100X650X700	600.00
73	LOOSE ITEMS (CONDENSER)	2900X956X406	380.00
74	LOOSE ITEMS (CONDENSER)	1000X500X500	275.00
75	FASTENERS (CONDENSER)	1000X800X800	1,450.00
76	LOOSE ITEMS (CONDENSER)	600X320X200	6.00
77	LOOSE ITEMS (CONDENSER)	3300X250X200	200.00
78	TOOLS & TACKLES (CONDENSER)	1000X500X500	600.00
79	STAND PIPE NO.1 (CONDENSER)	2750X420X400	60.00
80	LOOSE ITEMS (STAND PIPE)	3150X350X330	300.00
81	STAND PIPE NO.2 (CONDENSER)	2750X420X390	62.00
82	CONDENSER TUBES (WELDED AUSTENITIC STAINLESS STEEL TUBES SA249 GRADE-304, Dia 28.575 x Thk-0.889 and Dia28.575 x Thk-0.71 mm. Total about 15800 tubes))	LOT	86,443.00
83 (i)	Condenser inlet assembly R.E. Joints -2 Sets	2800x3950x6275	2x17,200.00

83 (ii)	Condenser Outlet Assembly R.E. Joints -2 Sets	3100x3000x3800	2x15,200.00
84	CW piping Butterfly valves for Condenser inlet & Outlet (Electrically operated, each of Dia.1800 mm) with fittings.- 4sets	2800x2000x750	4x7,000.00
		TOTAL	**374911.00**
(II)	**HEATERS & COOLERS**		
1	HP Heater No.-5	11500x2100x2500	44,000.00
2	HP Heater No.-6	12500x2100x2500	53,500.00
3	GLAND STEAM CONDENSER	1015X1180X1400	825.00
4	STAND PIPE/LOOSE ITEM (GSC)	2100X500X400	200.00
5	LOOSE ITEMS FRAGILE (GSC)	600X800X400	100.00
6	LOOSE ITEMS GSC(NON FRAGILE)	1500X650X450	320.00
7	DRAIN COOLER	4650X1000X1250	3,500.00
8	LOOSE ITEMS (DRAIN COOLER)	800X500X300	101.00
9	LOOSE ITEMS (DRAIN COOLER)	500X300X300	24.00
10	LOOSE ITEMS (DRAIN COOLER)	400X400X60	6.00
11	LP HEATER NO.1	11520X1400X1550	11,880.00
12	LP HEATER NO.1&STAND PIPES	2700X500X400	150.00
13	LP HEATER NO.1 STAND PIPE	2200X700X500	50.00
14	LOOSE ITEMS LP HEATER NO. 1	700X500X500	150.00
15	LP HEATER NO.2	9600X1350X1735	9,950.00
16	LP HEATER NO.2 & STAND PIPES(LOOSE ITEMS)	2700X500X400	140.00
17	LP HEATER NO.2, STAND PIPES	2200X700X500	100.00
18	LOOSE ITEMS, LP HEATER NO.2	2600X500X350	200.00
19	LP HEATER NO.3	9600X1270X1835	9,875.00
20	LP HEATER NO.3 & STAND PIPES(LOOSE ITEMS)	2700X500X400	140.00
21	LP HEATER NO. 3, STAND PIPES	2200X700X500	100.00
22	TUBRINE OIL COOLER	5050X1650X1980	8,200.00
23	TUBRINE OIL COOLER	5050X1650X1980	8,200.00
24	LOOSE ITEMS (TOC)	750X500X200	80.00
25	LOOSE ITEMS (TOC)	800X600X600	60.00
26	EXCITER AIR COOLER	2850X650X600	892.00
27	EXCITER AIR COOLER	2850X650X600	892.00
		Total	**56135.00**
C	**GENERATOR :**		
1	FOUNDATION ITEMS OF GENERATOR	3550X715X880	4,656.00
2	FOUNDATION ITEMS OF GENERATOR	3100X1050X850	3,374.00
3	ONSUMABLES FOR FOUNDATION	500X500X200	15.00
4	GENERATOR STATOR	7520X4200X4870	228,000.00
5	GENERATOR ROTOR	10550X1560X1660	47,742.00
6	END SHIELD (TE) LOWER HALF	3640X1140X2000	6,020.00
7	END SHIELD (EE) LOWER HALF	3640X1140X2000	6,020.00
8	H.V.BUSHING	2000X950X600	590.00
9	LOOSE ITEMS OF WOUND STATOR	1500X1200X1000	1,010.00

10	GENERATOR ACCESSORIES	1800X1000X550	1,546.00
11	GENERATOR ACCESSORIES(TERMINAL BUSHING BOX)	3500X1800X1250	4,075.00
12	GAS BAFFLE RING,INSERT COVERETC.	3700X3500X1340	4,364.00
13	BEARING SHELLS	1100X835X950	953.00
14	END SHIELD (EE) UPPER HALF	3640X1140X2000	5,620.00
15	END SHIELD (TE) UPPER HALF	3640X1140X2000	5,620.00
16	SEAL RINGS	600X600X200	73.00
17	DEVICE FOR ROTOR INSERTIONINTO STATOR	2240X940X1220	1,036.00
18	ERECTION DEVICES	2250X1180X800	997.00
20	DRY AIR BLOWER	1350X1250X800	190.00
21	TERMINAL CONNECTORS	1840X660X400	506.00
22	CONSUMABLES	500X600X300	30.00
23	BRUSHLESS EXCITER SET	5670X2390X2810	30,400.00
24	EXCITER FRONT COVER	4310X2950X2950	4,122.00
25	RR WHL.COVER & SEALING WALL DEFOR EXCITER	1800X1600X1600	970.00
26	EXCITER REAR COVER	4330X3050X2950	3,909.00
27	EXCITER BED PLATE ACCESSORIES	5500X1050X800	3,212.00
28	EXCITER ACCESSORIES	2000X500X500	350.00
29	COOLER RACK ASSEMBLY FOR EXCITER	3000X1800X1100	1,551.00
30	SEAL OIL UNIT	6000X2500X3000	9,325.00
31	SEAL OIL STORAGE TANK	3500X1300X1280	1,460.00
32	GAS UNIT	2550X1790X2560	1,150.00
33	HYDROGEN DISTRIBUTOR	3480X1540X440	333.00
34	CO2 DISTRIBUTOR	2770X1240X440	247.00
35	LIQUID DETECTOR RACK	1700X900X1800	450.00
36	LOOSE VALVES	2000X1000X1000	959.00
37	LOOSE INSTRUMENTS	500X500X300	40.00
38	CO2 VAPOURISER	1520X640X840	225.00
		Total	**381140.00**

D- PUMPS WITH AUX, TANKS & VESSELS ETC.

(I) DETAILS OF BOILER FEED PUMP PACAKGES

Sl. No.	Description	Qty	Each Size in mm	Total wt. In Kg.
1.	BFP skid (Pump assly. + Base plate+Tubing+seal coolers)	3	2250x1000x1050	3x5770
2.	Booster Pump Skid(Pump assly. + Base plate+ Tubing)	3	1650x1200x950	3x2511

3.	Hydraulic Coupling assly. and accessories	3 sets	1800x1700x1800	3x3560
4.	Hydraulic Coupling working oil cooler.	3	3700x1500x500	3x1475
5.	Hydraulic Coupling lube oil cooler .	3	3100x1300x450	3x775
6.	Hydraulic Coupling loose items	3	Loose for 3 sets	3x710
7.	Suction Strainer for BP	3	900x800x1400	3x800
8.	BFP Recirculation Valve	3	1800x550x1400	3x350
9.	Suction strainer for BFP	3	900x800x1100	3x460
10.	Local Gauge Board racks with instruments	3	2200x300x1800	3x650
11.	Loose items with piping etc.	1 set	loose	1x2449
12.	Motor tubing	3	4000x3000x3000	3x15000
			Total wt.	**98,632**

(II) DETAILS OF CONDENSATE EXTRACTION PUMPS

SN	**Description**	**Qty.**	**Dimensions (mm)**	**Weight (Kg.)**
1.	Condensate Extraction Pump Assembly	2	Dia.11000x3250	2x6150
2.	Canister	2	Dia.900x3100	2x2700
3.	CEP Foundation Ring	2	1100x1100x150	2x580
4.	CEP suction Strainer	2	900x800x1400	2x1350
5.	Motor Stool	2	-	2x545
6.	Local Gauge Board Rack	1	2000x300x1800	1x300

7.	Loose items	2 sets	Loose	2x210
8.	CEP Motors	2	2020x1810x1150	2x6000
			Total Wt.	**35,370**

III- Tanks & Vessels:

Sl.NO	DESCRIPTION	PACKAGE SIZE in (mm)	WT.IN KG
1.	HP Drain Flash Tank 1 No.	4100x3000x2900.	4,600
2.	LP Drain Flash Tank - 1 No.	2900x2200x2100	3,400
3.	Unit Flash Tank – 1 No.	2500x1500x1400	1,000
4.	DM CW Tank (Cpacity-10 CuM) -1 No.	Dia.2000x7150H	6,400
5.	Clean Oil Tank (Capacity-60 Cu M)-1 No.	5000x4500x3000	10,200
6.	Dirty Oil Tank(Capacity-60 Cu M) -1 No.	5000x4500x3000	10,200
7.	Oil unloading Tank(Capacity-1Cu M) -1 No.	2000x1000x500	600
		Total Weight	**36,400**

E. BOUGHT OUT ITEMS (BHEL HARDWAR SCOPE)

(I) TG-INTEGRAL PIPING

a. Carbon Steel & Alloy Steel piping 65.0 MT

(II) Bought out Equipments – 150 MT

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

SN	PGMA	DESCRIPTION	WT. (KG)	IBR (I)/ NON-IBR (N)
1	80-375	Unlisted SV Exhausts –TG Scope	3,000	N
2	80-381	HP Heater Vents – TG Scope	1,000	N
3	80-382	LP Heater Vents	1,500	N
4	80-385	Vent from Unlisted PPG/Equipment to Condenser	6,000	N
5	80-387	Condensate Pump vents	1,000	N
6	80-388	Condensate Air Evacuation Piping	3,500	N
7	80-400	Condensate Suction	3,000	N
8	80-401	CD from Pump to LPH-1/DC inlet TEE & Recir.	7,000	N
9	80-402	CD from LPH-1/DC inlet TEE to TG TP	6,000	N
10	80-407	Condensate For sealing of Vacuum	3,500	N
11	80-408	Condensate Dump from Header	2,500	N
12	80-413	Unlisted Condensate	2,000	N
13	80-440	Condenser Drains	1,000	N
14	80-442	Gland Steam Cooler Drains	500	N
15	80-443	LP Heater-1 to Condenser	2,500	N
16	80-444	LP Heater-2/3/4/5 Drains & Drip Pump Incl.	3,500	N
17	80-446	Deaerating Heater Over Flow and Drain	2,000	N
18	80-447	HP Heater Drains	7,000	N
19	80-449	TG Cycle piping Drains & Vents	12,500	N
20	80-457	Manifolds for HP Flash Box & Condenser	2,500	N

SN	PGMA	DESCRIPTION	WT. (KG)	IBR (I)/ NON-IBR (N)
21	80-463	TG Aux Cooling water	66,000	N
22	80-468	Main Circulation Water Piping	120,000	N
23	80-601	Low Pressure Dosing Piping	1,500	N
24	80-673	Lube Oil Piping System	3,500	N
25	80-901	Sub-Delivery Valves for Light up	1,700	N
26	80-928	H & S for Boiler Light up – TG	40,000	N
27	80-930	H & S for Synchronisation-TG	2,000	N
18	80-933	H & S for LP Piping	10,000	N
29	80-992	Imported Electrodes	10	N
30	81-415	Test Thermowells	100	N
31	XX-XXX	Root valves, Butterfly Valves, QCNRVs, Steam Traps, ME Bellows etc.	50,000	
32	XX-XXX	Aux. PRDS a. High Capacity PRDS-1400 Kg. b. Low Capacity PRDS-600 Kg. c. CRH PRV-350 Kg.	2350	
		TOTAL WEIGHT	**368,660**	

(CC) EQUIPMENTS/SYSTEMS, CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, COLTS, PLATE HEAT EXCHANGERS, MISC. HOISTS & CHAIN PULLEY BLOCKS, SELF CLEANING STRAINERS, LP DOSING SYSTEM ETC. (SUPPLIED FROM PEM/ BHOPAL AND RELATED VENDORS):

Sl. NO.	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
1.	**Central Lube Oil System:**		

Sl. NO.	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
1.1	Clean oil Pump with Drive motor, Duplex Type Strainer, Pressure Gauge& DP Gauge etc.-1 Set		450
2.	**MISC. HOISTS & CHAIN PULLEY BLOCKS**		
2.1	**Electric Hoists**		
2.1.1	Electric Hoist with straight path for ACW pumps & DMCW Pumps inside the TG Hall	1No. of Capacity 3 MT	450
2.1.2	Electric Hoist with straight path for Condenser Butterfly valves	1No. of Capacity 8 MT	580
2.1.3	Electric Hoist with straight path for Vacuum Pumps	1No. of Capacity 3 MT	450
2.1.4	Electric Hoist with straight path for ESP Control room	1No. of Capacity 3 MT	450
2.2	**Chain Pulley Blocks:**		
2.2.1	Chain Pulley Block and travel trolley for DMCW Pumps (SG) inside TG hall .	1 No. of Capacity 2MT	110
2.2.2	Chain Pulley Block for Sump Pupms lifting in TG hall.	1 No. of Capacity 2MT	70
2.2.3	Chain Pulley Block for Lube Oil Barrel handling	1 No. of Capacity 1MT	50
2.2.4	Chain Pulley Block for General Maintenance	1 No. of Capacity 3MT	85
3.	**Plate Heat Exchangers** with associated components/ items, attachment, fittings etc.- 2 **sets.**	Each of size- L-4500XW - 2000XH-3000 mm and weight-4500 kg	2x4500

Sl. NO.	DESCRIPTION	PACKAGE SIZE (mm)	Approx. WT.IN KG/ITEM
5.	Self Cleaning Strainers- 2Sets	Each of size L-3000xW-1500xH-1500 & weight 2500 Kg	2x2500
6.	Condenser On Load Tube Cleaning System **(COLTS)-** 2Sets (each set weighing about-6000 Kg.	Each set comprising of (i) Ball Injection Pipes. (ii) Ball re-circulating skid (iii) Ball Separator-/Ball collector strainer- (iv) D.P. Measuring system (v) Loose items	2x6000
7.	**Misc. Pumps**		
7.1	Sump Pumps / Submersible Pumps -4 sets		4x500
7.2	DMCW Pumps (Horizontal) & Drive Motors – 3 Sets		3x6,500
7.3	DM CW Booster Pumps (Horizontal)- 2 Sets		2x1,500
8.	**LP Chemical Dosing System**		
8.1	Hydrazine Dosing system-1 No.	2500x5250x3000	3,000
8.2	Ammonia Dosing Sysetm-1 No.	2500x5250x3000	3,000
8.3	NaOH Dosing System	2000x2000x2000	2,000
		TOTAL	**61,195**
		Total Weight Say (62 MT)	

NOTE:

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

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

SN	EQUIPMENT / PACKAGE	APPROX. WT. (MT)
A.	STEAM TURBINE & AUX.	583
B.	TURBO GENERATOR & AUX.	381
C.	CONDENSER WITH AUX,	375
D.	HEATERS ETC. (HEAT EXCHANGERS)	56
E.	BOILER FEED PUMPS & AUX.	99
F.	CONDENSATE EXTRACTION PUMPS & AUX.	35
G.	FLASH TANK & VESSELS	37
I.	TG INTEGRAL PIPING	65
K.	BOUGHT OUT ITEMS (BHEL Haridwar Scope) + GEN. AUX.	150
L	EQUIPMENTS/SYSTEMS OF CENTRAL LUBE OIL SYSTEM, MISC. PUMPS, CONDENSE ON-LOAD TUBE CLEANING SYSTEM, PLATE HEAT EXCHANGERS, MISC.HOISTS & CHAIN PULLEY BLOCKS, SELF CLEANING STRAINERS, LP DOSING SYSTEM ETC	**62**
	TOTAL WT.	**1843**

Details as in above table correspond to Item SN 01 of Rate Schedule. Broad description of the Equipment/Package has been furnished here for general guidance of the bidder. Contractor shall carry out the work of all these equipment/ packages in totality including all their accessories even though names of such accessories may not be specifically appearing in this Tender Specs.

M. EXTERNAL/RE-GENERATIVE PIPING SYSTEM WITH VALVES, H & S, FITTINGS AND OTHER RELATED PEM BOUGHT OUT ITEMS:

(i) Carbon steel & Alloy Steel Piping: 370 MT (Item 02. of Rate Schedule)

(ii) Stainless Steel Piping: 2 MT (Item 02. of Rate Schedule)

NOTE:

The details indicated above are approximate and there is likelihood of variations in weight & quantity of equipment/package/system. Variations will be dealt with in accordance with relevant provisions available in General Conditions of Contract.

11.0.1
The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for fabrication, engineering and construction management. The Bidder should ensure timely completion of work. The Bidder must have adequate quantity of tools, construction aids, equipments etc, in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel.

11.0.2
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Bidder and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

11.0.3
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineers decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

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

11.0.5
Contractor shall erect all the equipments as per sequence prescribed by BHEL at site. The sequence of erection, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from the Contractor will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets or for any reasons whatsoever.

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

11.0.7
The work to be carried out under the scope of these specifications covers the complete work of collection from stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, levelling, cold pulling, adjusting, Non-destructive testing, Post weld heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries covered under these specifications, commissioning and all other activities till handing over of the unit. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. That will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL at the cost and risk of the contractor. Contractor may please

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

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

11.0.9
The indicative schedule of weight of major equipments given in relevant appendices are meant for providing a general idea to the Contractor about the magnitude of the work involved.

11.0.10
During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feed back from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/rectification/fabrication/repairs etc., promptly and expeditiously. Daily log sheets indicating the details of work carried out, man hours, consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day. Claims of contractor, if any, for such works will be dealt as per relevant clauses of General Conditions of Contract.

11.0.11
All tools and tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

11.0.12
The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

11.0.13
All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.

11.0.14
Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

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

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

11.0.17
During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer.

11.0.18
Welding/threading of GI instrument air / Service air piping as specified in drawing / documents and instruction of BHEL engineer shall be carried out as part of scope of work.

11.0.19
No temporary supports should be welded on to the piping.

11.0.20
Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. The contractor shall provide this facility till the commissioning and handing over of the equipment to the customer. The contractor shall also carry out preservative and touch up painting on equipments covered under this specification stored at stores/storage yard.

11.0.21
Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor.

11.0.22
The contractor shall return to BHEL the excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (VEE), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.

11.0.23
All suitable access/approach platforms for valves/ isolating/throttling devices/equipments at suitable location/elevations shall be carried by contractor as per instruction of BHEL Engineer as part of scope of work.

11.1 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

11.1.1
Contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc from the storage yard/stores/sheds of BHEL/ client. The Contractor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the Contractor, in appropriate manner as per BHEL's instructions.

11.1.2
The contractor shall return all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost of parts/materials used in excess or misused, with departmental charges.

11.1.3
Transportation of lube oil, Chemicals, Gas cylinders etc. from stores, is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores.

11.2 PG TEST TAPPING POINTS

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

11.3.1
All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.

11.3.2
All Measuring and Monitoring Devices (MMD) used for the work in scope of this tender speciication shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established up to National Physical Laboratory.

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

11.4.1

All the required welding electrodes, except those indicated as BHEL scope elsewhere in these specifications, as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding manufacturer, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.

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

11.4.2
Gases like Argon, Oxygen and Acetylene etc. that are required for erection related activities shall be arranged by the contractor at his cost.

11.4.3
Nitrogen gas, if required for preservation during chemical cleaning process of piping system, will be arranged by BHEL free of charges. Contractor shall arrange necessary connector, Nipple, Regulator, Header and piping for usage of such Gas from Cylinders.

SECURITY, HOUSE KEEPIN & OTHER RESPONSIBILITY OF THE CONTRACTOR

11.5
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.

12 PREPARATION OF FOUNDATION

12.1

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

12.2

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

12.3

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

12.3.1

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

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

In order to ensure the quality, the major grouting of equipments using any of above grout mixes shall essential be done as per the recommendations of supplier with regard to grout mix preparation and use of machinery etc under the supervision of the respective supplier. BHEL has arrangement with above suppliers for supervision services and the supervision charges for the same will be borne by BHEL. However, the contractor shall ensure readiness of equipment for grouting in all respect before such a service is requisitioned and the duration is not prolonged unduly. Any overstay required due to contractor shall be charged to the contractor with BHEL's departmental charges. Contract shall consult BHEL engineer before deciding upon the vendor for the above.

12.3.2

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

12.4

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

12.5
The contractor shall carry out scrapping and matching of embedded plates, permanent spacers and all the matching parts of turbine, generator, pumps and other equipments under scope wherever required. The support and sole plates matching and concrete surface bedding is also covered in the scope of work. The fine dressing of concrete shall be with Prussian blue-match checks.

12.6
Packer plates shall not only be blue matched with foundations but also inter-packer contact surfaces, contact surfaces between packer and pedestals, contact surface between packer and foundation frame etc. shall also be blue matched and required percentage contact shall be achieved by chipping and scrapping as per engineer's instructions.

13 EQUIPMENTS INSTALLATION – COMMON REQUIREMENTS

13.1

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

13.2

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

13.3

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

13.4

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

13.5

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

13.6

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

13.7

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

14 PIPING INSTALLATION

14.1
The scope of work in piping system (air, Gas, Water, Oil, Steam, Governing oil/Control oil, Jacking Oil etc.) will include cutting to required length, edge preparation, laying, fixing and welding of the elbows/fittings/valves etc., fixing supports/hangers/shock absorbers/ guides and restraints etc. and carrying out all other activities/works to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in these specifications as per engineer's instructions and/or as per approved drawings. **Weld joints and NDT requirement for all TG Integral piping, External/ Regenerating System and other pipings as applicable under tender specification shall be as per drawings/schemes and suiting to site requirement. The necessary drawings/documents for these weld joints will be provided at site during execution of work.** Indicative list of schemes of piping and their approximate weights are provided relevant **Appendix.**

14.2
Carrying out of piping work as per the specifications between equipments constituting terminal points, whether the terminal equipments fall within the scope of the work/specification or not, is within the scope of the work/ specification. The contractor shall complete terminal joints at either ends, with due NDE & PWHT if applicable, for all the piping schemes covered in the scope of work.

14.3
The erection of equipments like Condenser R.E. Joints, Condenser Butterfly Valves, Misc. Pumps, Plate Heat Exchangers, Condenser On Load Cleaning System and Self-cleaning Strainers etc which are including under the scope of these specifications shall also be required as reference point for erection of piping etc. to other agencies/customer at site. Contractor shall carry out erection/installation of these systems on priority as per instruction of BHEL Engineer at site. The welding with NDE & PWHT etc of terminal joints / counter flanges either joint connected to these equipments shall be carried by contractor under these specifications under instruction of BHEL Engineer. The decision of BHEL Engineer shall be final and binding on contractor.

The Erection, Welding, NDE, Supporting, Hydraulic Test etc. work of Supply, Return and other related lines of Condenser Cooling water piping (Main Circulation Water Piping/CW piping and ACW System Cooling water piping interconnecting the customer terminal points (from "A" Row of TG Building) to above equipments/ systems is specifically included under these tender specifications. The contractor under these specifications shall carryout the erection, welding, NDE, Hydro Test etc. at site on priority as decided by BHEL Engineer-In-charge at site. Contractor shall carryout the Hydraulic Test including providing the Dummies/ Blanks with materials as scope of work. The necessary design of Dummies/Blanks will be furnished by BHEL at site. All the piping systems weighing about 120 MT are covered under PGMA No. 80-468 (**Main Circulation Water Piping)** of "EXTERNAL PIPING/RE-GENERATIVE PIPING WITH ASSOCIATED VALVES, COMPONENTS/ITEMS, FITTINGS AND SUPPORTS ETC." described in the scope of work. In order to facilitate to understand the contractor, the nature of work, it is clarified that the majority of size-wise of CW & ACW water pipings involved are 50 NB, 150NB, 500NB,

600NB, 1800 NB etc. Contractor shall carry out the entire piping work as stated above including the TG Aux. cooling water piping under PGMA No. 80-463, payments for which will be made by BHEL as per accepted piping item rate under Sl. No. 02 of Schedule of Rates & Quantities (Price Bid) for actual quantity of work executed."

14.4
Fit up and welding/bolting/fastening of piping to the terminal points (such as stubs, valves, flanges on terminal points/equipments, stubs on headers, battery limits etc) forming part of the scope of work/specification and stress relieving and radiography of joints so made are also within the scope of work. Permanent fasteners and gaskets will be supplied by BHEL.

14.5
Interconnection/Hook-up, if any, with the existing system shall form part of work. Such interconnections, hook-ups may require shut down of running plant and the relevant work has to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.

14.6
All drains / vents / relief / escapes / safety valve piping to various tanks/ sewage / drain canal / flash box / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by contractor is completely covered in the scope of this tender specification.

14.7
The following items of work shall be incidental and forming part of piping fabrication and erection:

- To locate cause of vibrations in equipments/auxiliaries/pipelines and carrying out necessary corrections in case the same is attributed to the contractor.
- Fabrication and erection & welding of racks, steel supports, guides, restraints for all the piping. Steel for this purpose will be supplied by BHEL free of charge in random and running lengths.
- Pre-assembly of spring suspension/hangers and shock absorber as per requirement.
- Erection of steam traps, filters, flow nozzles/ flow indicators/ flow orifices other measuring elements in the piping. These may have been supplied either by BHEL or their customer. This may involve cutting of pipe lines, fresh edge preparation and welding with stress relieving wherever applicable.
- Fabrication / making of bends for pipes and tubes of diameter up to 65mm.
- Matching of all fittings like tees, bends, flanges, reducers valves, socket fittings, etc with pipes for welding.
- Servicing of valves, Power Cylinders and actuators etc.

- Cleaning of all pipes by wire brushing / blowing by compressed air.
- Welding of root valves with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles/orifices/metering/ measuring elements fixed on piping.
- Welding of blanks with stress relieving if required on a temporary basis.

14.8
Pipelines will be field routed as per schemes/ suggestive layout or as per the instructions of BHEL engineer. Pipes & tubes will be supplied in random lengths and running lengths. The contractor shall have to lay the piping after carrying out the necessary fabrication, edge preparation, routing etc to suit site requirement in best professional manner.

14.9
As far as possible pre-assembly shall be done. The pipe laying shall be carried out from the available terminal point/points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required settings to be ensured as per requirement.

15 CONDENSER INSTALLATION

15.1
The condenser will be despatched in loose parts mainly comprising of bottom plates, dome valves, front and rear water chamber, front and rear water boxes, side walls, hot well, spring elements, support plates, air extraction pipes, baffles, stiffening rods and pipes etc. The condenser is to be assembled at site in position by welding the different parts. Condenser tubing and tube expansion (roller expansion) is to be done at site by the contractor, after taking due care to clean all the tube holes. After final alignment and levelling of turbine exhaust and condenser, the same has to be welded to the exhaust position of LP exhaust as per the sequential welding procedure.

The Condenser Tubes are Welded Austenitic Stainless Steel Tubes Grade-304 material having Dia. 28.575xThk-0.889 and Dia. 28.575 x Thk-0.71 mm. All the works of tube insertion, expansion / flaring etc. as per drawing requirement shall be carried out contractor as scope of work.

15.2
Before insertion of tubes, the contractor shall clean the holes in the tube plates and tube support plates to remove paint, corrosion spots, oxide scales etc. Usage of suitable cleaning agent may also be required which has to be supplied by the contractor.

15.3
The tubes shall be expanded using an Automatic Electronic Torque Controlled Tube Expanding unit/Pneumatic Tube Expander and as per drawing requirement procedure/ instruction of BHEL Engineer at site. Tube expansion shall be checked with dial bore gauge. The total set up including tube expanders and tube cutting tools etc. for carrying out the complete condenser tube expansion works shall be provided by the contractor.

15.4
The contractor shall carry out the condenser neck welding with LP cylinder exhaust hood only after final installation of LP casing. Neck welding shall be subjected to specified non-destructive testing.

15.5
The hydrostatic testing of steam space and hydraulic testing of water space up to the terminal point after assembly of water boxes are also included in the scope.

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

16 GENERATOR STATOR LIFTING & PLACEMENT

16.1

The Generator Stator, weighing 228 Metric Tonnes (approx.), will be despatched to site by Road on trailer. The customer's EOT (capacity 100/25 Tonnes) in TG hall shall not be suitable for lifting of Generator Stator and this Generator Stator shall be lifted by Strand and Jacks / Lift & Shift arrangement method. The Scope of contractor shall take complete responsibility and carry out the liaisoning and follow up with transporters, filling of ditches/levelling etc. for marching of trailer to unload at suitable location/point of lifting near the TG building, Shifting/dragging of Generator Stator by providing required arrangements like rails/plates/sleepers etc. (as per requirement), arranging the Strand And Jacks/Lift & Shift arrangements & their assembly /installation with expert supervision till lifting & placement of Generator, making resting Foundations/Footings to suit the installation of his Strand and Jack arrangements (as required) and Lifting & Placement of Generator Stator to required/designed foundation/elevation.

16.2

Contractor shall plan all his activities / operations so as to avoid the delay in unloading and releasing the transporters Carrier/trailer. For any demurrage Charges by Transporter / Customer on account of delay in Handling, Unloading from Trailer after arrival at site shall be the responsibility of Contractor. The all above complete works of receipt from trailer, unloading, shifting, Lifting & placement to required foundation /elevation of Generator Stator is the part of scope of work under this contract.

16.3

The Generator Stator will have to be lifted from space out side the "A" row of TG building and between A-3 & A-4 columns. Lifting and placement of Generator Stator from this side may require to hold casting of certain civil foundations of some Auxiliaries like CW Pit, TG hall column structural bracings etc., Contractor shall visit site and discuss his plan with Customer & BHEL Engineer at site and submit his plan of Generator Stator lifting along with Technical Bid. Contractor shall deploy his above Generator Stator lifting **Strand and Jack arrangements** & other resources well in time to suit the site requirement so as to lift & place it on required foundation in minimum possible time. **Contractor is advised to visit the site and plan the arrangements required to be deployed at site for this work.**

Some of the renowned agencies who can provide strand and jack lifting arrangement are :–

1 M/s Fagioli PSC India Pvt Ltd (203, Krishna Bhavan, Govandi Station Road, Deonar, Mumbai 400 088, Telephone No 022 – 25564388, Fax No 022 – 25562565)

2 M/s Freight Wings (P) Ltd, (309, Rex Chambers, Walchand Hirachand Marg, Ballard Estate, Mumbai 400 001, Telephone No 022 – 22631714, 22632261, 22639988)

3 M/s Dorman Long Technology Ltd, (233 Bharat Industrial Estate, Lal Bahadur Shastri Marg, Bhandup (West), Mumbai 400 078, Telephone No 022 – 25961960, Mo 09820192807)

4 M/S Basu and Basu Engineers Pvt Limited, Kolkata, Telephone No 033 – 24642967, 24664069, Fax 033 – 24664621)

5 M/S Lift and Shift India Private Limited (96 Chembur, Mankhurd Link Road, Mumbai 400 043, Telephone 022 – 25484180, 25560101, Fax 022 – 25563573, E-Mail – projects@liftandshift.co.in)

Contractor may engage **any of the above-named agencies or any other competent agency** known to contractor for this lifting activity. Generator Stator shall be required to be lifted and put on foundation within one week time after availability of material and other essential inputs, and clear the holds for further civil & structural works. All above shall be the part of scope of work and progressive payment for same shall be made per relevant chapter of Technical Conditions of Contract.

Lifting of Generator Stator by Jack and Sleeper/sand bag or such other methods is not permitted.

16.4
The Generator shall have to be placed on designed foundation at an elevation of about 15.8 Meters between “A” & “B” row of TG building and have to be lifted from about Zero meter level out side the TG hall other than shifting/dragging of Stator from point of unloading to point of lifting (if necessary and this is also the scope of work. To facilitate the contractor to understand the lifting Trunion arrangement, dimension of stator and fixing of lifting slings etc, **the drawing No.0-139-00-01341 (Generator Outline) and drawing No. PE-DG-328-100-M005 (T.G. Hall Equipment layout Plan at 9.0 M) and drawing No. PE-DG-328-100-M006 (Cross Section of T.G. hall) are attached with Tender Specification**.

16.5
Immediately after completion of Generator Stator lifting work, Contractor shall dismantle his Strand and Jack arrangements and vacate the holds within a week time to enable customer to proceed with further works of civil foundations and structural works kept under hold for Generator Stator lifting.

17 HANDLING OF HEAVIER EQUIPMENTS

Heavy and voluminous Equipments/consignments like HP Turbine module, IP Turbine module), LP Rotor, LP turbine (Inner-Outer & Inner-Inner) Lower half casing, LP turbine (Inner outer) Upper half casing, Generator rotor, Brushless Exciter, HP & LP Heaters etc. along with other Equipments shall be handled carefully. Contractor shall have to arrange his own Tools & Tackles, Trailer of suitable capacity including additional suitable capacity lifting Crane and any other arrangement required to handle right from collection of materials from BHEL/Customer store yards/stores, transportation to site of works and erection & their placement on respective elevation/foundation. BHEL shall not provide any T&P other than those specified for the specific work as relevant Appendix and other relevant clauses of tender specification.

18 INSTALLATION OF HP & LP HEATERS ETC.

18.1
Erection of Permanent approach platform and ladders etc for De-aerator and FST is in the scope of work. The structural steel and other members will be supplied in random length/size & will have to be cut to required size and profile as incidental to work.

18.2
HP Heaters (Horizontal Type), LP Heaters (Horizontal Type) are to be located in B-C Bay of TG Building at their designed foundations which are at elevations of 15.8 m & 09.30 m respectively. The customer's EOT crane 100/25T is located in A-B Bay of TG Building and as such this EOT crane will not have direct accessibility /approachability to handle and place these equipments to their foundations. Contractor may make use of this EOT crane subject to its feasibility, approachability, readiness with as per prior approval of BHEL/Customer engineer to carry out lifting and placement of these equipments to nearest location by using additional platform etc. along with dragging arrangements, wherever required. Contractor shall make his own arrangement of such requirements for shifting/dragging/making additional platforms etc. to place and assembled/ install these equipments to their respective designed foundations & elevations as part of scope of work. BHEL/Customer shall not provide any other additional arrangements/infrastructure for this purpose.

18.3
Boiler feed pumps with Auxiliaries are to be installed/erection between B-C Bay of TG Building at an elevation about 00.30M. EOT crane in TG hall which is located in A-B row will not be accessible for erection and handling of these BFPs. Contractor shall make his own arrangement for placement and installation of these equipments as part of scope of work so that the progress of work is not affected.

19 HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS

19.1
Contractor shall carry out the following tests required to complete the erection and commissioning of the TG Set:

(1) Hydraulic testing of individual equipments like condenser, coolers, heaters, other auxiliaries, equipments and piping systems. Required capacity Hydraulic test pump/Fill pump and other necessary arrangement shall be provided by contractor to carry out hydraulic testing, Chemical cleaning/Flushing etc. of the equipments and piping as part of scope of work under this tender specification.

(2) Ultrasonic test

(3) Dye-Penetrant test

(4) Magnetic Particle Test.

All above facilities (Men, Materials, Equipments, Consumables etc.) with operating engineer/experienced person and proper approach wherever required shall be provided by the contractor for satisfactory completion of the above tests.

19.2
Contractor shall lay all necessary temporary piping, welding, fabricate chemical mixing tank, supports, install pumps, valves, pressure gauges, electric cables and switches etc, required for the Hydro test, Air leak test, Chemical cleaning, Steam blowing etc.. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting above tests will be done by the contractor. No separate payment shall be made for this temporary piping work for above purpose. BHEL will provide only temporary piping and valve materials. Contractor shall provide Chemical cleaning/flushing/circulation pumps, Hydraulic test pumps of required capacity along with all other required arrangements of control panel, Motor Starters, cables, switches etc. as scope of work.

19.3
All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.

19.4
Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by contractor. After completion of hydraulic test, welded blanks shall be

cut and removed, weld burrs ground finished and cavities/scars to be repaired by weld deposit and finished ground as per BHEL engineers' instruction.

19.5
Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

19.6
While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions. Blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some–times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor.

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

20 PRE-COMMISSIONING TESTS, COMMISSIONING AND POST COMMISSIONING

20.1
Commissioning of the TG equipments with associated Aux. and other Equipments with auxiliaries shall involve the following tests and activities of the equipments erected:

(a) Trial run of Boiler Feed Pumps, C.E.P., Booster Pumps, Vacuum Pumps, Misc. Pumps, Central Lube oil system pumps etc. and other equipments like Misc. Hoists & Chain Pulley Blocks etc. and other various rotating machineries / pumps as per tender specification.

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

(c) Hydraulic Test, Chemical Cleaning/Flushing, Oil flushing of lube oil system, Governing oil system/Control oil system, Seal oil System, Air cleaning/blowing of pipelines, closed systems, Tanks and Vessels.

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

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

(f) Manual/mechanical cleaning of Oil tanks, Suction Strainers / Filter elements of CEP, BFP, Booster Pump, Misc. Pumps, Flash Tanks, Misc. Tanks etc., Plate Heat Exchangers, LP Bypass Governing/control oil System tanks and other various equipments & tanks /vessels erected by the contractor. This may have to be repeated several times during the commissioning process.

(g) Chemical cleaning of piping systems, Misc. tanks, Flash Tanks etc. as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components like gauges, instruments etc. as instructed by BHEL during this process.

(h) Putting Turbine on barring gear.

(i) Trial run/trial operation and Load test of Misc. Hoists and Chain Pulley Blocks etc.

(j) Rolling and synchronisation.

(k) Full load operation.

(l) Trial operation

The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements. Contractor shall provide assistance to BHEL for carrying out these activities.

20.2
Contractor shall lay temporary pipelines with fittings and accessories etc. as instructed by BHEL engineer for the purpose of pre-commissioning and commissioning activities like Hydraulic testing, chemical cleaning, oil flushing, steam blowing etc. of piping and other equipments as part of the scope of work. Temporary installations shall be dismantled by contractor and returned to BHEL stores as specified elsewhere in this T.S.

20.3
The contractor shall provide necessary assistance to facilitate/enable electrical and instrumentation testing and commissioning of equipments under this scope of work, to BHEL and their Testing & Commissioning agency.

20.4
The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor.

20.5
In case any malfunctioning and / or defect is found during tests / trial runs such as loose components, undue noise or vibrations, strain on connected equipments etc. The contractor shall immediately attend to these defects/ malfunctioning and take necessary corrective measures. If any readjustment and realignments are necessary, the same shall be done as per BHEL engineer's instructions, free of cost.

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

20.7
The contractor shall associate for initial and subsequent fillings of gas in generator gas system as and when required till unit is handed over to Customer.

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

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

20.10
During the stages of commissioning, and till Unit is handed over, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to the contractor, will be governed by relevant clauses of General Conditions of Contract of the specification. The parts to be replaced shall however, be provided by BHEL free of cost.

20.11
During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned units are taken over by the customer.

20.12
In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, strain on connected equipment etc., The contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment or realignment is necessary, same shall be done as per BHEL engineer's instruction.

20.13
The pre-commissioning activities will start prior to Lube oil, Governing/ Control oil flushing, Seal Oil of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need specialised gangs including electricians, Instrument Technicians, Fitters, in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilisation of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required.

20.14
Contractor shall cut open works if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over, without any extra payment.

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

1) Supervisor 2 Nos.

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

20.16
The above figures shows only minimum required over and above labour required for completing pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand.

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

20.18
During commissioning, opening of valves, changing of gaskets, checking, realigning of rotating and other equipment, attending to leakages in piping, tanks etc. and adjustments of erected equipment may arise. Valves shall be serviced and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions.

20.19
It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specifications, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.

21 WELDING AND HEAT TREATMENT

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

21.2
On all steam, oil, instrument, gas, air (Instrument air/services air) piping, DM water piping etc. both TIG welding and subsequent arc welding or total TIG welding process is to be adopted as instructed by BHEL engineer.

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

21.4
The Contractor shall procure all electrodes and filler wires of approved quality / brand as per the standards and specifications of BHEL and instruction of BHEL Engineer.

21.5
Contractor should purchase the electrodes as per the recommendations of BHEL engineer, welding manual, welding schedule and other relevant documents. The electrodes shall be purchased only from BHEL approved manufacturers.

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

21.7
All electrodes shall be stored in a clean dry area. The storage room shall be of permanent nature and damp proof, and the room shall be exclusively meant for storage of welding electrodes and filler wires. Excepting for a vent in the top, it is not preferred to have any other opening like windows or ventilators. The temperature inside the room has to be kept in the range of 8-10^0 c above atmospheric temperature and humidity should be less than 50. This is to be accomplished by using electric heaters or infrared lamps. The storage room must be provided with hygrometer and thermometer. Temperature and humidity are to be monitored regularly. 15-20 holders, welding cables, connecting cables to equipments and other welding accessories including temporary electrical connection from construction power point to individual equipment like winches, hoisting equipment, welding generators, transformers, heat treatment equipment and other construction equipment shall be arranged by contractor.

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

21.9

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

21.10
All welding consumables shall be issued to the welders only by authorised person who is controlled by contractor's welding engineer. The necessary baking requirements are to be ensured by Contractor's welding engineer.

21.11
All welders shall be tested and approved by BHEL engineer/customer before they are actually engaged on work though they may possess the requisite certificate. BHEL reserves the right to reject any welder without assigning any reasons. Statutory requirements like IBR approval for welders are to be complied with before starting of the work. If required, the welders may have to undergo Procedure Qualification test also. The decision of BHEL Engineer will be final in this regard.

21.12
All charges for testing of contractor's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by the contractor. However for initial testing of welders the test will be provided by BHEL. However, If deployed welders fails in initial testing due to lack of experience OR frequent testing of new welders, due to non-availability/non-deployment of earlier qualified/tested welders, it shall be the responsibility of Contractor to provide necessary test plates at his cost for above testing.

21.13
BHEL engineer is entitled to stop any welder from his work if his work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which, in the opinion of BHEL engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The fact that the welders have passed the test does not relieve the contractor from his contractual obligations to check the performance of the welders. Contractor shall submit a monthly performance record of all welders.

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

21.15
Pre-heating and stress relieving before and after welding are part of erection work and shall be performed by the contractor in accordance with instructions of BHEL engineer. Contractor has to arrange for the recorders along with accessories and suitable technicians for heat treatment purpose. The temperature recorders and thermocouples shall be duly calibrated. During preheat and stress relieving operations the temperature shall be measured as per the instructions of BHEL engineers by thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL.

21.16
For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using battery operated portable thermocouple attachment unit and not by manual arc welding. Contractor shall arrange sufficient number of thermocouple attachment units.

21.17
Wherever necessary, contractor should provide temperature indicator/temperature recorder as required by BHEL engineer for measuring preheat temperature for welding or for controlling temperature of metal for hot correction etc. Decision of BHEL engineer on method and of checking preheat temperature or controlling temperature for hot correction and welding shall be final and binding on contractor.

21.18
Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The contractor shall make all necessary arrangements including labour required for the same as per directions of BHEL.

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

21.20
For weld joints of heavy structural items like beams, I-sections, if heat treatment is required, the same shall be carried out as part of the work.

21.21
Checking effectiveness of stress relieving by hardness tests (either by Poldi Hardness Tester or other approved test methods as per BHEL engineer's instruction) including necessary testing equipments is within the scope of the work/specification.

21.22
TIG welding process is to be used for all root pass welds in pipes. Subsequent welding after root pass can be carried out by manual metal arc welding with basic coated electrodes. For the pipe of thickness less than 6mm, the entire welding has to be carried out by TIG welding. However, BHEL site engineer will have the option of changing the method adopted. Manual arc welding shall be done following weaving technique and the width of weaving shall not exceed 1.5 time of the diameter of the electrodes.

21.23
Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensions and with respect to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage shall depend on piping system as specified by BHEL engineer.

21.24

Joint fit up will be a stage for inspection.

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

22.0 RADIOGRAPHY

22.1
Radiographic inspection of welds shall be arranged by the contractor including all consumables like isotope camera, x-ray film, chemicals etc. Scaffolding and approaches for taking radiographs.

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

22.2
Contractor shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/code requirement. The defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance/rejection of the joints will be final and binding on the contractor.

22.3
Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if defect persists after first repair, as per radiograph, carrying out repairs and radiography shall be repeated till joint is made acceptable in case, the joint is not repairable, the same shall have to be cut and repaired at contractor's cost. Decision of BHEL engineer in all these matters is final and binding on the contractor.

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

22.5
It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. Necessary trained personnel shall be deployed for this purpose.

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

23.1

Contractor shall lay temporary pipelines with fittings and accessories and also erect/commission pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing etc. of piping and other equipments including **providing the Chemical Cleaning/ flushing Pumps/ equipments etc.** which are within the scope of work and also systems in which equipments and piping erected by contractor form a part of the scope of work. The required DM water and Steam will be provided by BHEL free of cost.

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

23.2

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

23.3

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

23.4

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

23.5

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

23.6

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

23.7

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

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

23.9
Contractor shall also carry out the repairs or attend leaks etc., in the temporary piping and equipments for the above operations/activities while carrying out the above activities/ operations.

23.10
For chemical cleaning of system which consist of equipment/piping erected by the contractor and also equipment/piping erected by other contractors of BHEL/customer's contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilised by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decisions on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on the contractor.

23.11
Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL. No separate payment on this account shall be entertained.

23.12
After acid cleaning/pickling of lubricating system (including oil piping of lube oil system, Seal oil system, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems, LP Bypass Governing/Control oil systems etc. as per instructions of BHEL Engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc. before and after oil flushing is the responsibility of the contractor.

23.13
For full welding of structures, tanks and piping etc., only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.

23.14
Erection and commissioning of connecting piping – permanent & temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load shall be the responsibility of contractor as part of scope of work.

24 ELECTRICAL AND INSTRUMENTATION

24.1
Contractor shall mount all flow indicators, centrifugal/speed switches of motors, accumulators, pressure regulators etc. which are received loose and which are to be erected/mounted at site on air lines, water lines, oil lines, LP Bypass system, steam lines, auxiliaries and firemen floor and other operating floors on boiler/power house and other equipments. These are to be mounted during erection for finalising routing/position etc. They are to be dismantled after completion of erection work and handed over to BHEL for calibration. After calibration, these instruments shall be remounted by the contractor in their respective positions just before commissioning.

24.2
Certain instrumentation like, pressure gauges, power cylinders, flow meters, valve actuators, flow indicators, etc are received in assembled condition as integral part of equipments. Contractor shall dismantle such equipment at an appropriate stage under the instruction of BHEL and hand them over to BHEL for calibration and storage. Contractor shall re-erect them in position just before commissioning of the equipment.

24.3
Seal welding of Thermo-wells, RT plugs before Hydro test of equipments and piping systems is also within the scope of this work/specification. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld Thermowells after Hydro test/steam blowing of lines.

24.4
Providing necessary engineer/supervisors/technicians/electricians as required by BHEL engineer for drying out the LT/HT motors is within the scope of the work. Job includes testing the motor for finding out PI & IR values and making necessary cabling connection for heating for dry out from the nearest source of supply and maintaining and controlling the temperature till the IR and PI values are achieved as per standards. However, BHEL will provide necessary motorised insulation testers for this purpose. The contractor shall provide necessary power cables and other tools and consumables for the above works free of charges. Before undertaking dry out/trial run of HT motors, the end shields and covers shall be opened on both the ends of the motor for inspection, cleaning and greasing of bearings.

24.5
Welding of all Thermo-wells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping, and auxiliaries is within the scope of this work.

24.6
All the HT Motors shall be preserved with space heaters on and provided with proper cover till the commissioning of the motors.

24.7

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

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

1) All protective paints for the protection of site weld joint fit-ups, application of primers on finished weld joints with providing all the consumables, paint brush, brush cleaner, labour & necessary tools and plants are in the scope of contractor.

2) The water boxes shall be sandblasted to remove all traces of primer applied at the works. After tubing & before hydraulic testing of condenser, the interior surface of Condenser Water Boxes and Water side Surfaces of Water Chambers and Tube plates shall be painted with two coats of Black Coal tar Epoxide finish Paint as per drawing requirement to achieve the total DFT of 250 microns. The Black Coal Tar Epoxide finish paint shall be from any BHEL/Customer approved manufacturer. Contractor shall submit manufacturer's batch test certificate / test certificate from BHEL/Customer approved laboratory for the primers and paints. Prior approval of BHEL for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing, number of coats may be applied and method of application shall be as recommended by the paint manufacturer. **Contractor shall arrange required paints & primers and other consumables for above works as part of scope of work.**

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

4) Preservation of all components/equipments during various stages of erection, commissioning till handing over is in the contractor's scope. All prescribed methods of surface cleaning prior to application of preservative paint shall be followed by the contractor. **Contractor has to arrange all consumables like wire brush, painting brush, labour with T&P etc. as required for this work as scope of work. However BHEL will provide the Primer & Paints free of charges.**

26 FINAL PAINTING

26.1
Equipments and Components of the TG & Auxiliaries will in general be supplied by BHEL with one coat of Primer and two coats of finish paint applied at the manufacturing shop; contractor shall apply one coat of finish paint on all such components (which are not insulated) after erection at site unless and otherwise the shop coating is damaged in the meanwhile. The tentative types of paints involved for final painting are Synthetic Enamel, Epoxy, Heat Resistant Aluminium, Chlorinated rubber paints etc..However, the final type of paints and thickness of coats shall be as per drawings & customer requirements at site.

26.2
In addition to components/equipment as above, there could be limited few without any prior protective coating. Such components shall first be thoroughly cleaned of all dirt, rust, scale, grease, oil and other surface deposits by wire brushing, scraping, washing, wiping with solvent or any appropriate method and the same being inspected and approved by

BHEL followed by application of one coat of primer. Afterwards, the above parts shall be over-coated with two layers of specified paint as per application procedure prescribed by the paint manufacturer.

26.3 Touch-up painting on damaged areas -

a) For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer.

26.4
Painting of site-welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc has been carried out by the bidder.

(a) Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.

(b) Painting procedure to be followed as mentioned above for touch-up painting on damaged areas.

26.5
The scope of work includes painting of colour bands, legends, lettering, marking the signs and direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/ customer engineer at site for the equipments/components covered in these specifications.

26.6
In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

26.7
Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents. The contractor at his own cost shall provide all the consumables and application implements.

26.8
During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, contractor shall repair the same free of cost to BHEL. BHEL will make available only the primer and paints free of any charge to contractor.

26.9
Specified drying time shall be permitted from one to another coat.

26.10

This work requires working at higher altitudes from ground level. The work spread is also substantial involving substantial run of structures, piping and equipments. Contractor shall take sufficient precautions to ensure safe and hazard-free working condition. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of appropriate quality for safe and smooth execution of work.

26.11
Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by contractor, BHEL shall have the right to recover the cost of such damages from the contractor.

26.12
Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the contractor without any extra charges.

26.13
In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush painting. However, areas/equipment inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the contractor. For the purpose of spray painting, service air at one point will be made available by BHEL free of cost. Laying of air pipeline, hose and any other line required shall be done by contractor at his cost. The contractor shall provide spray equipment set.

26.14
The contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during execution of the work.

26.15
Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

27 Preservation & Protection of Components

27.1
BHEL will issue majority of the plant equipment/components duly applied with primer and one coat of finish paint at shop. Components /equipment that will finally remain exposed to atmosphere will be coated with specified paints; During the course of activities at site, the shop coat of paint may get peeled off/burnt. Contractor at all stages of work, shall ensure appropriate preservation of all such equipment/ component that are in his custody including those erected by him by way of applying touch up paint coating. Such preservation shall conform to preservation procedure of BHEL (if any), else according to the instructions of BHEL engineer. BHEL will provide the necessary primer and paint free of charges; while contractor shall arrange for the preservation materials for all other types of surfaces including machined surfaces in his cost.

27.2
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.

27.3
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.

27.4
The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc shall be returned to BHEL stores by the contractor.

27.5
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.

27.6
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.

DRAWING No. PE-DG-328-100-M003

CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM

NORTH

PLAN AT 21.0M

PLAN AT 15.5M

REFERENCE DRGS:–

1.	CONDENSER	01601070055C160 (HWR)
2.	GENERATOR OUTLINE	0–139–00–01341 (HWR)
3.	FOUNDATION PLAN	0–13100–B7153 (HWR)
4.	OIL ROOM ARRANGEMENT	013100B7004 (HWR)
5.	GA SPRAY CUM TRAY DEAERATOR	11631011332 (HYD)
6.	OIL CANAL DETAILS	0–13100–B7001 (HWR)
7.	GA OF DMCW TANK	–(BPL)
8.	GA OF HP HEATER 1	1–17500–40138 (HYD)
9.	GA OF HP HEATER 2	1–17500–40139 (HYD)

LEGEND:

- CHEQUERED PLATE FLOORING
- REMOVABLE CHEQUERED PLATE
- GRATED FLOORING
- REMOVABLE GRATING
- CONCRETE BLOCK
- CUT OUTS
- HAND RAILING
- PARAPET WALL
- GLASS PARTITION
- BRICK WALL

NOTES:–

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE WITH RESPECT TO TG HALL 0.0M WHICH CORRESPONDS TO RL (+)248.5M.
3. FOR TG COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. ALL CIVIL DETAILS SUCH AS DOORS/WALLS/CLADDINGS/OPENINGS/TOILETS/STAIRCASES ETC. ARE INDICATIVE ONLY & FOR EXACT DETAILS REFER CIVIL/ARCHITECTURE DRAWINGS.
5. DETAILS OF LAYOUT AS SHOWN FOR OTHER THAN BHEL SCOPE ARE SUGGESTIVE ONLY.
6. CIVIL TO PROVIDE 2NOs. EPS (TOS) 150MM WIDEx13500MM LONG FOR HPH–5, 150MM WIDEx15800MM LONG FOR HPH–6 FOR MOVEMENT OF HP.HEATERS AS PER LOCATION SHOWN IN THE DWG.

REV	DATE	ALTD	CHD	APPD
01	25.11.09	VJ	BKA	AJ

1. Revision made as per customer comments vide DCPL Transmittal dt. 21.08.2009 & 12.10.2009..
2. Changes made are marked as △

CUSTOMER	IDEAL ENERGY PROJECTS LTD.
CUSTOMER'S CONSULTANT	DCPL, NEW DELHI
JOB No. 328	1x270MW BELA NAGPUR TPP NAGPUR, MAHARASHTRA
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.OF	

DEPT CODE	NAME	SIGN	DATE
DRN	V.KUMAR	Sd/–	05.08.2009
DESN	V. JAIN	Sd/–	05.08.2009
CHD	SB/BKA	Sd/–	05.08.2009
APPD	ANIL JOSHI	Sd/–	05.08.2009

TITLE: T.G. HALL EQUIPMENT LAYOUT PLAN AT 15.5M & 21.0M FLOOR

MPL	C	MSE	I	MAX.	E	DEPT.	SCALE 1:150	DRAWING No. PE–DG–328–100–M005
						SIGN		
						DATE		SHEET 1 OF 1 REV. 01

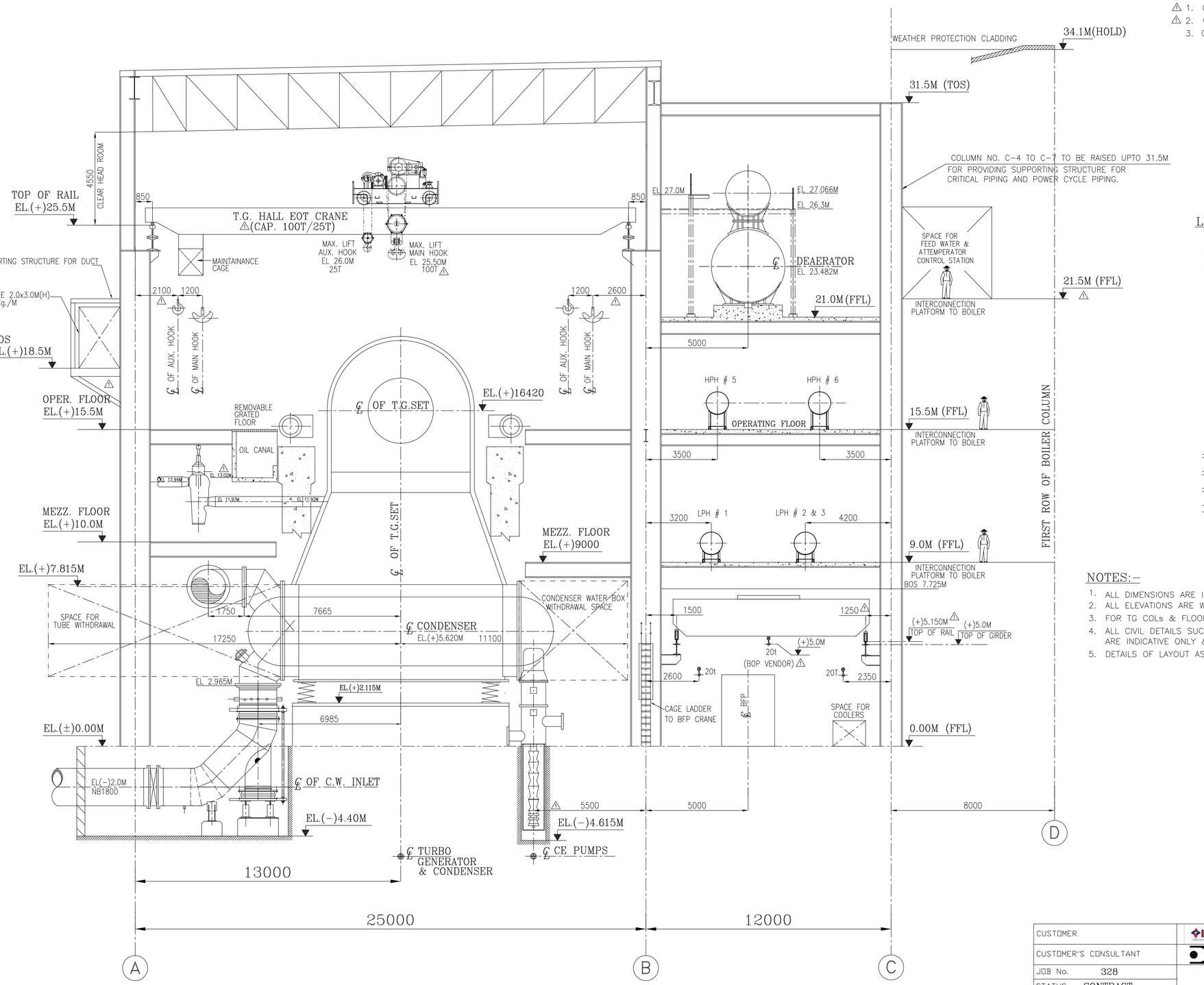
SIZE–A0

COMPUTER FILE NAME: 328_100_M003_R01

COMPUTER FILE NAME: 328_00_M006_R01

REFERENCE DRGS:-

⚠ 1.	CONDENSER	01601070055C160 (HWR)
⚠ 2.	GA OF SPRAY CUM TRAY DEAERATOR	11631011332 (HYD)
3.	GA OF CEP	HY-DG-1-18100-57136 (HYD)



LEGEND:

- CHEQUERED PLATE FLOORING
- REMOVABLE CHEQUERED PLATE
- GRATED FLOORING
- REMOVABLE GRATING
- CONCRETE BLOCK
- CUT OUTS
- HAND RAILING
- PARAPET WALL
- GLASS PARTITION
- BRICK WALL

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE WITH RESPECT TO TG HALL 0.0M WHICH CORRESPONDS TO RL (+)248.5M⚠
3. FOR TG COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. ALL CIVIL DETAILS SUCH AS DOORS/WALLS/CLADINGS/OPENINGS/TOILETS/STAIRCASES ETC. ARE INDICATIVE ONLY & FOR EXACT DETAILS REFER CIVIL/ARCHITECTURE DRAWINGS.
5. DETAILS OF LAYOUT AS SHOWN FOR OTHER THAN BHEL SCOPE ARE SUGGESTIVE ONLY.

REV	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	APPD
01	25.11.09	VJ	BKA	AJ

1. Revision made as per customer comments vide DCPL Transmittal dt. 21.08.2009 & 12.10.2009.
2. Changes made are marked as ⚠

CUSTOMER	IDEAL ENERGY PROJECTS LTD.
CUSTOMER'S CONSULTANT	DCPL, NEW DELHI
JOB No. 328	1x270MW BELA NAGPUR TPP NAGPUR, MAHARASHTRA
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.OFF	

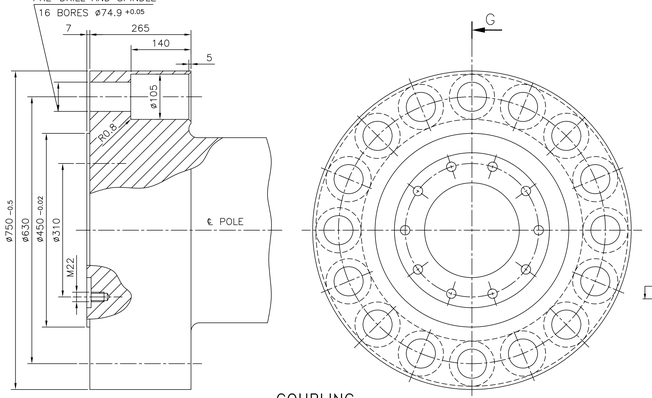
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
M	DRN	V.KUMAR	Sd/-	05.08.2009
	DESN	V. JAIN	Sd/-	05.08.2009
	CHD	SB/BKA	Sd/-	05.08.2009
	APPD	ANIL JOSHI	Sd/-	05.08.2009

TITLE
CROSS SECTION OF T.G. HALL

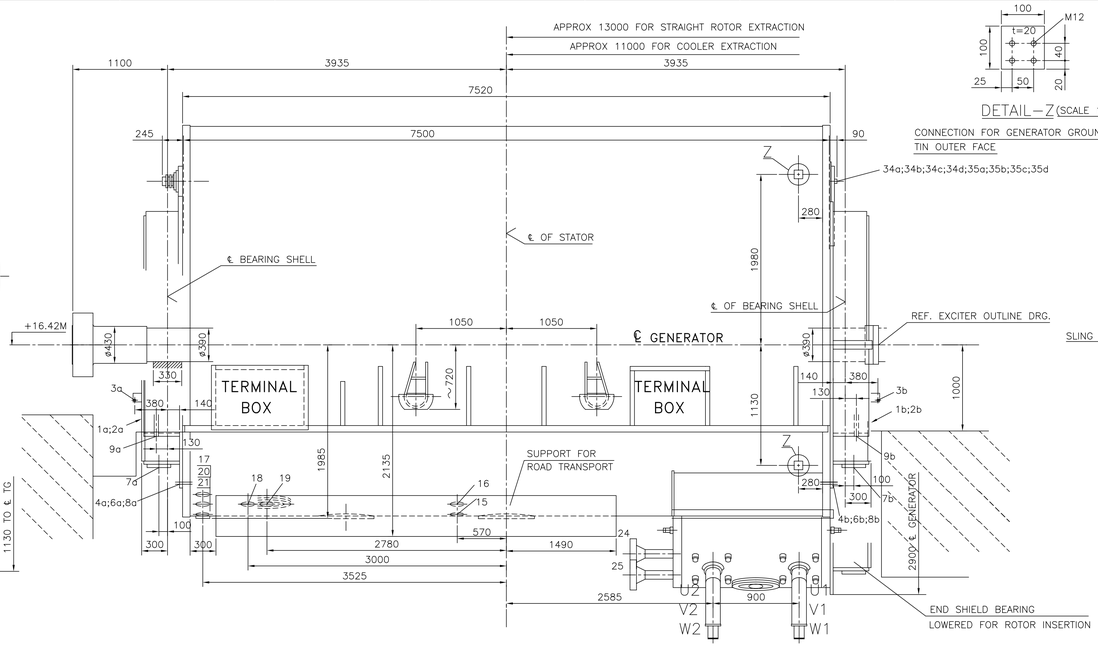
DEPT. SCALE 1:100 DRAWING No. PE-DG-328-100-M006
SIGN
DATE
SHEET 1 OF 1 REV 01
SIZE-A1

PRE-DRILL AND SPINDLE
16 BORES ø74.9 +0.05



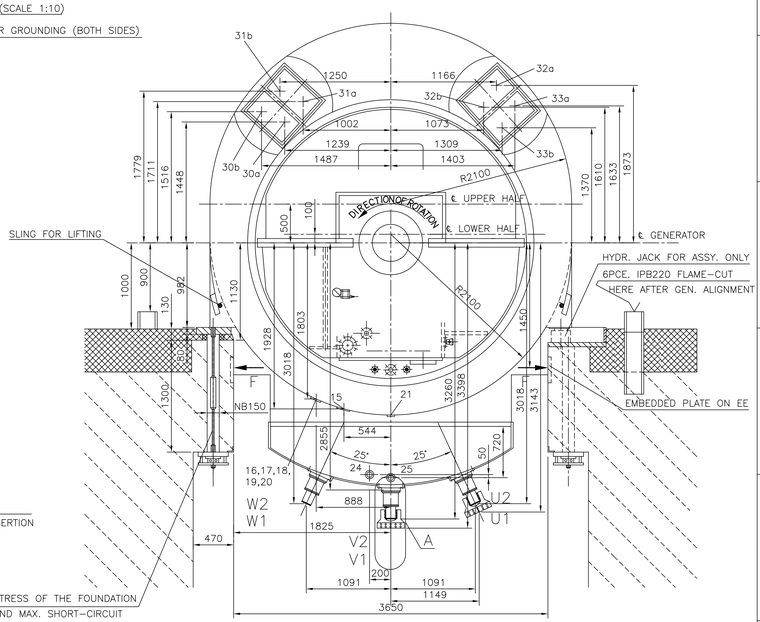
SECTION G-G (SCALE 1:5)

COUPLING



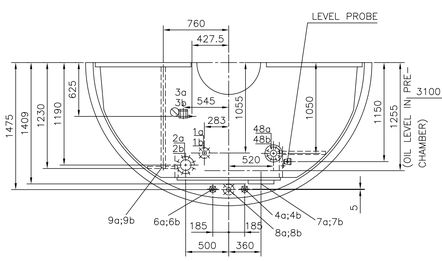
DETAIL-Z (SCALE 1:10)

CONNECTION FOR GENERATOR GROUNDING (BOTH SIDES)
TIN OUTER FACE

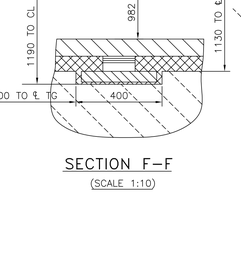


VIEW FROM 'TE' (SECTION A-B-C-D)

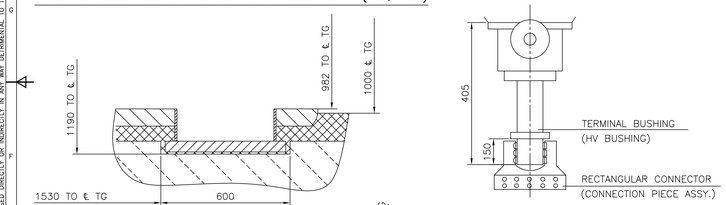
THE CHOSEN PRESTRESS OF THE FOUNDATION BOLT IS 260 KN AND MAX. SHORT-CIRCUIT FORCE IS 238 KN.



END SHIELD BEARING LOWER SECTION (TE; EE)



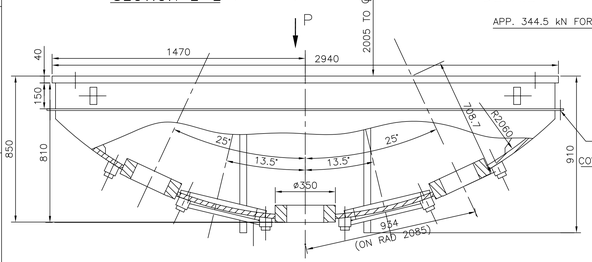
SECTION F-F (SCALE 1:10)



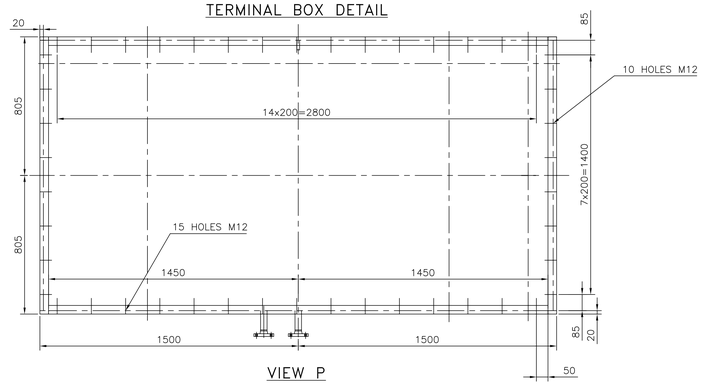
SECTION E-E (SCALE 1:10)

DETAIL 'A'

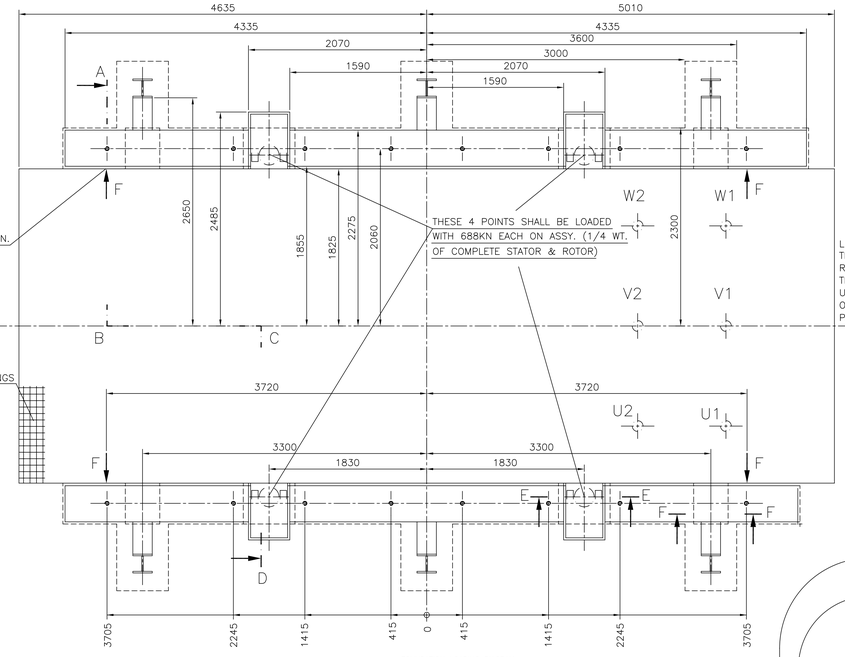
APP. 344.5 kN FOR LATERAL ALIGNMENT OF GEN.



TERMINAL BOX DETAIL

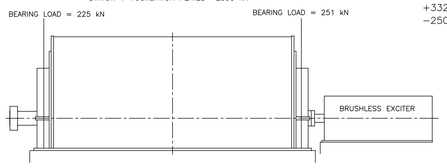


VIEW P



FOUNDATION LOADING DIAGRAM
(DEAD LOAD)

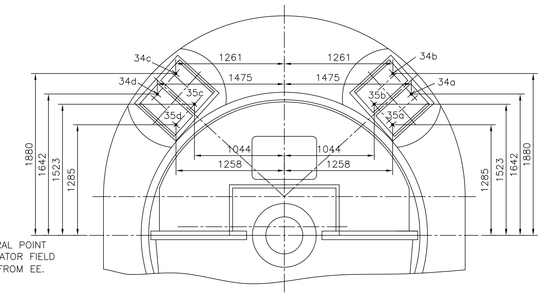
STATOR + FOUNDATION PLATES= 2390 kN



LINE TERMINALS ARE MARKED U1,V1,W1. NEUTRAL POINT TERMINALS ARE MARKED U2,V2,W2. THE GENERATOR FIELD ROTATES IN CLOCKWISE DIRECTION AS SEEN FROM EE. TERMINAL VOLTAGE GETS POSITIVE MAXIMUM IN U1,V1,W1 SEQUENCE.
ONLY FLEXIBLE CONNECTIONS ALLOWED.
PHASE SEQUENCE: U1-V1-W1

NAME/RATING PLATE DETAILS

K.W.	270000
P.F.	0.85 LAG
K.V.A.	317700
STATOR VOLTS	16500
STATOR AMPS	11115
ROTOR VOLTS	325
ROTOR AMPS	2666
RPM	3000
HZ	50
PHASE	3
CONNECTION	YY
COOLANT	HYDROGEN
INSULATION CLASS	F
GAS PRESSURE	4 BAR (G)



VIEW FROM 'EE'

TERMINATION DETAILS

1a	FLANGED	65	INLET BRG. OIL TE
1b	FLANGED	65	INLET BRG. OIL EE
2a	FLANGED	150	OUTLET BRG. OIL TE
2b	FLANGED	150	OUTLET BRG. OIL EE
3a	FLANGED	15	JACKING OIL INLET TE
3b	FLANGED	15	JACKING OIL INLET EE
4a	FLANGED	40	INLET SEAL OIL TE
4b	FLANGED	40	INLET SEAL OIL EE
6a	FLANGED	15	RING RELIEF TE
6b	FLANGED	15	RING RELIEF EE
7a	FLANGED	50	OUTLET S.O. TE H2 SIDE
7b	FLANGED	50	OUTLET S.O. EE H2 SIDE
8a	FLANGED	50	OUTLET S.O. TE AIR SIDE
8b	FLANGED	50	OUTLET S.O. EE AIR SIDE
9a	FLANGED	65	EXHAUST BRG. CHAMBER TE
9b	FLANGED	65	EXHAUST BRG. CHAMBER EE
15	FLANGED	50	CONNECTION FOR CO2
16	FLANGED	50	CONNECTION FOR H2
17	FLANGED	25	PRESSURE BEFORE FAN
18	FLANGED	25	PRESSURE AFTER FAN
19	FLANGED	50	CONN. TO GAS DRIER
20	FLANGED	50	CONN. FROM GAS DRIER
21	FLANGED	50	TO LIQUID DETECTOR RACK
24	WELDED	25	TO LIQUID DETECTOR RACK
25	WELDED	25	TO LIQUID DETECTOR RACK
30a,31a,32a,33a	FLANGED	100	COOLING WATER INLET TO H2 COOLER
30b,31b,32b,33b	FLANGED	100	COOLING WATER OUTLET FROM H2 COOLER
34a,34b,34c,34d	THREADED	G1/2"	VENT COOLERS A,B,C,D
35a,35b,35c,35d	THREADED	G1/2"	DRAIN COOLERS A,B,C,D

SHORT-CIRCUIT FORCES; WEIGHTS CONSIDERED

MAX. FORCE CALULATED FROM MAX. MOMENT FOR A 2-POLE TERMINAL SHORT-CIRCUIT AT 100% NOM. VOLTAGE. ANY ALLOWANCES NOT INCLUDED. THE FORCES ARE AS SHOWN ALTERNATING FORCES, INDEPENDENT OF THE DIRECTION OF ROTATION.

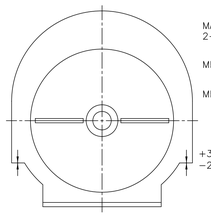
SHORT-CITCUIT + 1/2 GEN. WEIGHT = FOUNDATION LOAD
LOAD

1910kN	+	1410 kN	=	3320 kN
-1910 kN	+	1410kN	=	-500 kN

MASS MOMENT OF INERTIA OF STATOR AT IST LONG AXIS 458×10^3 kgm^2

MASS MOMENT OF INERTIA OF ROTOR 5330 kgm^2

FOUNDATION LOAD AT SHORT-CIRCUIT (ALTERNATING FORCES)



MAX. SHORT CIRCUIT TORQUE AT
2-POLE TERMINAL FAULT (t IN s; M IN kNm)

$Mk = 5582e^{-t/0.2344} \times \sin wt - 2791e^{-t/0.2367} \times \sin 2wt + 814e^{-t/0.2602}$

Mk=7842kNm

WEIGHT:

STATOR SHIPPING WEIGHT	228.0 Mg
COOLERS	8.6 Mg
END SHIELD & COMPLETING ASSEMBLIES	23.3 Mg
ROTOR	42.915 Mg
TOTAL WEIGHT OF GENERATOR	297.5 Mg
BRUSHLESS EXCITER ASSEMBLY	30.4 Mg

GRADE OF UNTOL. DIM.:-		GRADE OF UNTOL. DIM.:-	
M/CG- V/C/M/F AA 0230208		M/CG- V/C/M/F AA 0230208	
WELDING-A/B/C/D-AA621104		WELDING-A/B/C/D-AA621104	
GAS CUTTING-T3'AA0621101		GAS CUTTING-T3'AA0621101	
REV.	DATE	ALTERED	
		CHECKED	

CBOM NO.			STATUS OF DRG.
AGREED DCPT.	NAME	SIGN	DATE

REV.	DATE	ALTERED	
01	16.10.09	CHECKED	RCS sd/-

REVIEWED IN LINE WITH CUSTOMER COMMENTS.

DEVELOPMENT CONSULTANTS PRIVATE LIMITED
CONSULTING ENGINEERS

1X270MW BELA NAGPUR TPP
NAGPUR, MAHARASHTRA

BHARAT HEAVY ELECTRICALS LTD.
HARDWAR

	NAME	SIGN	DATE	NO.OF VAR.
DRN	ASHISH	sd/-	02.06.09	
CHD	RC SHARMA	sd/-	08.06.09	
APD	R C BAJPAI	sd/-	08.06.09	

DEPT.	SCALE	WEIGHT(Kg.)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
EME	1:25	-	-		
CODE 4033					

TITLE
GENERATOR OUTLINE

DRAWING NO. 0-139-00-01341 REV. -
SHEET NO.01 NO.OF SHEETS 01
SIZE A0

REF. DRG NO. | SIGN & DATE | INVENTORY NO.