TENDER SPECIFICATION

S N	Tender Specification Number	Unit Number & Project
1	**BHE/PW/PUR/DHJOI-MECH (BLOCK I)/1031**	**UB1, HRSG 2 & 4 , STG1 and GT/GTG 2 & 4 (Block I)**
2	**BHE/PW/PUR/DHJOI-MECH (BLOCK II)/1032**	**UB2, HRSG 1 & 3, STG2 and GT/GTG 1 & 3 (Block II)**

RECEIPT/COLLECTION/LOADING/UNLOADING/TRANSPORTATION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING, SUPPLY OF PAINTS/PRIMER AND APPLICATION OF PAINTS FOR FINAL PAINTING AND HANDING OVER OF ONE UNIT OF CAPACITY 220 TPH UTILITY BOILER (UB) + 2 UNITS EACH OF 110 TPH HEAT RECOVERY STEAM GENERATORS (HRSG) ALONG WITH THERE AUXILIARIES, STEEL STACK WITH COMPLETE PLATFORMS ETC INCLUDING ELECTRICAL WORK OF STACK, 2 UNITS EACH OF Fr6 B GAS TURBINE, GAS TURBINE GENERATOR SETS & RELATED AUXILIARIES, BYPASS-STACK, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, CONDENSER WITH R.E. JOINTS, STEAM TURBINE-ONE UNIT, TURBO-GENERATOR AND RESPECTIVE ASSOCIATED AUXILIARIES, POWER CYCLE PUMPS INCLUDING CW PUMPS, HEAT EXCHANGERS, INTEGRAL PIPING, BOUGHT OUT ITEMS, BALANCE OF PLANTS EQUIPMENTS / PACKAGES LIKE MISC. PUMPS, MISC. CRANES AND HOISTS, TANKS & VESSELS ETC., APPLICATION OF THERMAL INSULATION OF UB AND HRSG WITH AUXILIARIES, STEEL STACK, AND APPLICATION OF THERMAL INSULATION OF EQUIPMENTS/PIPING/ & VESSELS, PIPING WITH VALVES & FITTINGS INCLUDING GAS TURBINE AND STEAM TURBINE SET EQUIPMENTS – HEATERS, DE-AERATOR, TANKS, VESSELS & PIPING ETC FOR OPaL (ONGC PETRO ADDITIONS LIMITED) STEAM AND POWER GENERATION SYSTEM PACKAGE FOR DAHEJ PETROCHEMICAL COMPLEX, (BLOCK I) UB1, HRSG 2&4, STG1 AND GT/GTG 2&4, (BLOCK II) UB2, HRSG 1&3 AND STG2, GT/GTG 1&3.

AT

2X220 TPH UB + 2X30MW STG + 4XFr6 B GT + 4X110 TPH HRSG
AT ONGC PETRO ADDITIONS LIMITED, SEZ, DAHEJ GUJARAT

TECHNICAL BID - VOLUME- I

TENDER SPECIFICATIONS CONSISTS OF:

- **Notice Inviting Tender**
- **Volume 1 A - Technical Conditions of Contract,**
- **Volume 1 B - Special conditions of Contract,**
- **Volume 1 C - General conditions of Contract**
- **Volume 1 D - Forms & Procedures**

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

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TENDER SPECIFICATION ISSUE DETAILS

S N	Tender Specification Number	Unit Number & Project
1	**BHE/PW/PUR/DHJOI-MECH (BLOCK I)/1031**	**UB1, HRSG 2 & 4 , STG1 and GT/GTG 2 & 4 (Block I)**
2	**BHE/PW/PUR/DHJOI-MECH (BLOCK II)/1032**	**UB2, HRSG 1 & 3, STG2 and GT/GTG 1 & 3 (Block II)**

RECEIPT/COLLECTION/LOADING/UNLOADING/TRANSPORTATION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING, SUPPLY OF PAINTS/PRIMER AND APPLICATION OF PAINTS FOR FINAL PAINTING AND HANDING OVER OF ONE UNIT OF CAPACITY 220 TPH UTILITY BOILER (UB) + 2 UNITS EACH OF 110 TPH HEAT RECOVERY STEAM GENERATORS (HRSG) ALONG WITH THERE AUXILIARIES, STEEL STACK WITH COMPLETE PLATFORMS ETC INCLUDING ELECTRICAL WORK OF STACK, 2 UNITS EACH OF Fr6 B GAS TURBINE, GAS TURBINE GENERATOR SETS & RELATED AUXILIARIES, BYPASS-STACK, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, CONDENSER WITH R.E. JOINTS, STEAM TURBINE-ONE UNIT, TURBO-GENERATOR AND RESPECTIVE ASSOCIATED AUXILIARIES, POWER CYCLE PUMPS INCLUDING CW PUMPS, HEAT EXCHANGERS, INTEGRAL PIPING, BOUGHT OUT ITEMS, BALANCE OF PLANTS EQUIPMENTS / PACKAGES LIKE MISC. PUMPS, MISC. CRANES AND HOISTS, TANKS & VESSELS ETC., APPLICATION OF THERMAL INSULATION OF UB AND HRSG WITH AUXILIARIES, STEEL STACK, AND APPLICATION OF THERMAL INSULATION OF EQUIPMENTS/PIPING/ & VESSELS, PIPING WITH VALVES & FITTINGS INCLUDING GAS TURBINE AND STEAM TURBINE SET EQUIPMENTS – HEATERS, DE-AERATOR, TANKS, VESSELS & PIPING ETC FOR OPaL (ONGC PETRO ADDITIONS LIMITED) STEAM AND POWER GENERATION SYSTEM PACKAGE FOR DAHEJ PETROCHEMICAL COMPLEX, (BLOCK I) UB1, HRSG 2&4, STG1 AND GT/GTG 2&4, (BLOCK II) UB2, HRSG 1&3, STG2 AND GT/GTG 1&3.

AT

2X30MW STG + 2X220 TPH UB + 4XFr6 B GT + 4X110 TPH HRSG
AT ONGC PETRO ADDITIONS LIMITED, SEZ, DAHEJ GUJARAT

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

DY. GENERAL MANAGER (Purchase)
Place: Nagpur
Date :

1031
&
1032

NOTICE INVITING TENDER

(Document No PS:MSX:NIT:Rev 01 dated 1st Jun 2012)

Bharat Heavy Electricals Limited

Ref: NO: BHE/PW/PUR/DHJOI-MECH Block I & II /1031-1032 Dt: 28/07/2012

NOTICE INVITING TENDER (NIT)

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

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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/DHJOI-MECH (BLOCK I)/1031 BHE/PW/PUR/DHJOI-MECH (BLOCK II)/1032
ii	Broad Scope of job	RECEIPT/COLLECTION/LOADING/UNLOADING/TRANSPORTATION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING, SUPPLY OF PAINTS/PRIMER AND APPLICATION OF PAINTS FOR FINAL PAINTING AND HANDING OVER OF ONE UNIT OF CAPACITY 220 TPH UTILITY BOILER (UB) + 2 UNITS EACH OF 110 TPH HEAT RECOVERY STEAM GENERATORS (HRSG) ALONG WITH THERE AUXILIARIES, STEEL STACK WITH COMPLETE PLATFORMS ETC INCLUDING ELECTRICAL WORK OF STACK, 2 UNITS EACH OF Fr6 B GAS TURBINE, GAS TURBINE GENERATOR SETS & RELATED AUXILIARIES, BYPASS-STACK, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, CONDENSER WITH R.E. JOINTS, STEAM TURBINE-ONE UNIT, TURBO-GENERATOR AND RESPECTIVE ASSOCIATED AUXILIARIES, POWER CYCLE PUMPS INCLUDING CW PUMPS, HEAT EXCHANGERS, INTEGRAL PIPING, BOUGHT OUT ITEMS, BALANCE OF PLANTS EQUIPMENTS / PACKAGES LIKE MISC. PUMPS, MISC. CRANES AND HOISTS, TANKS & VESSELS ETC., APPLICATION OF THERMAL INSULATION OF UB AND HRSG WITH AUXILIARIES, STEEL STACK, AND APPLICATION OF THERMAL INSULATION OF EQUIPMENTS/PIPING/ & VESSELS, PIPING WITH VALVES & FITTINGS INCLUDING GAS TURBINE AND STEAM TURBINE SET EQUIPMENTS – HEATERS, DE-AERATOR, TANKS, VESSELS & PIPING ETC FOR OPaL (ONGC PETRO ADDITIONS LIMITED) STEAM AND POWER GENERATION SYSTEM PACKAGE FOR DAHEJ PETROCHEMICAL COMPLEX, (Block I consist of

		UB1, HRSG 2&4 + STG1, GT/GTG 2&4), & (Block II consist of UB2, HRSG 1&3 + STG2, GT/GTG 1&3). **BOTH THE BLOCKS SHALL BE AWARDED TO THE SEPARATE AGENCIES**	
iii	**DETAILS OF TENDER DOCUMENT**		
a	Volume-IA	*Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc*	*Applicable*
b	Volume-IB	*Special Conditions of Contract (SCC)*	*Applicable*
c	Volume-IC	*General Conditions of Contract (GCC)*	*Applicable*
d	Volume-ID	*Forms and Procedures*	*Applicable*
e	Volume- I E	*Technical Specifications*	*Applicable*
e	Volume-II	*Price Schedule (Absolute value).*	*Applicable*
iv	**Issue of Tender Documents**	***1. Sale from BHEL PS Regional office at :*** ***Start : 28/07/ 2012*** ***Closes: 06/08/2012 , 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 :07/08 / 2012 , Time :15.00Hrs*** ***Place : BHEL OFFICE AT NAGPUR***	*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 3 days before the due date of offer submission)* *Along with soft version also, addressing to undersigned & to others as per contact address given below*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**	*Date : Not applicable.*	*Not applicable.*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	*NAME OF IEM –* Shri J. M. Lyngdoh , IAS (Retd.) Plot No. 144-145, Pragati Resort, Proddator Village & P.O. Shankarpally Road, Rangareddy Distt. (AP)- 500 033	*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)
- One set of tender documents shall be retained by the bidder for their reference

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 Deviation with respect to tender clauses and additional clauses/suggestions in Techno-commercial bid / Price bid shall NOT 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:

Bidders capacity for executing the job under tender shall be assessed 'LOAD' wise and 'PERFORMANCE' wise as per the following:

I. **LOAD**: Load takes into consideration **ALL** the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The 'Load' is the sum of the unit wise identified packages (refer Table-1) for contracts with BHEL Regions. The cut off month for reckoning 'Load' shall be the month, two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(Note: For example if latest bid submission is in Aug 2011, then the 'load' shall be calculated upto and inclusive of June 2011)

i). Total number of Packages

Total number of Packages in hand = P
Where
- P is the sum of all unit wise identified packages under execution with BHEL Regions as of the cut off month defined above, including packages yet to be commenced.

ii) Weightage "A" assigned to bidders based on Total number of Packages 'P':
a) If 'P' = 0-9, : "A" will be equal to '4'
b) If 'P' = 10-18, : "A" will be equal to '3'
c) If 'P' = 19-36, : "A" will be equal to '2'
d) If 'P' = 37-60, : "A" will be equal to '1'
e) If 'P' is above 60 : "A" will be equal to '0'

II. **PERFORMANCE**: Here 'Monthly Performance' of the bidder for all the packages (**under execution**/ executed during the 'Period of Assessment' in all the Power Sector Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the month two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(Note: For example if 'latest date of bid submission' is in Aug 2011, then the 'performance' shall be assessed for a 6 month period upto and inclusive of June 2011, for all the unit wise identified packages (refer Table I)

i). Calculation of Overall 'Performance Rating' for 'similar Package/Packages' for the tendered scope under execution at Power Sector Regions:
This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for all the similar Package/packages', divided by the total number of Package months for which evaluation should have been done, as per procedure below:

a) $P_1, P_2, P_3, P_4, P_5, \ldots P_N$ etc be the packages (**under execution**/ executed during the 'Period of Assessment' in all Regions) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced. Total number of similar packages for all Regions = $\mathbf{P_T}$ (ie $P_T = P_1 + P_2 + P_3 + P_4 + .. P_N$)

b) Number of Months 'T_1' for which 'Monthly Performance Evaluation' as per relevant formats, should have been done in the 'Period of Assessment' for the corresponding similar package P_1. Similarly T_2 for package P_2, T_3 for package P_3, etc for the tendered scope. Now calculate cumulative total months '$\mathbf{T_T}$' for total similar Packages '$\mathbf{P_T}$' for all Regions (i.e $\mathbf{T_T} = T_1 + T_2 + T_3 + T_4 + .. T_N$)

c) Sum 'S_1 ' of 'Monthly Performance Evaluation' Scores (S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, S_{1-5},…. S_{1-N}) for similar package P_1, for the 'period of assessment' 'T_1' (i.e $S_1 = S_{1-1}+ S_{1-2}+ S_{1-3}+ S_{1-4}+ S_{1-5}+…S_{1-N}$). Similarly S_2 for package P_2 for period T_2, S_3 for package P_3 for period T_3, etc for the tendered scope for all Regions. Now calculate cumulative sum 'S_T' of 'Monthly Performance Evaluation' Scores for total similar Packages 'P_T' for all Regions (i.e 'S_T '= $S_1+ S_2+ S_3+ S_4+ S_5+…. S_N$.)

d) **Overall Performance Rating 'R_{BEHL}' for the similar Package/Packages** (**under execution**/ executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL)**:**

$$= \frac{\text{Aggregate of Performance scores for all similar packages in all the Regions}}{\text{Aggregate of months for each of the similar package for which performance should have been evaluated in all the Regions}}$$

$$= \frac{S_T}{T_T}$$

e) Bidders to note that the risk of non evaluation or non availability of the 'Monthly Performance Evaluation' reports as per relevant formats is to be borne by the Bidder

f) Table showing methodology for calculating 'a', 'b' and 'c' above

Sl no	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
1	Similar Packages for all Regions →	P_1	P_2	P_3	P_4	P_5	…	P_N	Total No of similar packages for all Regions = **P_T** ie Sum (Σ) of columns (iii) to (ix)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of assessment for corresponding similar Package (as in row 1)	T_1	T_2	T_3	T_4	T_5	…	T_N	Sum (Σ) of columns (iii) to (ix) = **T_T**
3	Monthly performance scores for the corresponding period (as in Row 2)	S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, … S_{1-T1}	S_{2-1}, S_{2-2}, S_{2-3}, S_{2-4}, … S_{2-T2}	S_{3-1}, S_{3-2}, S_{3-3}, S_{3-4}, … S_{3-T3}	S_{4-1}, S_{4-2}, S_{4-3}, S_{4-4}, … S_{4-T4}	S_{5-1}, S_{5-2}, S_{5-3}, S_{5-4}, … S_{5-T5}	.. … … … …	S_{N-1}, S_{N-2}, S_{N-3}, S_{N-4}, … S_{N-TN}	---------
4	Sum of Monthly Performance scores of the corresponding Package for the	S_1	S_2	S_3	S_4	S_5	…	S_N	Sum (Σ) of columns (iii) to (ix) = **S_T**

	corresponding period (as in row-3)								

ii) Weightage "B" assigned to bidders based on Overall Performance Rating (R_{BHEL}) at Power Sector Regions, for the respective Package:

a) If $\mathbf{R_{BHEL}}$ is ≥ 80%, "B" will be equal to '6'
b) If $\mathbf{R_{BHEL}}$ is ≥ 75% < 80%, "B" will be equal to '5'
c) If $\mathbf{R_{BHEL}}$ is ≥ 70% < 75%, "B" will be equal to '4'
d) If $\mathbf{R_{BHEL}}$ is ≥ 65% < 70%, "B" will be equal to '3'
e) If $\mathbf{R_{BHEL}}$ is ≥ 60% < 65%, "B" will be equal to '2'
f) If $\mathbf{R_{BHEL}}$ is < 60%, "B" will be equal to '0'

III. 'Assessment of Capacity of Bidder' to be Qualified for the tender:

Shall be based on the sum of the weightages obtained in 'LOAD' (A) and 'PERFORMANCE' (B) as below:

a) If the sum (A+B) is 6 or above for each of the applicable Package, then the Bidder is considered 'Qualified' for the tender
b) If the sum (A+B) is less than 6 for any of the applicable Package, then the Bidder is considered 'NOT Qualified' for the tender

IV. **Explanatory note**:

a) Similar package means Boiler or ESP or Piping or Turbine or Civil or Structure or Electrical or CI, etc at the individual level irrespective of rating of Plant, and irrespective of whether the subject tender is a single package or as part of combined/composite packages. Normally Boiler, ESP, Piping, Turbine, Electrical, CI, Civil, Structure, etc is considered individual level of package. For example in case the tendered scope is a Boiler Vertical Package comprising of Boiler, ESP and Power Cycle Piping (i.e the 'identified packages as per Table-1 below), the 'PERFORMANCE' part against sl no II above, needs to be evaluated considering all the identified packages (ie Boiler, ESP and Power Cycle Piping) and finally the Bidder's capacity to execute the tendered scope is assessed in line with III above

b) Identified Packages (Unit wise)

Table-1

	Civil	Electrical & CI	Mechanical
	i). Enabling works ii). Pile and Pile Caps iii). Civil Works including foundations iv). Structural Steel Fabrication & Erection v). Chimney vi). Cooling Tower vii). Others (Civil)	i). Electrical ii). CI iii). Others (Elec & CI)	i). Boiler & Aux (All types including CW Piping if applicable) ii). Power Cycle Piping/Critical Piping iii). LP Piping iv). ESP v). Steam Turbine Generator set & Aux vi). Gas Turbine Generator set & Aux vii). Hydro Turbine Generator set & Aux viii). Turbo Blower (including Steam Turbine)

			ix). Material Handling x). Material Management xi). Material Handling & Material Management xii). Others (Mechanical)

c) Vendors who are first timers to any BHEL Region, may be considered subject to satisfying other tender conditions. Eligibility of the party for the next tender of any package in that Region, shall be subject to the bidder satisfying the 'Assessment of Capacity of Bidder' for a period of first **nine months** after commencement of work or contract duration whatever is lesser.

In case the first timer is executing any other packages in any BHEL Region, then the performance evaluation will be based on the data available for the other packages though not similar, for the 'Period of assessment', for the purpose of 'Assessment of Capacity of Bidder'

d) Vendors who are not first timers and who have not been executing any package or packages similar to the packages under the tender in the 'Period of assessment', shall be considered qualified subject to them satisfying all other tender conditions.

e) In the unlikely event of all bidders shortlisted against Technical and Financial Qualification criteria not meeting the criteria on 'Assessment of Capacity of Bidders' detailed above, OR leads to a single tender response on applying the criteria of 'Assessment of Capacity of Bidders', then BHEL at its discretion, reserves the right to consider the further processing of the Tender based on the **Overall Performance Rating** '**R_{BHEL}'** only**.**

f) 'Under execution' shall mean works in progress as per the following:

i. upto Boiler Steam Blowing in case of Steam Generator and Auxilliaries

ii. upto Synchronisation in case of all other works excepting sl no (i) and (iii)

iii. upto execution of at least 75% of anticipated contract value (unit wise), in case of Enabling works or Civil & Structures.

Note : BHEL at its discretion can extend (or reduce in exceptional cases in line with Contract conditions) the period defined against (i), (ii) and (iii) above, depending upon the balance scope of work to be completed.

g) Performance evaluation in CL 9 above is applicable to Prime bidder and consortium partner (or Technical tie up partner) for their respective scope of work

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, applicable wage structure, wage rules, 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.

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 of 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 (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 satisfying the Pre Qualification Criteria specified in this NIT as per Annexure-I (as applicable), past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right not to consider offers of parties under HOLD.

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) unless specified otherwise.

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 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre Qualifying Requirement (PQR) criteria, and in such a case the following shall be complied with:

23.1 Prime Bidder and Consortium Partner or partners are required to enter into a consortium agreement with a validity period of six months initially. In case the consortium is awarded the contract, then the Consortium Agreement between the Prime Bidder and Consortium Partner or partners shall be extended till contractual completion period including extension periods if any applicable.

23.2 'Stand alone' bidder cannot become a '**Prime Bidder' or a 'Consortium bidder' or 'Technical Tie up bidder' in a consortium (or Technical Tie up) 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.

23.3 Number of partners for a consortium Bidding (or Technical Tie up) shall be as specified in the PQR

23.4 Prime Bidder shall be as specified in the Pre Qualification Requirement, else the bidder who has the major share of work

23.5 In order to be qualified for the tender, Prime Bidder and Consortium partner or partners shall satisfy (i) the Technical 'Pre Qualifying Requirements' specified for the respective package, (ii) "Assessment of Capacity of Bidder' as specified in clause 9.0

23.6 Prime Bidder shall comply with additional 'Technical' criteria of PQR as defined in 'Explanatory Notes for the PQR'

23.7 Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified

23.8 In case customer approval is required, then Prime Bidder and Consortium Partner or partners shall have to be individually approved by Customer for being considered for the tender.

23.9 Prime Bidder shall be responsible for the overall execution of the contract

23.10 In case of award of job, Performance shall be evaluated for Prime Bidder and Consortium Partner or partners for their respective scope of work(s) as per prescribed formats

23.11 In case the Consortium partner or partners back out, their SDs shall be encashed by BHEL. In such a case, other consortium partner or partners meeting the PQR have to be engaged by the Prime Bidder, and if not, the respective work will be withdrawn and executed on risk and cost basis of the Prime Bidder. The new consortium partner or partners shall submit fresh SDs as applicable.

23.12 In case the prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.

23.13 After execution of work, the work experience shall be assigned to the Prime Bidder and the consortium partner or partners for their respective scope of work. After successful execution of two similar works with the same consortium partner or partners under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'stand alone' bidder for similar works, subject to certification from BHEL about the active involvement of the Prime Bidder for satisfactory execution of the works.

23.14 The consortium partner shall submit SD equivalent to 2% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. In case there are two consortium partners, then each partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value.

23.15 In case of a Technical Tie up, all the clauses applicable for the Consortium partner shall be applicable for the Technical Tie up partner also

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 Annexure-3: Important Infor
04 Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	**RECEIPT/COLLECTION/LOADING/UNLOADING/TRANSPORTATION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING, SUPPLY OF PAINTS/PRIMER AND APPLICATION OF PAINTS FOR FINAL PAINTING AND HANDING OVER OF ONE UNIT OF CAPACITY 220 TPH UTILITY BOILER (UB) + 2 UNITS EACH OF 110 TPH HEAT RECOVERY STEAM GENERATORS (HRSG) ALONG WITH THERE AUXILIARIES, STEEL STACK WITH COMPLETE PLATFORMS ETC INCLUDING ELECTRICAL WORK OF STACK, 2 UNITS EACH OF Fr6 B GAS TURBINE, GAS TURBINE GENERATOR SETS & RELATED AUXILIARIES, BYPASS-STACK, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, CONDENSER WITH R.E. JOINTS, STEAM TURBINE-ONE UNIT, TURBO-GENERATOR AND RESPECTIVE ASSOCIATED AUXILIARIES, POWER CYCLE PUMPS INCLUDING CW PUMPS, HEAT EXCHANGERS, INTEGRAL PIPING, BOUGHT OUT ITEMS, BALANCE OF PLANTS EQUIPMENTS / PACKAGES LIKE MISC. PUMPS, MISC. CRANES AND HOISTS, TANKS & VESSELS ETC., APPLICATION OF THERMAL INSULATION OF UB AND HRSG WITH AUXILIARIES, STEEL STACK, AND APPLICATION OF THERMAL INSULATION OF EQUIPMENTS/PIPING/ & VESSELS, PIPING WITH VALVES & FITTINGS INCLUDING GAS TURBINE AND STEAM TURBINE SET EQUIPMENTS – HEATERS, DE-AERATOR, TANKS, VESSELS & PIPING ETC FOR OPaL (ONGC PETRO ADDITIONS LIMITED) STEAM AND POWER GENERATION SYSTEM PACKAGE FOR DAHEJ PETROCHEMICAL COMPLEX, (BLOCK I) UB1, HRSG 2&4, STG1 AND GT/GTG 2&4, (BLOCK II) UB2, HRSG 1&3, STG2 AND GT/GTG 1&3.**
TENDER NO	**BHE/PW/PUR/DHJOI-MECH (BLOCK I)/1031** **BHE/PW/PUR/DHJOI-MECH (BLOCK II)/1032**

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. **Bidder must fill up this column as per applicability**
A	Submission of Integrity Pact duly signed (if applicable) (Note: To be submitted by Prime Bidder & Consortium/Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)	APPLICABLE	
B	**Technical** 1) Bidder must have, **Executed** in last seven years as on the latest date of offer Submission, Erection, Testing and Commissioning of **Boiler consisting of pressure parts, structures/ESP, IBR/Power Cycle Piping of same unit of 190 MW or higher rating AND** Bidder must have also Executed Erection, Testing and Commissioning **One set of Steam Turbine Generator (STG) of 190 MW** or higher rating **OR** **Consortium is permitted with One Agency for E & C of GT,GTG, STG and Their Auxl.**	APPLICABLE	

	2) **Prime Bidder** must have, **Executed** Erection, Testing and Commissioning of **Boiler consisting of pressure parts, structures/ESP , IBR/Power Cycle Piping of same unit of 190 MW** or higher rating in last seven years as on the latest date of offer Submission **And** Prime Bidder **can form consortium with experienced agency who have executed Erection, Testing and Commissioning of One set of Steam Turbine Generator (STG) of at least 190 MW** in last seven years as on the latest date of offer Submission**.** **Consortium is permitted for E & C of GT,GTG, STG and Their Auxl.** Prime Bidder (who is submitting the offer), shall also submit relavent documents of the consortium Partner in support of the experience of the consortium partner satisfying PQR (i.e. work order, work completion certificate & profile of organization). Prime bidder has to submit the copy of consortium agreements executed between both agencies on Rs 50/- non judicial stamp paper duly certified by Notary as per Format No- F-22 of Vol- BCD of tender.		
C-1	**Financial** **TURNOVER** Bidder (Prime Bidder/Stand alone bidder) must have achieved an average annual financial turnover (Audited) of Rs 1050 Lakhs or more over last three Financial Years i.e. 2009-2010, 2010-2011, 2011-12 or for 2008-2009, 2009-2010 and 2010-11 if Annual Accounts for FY 2011-12 are not audited.	APPLICABLE	
C-2	NETWORTH (only in case of Companies) Net worth of the Bidder (Prime Bidder/Stand alone bidder) based on the latest Audited Accounts as furnished for 'C-1' above should be positive	APPLICABLE	
C-3	PROFIT Bidder(Prime Bidder/Stand alone bidder) must have earned cash profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1 above based on latest Audited Accounts.	APPLICABLE	
D	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)	APPLICABLE	By BHEL

E	Approval of Customer (if applicable) **Note:** Names of bidders (including consortium/Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval.	APPLICABLE	BY BHEL
F	Price Bid Opening **Note:** Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E	APPLICABLE	BY BHEL
F	Consortium criteria (if applicable)	APPLICABLE for the scope of E & C of STG, GTG and their Auxl	

Explanatory Notes for the PQR (unless otherwise specified in the PQR):

1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above along with all annexures
2. In case audited Financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e total divided by three.
3. C-2:-NETWORTH : Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
4. C-3:- PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the three financial years as in C-1 above
5. ~~'Additional' Criteria in respect of 'Technical' criteria of PQR (as in 'B' above) for Civil, Electrical, CI, unless otherwise specified :~~
   1. ~~Bidder should have executed similar work of any one of the following:~~
      - ~~a. One (1) work of value not less than Rs XXX~~
      - ~~OR~~
      - ~~b. Two (2) works of not less than Rs YYY~~
      - ~~OR~~
      - ~~c. Three (3) works of not less than Rs ZZZ~~
      - ~~(Value XXX, YYY, ZZZ shall be as indicated by BHEL~~
   2. ~~'Similar' work for criteria 5 above means~~
      - ~~a. Civil or Structures or Civil & Structures or Chimney respectively as applicable to the tendered scope in respect of 'CIVIL' Works~~
      - ~~b. Electrical works in respect of 'ELECTRICAL'~~
      - ~~c. CI works in respect of 'CI' Works~~
      - ~~d. Material Handling and/or Management works in respect of 'MM' works~~
6. Time period for achievement of the 'Technical' criteria of PQR (as in 'B' above) will be the last 7 years ending on the 'latest date' of Bid submission
7. **'EXECUTED' means the Vendor should have achieved the criteria specified in the Technical criteria of PQR (as in 'B' above) even if the Contract has not been completed or closed**
8. **Unless otherwise specified, for the purpose of 'Technical' criteria of PQR (as in 'B' above), the word 'EXECUTED' means:**
   1. **"BOILER LIGHT UP" in respect of Boiler & Aux and ESP**
   2. **"SYNCHRONISATION" in respect of STG/GTG and 'SPINNING' in case of HTG**
   3. "STEAM BLOWING COMPLETION" in respect of at least Main Steam Line of Power Cycle Piping
   4. "HYDRAULIC TEST" of the system in respect of Structures, Pressure parts/IBR Piping
   5. "CHARGING" in respect of power Transformers, Bus ducts, HT/LT switchgears
   6. "Completion of RCC Shell and liner (steel or brick as per tendered scope) up to the HEIGHT specified using slip form" in case of RCC Chimney.
   7. Achievement of physical Quantities as per respective PQRs in respect of Civil & Structures and Piling Works
   8. 'Readiness for coal Filling" in respect of Bunker Structure Work.
9. Boiler means HRSG or WHRB or any other types of Steam Generator
10. Critical/Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass, LP Bypass lines
11. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size,

	ISO rating in terms of MW shall be considered for evaluation. 12. In case the experience/PO/WO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR. 13. Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine unless otherwise specifically indicated in the PQR. 14. In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil/Gas Fired Boilers also can be considered unless otherwise specifically indicated in the PQR.

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

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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
6	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
7	Audited profit and Loss Account for the last three years submitted	Applicable	YES/NO
8	Copy of PAN Card submitted	Applicable	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable	YES/NO
10	Integrity Pact	YES/NO	YES/NO
11	Declaration by Authorised Signatory submitted	Applicable	YES/NO
12	No Deviation Certificate submitted	Applicable	YES/NO
13	Declaration confirming knowledge about Site Conditions submitted	Applicable	YES/NO
14	Declaration for relation in BHEL submitted	Applicable	YES/NO
15	Non Disclosure Certificate submitted	Applicable	YES/NO
16	Bank Account Details for E-Payment submitted	Applicable	YES/NO

17	Capacity Evaluation of Bidder for current Tender	Applicable	------
18	**Consortium Agreement against this tender**	Applicable	YES/NO
19	Power of Attorney for Submission of Tender/Signing Contract Agreement submitted	Applicable	YES/NO
20	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)

ANNEXURE - 3

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House" Siri Fort, New Delhi – 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context of meaning hereof shall include its successors or assigns of the ONE PART

And

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for

_____

_____

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 - Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for itself or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 the Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The bidder(s)/ Contractors(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 The Bidders (s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and execution from future contracts

If the Bidder(s)/Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per separate "Guidelines on for Suspension of Business Dealings with Suppliers/ Contractors" framed by the Principal.

Section 4 – Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

5.1 **The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption.** approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on his subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-Contractors

6.1 The Bidder(s)/ Contractor(s) undertake(s) to obtain from his sub-contractors a commitment consistent with this Integrity Pact and report Compliance to the Principal. This commitment shall be taken only from those sub-contractors whose contract value is more than 20% of Bidder's/ Contractor's contract value with the Principal. The Bidder(s)/Contractor(s) shall continue to remain responsible for any default by his Sub-contractor(s).

6.2 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.

6.3 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section -7 Criminal Charges against violating Bidders/ Contractors/ Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder. Contractor or Sub-contractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section – 8 Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractors(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s)/ Sib-contractor(s) with confidentiality.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meeting could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

8.6 The Monitor will submit a written report to the CMD, BHEL within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.

8.7 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.8 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant IPC/PC Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.9 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.10 The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact begins and shall be binding on and from the submission of bid(s) by bidder(s). It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

9.2 If any claim is made/ lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 – Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the reminder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those Bidders/ Contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

_____	_____
For & On Behalf of the Principal	For & On Behalf of the Bidder/ Contractor
(Office Seal)	(Office Seal)

ANNEXURE 4: IMPORTANT INFORMATION

1. The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site (www.bhel.com ---> Tender Notification -→ List of Banned Firms)

2. This tender is for 6 Units of Steam Generators (2 Units of 220 TPH Utility Boiler and 4 Units of 110 TPH HRSG) AND 6 Units of TGs (2 Units of STG and 4 Units of GTG), which is divided into 2 Blocks. Block – I comprises of (UB # 1, HRSG 2 & 4, STG # 1, GTG 2 & 4) and Block – II comprises of (UB # 2, HRSG 1 & 3, STG # 2, GTG 1 & 3).

1. Tender specification (Volume I) is common for both the Blocks.
2. Both the BLOCKS shall be awarded to separate agencies.
3. Scope of work for Both the Blocks are identical except additional 'Common Fuel Oil System/Equipments (320 MT)' included in the scope of Block I agency
4. Rates for E & C of Steam Generators in ONE BLOCK (Part A of Price Bid) and E & C of 3 Units of TGs including Auxl (Part B of price Bid specification) has been invited in Volume II price bid specification. **Lumpsum price for the 'Common Fuel Oil System/Equipments (320 MT)' shall be 8.5 % of the Lumpsum price quoted by the bidder for E & C of TGs in Sl No 1 of Part B of price bid specification.**
5. Bidders shall not quote any other rate for the 'Common Fuel Oil System/Equipments (320 MT)'.
6. Evaluation of Price Bid to arrive at the relative standing of the bidders (i.e L-1, L-2 etc) shall be based on the sum total of the prices quoted for Part A and Part B of price bid specification.
7. L-1 bidder shall be considered for award of BLOCK 1 (**UB # 1, HRSG 2 & 4, STG # 1, GTG 2 & 4**).
8. For award of BLOCK 2 (**UB # 2, HRSG 1 & 3, STG # 2, GTG 1 & 3**), next bidder in the order of their price competitiveness (i.e L-2, then L-3 and hence forth) shall be given an option to match their unit rate/price, with the Awarded/finalised rate/price of BLOCK I. However scope of work and the award value of Block II shall not include the 'Common Fuel Oil System/Equipments' which is in the scope of Block I.
9. In case none of the bidders agree to match the Awarded per unit rate of BLOCK I, then BHEL may consider awarding the BLOCK 2 (**UB # 2, HRSG 1 & 3, STG # 2, GTG 1 & 3**)to L-1 bidder or opt any other suitable method to finalize BLOCK 2 (**UB # 2, HRSG 1 & 3, STG # 2, GTG 1 & 3**)

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&
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TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CONTENTS

1.0 Project Information

1.1 INTROUCTION

ONGC Petro Additions Limited (OPaL) is setting up a Petrochemical Complex at Dahej in the state of Gujarat, India. The complex consist of dual feed Ethylene Cracker of 1100 KTPA capacity.

The scope of the present project is to set up a steam and power generation system to primarily meet the process steam requirement and incidentally generate power to partly meet the power requirement for the Petrochemical Complex. The project shall consist of 2X220 TPH Utility Boilers, 2X30 MW STG, 4XFr6B GTG and 4X110 TPH HRSG with associated auxiliary systems and accessories.

BHEL has been awarded the EPC package comprising of system design, detailed engineering, manufacturing, procurement, civil works, supply, fabrication, inspection, transportation, storage, installation, insurance, testing, mechanical completion, pre-commissioning, commissioning and performance guarantee test runs of the complete system. The project is to be completed within 30 months from zero date i.e. 15/04/2011.

Site information

a)	Location	: Dahej SEZ near Village Ambhetha at Dahej, District-Bharuch, Gujarat
b)	Longitude	: 21°40'47"N to 21°41'48"N
c)	Latitude	: 72°35'24"E to 72°36'44"E
d)	Nearest Railway Station	: Bharuch – 45 km
e)	Nearest Town	: Bharuch - 45 Km, Vadodara - 140 Km
f)	Nearest Port	: Dahej - 10 Km
g)	Nearest Air Port	: Vadodara - 140 km
h)	Access Road	: Bharuch-Dahej State Highway - SH6 - 1.2 Km
i)	Height above mean sea level	: Mean Sea Level (MSL) = 5.1M w.r.t. Chart datum Finished Grade Level (FGL)=6.6M/ 7.1M/ 7.6M above MSL

1.2 CLIMATIC CONDITIONS

1. **Seismic data**
   a. Zone : III

2. **Air Temperature**
   a. Air Temperature Max/Min : 40° C / 13° C

	b. Design dry bulb Temp Max/Min : 42° C / 29° C **3. Relative Humidity** : 90%@ 42 °C **4. Rainfall** Annual Rainfall : 1000 mm **5. Wind velocity/ direction** a. March- October : 44 km/h/ South west b. November- February : 15KM/Hr/ North west/North/ North East **6. Climatic Conditions** : Tropical

The bidder is advised to visit and examine the site of works and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the contract. All costs for and associated with site visits shall be borne by the bidder.

2.0 SCOPE OF WORK:

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

2.1 UTILITY BOILER

The scope of work shall include the receipt / collection / loading of materials from BHEL/client's stores / storage yard / pre-identified location, shifting / transportation/ unloading / dragging of materials to site of work / designated location; pre-erection checks, pre-assembly if necessary, erection, testing, assistances for commissioning & trial operation, handing over, completion of PG test related works and assistance for performance guarantee test of Utility Boiler of 1x220TPH capacity (fired on NAPTHA, Natural Gas, Complex Gas, & HSD) with all its auxiliaries and accessories, Rotating equipments, support & supporting structures, ducts & dampers, fuel piping, Deaerator with Feed Storage Tanks, Utility Boiler piping including integral piping, Power Cycle Piping, application of thermal insulation and cladding work of equipments / piping / vessels / & tanks etc, surface preparation, supply of Paints/Primer and application of paints for final painting of Block I (UB 1, HRSG 2 & 4, STG1 and GT/GTG 2&4) and Block II (UB 2, HRSG 1 & 3, STG1 and GT/GTG 1&3) with all its auxiliaries for ONGC Petro Additions Limited , 2X220 TPH UB + 2X30 MW STG + 4XFr6 B GT+4X110 TPH HRSG, at OPaL, SEZ , Dahej- Gujarat.

2.1.1

Following named systems are broadly in the scope for Utility Boiler (for each Block) in the present contract:

- Utility Boiler supporting structures.
- Stairs, Platforms, Hand Rails, Toe Guards etc.
- Utility Boiler pressure parts.
- Utility Boiler trim & integral piping and mountings
- Fuel oil Pumps & pipeline
- Feed Water System piping for UB
- Complex Gas system piping for UB
- HSD system piping for UB
- Natural Gas System piping for UB
- Naphtha system piping for UB
- HP steam system piping
- Utility Boiler Non-pressure parts

- Rotating machines with their drives (Naphtha pump for UB-1 one pump driven by Steam Turbines and other one pumps is electric motor driven, FD fan & GR fan for UB are dual drive (Motor + Turbine).
- Handling arrangements for rotating machines & other equipment.
- Low Pressure (Instrument Air, Service Air, Cooling water & Service water, Fire water etc.) Pipeline
- De-aerating Heater & Feed Water Storage Tank with associated structures and approach platforms
- Roof & Side Cladding (metapoly sheet) of Boiler & Elevator.
- Insulation and Cladding.
- Temporary piping with tanks, valves, supports & fittings for EDTA cleaning/Chemical cleaning/flushing, Steam Blowing, Hydraulic test etc.
- Surface preparation and supply of Paints/Primer and application of paints for final painting on non-insulated surfaces.

2.2 HEAT RECOVERY STEAM GENERATORS (HRSG)

Collection of materials from BHEL/Client's stores/storage yard; transportation to site, Erection, Testing & Assistance for commissioning, Trial Operation and handing over of complete HRSG & its auxiliaries and steel stack including its electrical works, piping including P-91 materials, regenerative system piping with associated fittings, valves, supports including tanks & vessels, application of thermal insulation of HRSG with auxiliaries, steel stack, piping's with valves & fittings including gas turbine and steam turbine set equipments, heaters, tanks, vessels & pipings, supply of Paints/Primer and application of paints for final painting etc. of Block I (UB 1, HRSG 2 & 4, STG1 and GT/GTG 2&4) and Block II (UB 2, HRSG 1 & 3, STG1 and GT/GTG 1&3) with all its auxiliaries for ONGC Petro Additions Limited , 2X220 TPH UB + 2X30 MW STG + 4XFr6 B GT+4X110 TPH HRSG, at OPaL, SEZ , Dahej-Gujarat.

The work is mainly categorized as follows:

- Erection, testing and commissioning of 110 TPH HRSG (for Block I & II) and its auxiliaries.
- Assembly, erection including welding & NDE etc. of steel stack / chimney of 40 meter height with associated electrical works of aviation lights, earthing & lightening arrestors etc.
- Erection, welding, testing and commissioning with radiography, NDE & heat treatment etc. of piping's with associated valves, hangers & supports and fittings etc.

- Erection, welding, testing and commissioning with radiography, NDE & heat treatment etc. of regenerative piping with associated valves, hangers & supports, fittings etc.
- Preparation & chipping of civil foundations and grouting of foundations / packers / foundation bolts / frames etc.
- Application of thermal insulation & lining on HRSG with associated auxiliaries / equipments, steel stack, tanks / vessels, piping's with valves & fittings including gas turbine and steam turbine set equipments, heaters, tanks, vessels & pipings etc.
- Chemical cleaning/ flushing including EDTA cleaning, flushing with air / water / oil etc., Hydro testing, steam blowing including lube oil flushing etc. of equipments, pipings and other associated systems covered under the scope.
- supply of Paints/Primer and application of paints for final painting including surface preparation, cleaning, marking of identification marks, colour bands, direction of rotation / flow marks, legends etc. as per OPal/EIL/ site requirement.

2.3

Collection of materials from BHEL/client's stores /storage yards to site of work, erection, testing, commissioning, supply of paints/primer and application of paints for final painting and handing over of 2 units each of Fr6 B Gas Turbine, Gas Turbine Generator set & related auxiliaries, Bypass-Stack, balance of plant equipments / systems with related auxiliaries, condenser with RE Joints, 1 unit of Steam Turbines, Turbo-Generator and respective associated auxiliaries, power cycle pumps including CW pumps, Heat exchangers, integral piping, bought out items, balance of plants equipments / packages like misc. Pumps, misc. Cranes and hoists, tanks & vessels etc., and application of thermal insulation of equipments/piping/vessels & tanks etc. For OPaL (ONGC petro additions limited) steam and power generation system package for Block I (UB 1, HRSG 2 & 4, STG1 and GT/GTG 2&4) and Block II (UB 2, HRSG 1 & 3, STG1 and GT/GTG 1&3) with all its auxiliaries for ONGC Petro Additions Limited, 2X220 TPH UB + 2X30 MW STG + 4XFr6 B GT+4X110 TPH HRSG, at OPaL, SEZ, Dahej- Gujarat.

Collection of materials from BHEL/client's stores/storage yard; transportation to site; erection, testing & assistance for commissioning, trial operation and handing over of the following for **each Block**:-

A) STEAM TURBINE AND STEAM TURBINE GENERATOR WITH AUX. (ONE UNIT FOR EACH BLOCK)

1. Steam Turbine along with auxiliary systems :-

a) Steam Turbine-1 nos.
b) Load Gear Box-1 nos.
c) Turbine Steam Governing Valves
d) Gland Steam Piping for both STG.
e) Turbine Drain Water Piping within TG Block
f) Lube Oil System

g) Steam turbine Integral Piping
h) Governing Console
i) Control & Safety Valves (Turbine extraction line, Steam Governing line)
j) Oil Cooler 2 No. - (1 Main + 1Standby) (for each STG)

2. **Steam Turbine Generator coupled to steam turbines and complete with auxiliary systems.**
3. **Surface Condenser & Hot well**
4. **Steam Jet Air Ejector**
5. **Gland Steam Condenser**
6. **LP Heater (for Block I)**
7. **Bought Out Items.**
8. **BFP-Drive Turbine (2 nos. for UB- BFP, one for each Block)**
   a) Drive Turbine
   b) Load Gear Box- nos. (b/w Turbine & Pump)
   c) Turbine Steam Governing Valves (for both STG)
   d) Gland Steam Piping for both STG.
   e) Turbine Drain Water Piping within TG Block
   f) Lube Oil System
   g) Lube Oil Console-. (consisting of Main Oil Pump (and associated drive turbine), Aux. Oil Pump, Emergency Oil Pump)
   h) Main Oil Tank
   i) Over Head Oil Tank
   j) Jacking oil pump with AC motor
   k) Duplex Filter for Lube Oil
   l) Lube Oil Piping
   m) Jacking Oil Piping
   n) Governing Oil Piping
   o) Oil Centrifuge 1000 LPH – Portable Type
   p) Drive turbine Integral Piping
   q) Governing Console
   r) Control & Safety Valves (Turbine extraction line, Steam Governing line)
   s) Oil Cooler 2 No. - (1 Main + 1Standby) (for each)

B) GAS TURBINE AND GAS TURBINE GENERATOR WITH AUX. (TWO UNIT FOR EACH BLOCK)

1. **Fr- 6 B Gas Turbine- 2 nos.**
2. **GT Generators-2 nos.**
3. **GT Accessory Base- 2 nos.**
4. **Bypass-Stack-2 nos. in each Block Total 4 Bypass stack**
5. **Inlet Air Systems (4 nos.) consisting of:**
   - Filter compartment
   - Air processing unit
   - Inlet ducting with silencer
   - Transition piece from inlet ducting to inlet plenum
6. GT vent fans (2 nos)
7. CO_2 fire protection system (2 nos.)

8. GT & Generator Off base enclosure (2 nos.)
9. Exhaust Gas system (side Exhaust) (2 nos.) consisting of:
   - Exhaust ducting
   - Electrically operated Diverter damper with 2 X 100 % seal air fans.
   - Electrically operated Guillotine damper with 2 X 100 % seal air fan.
   - 30m high bypass stack (height from machine base-line) including Transition piece & silencer
10. Water injection skid with 1x100% pumps for NOx control (2 nos.)
11. Off-base compressor cleaning and washing skid for off-line/on-line cleaning (one number common for 4 GTs)
12. Mobile Lube oil centrifuge - 1000 LPH (one number common for 4 GTs)
13. Lube oil drain pump (2 m3) (one number common for 4 GTs)
14. Load gear box between GT & Generator (2 nos.)
15. DM water injection skid with 2x100% water injection pump for Nox control.
16. System 1 for Gas Turbines (System 1 - common for 4 GTGs, 2 STG sets and BFP's.)
17. LUBE OIL COOLER: -2 Nos (one for each GTG)
18. Water to Water Heat Exchanger (For Cooling DM water used in GT Oil Cooler)-2 Nos
19. Atomizing air pre cooler (2 Nos).
20. **GAS TURBINE GENERATOR WITH AUX.**

D) BOP PACKAGES FOR EACH BLOCK

A. <u>PUMPS</u>

1. **BFP for HRSG- Motor driven – 3 nos.**
2. **LO Skid for BFP-HRSG-3 nos.**
3. **BFPS for UB-Steam Turbine Driven-1 no.**
4. **BFPS for UB-Motor Driven-1 no.**
5. **LO Skid for BFP UB-1 no.**
6. **MUH Transfer Pumps-Motor Driven- 2 nos.**
   (Total 3 nos. – 2 nos. for Block I and 1 no. in Block-II scope)
7. **Condensate Transfer Pump-Motor Driven -2 nos.**
   (Total 3 nos. - 2 nos. for Block I and 1 no. in Block-II scope)
8. **LP Heater Condensate Drain Transfer Pumps-1 no.**
9. **Cond. Extraction Pump-Motor Driven (Vertical Pumps)-2 nos.**
10. **Black Start Cooling Water Pumps-Motor Driven-1 no.**
11. **Blow down Transfer Pumps for UB area-Motor driven (vertical pumps)-2 nos.**
12. **Blow down Transfer Pumps for HRSG area-Motor driven (vertical pumps)-2 nos.**
13. **DM Water Pumps for Atomising Air Pre-Cooler of GT-Motor Driven-4 nos.**
14. **Dewatering Pumps- 1 no.**

B. <u>LP dosing system (For Block I)</u>

i. Hydrazine at De-aerator outlet
ii. Morpholine at De-aerator outlet
iii. Morpholine in Condensate Storage Tank

C. <u>FUEL SYSTEM</u>

1. **Filter Separator (2*100%) Skid – 1 no. common for 4 GT's & 4 HRSGs (Block I scope).**
2. **Fine Filter skids-2 nos. for each Block (Total 4 nos.)**

3. **Natural Gas Electric Heater Skid(550KW) along with Thyristor control panel-1 no. for each Block (Total 2 nos.)**
4. **Natural Gas Steam Heater (1*100) Skid for GT's-1 no. for each Block (Total 2 nos.)**
5. **Natural Gas Scrubber (2*50%)– 1 no. common for 4 GT's & 4 HRSGs (Block I scope).**
6. **Natural Gas Scrubber (2*50%) skid for UBs- 1 no. for 2 UBs ((Block I scope).**
7. **Complex Gas Scrubber (1 x 100%) skid for UBs- 1 no. for 2 UBs ((Block I scope).**
8. **NAPHTHA Forwarding Skid for HRSG-1No. +Long Recirculation Orifice-1No.:- 2 nos. for each Block (Total 4 nos.)**
9. **Naphtha Forwarding Skid for GT-1No.+Long Recirculation Orifice-1No.:- 2 nos. for each Block (Total 4 nos.)**
10. **HSD Forwarding Skid for HRSG-1No.+Long Recirculation Orifice-1No. : - 1 nos. for each Block (Total 2 nos.)**
11. **HSD Forwarding Skid for GT- 1No.+Long Recirculation Orifice-1No.:- 2 nos. for each Block (Total 4 nos.)**
12. **Lubricity Additive Dosing Skid-2 nos. for each Block (Total 4 nos.)**
13. **HSD 25 µ Duplex Filter Skid: - 2 nos. for each Block (Total 4 nos.)**
14. **NAPHTHA 25 µ Duplex Filter Skid: - 2 nos. for each Block (Total 4 nos.)**
15. **HSD 6 µ Duplex Filter Skid: - 2 nos. for each Block (Total 4 nos.)**
16. **Magnetic Filter Skid: - 2 nos. for each Block (Total 4 nos.)**
17. **NAPHTHA 6 µ Duplex Filter Skid: - 2 nos. for each Block (Total 4 nos.)**
18. **2 m3 HSD/ NAPHTHA/ Gas Condensate Drain Tanks: - 3 nos. for each Block (Total 6 nos.)**
19. **30m3 Gas Condensate Drain Tank:-1 no. for Block I**
20. **30m3 HSD/NAPHTHA Drain Tank Near Storage FAM Area:-1 no. for Block I**
21. **30m3 HSD/NAPHTHA Unloading vessel with hose pipes:-1 no. for Block I**
22. **HSD Centrifuge Skid:-1 no. for Block I**
23. **Accumulators: - 7 nos. for each Block (Total 14 nos.)**

D. Turbine integral piping

E. Insulation of TG equipments.

F. Manual Hoist with travelling trolley for Air Compressor House- **1 no. for Block 1**

G. Manual Hoist with travelling trolley for Switch gear Building- 2 nos. for each Block(Total 4 nos.)

H. Supply of Paints/Primer and application of Paints for final painting.

Detailed scope of (Block I) UB1+HRSG 2&4 + STG 1, GT/GTG 2&4, and (Block II) UB2+ HRSG 1&3 + STG 2, GT/GTG 1&3 are given in relevant Appendix.

2.4 Construction Power & Water:

2.4.1 CONSTRUCTION POWER: Shall be provided on chargeable basis.

Tariff & other details shall be as follows:

1. BHEL is lining up construction power from M/s Torrent and it is expected to be made available by end of Jan'12 at 415 V at a single point.

   Construction power will be provided on chargeable basis. The charges will comprise of per unit charges as charged by M/s Torrent plus 56% additional charges towards fixed cost. Hence the monthly charges to be paid by bidder will be as below:

   Monthly Charge = 1.56 X (per unit rate charged by M/s Torrent) X (Units consumed for that month)

   Per unit rate charged by M/s Torrent may vary in future and same shall be applicable to contractor. At present, the rate charged by M/s Torrent is Rs 6.30 per unit as energy charges.

   There will be number of contractors using construction power at LT side. In case there is a difference in energy consumption in HT & LT side, i.e the sum of LT side energy meter readings with individual agency are less than the total energy consumption recorded in HT side energy meter of respective month, the differential consumption shall be proportionately distributed among all users in line with their energy consumption

2. Construction power (three phase, 415 V/ 440 V) will be provided at one point near the site at a distance of approx. 500M. **The electricity shall be provided on chargeable basis including all taxes, duties, levies etc as applicable**. Further distribution shall be arranged by the contractor at his own cost and services. Contractor shall be responsible for fulfillment of all requirements including statutory requirements in this regard. Contractor shall deploy and install required energy meter, cables, fuses, distribution boards, switchboards, bus bars, earthing arrangements, protection devices and any other installation as specified by statutory authority/act. Contractor shall also obtain approvals of appropriate authority and pay necessary fees, levies etc towards the clearance of such installations, prior to use. Sufficient power factor compensation equipments like capacitor shall be provided by contractor for reactive loads like welding machines etc. In case of any fine/penalty on account of low power factor, same shall be shared by contractor proportionately according to power consumption.

3. Contractor shall make necessary arrangements for onward distribution of construction power taking due care of surrounding construction activities like movement of cranes &

vehicles, civil work, fabrication/construction/assembly/ erection etc and safety of personnel. It may become necessary to relocate some of the installations to facilitate work by other agencies or by him.

4. It shall be the responsibility of the Contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced electrician.

5. While reasonable efforts will be made to ensure continuous electric power supply, interruptions cannot be ruled out and no claim from the Contractor shall be entertained on this account such as idle labor, extension of time etc. The Contractor shall adjust his working shift accordingly and deploy additional manpower, if necessary, so as to achieve the target.

6. Contractor shall be well equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc to tackle situations arising due to failure of supplied power, so as to ensure continuity and completion of critical processes that are underway at the time of power failure or important activities planned in immediate future.

7. BHEL is not responsible for any loss or damage to the Contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply.

8. **Contractor to note that till construction power is made available by BHEL, contractor shall make his own arrangement like DG set etc. The contractor shall also take the approval/ permission of Gujarat State statutory authorities for his DG set installation.**

9. Contractor is requested to maintain the power factor above 0.95. On account of lapses by contractor on such account, the penalty as charged by M/s Torrent Power on account of drop in power factor below 0.9 shall be charged proportionately by sub-contractors working in the respective calendar month.

10. Contractor is advised to maintain the calibrated energy measuring instruments and use their system as efficiently as possible to maintain the HT side input energy meter reading and LT side outgoing energy meter reading to sub-contractors as equal.

    In case there is any difference between the sum of the LT side meter readings of all sub-contractors and the HT side meter reading of M/s Torrent, same shall be distributed proportionately among all sub-contractors working during the respective calendar month.

1) Any taxes, duties, levies, cess etc as being charged/ levied by M/s Torrent/ state statutory authority shall be passed on to the sub-contractors proportionately in the respective calendar month bill.

2.4.2 Construction and Potable water shall be arranged by Contractor within the quoted rate. No additional payment shall be made on account of this.

Since the project site is under the SEZ's Area (Special Economic Zone), benefit of Exemption in Excise Duty, Service Tax, VAT etc may be availed by the contactor. For this necessary document shall be provided by BHEL to Contractor for obtaining Exception Certificate from the concerned Authority.

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE:**			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Fire fighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labour colony (as per availability)		Yes	Contractor has to make his own arrangements for space, shelter and transportation of labours as per their requirement.
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity for construction purposes 3 Phase** 415/440 V **(To be specified whether chargeable or free)**			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	Single point source	Yes		**Shall be provided by BHEL on chargeable basis. Pl. refer clause no. 2.3.1 in this regard.**
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**.			Contractor has to make his own arrangement.
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	
3.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc**		Yes	Contractor has to make his own arrangement.
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: (to be specified whether chargeable or free)**			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	Making the water available at single point		**yes**	Contractor has to make his own arrangement.
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	**Water supply for bidder's office, stores, canteen etc**			
a	Making the water available at single point			Contractor has to make his own arrangement.
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	**Water supply for Living Purpose**			Contractor has to make his own arrangement.
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
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	Téléphone, 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**	
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:			

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

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	NOT APPLICABLE
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	NOT APPLICABLE
L	Arranging the materials required for preassembly		Yes	NOT APPLICABLE

A: TOOLS AND PLANTS TO BE DEPLOYED BY CONTRACTOR FOR EACH BLOCK

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
1	CRAWLER CRANE	75 MT	2	From the first month of start of Erection work
2	SUITABLE CAPACITY LIFT & SHIFT / STRAND JACKS ARRANGEMENTS TO FACILITATE HANDLING, LIFTING AND ERECTION OF STEAM TURBINE, STEAM TURBINE GENERATOR	AS PER REQUIREMENT	AS PER REQUIREMENT	
3	SUITABLE CAPACTY OF CRANE FOR HANDLING, LIFTING OF EQUIPMENTS	AS PER REQUIREMENT	AS PER REQUIREMENT	
4	MOBILE CRANE	18 MT	2	TO BE DEPLOYED FROM THE START OF ERECTION
5	PICK & CARRY CRANE	12 MT	3	TO BE DEPLOYED FROM THE START OF ERECTION
6	PICK & CARRY CRANE	10 MT	2	TO BE DEPLOYED FROM THE START OF ERECTION
7	TRAILER WITH PRIME MOVER	15/20 MT	As Required	1 NO. FROM START AND 1 MORE FROM START+2 MONTHS BOTH TILL TRIAL RUN
8	AIR COMPRESSOR (ELECTRIC/DIESEL OPERATED)	140 CFM, 7 KG/CM2	As Required	
9	TIG WELDING SET	AS REQUIRED	8 NOS. AND FURTHER AS PER REQUIREMENT	
10	PLASMA CUTTING M/C	FOR CUTTING UP TO 10 MM THICK STAINLESS STEEL	AS REQUIRED	
11	3-PHASE DISTRIBUTION BOARD WITH COMPLETE SET UP FOR DRAWL OF CONSTRUCTION POWER & FITTED WITH ENERGY METER	600 Amp	AS PER REQUIREMET	
12	POWER CABLE FOR DRAWL OF CONSTRUCTION POWER	AS REQUIRED	AS REQUIRED	
13	PRE HEATING / STRESS RELIEVING SET (HEATING CONTROL PANEL, CABLES, HEATING ELEMENTS, THERMOMETERS ETC.)	AS REQUIRED	AS REQUIRED	
14	RADIOGRAPHY ARRANGEMENT WITH RADIOACTIVE ISOTOPE SOURCE	IRIDIUM-192	AS PER REQUIREMENT	

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
15	THEODOLITE OF REQUIRED ACCURACY	TO ENSURE VERICALITY OF STRUCTURAL COLUMNS	AS REQUIRED	
16	SELF DRILLING CUM TAPPING MACHINE FOR FIXING OF SHEETING WORK SCREWS	AS REQUIRED	AS REQUIRED	
17	RADIOGRAPHY ARRANGEMENT WITH RADIOACTIVE ISOTOPE SOURCE	COBALT-60	1 SET	
18	CHEMICAL CIRCULATION PUMPS TO HANDLE ACID SOLUTION, OPR TEMP 80 DEG CEL, WITH DRIVE MOTORS, STARTER PANEL, CABLE, SWITCH FUSE UNIT ETC.	SUGGESTED RATING: 150 M3, 120-150 M WC, WITH 90KW, 3000 RPM, 150 Amps MOTOR. HOWEVER, CONTRACTOR SHALL DEPLOY THE RQUIRED CAPACITY PUMP WITH ACCESSORIES AFTER OBTAINING WRITTEN APPROVAL OF BHEL.	AS REQUIRED	
19	WELDING GENERATOR (ELECTRICAL)	300 AMPERE RATING	AS REQUIRED	
20	WELDING GENERATOR (DIESEL OPERATED)	300 AMPERE RATING	AS REQUIRED	
21	RADIOGRAPHY FILM VIEWER	AS REQUIRED	AS REQUIRED	
22	ELECTRIC CABLE FOR DRAWAL & DISTRIBUTION OF CONSTRUCTION POWER	AS PER SITE REQUIREMENT	AS PER SITE REQUIREMENT	
23	ELECTRIC WINCH	3/2 TON CAPACITY	AS REQUIRED	
24	ELECTRO-HYDRAULIC PIPE BENDING MACHINE	FOR UP TO 100 mm Nb PIPES	AS PER SITE REQUIREMENT	
25	PIPE BENDING MACHINE-HAND OPERATED	UP TO 2” NB PIPES	AS REQUIRED	
26	HAND WINCH	1 TON	AS REQUIRED	
27	BAKING OVEN AND HOLDING OVEN WITH THERMOSTAT AND TEMPERATURE GAUGE FOR WELDING ELECTRODES	AS PER REQUIREMENT	AS REQUIRED	

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
28	PORTABLE OVEN FOR COATED WELDING ELECTRODES	AS PER REQUIREMENT	AS REQUIRED	
29	ELECTRIC MOTOR DRIVEN HYDRAULIC TEST PUMP WITH DRIVE AND STARTER ETC.	400 Kg/Cm2 250 Kg/Cm2	1 NO. 1 NO.	FURTHER AS REQUIRED
30	MIXER FOR GROUTING OF EQUIPMENT FOUNDATIONS	AS PER REQUIREMENT	AS PER REQUIREMENT	
31	SCAFFOLDING MATERIALS (SCAFFOLDING PIPES WITH CLAMPS ETC.)	ADEQUATE TO SUIT THE REQUIREMENT	800 SETS AND FURTHER AS PER REQUIREMENT	
32	ALU. SHEET CLAD PROFILE MAKING MACHINE	AS PER REQUIREMENT	AS REQUIRED	
33	HAND TOOLS, CUTTING TOOLS GRINDING MACHINES ETC	AS PER REQUIREMENT	AS REQUIRED	
34	NIBBLING MACHINE	AS PER REQUIREMENT	AS REQUIRED	
35	SHEARING MACHINE	AS PER REQUIREMENT	AS REQUIRED	
36	WATER PUMP TO LIFT WATER TO TOP OF BOILER	AS PER REQUIREMENT	AS REQUIRED	
37	PORTABLE GRINDING M/C	AS PER REQUIREMENT	AS REQUIRED	
38	PORTABLE DRILLING M/C	AS PER REQUIREMENT	AS REQUIRED	
39	CHAIN PULLEY BLOCKS	Assorted capacities	AS REQUIRED	
40	FIRE RETARDANT TARPAULINS	AS PER REQUIREMENT	AS REQUIRED	
41	FIRE EXTINGUISHER	AS PER REQUIREMENT	AS REQUIRED	
42	VACUUM CLEANER (INDUSTRIAL)	AS PER REQUIREMENT	AS REQUIRED	
43	CONDENSER TUBE EXPANDER SET	AS PER REQUIREMENT	AS REQUIRED	

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
44	JACKING BOLTS / PRESSOUT BOLTS OF ALL SIZES	AS PER REQUIREMENT	AS REQUIRED	
45	GANG OPERATED AND HAND OPERATED HYDRAULIC JACKS WITH SUFFICIENT LONG HOSES OF VARIOUS CAPACITIES FOR GT, STEAM TURBINE AND GTG & ST GENERATOR	50 MT, 100 MT ADEQUATE NOS	AS REQUIRED	
46	HYDRAULIC J ACKS FOR CW PIPING AREA	100 MT	AS REQUIRED	
47	DEWATERING PUMP- VACUUM SUCTION, COMPLETE WITH MOTORS, STARTER, CABLES, SWITCHES ETC.	5 TO 10 HP	AS REQUIRED	
48	TORQUE WRENCH 0 TO 200 N-M CAP	AS PER REQUIREMENT	AS REQUIRED	
49	SLINGS OF VAROIUS CAPACITY AND QUANTITIES FOR HANDLING OF EQUIPMENTS	AS PER REQUIREMENT	AS REQUIRED	
50	BOLT STRETCHING DEVICES OF CAPACITY AS PER SITE REQUIREMENT	AS PER REQUIREMENT	AS REQUIRED	
51	FEELER GAUGE S OF VARIUOS SIZES INCLUDING LONG FEELER GAUGES	AS PER REQUIREMENT	AS REQUIRED	
52	SPANNERS / EYE BOLTS (OF ALL SIZES)	AS PER REQUIREMENT	AS REQUIRED	
53	SURFACE PLATES	1 M X 1M	AS REQUIRED	
54	CENTRIFUGAL PUMP WITH MOTOR, STARTER PANEL, CABLES BETWEEN STARTER PANEL AND MOTORS, INLET AND OUTLET VALVES FOR THE PUMPS FOR FILLING AND HYDRAULIC TESTING OF CW, ACW SYSTEMS	150-200TPH	AS REQUIRED	
55	24 V TRANSFORMERS	24 V OUTPUT	AS REQUIRED	

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
56	ELECTRIC CABLE FOR DRAWL & DISTRIBUTION OF CONSTRUCTION POWER	-	AS REQUIRED	
57	ANY OTHER MAJOR T&P REQUIRED FOR SATISFACTORY COMPLETION OF THE WORKS	AS PER REQUIREMENT	AS REQUIRED	

Note:

1

BHEL shall not provide any Chemical Cleaning /Flushing pumps / equipment's as required for Chemical cleaning/flushing of piping and related equipment's / 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) TO BE DEPLOYED BY CONTRACTOR

To be finalized at site as per requirement.

NOTE:

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

2) IF ABOVE MENTIONED T & P ARE NOT DEPLOYED IN SPECIFIED TIME BHEL WILL CHARGE TO CONTRACTOR CURRENT MARKET RATE + 30 % OVERHEADS FOR NON AVAILABILITY T&P OR LEVY A DAY WISE PENALTY FOR NON DEPLOYMENT OR DELAYED DEPLOYMENT.

3) IF THE WORKS GET DELAYED DUE TO NON-AVAILABILITY OF T&P, BHEL RESERVES THE RIGHT TO GET THE WORK DONE AT THE RISK AND COST OF CONTRACTOR WITHIN PREJUDICE TO RIGHTS OF BHEL AS IN GCC.

4) THE MANUFACTURING YEAR OF ALL MAJOR T&PS DEPLOYED BY THE CONTRACTOR (75 MT, CRAWLER CRANE, 18 MT MOBILE CRANE AND 12/10 MT PICK & CARRY CRANE) SHOULD NOT BE MORE THAN 10 YEARS AS ON THE DATE OF DEPLOYMENT. IF AT ANY MOMENT OF TIME DURING THE EXECUTION OF WORK, ANY CRANE IS FOUND TO BE NOT IN A GOOD WORKING CONDITION AND NON-PERFORMING AT DESIRED MINIMUM CAPACITY, AS CERTIFIED BY BHEL ENGINEER, THE CONTRACTOR SHALL DEPLOY ANOTHER CRANE IN GOOD WORKING CONDITION WITH MINIMUM DESIRED CAPACITY. IF CONTRACTOR FAILS TO DEPLOY THE SAME WITH IN 10 DAYS, BHEL WILL RECOVER NON-REFUNDABLE PENALTY PER DAY OF DELAY IN THE FOLLOWING MANNER -

   1. IN RESPECT OF 75 MT CRANE: @ RS. 5,000 / -
   2. IN RESPECT OF 18 MT CRANE: @ RS. 3,000 / -
   3. IN RESPECT OF 12 MT CRANE: @ RS. 1,000 / -
   4. IN RESPECT OF 10 MT CRANE: @ RS. 1,000 / -

   BES = BOILER ERECTION START, CF = COAL FIRING, BLU = BOILER LIGHT UP, FL = FULL LOAD,

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

SN	DESCRIPTION	QUANTITY	REMARKS
1	Cranes	-	All cranes (except Contractor scope) required for the mentioned work will be arranged by BHEL as per requirement.
2	EOT CRANE IN STG HALL (Main Hook-35 T, Aux Hook- 5 T)	-	FOR HANDLING AND ERECTION WITHIN TG HALL ON SHARING BASIS AS AVAILABLE AND SUBJECT TO THEIR ACCESSIBILITY AND APPROACHABILITY.
3	Multi Sheave Pulley	-	For DL
4	Single Sheave Pulley	-	”
5	Electric Winch with wire rope	-	”

Note:

1) CRANES DEPLOYED BY BHEL SHALL BE OWNED OR HIRED BY BHEL.

2) OPERATOR AND O&M FOR BHEL OWNED CRANE WILL BE ARRANGED BY BHEL (FREE OF CHARGES).

3) OPERATORS AND O&M FOR HIRED CRANE WILL BE PROVIDED BY THE HIRING AGENCY (FREE OF CHARGES).

4) CONTRACTOR SHALL PROVIDE THE FUEL FOR BHEL PROVIDED CRANES (HIRED/OWNED) FOR THEIR USE.

5) CONTRACTOR SHALL MAKE NECESSARY ARRANGEMENTS LIKE LAYING OF SPECIAL SLEEPER BEDS AND STEEL PLATES (ALL ARRANGED BY CONTRACTOR), ASSEMBLY AND DISMANTLING OF HEAVY LIFT ATTACHMENT, BOOM, JIB ETC FOR MOVEMENT AND OPERATION OF THE CRANE.

6) CRANES PROVIDED BY BHEL WILL BE ON SHARING BASIS WITH OTHER AGENCIES / CONTRACTORS OF BHEL. THE ALLOCATION OF CRANES SHALL BE THE DISCRETION OF BHEL ENGINEER, WHICH SHALL BE BINDING ON THE CONTRACTOR. CRANES WILL BE DEPLOYED AT APPROPRIATE TIME AS DECIDED BY BHEL FOR SUITABLE DURATION AND INTENDED PURPOSE.

7) **OPERATOR** FOR EOT CRANE AND PORTAL CRANE WILL BE PROVIDED **BY THE CONTRACTOR**.

8) 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. THE CONTRACTOR SHALL EXTEND THE SERVICES OF HIS OPERATOR TO SUCH OTHER AGENCIES AS WELL ON MUTUALLY AGREED MODE OF COST SHARING.

9) ABOVE T&PS WILL BE PROVIDED ON SHARING BASIS ONLY. CONTRACTOR HAS TO PLAN HIS ACTIVITIES WELL IN ADVANCE AND INFORM BHEL ENGINEER IN CHARGE/ CONSTRUCTION MANAGER THE DATE OF ACTUAL USE.

10) IN CASE BHEL CRANES, AT S.NO 1 & 2, ARE NOT AVAILABLE DUE TO ANY REASON, CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS AND CARRY OUT THE JOB WITHOUT ANY FINANCIAL IMPLICATION TO BHEL.

11) CONTRACTOR SHALL PROVIDE ALL NECESSARY TOOLS & TACKLES, CRANE, TRAILERS ETC FOR TRANSPORTATION OF PORTAL GANTRY CRANE/STRAND JACK COMPONENTS/PARTS FROM BHEL STORES/ STORAGE YARD, ASSEMBLY/ERECTION AT SITE, TESTING, COMMISSIONING, DISMANTLING AFTER COMPLETION OF WORKS AND RETURNING TO BHEL STORES/STORAGE YARD AS PER INSTRUCTION OF BHEL ENGINEER.

6.1 TIME SCHEDULE & MOBILIZATION

6.1.1 INITIAL MOBILIZATION

After receipt of fax **Letter of Intent (LOI),** Contractor shall discuss with Project Manager / Construction Manager regarding initial mobilization. Contractor shall mobilize necessary resources within 2 weeks of issue of fax letter of intent or as per the directive of Project Manager / Construction Manager. Such resources shall be progressively augmented to match the schedule of milestones and commissioning.

6.1.2 MOBILIZATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC.

The activities for Erection, Testing etc. shall be started as per directions of Construction Manager of BHEL. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.1.1) as per requirement to commence the work of erection, testing etc. of boiler and auxiliaries and progressively augment the resources to match schedule of the project.

6.1.3 COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

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

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

According to the contract between BHEL and Owner the schedule of important milestones is as follows:

6.1.3 (A) Schedule for Block I (UB1, HRSG 2 & 4 + STG1, GT/GTG 2&4) :

Major Milestone for UB 1, HRSG 2 & 4 + STG1, GT/GTG 2&4 (Block I) of OPaL Dahej Project

SL No.	Milestones	Date of completion Assuming DOS: 10/09/12 (Block-I)
	UB 1 + STG 1	
1	Erection Start	10/09/2012
2	Drum Lifting	30/10/2012
3	Hydro Test	30/12/2012
4	Boiler Light Up (BLU)	15/01/2013
5	Safety Valve Floating	30/01/2013
6	UB Commissioning	15/02/2013
6	Condenser Erection Start	01/12/2012

7	Box up of Turbine	30/01/2013
8	Oil Flushing	28/02/2013
9	STG Barring Gear Operation	30/03/2013
10	STG Rolling & Synchronization	30/04/2013
11	Completion of Trail run	30/05/2013
12	Completion of all Facilities	15/06/2013
	HRSG 2 + GT/GTG 2	
1	HRSG Erection Start	01/11/2012
2	HRSG Drum Lifting	30/12/2012
3	Hydraulic Test	28/02/2013
4	Gas In and Alkali boil Out	30/03/2013
5	Safety Valve Floating & Steam Blowing	25/04/2013
6	GT Erection start	01/11/2012
7	Flushing	30/01/2013
8	GT Cranking	25/02/2013
9	FSNL of GT	15/03/2013
10	GT Synchronization & Open cycle Commissioning	30/03/2013
11	Co-Gen Commissioning (GTG 2 + HRSG 2)	15/04/2013
12	Reliability Run Completion	30/04/2013
13	Completion of all Facilities	15/05/2013
	HRSG 4 + GT/GTG 4	
1	HRSG Erection Start	01/03/2013
2	HRSG Drum Lifting	30/05/2013
3	Hydraulic Test	25/07/2013
4	Gas In and Alkali boil Out	30/08/2013
5	Safety Valve Floating & Steam Blowing	30/09/2013
6	GT Erection start	01/02/2013
7	Flushing	25/05/2013
8	GT Cranking	25/06/2013
9	FSNL of GT	25/07/2013
10	GT Synchronization & Open cycle Commissioning	25/08/2013
11	Co-Gen Commissioning (GTG 4 + HRSG 4)	15/09/2013
12	Reliability Run Completion	30/09/2013
13	Completion of all Facilities	15/10/2013

6.1.3 (B) Schedule for Block II (UB2, HRSG 1 & 3 + STG2, GT/GTG 1&3) :

Major Milestone for UB 2, HRSG 1 & 3 + STG2, GT/GTG 1&3 (Block II) of OPaL Dahej Project

SL No.	Milestones	**Date of completion Assuming DOS: 10/09/12 (Block- II)**
	HRSG 1 + GT/GTG 1	
1	HRSG Erection Start	10/09/2012
2	HRSG Drum Lifting	10/11/2012
3	Hydraulic Test	10/01/2013
4	Gas In and Alkali boil Out	15/02/2013
5	Safety Valve Floating & Steam Blowing	20/03/2013
6	GT Erection start	10/09/2012
7	Flushing	12/12/2012
8	GT Cranking	15/01/2013
9	FSNL of GT	25/02/2013
10	GT Synchronization & Open cycle Commissioning	15/03/2013
11	Co-Gen Commissioning (GTG 1 + HRSG 1)	25/03/2013
12	Reliability Run Completion	15/04/2013
13	Completion of all Facilities	15/04/2013
	HRSG 3 + GT/GTG 3	
1	HRSG Erection Start	25/11/2012
2	HRSG Drum Lifting	25/01/2013
3	Hydraulic Test	25/03/2013
4	Gas In and Alkali boil Out	10/05/2013
5	Safety Valve Floating & Steam Blowing	30/05/2013
6	GT Erection start	25/11/2012
7	Flushing	25/02/2013
8	GT Cranking	25/03/2013
9	FSNL of GT	25/04/2013
10	GT Synchronization & Open cycle Commissioning	15/05/2013
11	Co-Gen Commissioning (GTG 3 + HRSG 3)	15/06/2013
12	Reliability Run Completion	15/07/2013
13	Completion of all Facilities	15/07/2013
	UB 2 + STG 2	

1	Erection Start	25/12/2012
2	Drum Lifting	25/02/2013
3	Hydro Test	25/03/2013
4	Boiler Light Up (BLU)	25/04/2013
5	Safety Valve Floating	25/05/2013
6	UB Commissioning	25/07/2013
6	Condenser Erection Start	25/03/2013
7	Box up of Turbine	25/04/2013
8	Oil Flushing	25/05/2013
9	STG Barring Gear Operation	25/07/2013
10	STG Rolling & Synchronization	15/08/2013
11	Completion of Trail run	15/09/2013
12	Completion of all Facilities	15/10/2013

6.1.4

In order to meet above schedule, and any other intermediate Schedule/targets as set by BHEL/Customer, to meet customer and project schedule requirements, Contractor shall make the note of above and will mobilize his manpower and resources. It will require working in 2 to 3 shifts to meet the above schedule / Intermediate targets as set by BHEL Engineer/Customer at site and contractor shall augment the manpower/resources accordingly whiten the quoted price without any compensation.

Contractor to note that above indicated DOS (Date of Start – 10/09/2012) is tentative. However as per availability of inputs contractor may have to start erection work prior to above DOS and Contract period will be consider accordingly.

6.1.5 CONTRACT PERIOD

The contract period for completion of entire work under scope shall be 12 **(Twelve)** months for **Block I** (UB 1, HRSG 2 & 4 + STG1, GT/GTG 2&4) and 12 **(Twelve)** months for **Block II** (UB 2, HRSG 1 & 3 + STG1, GT/GTG 1&3) from the "start of contract period" as specified earlier.

The period from the commencement of preparatory work for erection till the actual "start of contract period" shall not be reckoned for the above purpose.

Note:

- **Agency should note that the construction works for both the stream viz UBs and HRSGs along with its auxiliaries shall have to go parallely to match with the commissioning schedule of the plant. For this it will necessary to deploy "Dedicated Resources" like Manpower, Machineries and Materials Area wise to execute the woks simultaneously.**

- **Bidders are requested to submit Resource deployment plan Area wise with detail program in line with above schedule in the form of Bar Chart / MS project planer along with their offer.**

6.1.6

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 CONCURRENTLY IN ALL POSSIBLE FRONTS AS MADE AVAILABLE TO CONTRACTOR.

CONTRACTOR SHALL NOTE THAT INDIVIDUAL MILESTONES AS ABOVE SHALL BE ACHIEVED AS PER SCHEDULE FURNISHED ABOVE. **THE DATE OF START OF FIRST MAJOR PERMANENT EQUIPMENT / COMPONENT / COLUMN COVERED IN THE SCOPE SHALL BE RECKONED AS THE START OF CONTRACT PERIOD FOR THIS PURPOSE.**

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

A) TERMS OF PAYMENT FOR STEAM GENERATOR (UTILITY BOILER AND HRSG)

SL NO	Contract (Main Package) Identitification ---->	Boiler				Rotating Machine	Steel Stack	PIPING			De-aerator	INSULATION
	Rate schedule Identification ------->	**Structure**	**Pressure Parts**	**Non Pressure Parts**	**Air Pre Heaters**	**1) RM 2) Handling Eqpts**	**HRSG Chimney/Steel stack**	**1)P-91 2) AS 3) CS (HP) 4) CS (LP) 5) SS**	**Hangers & Supports**	**Temporary Piping 1) Steam Blowing 2) Chemical Cleaning**	**De-aerator, feed storage Tank and associate approach platform with ladders**	**1) Castable & Pourable 2) Iron Components 3) Wool mattresses 4) Aluminium sheeting**
I	**PRO RATA PAYMENTS (85%)**											
1.1	ON PRE-ASSEMBLY WHEREVER APPLICABLE (IF NOT APPLICABLE, THIS PORTION SHALL BE CLUBBED WITH PLACEMENT IN POSITION)	20	20	25		15	15	20	15			--
1.2	PLACEMENT IN POSITION	15	10	10		20	20	20	25		25	50
1.3	ALIGNMENT	15	15	10		20	15	10	15		20	15
1.4	WELDING/BOLTING/FIXING	15	20	15		20	20	15	30		30	20
1.5	COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT (if not applicable, then this portion to be paid along with welding)	5	10	--		--	--	5				--
1.6	On Drum Lifting	0										
1.7	COMPLETION OF ATTACHMENT WELDING, FIN WELDING, SUPPORTS		5									

1.8	COMPLETION OF ROOF SKIN CASING		5									
1.9	INSTALLATION OF TEMPORARY PIPING									60		
1.10	DISMANTLING OF TEMPORARY PIPING, EDGE PREPARATION AND RETURN TO BHEL STORES, AREA CLEANING									25		
1.11	HANGERS & SUPPORTS ETC WHEREVER NECESSARY AS PER DRG		--	25		--	15	10				--
1.12	COMPLETION OF FURNACE ALIGNMENT AND FIRE BALL CHECKING	5										
1.13	COMPLETION OF BACK PASS ALIGNMENT	5										
1.14	COMPLETION OF VIBRATION SNUBBERS, MECHANICAL SPACERS, CASSETTE BAFFLES, STEAM COOLED SPACERS	5										
1.15	COMPLETION OF HOPPERS ALONG WITH ALL DOORS, HEATING ELEMENTS, POKING DOORS, ETC		--	0		--	0	--				--
1.16	COMPLETION OF INNER, OUTER ROOF INSULATOR HOUSING, RECTIFIER TRANSFORMERS, PENT HOUSE MONO RAILS, HOISTS ETC		--	--		--	--	--				--
1.17	ERECTION OF EMITTING AND COLLECTING RAPPING SYSTEM WITH ALL DRIVES		--	--		--	--	--				--
1.18	EQUIPMENT TRIAL OPERATION					10						
1.19	HYDRAULIC TEST OR PNEUMATIC TEST							3				

1.20	FLOATING OF LINES, FINAL ADJUSTMENT OF SUPPORTS FOR COLD AND HOT VALUES (if not applicable, this portion to be clubbed along with hydraulic test/pneumatic test)							2				
1.21	**AIR PRE HEATERS (PG 52)From the total amount payable for the PGMA weight at tonnage rates, payment will be regulated as under:**											
1.21.1	Completion of Support steel squareness and levelling, Expansion arrangement, Housing panel erection and alignment, Erection, alignment and welding of pedestals				11							
1.21.2	Completion of Erection, alignment and welding of Support Bearing, Guide Bearing, Rotor post, Bottom and Top centre sections, Hot and cold end connecting plates				14							
1.21.3	Completion of erection and alignment of modules				15							
1.21.4	Completion of erection, alignment and welding of Pin Rack assembly and Drive assembly				12							
1.21.5	Completion of seals setting				17							
1.21.6	Erection, alignment and welding of Lube oil systems, Cleaning Device, Fire sensing device, Deluge and water wash lines, Observation port and lighting assemblies and other accessories				13							
1.21.7	Completion of PGMA				1							
1.21.8	Air preheater Trial Run				2							
1.21.8	Erection, Testing & commissioning of De-aerator, feed storage tank and associated approach platform with ladders etc.										10	

	TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)	**85**	**85**	**85**	**85**	**85**	**85**	**85**	**85**	**85**	**85**	**85**
II	**STAGE/MILESTONE PAYMENTS (15%)**											
2.1	AIR & GAS TIGHTNESS TEST		--	5		--	5	--				--
2.2	GAS DISTRIBUTION TEST		--	--		--		--				--
2.3	CHARGING OF ESP FIELDS		--	--		--		--				--
2.4	COMPLETION OF AIR & GAS TIGHTNESS TEST FOR FURNACE		2									
2.5	BOILER HYDRAULIC TEST (DRAINABLE)	0	2									
2.6	BOILER HYDRAULIC TEST (NON DRAINABLE)		1									
2.7	Reheater Coils Hydraulic Test		2									
2.8	Clean Air Flow test					1						
2.9	Boiler Light Up/Gas In	0	1		2	1		1	1			1
2.10	ABO		1	1	2	1	1	1	1			1
2.11	Steam Blowing	0		2	1	1	2	1	1			1
2.12.	SVF		2		2			1	1			1

2.13	Oil Flushing (TG/GT)											
2.14	Barring Gear (TG)/ Cranking (GT)											
2.15	Rolling/FSNL and Synchronisation	0							1			
2.16	Fuel Firing			2	2	2	2		1			1
2.17	Full Load					1		1	1			1
2.18	Trial Operation of Unit					2		2	2			2
2.19	Completion of sheet covering for Boiler roof, burner roof, lift shaft cladding, completion of gutters	3										
2.20	Completion of all drains and vents to respective locations and placement of instrument sensors after steam blowing							2				
2.21	Painting	6	0	1	1	2	1	2	1			0
2.22	Area cleaning, temporary structures cutting/removal and return of scrap	1	1	1	1	1	1	1	2			3
2.23	Punch List points/pending points liquidation	2	1	1	2	1	1	1	1			1
2.24	Submission of 'As Built Drawings'											
2.25	Material Reconciliation	2	1	1	1	1	1	1	1	15		2
2.26	Completion of Contractual Obligation	1	1	1	1	1	1	1	1			1
	TOTAL FOR STAGE/MILESTONE PAYMENTS (15%)	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**		**15**

	TOTAL I + II	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**		**100**
	*INCLUDING NDE AND SR/HT WHERE EVER APPLICABLE (IF APPLICABLE, WEIGHTAGE OF 10%)											

B) **STAGE BREAK UP PAYMENT FOR ERECTION, TESTING, COMMISSIONING, WELDING WITH RADIOGRAPHY/NDE/NDT AND FINAL PAINTING ETC. OF GAS TURBINE - GENERATOR SETS WITH AUX., STEAM TURBINE & STG WITH AUX., INTEGRAL PIPING, SURFACE CONDENSER WITH AUX., PUMPS & AUX., BALANCE OF PLANT AND OTHER RELATED EQUIPNMENTS & AUXILIARIES ETC. PAYMENTS SHALL BE MADE AS FOLLOWS ON BASIS OF PERCENTAGE OF AGREED LUMPSUM VALUE AS PER RATE SCHEDULE. THE FOLLOWING BREAK UP IS ONLY FOR THE PURPOSE OF REGULAR STAGE PAYMENT AND SHOULD NOT BE CONSTRUED AS PRICE FOR INDIVIDUAL ITEM AND ALSO IT DOES NOT CONSTITUTE TOTAL SCOPE OF WORK. THE TOTAL SCOPE OF WORK IS AS DETAILED IN THIS TENDER DOCUMENT AND SHALL BE COMPLETED BY CONTRACTOR WITHOUT MAKING ANY REFERENCE TO THE FOLLOWING BREAK UP.**

STAGES OF PROGRESSIVE PRO-RATA PAYMENTS

(B.1) FOR Sl. No. 01 OF PART (B) OF PRICE SCHEDULE FOR ONE UNIT OF STEAM TURBINE AND TWO UNITS OF GT/GTG's (Including TG Integral piping):

S.N.	Description	%
1	**GAS TURBINE, DUCTING AND AUXILIARIES ETC. (16 % for Two Sets i.e. 8 % for each set)**	
1.1	Preparation and chipping of foundation of Gas Turbine	0.5
1.2	Placement, leveling & centering of Gas Turbine with accessories on foundation	1
1.3	Erection of Load Gear Box	0.5
1.4	Assembly of on base components, piping & fittings	0.5
1.5	Erection & Installation of Accessory package (accessory base)	0.5
1.6	Assembly of Turning Gear	0.5

1.7	Alignment of Gas Turbine with Gas Turbine Generator	1
1.8	Box up of Bearings	0.5
1.9	Erection and installation of CO2 bottle Racks	0.5
1.10	Assy, Erection and installation of Main Filter House	0.5
1.11	Erection and installation of Turbine Vent Fans	0.5
1.12	Erection and installation of Air Processing Skid	0.5
1.13	Erection and installation of APU cooler	0.5
1.14	Erection and installation of Compressor Water Washing skid	0.5
1.15	Erection and installation of Lube oil Centrifuge	0.5
1.16	Erection of Field Inter connection piping	1
1.17	Erection of GT off-base Enclosures	0.5
1.18	Erection of Gas valve module	0.5
1.19	Erection of Exhaust frame blowers	0.5
1.20	Assembly and Erection of Inlet Ducting with fittings (Transition pieces, Expansion pieces, Duct elobw, Silencer, Straight duct, support structure etc.)	1
1.21	Erection and installation of Lube Oil Mist Eliminators with accessories	0.5
1.22	Assembly and erection of Exhaust ducts with fittings (Expansion Joints, Silencer Duct, Diverter Damper, Guillotine Damper, Horizontal ducts, Transit ducts etc.)	1
1.23	Erection and installation of Plenum Covers	0.5
1.24	Erection and installation of GD & GFD Seal Air Fan Assy	0.5
1.25	Erection and installation of Water Injection Skid	0.5
1.26	Erection of miscellaneous equipments	1
	Sub-Total of 1	**16**
2	**BALANCE OF PLANT (MECHANICAL) AND OTHER RELATED EQUIPMENTS & AUX. (8%)**	
2.1	Erection of Fine Filter skids - 2 Nos.	0.5
2.2	Erection of NAPHTHA Forwarding Skid for HRSG-1No.+Long Recirculation Orifice-1No. - 2 Nos.	1
2.3	Erection of Naphtha Forwarding Skid for GT-1No.+Long Recirculation Orifice-1No. - 2 Nos.	0.5
2.4	Erection of HSD Forwarding Skid for GT- 1No.+Long Recirculation Orifice-1No. - 2 Nos.	0.5
2.5	Erection of Lubricity Additive Dosing Skid - 2 Nos.	0.5
2.6	Erection of HSD 25 µ DUPLEX FILTER SKID - 2 Nos.	0.5

2.7	Erection of NAPHTHA 25 µ DUPLEX FILTER SKID - 2 Nos.	0.5
2.8	Erection of HSD 6 µ DUPLEX FILTER SKID - 2 Nos.	0.5
2.9	Erection of MAGNETIC FILTER SKID - 2 Nos.	0.5
2.10	Erection of NAPHTHA 6 µ DUPLEX FILTER SKID - 2 Nos.	0.5
2.11	Erection of 2 m3 HSD/ NAPHTHA/ GAS CONDENSATE DRAIN TANKS-3 nos.	1
2.12	Erection of Accumulators- - 7 Nos.	0.5
2.13	Erection of miscellaneous equipments	1
	Sub-Total of 2	**8**
3	**Common Fuel System/Equepments within two GT (3%)**	
3.1	Natural Gas Electric Heater Skid(550KW) along with Thyristor control panel (1 no. within 2 GT)	1
3.2	Natural Gas Steam Heater (1*100) Skid for GT's (1 no. within 2 GT)	1
3.3	HSD Forwarding Skid for HRSG-1No.+Long Recirculation Orifice-1No. (1 no. within 2 GT)	1
	Sub-Total of 3	**3**
4	**GAS TURBINE GENERATOR & AUX (4%) (4% for Two Sets i.e. 2 % for each set)**	
4.1	Preparation of foundation & base plate / packers grouting etc.	0.5
4.2	Placement Of Generator on foundation	0.5
4.3	Centering & leveling of Generator on foundation	0.5
4.4	Alignment of GTG with load gear box	0.5
4.5	Erection of exciter and alignment	0.5
4.6	Erection of air filter , air cooler duct with air cooling elements	0.5
4.7	Grouting of Generator	0.5
4.8	Erection of Miscellaneous items	0.5
	Sub-Total of 4	**4**
5	**STEAM TURBINE & AUXILIARIES (11 %) (one set)**	
5.1	Placement, alignment and grouting of base plates of Turbine and bearing pedestals	0.5
5.2	Placement of Turbine, lowering of Rotor on bearings and checking of clearances, coupling etc.	1.5
5.3	Alignment of all Rotors including reaming, honing and fixing of coupling bolts	0.5
5.4	Assembly of regulation system	0.5
5.5	Erection of Lube Oil console package (Tank), Lube Oil console package (Pump Assy) etc.	0.5

5.6	Erection of Jacking oil pump	0.5
5.7	Erection of Emergency oil pump assembly.	0.5
5.8	Erection of Oil purification unit	0.5
5.9	Erection of Oil accumulators	0.5
5.10	Erection of Turbine enclosure	0.5
5.11	Erection of Governing console	0.5
5.12	Erection of Gear box	0.5
5.13	Erection of Input Coupling	0.5
5.14	Erection of Output Coupling.	0.5
5.15	Final box-up of turbine	1.5
5.16	Completion of Turbo-visory works	0.5
5.17	Final boxing up of Pedestals	0.5
5.18	Erection of Miscellaneous items	0.5
	Sub-Total of 5	**11**
6	**STEAM TURBINE GENERATOR (8%)**	
6.1	Preparation of foundation of foundation	0.5
6.2	Placement, leveling and centering of Generator Stator on foundation.	4
6.3	Alignment of Generator Rotor & Turbine Rotor Generator Exciter rotor and foundation grouting.	1
6.4	Reaming and coupling Generator Rotor and Turbine rotor holes	0.5
6.5	Bearing boxup of Generator	1
6.6	Erection of Air coolers.	0.5
6.7	Erection of Misc. auxiliaries	0.5
	Sub-Total of 6	**8**
7	**ERECTION, ALIGNMENT, FITUP, WELDING, NDE/NDT/RADIOGRAPHY, HYDAULIC TESTING AND SUPPRING OF INTEGRAL PIPING OF GT's AND stg WITH Aux. (8%)**	
7.1	Lube and control oil piping of Gas Turbine and Gas Turbine Generator	1.5
7.2	Gas interconnecting piping of GT system	1
7.3	Water wash piping and Field drain pipings & headers of GT system	0.5
7.4	Seal Oil System and Gas system piping of Gas Turbine Generator	0.5

7.5	Cross around piping of Steam Turbine	0.5
7.6	Central Lube oil piping	0.5
7.7	Steam piping of STG system	1
7.8	Turbine water Drains piping of STG system	0.5
7.9	Lube oil piping and Control oil piping of STG	0.5
7.10	BFP / TDBFP oil piping	0.5
7.11	Other Misc. piping	1
	Sub-Total of 7	**8**
8	**CONDENSER (8%)**	
8.1	Preparation of foundation	0.5
8.2	Placement, alignment, assembly and welding of bottom plate segments, hot well, NDT and spring elements placement	0.5
8.3	Assembly and positioning of water chamber, water boxes, side plates, bottom plates, welding and NDT	1
8.4	Assembly, alignment and welding & NDT of tube support plates and internals like baffle plates, air evacuation pipes etc.	0.5
8.5	Assembly, welding & NDT of dome walls and dome stiffeners, extraction piping and steam throw device etc.	1
8.6	Insertion, expansion, end milling of condenser tubes	1
8.7	Hydro test of steam and water side	1
8.8	Welding of condenser neck joint and NDT & completion of balance works	1
8.9	Assy. and Erection of R.E. Joints and Butterfly valves	0.5
8.10	Other Misc. piping	1
	Sub-Total of 8	**8**
9	**PUMPS AND AUXILIARIES (18 %)**	
9.1	**Erection, testing and commissioning of BFP Drive Turbine with AUXILIARIES - 1 Set (4 %)**	
i	Erection of Turbine assembly	0.5
ii	Erection of Lube oil console package-I	0.25
iii	Erection of Lube oil console package-II+EOP	0.25
iv	Erection of Over head oil Tank	0.25

v	Erection of Oil purification unit	0.25
vi	Erection of Oil accumulators	0.25
vii	Erection of Turbine enclosure.	0.25
viii	Erection of Governing console	0.5
ix	Erection of Gear box	0.5
x	Erection of Input Coupling	0.5
xi	Erection of Output Coupling.	0.5
	Sub-Total 9.1	**4**
9.2	**Erection / Testing and commissioning of Motor Driven BFP for HRSG - 3Nos. (2W+1S) (3%)**	
i	Foundation chipping, blue matching of foundation and levelling, centring of grillage/foundation frame and bolt grouting.	0.5
ii	Placement of feed pump, booster pump, motor, hydraulic coupling and preliminary alignment.	1
iii	Grouting of grillage/ foundation and final alignment of BFP, BP, Motor and HC	1
iv	Erection of lube Oil piping, working oil coolers & other balance piping like mechanical seal water coolers with piping etc, Erection of panel/racks and oil flushing of oil piping.	0.5
	Sub-Total 9.2	**3**
9.3	Erection and commissioning of LO SKID FOR BFP-HRSG (3 nos. for each Block total 6 nos)	1
9.4	Erection and commissioning of BFPS FOR UB-STEAM TURBINE DRIVEN (TURBINE IN T&C ENGG SCOPE) (1 nos. for each Block total 2 nos)	1
9.5	Erection and commissioning of BFPS FOR UB-MOTOR DRIVEN (1 nos. for each Block total 2 nos)	1
9.6	Erection and commissioning of LO SKID FOR BFP UB (1 nos. for each Block total 2 nos)	1
9.7	Erection and commissioning of MUH TRANSFER PUMPS-MOTOR DRIVEN (1 nos. for each Block total 3 nos)	1
9.8	Erection and commissioning of CONDENSATE TRANSFER PUMP-MOTOR DRIVEN (1 nos. for each Block total 3 nos)	1
9.9	Erection and commissioning of LP HEATER CONDENSATE DRAIN TRANSFER PUMPS (1 nos. for each Block total 2 nos)	0.5
9.10	Erection and commissioning of COND EXTRACTION PUMPS-MOTOR DRIVEN (VERTICAL PUMPS) (2 nos. for each Block total 4 nos)	0.5
9.11	Erection and commissioning of BLACK START COOLING WATER PUMPS-MOTOR DRIVEN (1 nos. for each Block total 2 nos)	0.5
9.12	Erection and commissioning of BLOW DOWN TRANSFER PUMPS FOR UB AREA-MOTOR DRIVEN (VERTICAL PUMPS) (2 nos. for each Block total 4 nos)	0.5

9.13	Erection and commissioning of BLOW DOWN TRANSFER PUMPS FOR HRSG AREA-MOTOR DRIVEN (VERTICAL PUMPS) (2 nos. for each Block total 4 nos)	0.5
9.14	Erection and commissioning of DM WATER PUMPS FOR ATOMISING AIR PRE-COOLER OF GT-MOTOR DRIVEN (4 nos. for each Block total 8 nos)	1
9.15	Erection and commissioning of DEWATERING PUMPS (1 no. for each Block total 2 nos.)	0.5
9.16	Erection of Misc. / other Auxiliaries	1
	Sub-Total of 9 (9.1+9.2+9.3+9.4+9.5+9.6+9.7+9.8+9.9+9.10+9.11+9.12+9.13+9.14+9.15+9.16)	**18**
10	**FINAL PAINTING (6%)**	
10.1	Progressive Final Painting of GTG system equipments	1.5
10.2	Progressive Final Painting of STG system Equipments	1.25
10.3	Progressive Final Painting of Pumps and Auxiliaries	1.25
10.4	Progressive Final Painting of Integral Piping	1
10.5	Completion of Misc. equipments	1
	Sub-Total of 10	**6**
11	**Commissioning 10%**	
11.1	Oil flushing completion of GT system	0.5
11.2	Cranking of GT	0.5
11.3	Full speed no load sum of GT	0.5
11.4	Synchronisation of GT set	0.5
11.5	Commissioning of feed water system	0.5
11.6	Oil flushing completion of STG system	0.5
11.7	Steam Blowing completion	0.5
11.8	Barring Gear Operation of STG set	0.5
11.9	Rolling and Synchronization of STG set	1
11.10	Completion of Trial run operation in combined cycle mode of GT & STG and PG test related works	1
11.11	Commissioning of BFP	0.5
11.12	Area cleaning, temporary structures cutting removal and return scrap	0.5
11.13	Punch list points/pending points liquidation	0.5
11.14	Material reconcilation	0.5

11.15	Completion of Contractual obligation	1
11.16	Completion of all facilities	1
	Sub-Total of 11	**10**
GRAND TOTAL OF 1,2,3,4,5,6,7,8,9,10 & 11		**100.00**

(B.2) FOR Sl. No. 2.0 OF PART (B) OF RATE SCHEDULE (BLOCK- I Scope) –Stage Break Up for payment of Common system Equipments/Items/ System with related equipments & Auxiliaries (to be executed by the Block I Agency):

S.N.	Description	%	Remarks
a	Erection and commissioning of Filter Separator (2*100%) Skid	8.0	common for 4GT's & 4 HRSGs
b	Erection and commissioning of Natural Gas Scrubber (2*50%)	8.0	Common for 4GT's &4 HRSG's
c	Erection and commissioning of Natural Gas Scrubber (2*50%) skid for Ubs	8.0	For 2 UB's
d	Erection and commissioning of Complex Gas Scrubber (1x100%) skid for Ubs	8.0	For 2 UB's
e	Erection and commissioning of 30m3 GAS CONDENSATE DRAIN TANK	8.0	Buried Tank
f	Erection and commissioning of 30m3 HSD/NAPHTHA DRAIN TANK NEAR STORAGE FAM AREA	8.0	Buried Tank
g	Erection and commissioning of 30m3 HSD/NAPHTHA Unloading vessel with hose pipes	8.0	Buried Tank
h	Erection and commissioning of HSD Centrifuge Skid	4.0	(consisting of 2 nos of centrigue modules of min.50m3/hr capacity)
i	**LP Heater (1 no.)**		
i)	Per Heater	2.0	
ii)	Misc (Stand pipes etc)	1.0	

j	**Flash tank for LP Heater (1 no.)**		
i)	Per Heater	2.0	
k	MUH TRANSFER PUMPS-MOTOR DRIVEN	5.0	
l	CONDENSATE TRANSFER PUMP-MOTOR DRIVEN	5.0	
m	Erection and commissioning of Off-base compressor cleaning and washing skid for off-line/on-line cleaning (one number common for 4 GTs)	5.0	
n	Erection and commissioning of Mobile Lube oil centrifuge - 1000 LPH (one number common for 4 GTs)	5.0	
o	Erection and commissioning of Lube oil drain pump (2 m3) (one number common for 4 GTs)	6.0	
p	**LP Dosing Skids (6%)**		
i)	Erection and commissioning of LP Dosing System(**Hydrazine at Deaerator outlet**)-Skid Dimensions: 3.6X2.5X5m(LXBXH) and Operating Weight is 3500kg.	3.0	
ii)	Erection and commissioning of LP Dosing System(**Morpholine at Deaerator outlet**)-Skid Dimensions: 5.5X3.5X7m(LXBXH) and Operating Weight is 5000kg.	3.0	
iii)	Erection and commissioning of LP Dosing System(**Morpholine in Condensate Storage Tank**)-Skid Dimensions: 4.0X3.0X6m(LXBXH) and Operating Weight is 4000kg.	3.0	
	Sub-Total p	**9.0**	
	Total (B)	**100.0**	

C.) **GENERAL**

C.1
Weight of packers and shims which become permanent part of equipment, both figuring in shipping list and those fabricated at site will be paid for on shipping list based actual weight.

C.2
Certain optimized assemblies / or modules may be made, assembling products from two or more different product group main assembly and dispatched. Payment for erection of these optimized assemblies / or modules will be regulated as per the weight of individual product group main assemblies contributing to the total weight of the module or optimized assembly at the quoted rate for the respective product group main assemblies, in the rate schedule.

C.3
For the purpose of release of progressive payments, month-wise break up for each of the above services will be jointly worked out by BHEL and the contractor at site at the time of start of work. This will be dynamically and regularly reviewed every month or mutually agreed periodicity and shall be re-set based on expected requirement or various services keeping in view relevant aspects. On all the issues as above, BHEL engineer's decision shall be final & binding.

12.3 MEASUREMENT OF THE WORK COMPLETED

A) Where payment is to be made on the basis of weight, the weight per unit given in the BHEL document only shall be taken in to consideration. In case such an information is not available in BHEL documents, then the latest relevant Indian standards in this regard may be applied.

B) Spares, surplus quantity, erection contingency materials will not be paid for unless the same has been consumed in place of regular item of measurable work as per the rate schedule.

C) Where the payment is made on the basis of item rate, actual executed quantity measured jointly shall only be paid for.

D) It is clarified that as far as weight constituted by welding consumables and other consumables supplied by BHEL as well as by the contractor, shall be ignored for the purpose payment.

E) BHEL engineer's decision regarding stage of payment corresponding to progress of work, calculation of weight etc. will be final and binding on the contractor.

F) Wastage allowance provided elsewhere on application of refractory & insulation will be applied on the net issued quantity. The net issued quantity is gross issue less the quantity returned. The wastage allowance will be applied at the final reconciliation stage. The payable amount will then be restricted to the net quantity after wastage allowance.

No separate payment shall be made for grouting of equipments, structures etc specified elsewhere in these specifications.

8.0 TAXES, DUTIES, LEVIES (Consolidated Rev 00 dated 07/06/2012)

8.1. For All types of works excepting works covered under sl no 8.2

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 Services are excluded from contractor's scope; therefore contractor's price/rates shall be **exclusive** of Service Tax and Cess on Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and pay the same to the concerned tax authorities, such applicable amount will be paid by BHEL at the prevailing Service Tax Rate (presently 12.36 %) on the admitted bill value.

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.
Wherever, more than one route/option are available for discharge of service tax liability under a particular service, (e.g. "works contract Service"), contractor shall obtain prior written consent from BHEL site before billing the amount towards Service Tax.

8.1.3 VAT (Sales Tax /WCT)

(i) Applicable for All Tenders excepting sl no 8.1.3 (ii)

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.

~~(ii) Civil Works in Gujarat~~

~~As regards Value Added Tax (VAT)/CST 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 **inclusive** of the same and in no case input or output VAT/CST will be reimbursed extra.~~
~~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. Contractor will submit all the details of VAT/CST paid for the contract in the prescribed format of the respective state VAT laws. Also, the contractor will issue the tax Invoices to BHEL as per the Tax laws of respective state on monthly basis. Contractor shall also be required to furnish to BHEL necessary proof of VAT remittance on monthly basis.~~
~~Deduction of tax at source shall be made as per the provisions of law and is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made.~~
~~Further, if BHEL, at the instance of customer or otherwise adopts the specific route for discharging output VAT liability itself, benefit of the reduction in liability of the contractor will be passed on to BHEL.~~
~~In case, BHEL is forced to pay any VAT liability on behalf of contractor, the same will be recovered from~~ contractor's bill or otherwise as deemed fit.

8.1.4 Modalities of Tax Incidence on BHEL (Applicable for All Tenders Other Than Civil in Gujarat)

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.

~~8.2 'Enabling Works'~~

~~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. (**i.e. rates quoted by bidder shall be inclusive of Service Tax, VAT/WCT and all other taxes and duties**)~~

8.3 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.

8.4 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998.

In case any portion of work involves execution through building or construction workers, then compliance to the above titled Acts shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under:-

i. It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a licence to the Competent Authority under the BOCW Act and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of licence / permission to BHEL within a period of one month from the date of award of contract.

ii. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these act and rules including that of payment / deposit of 1% cess on the extant of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.

iii. It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building workers) engaged by the sub-contractor during the preceding month.

iv. It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

SPECIFIC INCLUSIONS

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

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

9.3
Servicing and assembly of control valves/regulating valves, fixing of filter elements/strainers & steam blowing & blanking devices in MS strainer, HRH strainer & and blanking ESV & IV system, for hydro test, steam blowing etc. is the part of scope of work.

9.4
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.

9.5
Complete control fluid system 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
Chipping of foundation, placement, erection, alignment, commissioning, grouting, and mounting of equipment mount instruments, panels and other fittings of BHEL (bought out items) supplied pumps & packages are in scope of the work. Erection and commissioning of these equipments/pumps & packages will be required to complete and meet the commissioning schedule/ milestone activities of other areas like boiler, 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.

9.8
Most of the Misc. Pumps with drive motors, base frame, fittings etc will be supplied in loose parts/ dismantled condition as skid mount. These pumps along with drive and fittings shall be assembled at site. The Delivery of these will be taken from BHEL stores/storage yard and will be assembled/ installed at different locations as per drawing and instruction of BHEL Engineer at site. The work involved is preservation, assembly, installation, erection, alignment, foundation grouting including providing non-shrink free flow grout mix material, fixing of loose items, filling of lubricants, greasing, commissioning, no load/ load trial run of motors & pumps. All the works shall be carried our as part of scope of work.

These Misc. pumps will be required for erection and commissioning of other systems, pipings, equipments which will be under scope of erection of other agencies. Contractor shall carry out the installation, erection and alignment works etc. as per priority decided by BHEL Engineer at site to enable the other agencies to proceed with their work. Contractor shall carry out the

welding of terminal point/interface/matching & connected flanges joints, pipe joints etc. of other system & other agencies as scope of work. The decision of BHEL Engineer shall be final and binding on contractor.

9.9
Manual Hoist with travelling trolley shall be erected tested and commissioned for Compressor House and Switchgear Building.

9.10
CONSUMABLES
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.

9.11
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
PRIMERS & PAINTS
Supply of Paints/Primer/Thinner and application of paints for final painting and all other consumables like brush, cleaning agents etc and all T&P including scaffolding materials, manpower, and supervision is in contractor's scope.

9.13
WELDING ELECTRODES, FILLER WIRES FOR TIG WELDING AND GASES

All welding consumables including filler wires are in the contractor's scope.

9.14
All the required welding electrodes 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.

9.15
The contractor shall provide all consumables required for carrying out the work covered under this scope of work including TIG wires for welding of piping joints.

9.16

All the required gases like argon, oxygen, and acetylene etc. including required high purity nitrogen gas (for purging of generator stator water system) shall be arranged by the contractor at his cost.

10.0 EXCLUSIONS

The following works are specific exclusions from the scope of work under erection, testing & commissioning of tender specification-

- Sub-delivery items and electrical components such as push-buttons, junction boxes etc.
- E&C work of cable trays, cables and earthing etc
- Control panels, EPMS, MCC etc.
- Electrical & C&I items of handling system.
- All electrical and control & instrumentation items except those specified elsewhere in these specifications.
- Civil works except to the extent specifically indicated elsewhere in this tender.
- Pneumatic copper tubing and fittings thereof.
- Testing and commissioning of heating elements, thermostats, HV rectifier transformers.
- Electrical and C&I items of Variable Frequency Drives as provided elsewhere in these specifications.

ESTIMATED WEIGHT OF VARIOUS SYSTEM IN SCOPE OF WORK

LIST OF APPLICABLE PGMA'S FOR UTILITY BOILER (Applicable for UB 1 & 2)

S.N.	PG	MA	PGMA Description	Est Wt in Kg	Wt in MT	PKG	PG Wt MT
[1]	**From Trichy (Cust. No.-6011)**						
A	**STRUCTURES**						
1	08	101	FURNACE BUCKSTAY-UPPER	30000.00	30.00	STR	
2	08	104	FURNACE BUCKSTAY-MIDDLE	30000.00	30.00	STR	
3	08	107	FURNACE BUCKSTAY-LOWER	20000.00	20.00	STR	
4	08	900	FURNACE KEY BUCKSTAY	6000.00	6.00	STR	
			PG Weight				**86.00**
5	09	001	Seal Boxes For Furnace Opening	2800.00	2.80	STR	
6	09	002	Seal Boxes For Instrument Inserts	1400.00	1.40	STR	
7	09	003	Light Up Supplies	300.00	0.30	STR	
			PG Weight				**4.50**
8	35	010	FOUNDATION MATERIAL	10000.00	10.00	STR	
9	35	110	MAIN COLUMN-LEFT	115000.00	115.00	STR	
10	35	120	MAIN COLUMN-RIGHT	115000.00	115.00	STR	
11	35	210	CEILING STRUCTURE FABRICATED BEAMS	80000.00	80.00	STR	
12	35	220	CEILING STRUCTURE ROLLED BEAMS	20000.00	20.00	STR	
13	35	230	HORIZONTAL BRACING FOR CEILING STRUCT	5000.00	5.00	STR	
14	35	310	AIR HEATER SUPPORT FRAME	15000.00	15.00	STR	
15	35	351	HORIZONTAL BRACING LEVEL-1	12000.00	12.00	STR	
16	35	352	HORIZONTAL BRACING LEVEL-2	12000.00	12.00	STR	
17	35	353	HORIZONTAL BRACING LEVEL-3	12000.00	12.00	STR	
18	35	380	LANDINGS FOR DRUM LIFTING	30000.00	30.00	STR	
19	35	390	PLATFORM FOR DRUM ERECTION	20000.00	20.00	STR	
20	35	510	COLUMN FRONT BRACING	55000.00	55.00	STR	
21	35	520	COMLUMN SIDE BRACING	95000.00	95.00	STR	
22	35	530	COLUMN REAR BRACING	65000.00	65.00	STR	
23	35	811	FLOOR GRILLS	20000.00	20.00	STR	
24	35	820	STAIRS AND LADDERS	9000.00	9.00	STR	
25	35	850	HAND RAILS AND POSTS	15000.00	15.00	STR	
			PG Weight				**705.00**
26	36	110	COLUMNS NEAR APH	25000.00	25.00	STR	
27	36	150	COLUMN BRACINGS	45000.00	45.00	STR	

28	36	210	MAIN FLOOR-1ST LEVEL	30000.00	30.00	STR	
29	36	230	MAIN FLOOR-3RD LEVEL	20000.00	20.00	STR	
30	36	240	MAIN FLOOR-4TH LEVEL	20000.00	20.00	STR	
31	36	250	MAIN FLOOR-5TH LEVEL	25000.00	25.00	STR	
32	36	380	LANDINGS FOR COMMISSIONING	20000.00	20.00	STR	
33	36	390	MISCELLANEOUS FLOOR	20000.00	20.00	STR	
34	36	440	HORIZONTAL BEAMS	30000.00	30.00	STR	
35	36	441	DUCT SUPPORTS	35000.00	35.00	STR	
36	36	442	PIPING SUPPORTS	25000.00	25.00	STR	
37	36	446	EXTWRNAL PIPING SUPPORTS	25000.00	25.00	STR	
38	36	610	ROOF STRUCTURE	45000.00	45.00	STR	
39	36	611	ROOF SHEETING	20000.00	20.00	STR	
40	36	612	RAINWATER PIPES-PVC	5000.00	5.00	STR	
41	36	820	STAIRS AND LADDERS	15000.00	15.00	STR	
42	36	850	HAND RAILS AND POSTS	35000.00	35.00	STR	
			PG Weight				**440.00**
43	38	010	FOUNDATION MATERIAL INTER CONN COLUMNS	5000.00	5.00	STR	
44	38	110	COLUMNS-INT. CONNECTION	20000.00	20.00	STR	
45	38	150	COLUMN BRACINGS	20000.00	20.00	STR	
46	38	210	PLATFORMS AND FLOORS	20000.00	20.00	STR	
47	38	810	FLOOR GRILLS	15000.00	15.00	STR	
			PG Weight				**80.00**
48	39	010	FOUNDATION MATERIAL ID & FD	10000.00	10.00	STR	
49	39	101	COLUMN-ID SYSTEM	40000.00	40.00	STR	
50	39	121	COLUMN -PA&FD SYSTEM	40000.00	40.00	STR	
51	39	150	COL.BRACING BET.ID & CHIMNEY	10000.00	10.00	STR	
52	39	200	PA&FD DUCT SUPPORT BEAMS	25000.00	25.00	STR	
53	39	210	COLUMN BRACING PA&FD SYSTEM	25000.00	25.00	STR	
54	39	300	ID SYSEM FLOOR	10000.00	10.00	STR	
55	39	301	PLATFORM FOR FANS	3000.00	3.00	STR	
56	39	302	STRUCTURE FOR MOTOR HOOD	12000.00	12.00	STR	
57	39	303	FD FAN HANDLING STRUCTURE	15000.00	15.00	STR	
58	39	311	ID DUCT SUPPORT BEAMS	25000.00	25.00	STR	
			PG Weight				**215.00**
59	41	200	GAS SPUDS	1000.00	1.00	STR	
			PG Weight				**1.00**
			SUB TOTAL A (Structure)	**1531500.00**	**1531.50**		
B	**PRESSURE PARTS**						

60	04	114	Upper Drum + Intl Id 49-60	60000.00	60.00	PP	
61	04	144	Upper Drum Sspn Id 49-60	4850.00	4.85	PP	
62	04	194	Upper Drum Trans Strr Id 49-60	5150.00	5.15	PP	
			PG Weight				**70.00**
63	05	137	Inlet Front Lower Ww Header	5000.00	5.00	PP	
64	05	147	Inlet Rear Lower Ww Header	6100.00	6.10	PP	
65	05	155	Inlet Side Lower Ww Header	12000.00	12.00	PP	
66	05	228	Ww Outlet Header Screen Tube	3000.00	3.00	PP	
67	05	231	Outlet Front Upper Ww Header	1900.00	1.90	PP	
68	05	251	Outlet Side Upper Ww Header	4500.00	4.50	PP	
			PG Weight				**32.50**
69	06	400	Unclassified Burner Panel	12000.00	12.00	PP	
70	06	631	Front Upper Ww Pnl	22000.00	22.00	PP	
71	06	634	Front Intermediate Ww Pnl	15000.00	15.00	PP	
72	06	637	Waterwall Lower Front Panel	9000.00	9.00	PP	
73	06	641	Rear Upper Ww Pnl	7000.00	7.00	PP	
74	06	644	Rear Intermediate Ww Pnl	19000.00	19.00	PP	
75	06	647	Rear Lower Ww Pnl	9000.00	9.00	PP	
76	06	651	Side Upper Ww Pnl	48000.00	48.00	PP	
77	06	653	Side Intermediate Ww Pnl	20000.00	20.00	PP	
78	06	655	Side Lower Ww Pnl	29000.00	29.00	PP	
			PG Weight				**190.00**
79	07	101	Downcomer Piping-Natural Circulation	46000.00	46.00	PP	
80	07	201	Riser Tubes	18000.00	18.00	PP	
81	07	223	Furnace Screen Tubes	2500.00	2.50	PP	
82	07	231	Lower Corner Transition Tubes	2500.00	2.50	PP	
83	07	232	Upper Corner Transition Tubes	900.00	0.90	PP	
84	07	401	Waterwall Suspension	7500.00	7.50	PP	
85	07	410	Downcomer Suspension	2500.00	2.50	PP	
86	07	420	Downcomer Guides	1500.00	1.50	PP	
87	07	431	Riser Tube Support	2000.00	2.00	PP	
88	07	601	Pressure Seals	500.00	0.50	PP	
89	07	992	Welding Consumables	100.00	0.10	PP	
			PG Weight				**84.00**
90	10	135	LTSH Inlet Header	2000.00	2.00	PP	
91	10	137	Final SH Inlet Header	2000.00	2.00	PP	
92	10	184	Rear steam cooled wall outlet header	2000.00	2.00	PP	
93	10	191	SH Radiant Roof Inlet Header	2000.00	2.00	PP	
94	10	235	LTSH Outlet Header	3000.00	3.00	PP	
95	10	237	Final SH Outlet Header	3000.00	3.00	PP	

96	10	240	Platen SH O/L Header	3000.00	3.00	PP	
97	10	258	Platen SH Outlet Header	3000.00	3.00	PP	
98	10	655	Hanger Platen SH Inlet Header	3000.00	3.00	PP	
			PG Weight				**23.00**
99	11	235	Loose Tubes for Platen SH	2000.00	2.00	PP	
100	11	236	Loose Tubes for Platen SH	10000.00	10.00	PP	
101	11	248	LTSH Coil Assembly	40000.00	40.00	PP	
102	11	249	LTSH loose tubes (Inlet & Outlet)	5000.00	5.00	PP	
103	11	250	Final SH Coil Assembly (Upper)	22000.00	22.00	PP	
104	11	251	Final SH Coil Assembly (Lower)	35000.00	35.00	PP	
105	11	252	Platen SH Loose tubes (Inlet & Outlet)	4000.00	4.00	PP	
106	11	255	SH Hanger Platen Coil Assembly	15000.00	15.00	PP	
107	11	271	Final SH Loose tubes (Inlet & Outlet)	4000.00	4.00	PP	
108	11	615	SH Rear Panel	3000.00	3.00	PP	
109	11	691	SH Radiant Wall Roof Panels	7000.00	7.00	PP	
			PG Weight				**147.00**
110	12	136	SH linkfrom SCW to LTSH	1200.00	1.20	PP	
111	12	147	Link from LTSH to Hanger Platen SH I/L H	2700.00	2.70	PP	
112	12	551	SH Horizontal Platen Hanger tubes	5500.00	5.50	PP	
113	12	803	SH Steam Cooled Spacer tubes	1000.00	1.00	PP	
114	12	850	Sat Links	4000.00	4.00	PP	
115	12	852	DESH Links	4000.00	4.00	PP	
116	12	900	SH DESH	1500.00	1.50	PP	
117	12	901	SH Hangers and supports (Headers)	4000.00	4.00	PP	
118	12	902	SH Hangers and supports (Links)	4000.00	4.00	PP	
119	12	903	SH Misc components	4000.00	4.00	PP	
120	12	992	Welding consumables	100.00	0.10	PP	
121	12	993	Erection materials	200.00	0.20	PP	
			PG Weight				**32.20**
122	18	001	Furnace roof skin casing	2000.00	2.00	PP	
123	18	010	PP Attachments in Furnace Roof Skin Casi	1800.00	1.80	PP	
			PG Weight				**3.80**
124	19	105	Economiser coils	16000.00	16.00	PP	
125	19	115	Eco - III	26000.00	26.00	PP	
126	19	125	Eco - II	28000.00	28.00	PP	
127	19	194	Eco loose tubes (Inlet & Intermediate st	2000.00	2.00	PP	
128	19	701	Eco Inlet Header	2000.00	2.00	PP	
129	19	702	Eco Outlet Header	1400.00	1.40	PP	
130	19	753	Eco intermediate header (Rear)	2500.00	2.50	PP	

131	19	763	Eco intermediate header (Front)	2500.00	2.50	PP	
132	19	802	Eco Hanger Tubes	1500.00	1.50	PP	
133	19	850	Eco Feed pipe	1000.00	1.00	PP	
134	19	851	Eco Link to Drum	4000.00	4.00	PP	
135	19	901	Eco supports and suspensions (Headers)	3000.00	3.00	PP	
136	19	902	Eco supports and suspensions (Links)	3500.00	3.50	PP	
137	19	903	Eco Misc components	2000.00	2.00	PP	
			PG Weight				**95.40**
138	20	002	Long Retractable Soot Blower T30 Mk 1e	9372.00	9.37	PP	
139	20	004	Wall Box Non-Pressurised For Lrsb Mk-1	400.00	0.40	PP	
140	20	511	Da Head Valve Assy	85.00	0.09	PP	
141	20	988	Sdot Blower Commissioning Spare	7.00	0.01	PP	
142	20	998	Special Tools For Soot Blowers	8.00	0.01	PP	
			PG Weight				**9.87**
143	21	600	Soot Blower Piping And Fittings	5600.00	5.60	PP	
144	21	601	Sootblower Piping Supports	3800.00	3.80	PP	
145	21	700	Bulked Bps Components For Sb Piping	600.00	0.60	PP	
146	21	800	Sb Valves (Bhel)	250.00	0.25	PP	
147	21	825	Sb Valves (Sub Delivery)	200.00	0.20	PP	
148	21	850	Soot Blower Safety Valve (Bhel)	23.00	0.02	PP	
149	21	875	Silencer For Sb Safety Valve (Bhel)	400.00	0.40	PP	
150	21	987	Commg Spares For Sb Safety Valve	1.00	0.00	PP	
151	21	988	Commg Spares For Sub Deliveries	1.00	0.00	PP	
152	21	992	Welding Consumables	40.00	0.04	PP	
			PG Weight				**10.92**
153	24	200	Boiler Trim Piping And Fittings	23400.00	23.40	PP	
154	24	201	Supports For Trim Piping	5800.00	5.80	PP	
155	24	220	Safety Valve Esc Pipe&Drain - Rh Uty B	8500.00	8.50	PP	
156	24	225	Silencer Support-Safety Valves	14300.00	14.30	PP	
157	24	235	Slncr&Suprt-Starting Vent - Rh Uty Blr	1900.00	1.90	PP	
158	24	240	Sample Cooler And Supports	700.00	0.70	PP	
159	24	260	Valves (Bhel) Rh Uty Blr	6600.00	6.60	PP	
160	24	265	Valves & Fittings (Sd) Rh Uty Blr	1600.00	1.60	PP	
161	24	273	Direct Water Level Gauge - Bhel	280.00	0.28	PP	
162	24	275	Headers For Trim Piping	810.00	0.81	PP	
163	24	280	Erv And Safety Valves(Bhel)	2000.00	2.00	PP	
164	24	285	Safety Valve/Erv Silencers(Bhel)	27000.00	27.00	PP	
165	24	290	Startup vent Silencer	1000.00	1.00	PP	
166	24	350	Boiler Filling Piping	500.00	0.50	PP	
167	24	351	Hangers And Supports Of Blr Filling Pipe	250.00	0.25	PP	

168	24	700	Bulked Bps Components For Trim Pipes	300.00	0.30	PP	
169	24	955	Lapping Tools For Sv&Erv	85.00	0.09	PP	
170	24	960	Lapping Tools For Conventional Valves(	35.00	0.04	PP	
171	24	987	Commg Spares For Safety Valves/Erv	2.00	0.00	PP	
172	24	988	Commg Spares For Sub-Dely Valves	25.00	0.03	PP	
173	24	989	Commg Spares For Conventional Valves	6.00	0.01	PP	
			PG Weight				**95.09**
174	42	010	FF SKID - LO PUMPING	10000.00	10.00	PP	
175	42	045	FF SKID - DO PUMPING	500.00	0.50	PP	
176	42	065	FF SKID - DO TANK	500.00	0.50	PP	
177	42	072	FF SKID - LO_AIR CONTROL STATION	3000.00	3.00	PP	
178	42	076	FF SKID - FG_PG CONTROL STATION	4000.00	4.00	PP	
179	42	122	PIPING, PH - LO	2000.00	2.00	PP	
180	42	152	PIPING, OPRG FLOOR - LO	2000.00	2.00	PP	
181	42	154	PIPING, OPRG FLOOR - DO	500.00	0.50	PP	
182	42	155	PIPING, OPRG FLOOR - IGNITOR GAS	600.00	0.60	PP	
183	42	156	PIPING, OPRG FLOOR - FUEL GAS	18000.00	18.00	PP	
184	42	157	PIPING, OPRG FLOOR - ATM AIR	1500.00	1.50	PP	
185	42	270	SD - BURNER FLOOR SKIDS	3000.00	3.00	PP	
			PG Weight				**45.60**
186	43	002	PIPING - SCANNER COOLING AIR SYSTEM	12000.00	12.00	PP	
			PG Weight				**12.00**
187	xx	xxx	Spry Cum Tray Dearator				
188			Heater (L 7850 x W 2550 x H 2850)	11800.00	11.80	PP	
189			Feed storage tank (Sec-I) (L 8750 x W 3700 x H 4300)	15800.00	15.80	PP	
190			Feed storage tank (Sec-II) (L 10000 x W 3700 x H 4300)	17200.00	17.20	PP	
191			Feed storage tank (Sec-III) (L 8750 x W 3700 x H 4300)	15800.00	15.80	PP	
192			Loose items (for Stand pipes, Platform etc)	5000.00	5.00	PP	
			PG Weight				**65.60**
			SUB TOTAL B (Pressure Parts)	**916980.00**	**916.98**		
C	**Non Pressure Parts**				0.00		
193	07	993	Consumables & Erection Materials	1200.00	1.20	NPP	
			PG Weight				**1.20**
194	18	020	Vibration Snubbers	500.00	0.50	NPP	
			PG Weight				**0.50**
195	19	992	Welding consumables	100.00	0.10	NPP	

196	19	993	Erection materials	200.00	0.20	NPP	
			PG Weight				**0.30**
197	24	992	Welding Consumables	20.00	0.02	NPP	
198	24	993	Consumables & Erection Materials	7.00	0.01	NPP	
199	24	994	Name Plates	160.00	0.16	NPP	
			PG Weight				**0.19**
200	28	220	Doors	2500.00	2.50	NPP	
201	28	700	Fasteners	500.00	0.50	NPP	
			PG Weight				**3.00**
202	30	103	Seal Plate Assy	3000.00	3.00	NPP	
203	30	105	Furnace Bottom Enclosure Framing	2300.00	2.30	NPP	
204	30	215	Main Boiler	4200.00	4.20	NPP	
205	30	219	Vertical Roof Enclosure Framing	21000.00	21.00	NPP	
206	30	220	Deck Support And Seals	6200.00	6.20	NPP	
			PG Weight				**36.70**
207	31	010	Skin Casing Comps Welded To Pressure P	400.00	0.40	NPP	
208	31	301	Miscellaneous Casing	1000.00	1.00	NPP	
			PG Weight				**1.40**
209	32	993	Erection Materials	1500.00	1.50	NPP	
			PG Weight				**1.50**
210	41	350	AIR COOLED OIL GUN ASSY.	3150.00	3.15	NPP	
211	41	390	OIL GUN VICE AND RACK ASSY	300.00	0.30	NPP	
212	41	450	GAS IGNITORS	600.00	0.60	NPP	
213	41	998	COMM SPARES - BURNERS	50.00	0.05	NPP	
			PG Weight				**4.10**
214	42	700	BPS FASTENERS	300.00	0.30	NPP	
215	42	988	COMM SPARES - FF SKIDS	300.00	0.30	NPP	
			PG Weight				**0.60**
216	43	202	SD - SCANNER COOLING AIR SYSTEM	1000.00	1.00	NPP	
217	45	180	WIND BOX ASSY - 18 IN	5000.00	5.00	NPP	
218	45	181	WIND BOX ASSY - 18 IN	5000.00	5.00	NPP	
			PG Weight				**11.00**
219	48	012	DUCT FD FAN TO AH	29000.00	29.00	NPP	
220	48	013	DAMPER FD FAN TO AH	2100.00	2.10	NPP	
221	48	014	EXPN JT FD FAN TO AH	500.00	0.50	NPP	
222	48	015	SUPPORT FD FAN TO AH	1450.00	1.45	NPP	
223	48	042	COMBUSTOR BOTTOM WIND BOX	6000.00	6.00	NPP	
224	48	202	DUCT AH TO COMBUSTOR	10700.00	10.70	NPP	
225	48	203	DAMPER AH TO COMBUSTOR	2500.00	2.50	NPP	

226	48	204	EXPN JT AH TO COMBUSTOR	500.00	0.50	NPP	
227	48	205	SUPPORT AH TO COMBUSTOR	5350.00	5.35	NPP	
228	48	432	DUCT COMBUSTOR TO AH	25000.00	25.00	NPP	
229	48	433	DAMPER COMBUSTOR TO AH	2500.00	2.50	NPP	
230	48	434	EXPN JT COMBUSTOR TO AH	500.00	0.50	NPP	
231	48	435	SUPPORT COMBUSTOR TO AH	1250.00	1.25	NPP	
232	48	442	DUCT AH TO CHIMNEY	34000.00	34.00	NPP	
233	48	443	DAMPER AH TO CHIMNEY	2500.00	2.50	NPP	
234	48	444	EXPN JT AH TO CHIMNEY	500.00	0.50	NPP	
235	48	445	SUPPORT AH TO CHIMNEY	1700.00	1.70	NPP	
236	48	452	DUCT COMBUSTOR TO GR FAN	13000.00	13.00	NPP	
237	48	453	DAMPER COMBUSTOR TO GR FAN	1500.00	1.50	NPP	
238	48	454	EXPN JT COMBUSTOR TO GR FAN	500.00	0.50	NPP	
239	48	455	SUPPORT COMBUSTOR TO GR FAN	650.00	0.65	NPP	
240	48	462	DUCT GR FAN TO COMBUSTOR	3000.00	3.00	NPP	
241	48	463	DAMPER GR FAN TO COMBUSTOR	1500.00	1.50	NPP	
242	48	464	EXPN JT GR FAN TO COMBUSTOR	500.00	0.50	NPP	
243	48	465	SUPPORT GR FAN TO COMBUSTOR	300.00	0.30	NPP	
			PG Weight				**147.00**
	Gate & Dampers (Ranipet supply)						
244	57	013	DAMPERS BET FD FAN & APH	2000.00	2.00	NPP	
245	57	023	DAMPERS SEC. AIR INT	1750.00	1.75	NPP	
246	57	033	SA SCAPH INLET DAMPE	2000.00	2.00	NPP	
247	57	053	DAMPER GAS RECIRCLN	500.00	0.50	NPP	
248	57	063	SA SCAPH OUTLET DAMP	2000.00	2.00	NPP	
249	57	083	DAMPER COLD AIR FD F	2000.00	2.00	NPP	
250	57	293	DAMPER HOT SA FOR GA	600.00	0.60	NPP	
251	57	303	DAMPERS GR FAN SUCTI	1000.00	1.00	NPP	
252	57	313	DAMPERS GR SYSTEM OU	800.00	0.80	NPP	
253	57	323	DAMPERS FLOWGAS ECO	800.00	0.80	NPP	
254	57	577	ELECT ACTUATOR FOR G	3000.00	3.00	NPP	
255	57	988	DUCTS COMMISSIONING	50.00	0.05	NPP	
			PG Weight				**16.50**
			SUB TOTAL C (Non-Pressure Parts)	**223987.00**	**223.99**		
D	**Insulation**						
256	32	010	Fixing Comp For Blr Pr Parts Insul	2800.00	2.80	INSU	
257	32	110	Fixing Comp For Blr Mountings Insul	1200.00	1.20	INSU	
258	32	120	Fixing Comp For Sb Pipes Insul	5000.00	5.00	INSU	
259	32	310	Fixing Comp For Air Ducts Insul	5500.00	5.50	INSU	

260	32	410	Fixing Comp For Ah And Gas Ducts Insul	5000.00	5.00	INSU	
261	32	510	Fixing Comp For Id Ducts Insul	6500.00	6.50	INSU	
262	32	710	Fixing Comp For Oil System Insul	1000.00	1.00	INSU	
			PG Weight				**27.00**
263	33	021	Blr Pr Parts Mineral Wool	3000.00	3.00	INSU	
264	33	121	Blr Mountings Mineral Wool	2500.00	2.50	INSU	
265	33	126	Sb Pipes Mineral Wool	1000.00	1.00	INSU	
266	33	201	Main Blr Formed Refractory Is8	1000.00	1.00	INSU	
267	33	212	Main Blr Castable Refractory Gr C	31000.00	31.00	INSU	
268	33	230	Main Blr Pourable Insulation	30000.00	30.00	INSU	
269	33	241	Main Blr Calcium Silicate	3500.00	3.50	INSU	
270	33	321	Air Ducts Mineral Wool	15000.00	15.00	INSU	
271	33	421	Air Heater And Gas Ducts Mineral Wool	15000.00	15.00	INSU	
272	33	521	Id Ducts Mineral Wool	5500.00	5.50	INSU	
273	33	721	Oil System Mineral Wool	2100.00	2.10	INSU	
274	33	924	Misc Eqpts Asbestos Materials	150.00	0.15	INSU	
275	33	970	Misc Eqpts Expanded Metal	1000.00	1.00	INSU	
276	33	975	Misc Eqpts Sealing Compound	100.00	0.10	INSU	
			PG Weight				**110.85**
277	37	010	Blr Outer Casing Components	3000.00	3.00	INSU	
278	37	810	Blr Outer Casing Aluminium-Ribbed	6000.00	6.00	INSU	
279	37	910	Blr Outer Casing Aluminium-Plain	9000.00	9.00	INSU	
			PG Weight				**18.00**
	xx	xxx	CLADDING SHEET, INSULATION MATERIALS (HYDERABAD SUPPLY)- THIS SHOULD BE INCLUDING OF TG SIDE EQUIPMENTS, PIPING, and VALVE etc. TURBINE DRAIN PIPING, GLAND /SEAL STEAM PIPING & COMMON SYSTEM ETC WHICH WILL BE ERECTED BY OTHER TG ERECTION AGENCY OF RESPECTIVE UNITS.	6000.00	6.00	INSU	
			SUB TOTAL D (Insulation)	**161850.00**	**161.85**		
E	**Rotating Machines**						
1	99	100	FAN HANDLING EQUIPMENTS	2000.00	2.00	R/M	
			PG Weight				**2.00**
	Air Pre Heater (Ranipet Supply)						
2	50	510	STEAM COIL A P H	4000.00	4.00	R/M	
			PG Weight				**4.00**
3	53	000	SPECIAL TOOLS/CONT	301.63	0.30	R/M	

4	53	010	RTYP AH-ROTOR ASSY	11250.00	11.25	R/M	
5	53	013	RTYP AH-ROTORSEALS	1059.61	1.06	R/M	
6	53	024	RTYP AH-BAS&ELE ASSY	12240.00	12.24	R/M	
7	53	025	RTYP AH-BAS&ELE ASSY	24805.00	24.81	R/M	
8	53	061	RTYP AH-CENTRE SECTN	7350.00	7.35	R/M	
9	53	062	RTYP AH-CENTRE SECTN	3863.56	3.86	R/M	
10	53	070	RTYP AH-HOUSINGSHELL	6612.17	6.61	R/M	
11	53	071	RTYP AH-PEDASTAL	423.18	0.42	R/M	
12	53	072	RTYP AH-PEDASTAL	447.80	0.45	R/M	
13	53	100	RTYP AH-ROTOR DRIVE	850.00	0.85	R/M	
14	53	211	RTYP AH-AIRSEAL PIPE	107.94	0.11	R/M	
15	53	220	RTYP AH-GENL DETAILS	6091.58	6.09	R/M	
16	53	261	RTYP AH-GUIDE BEARNG	437.15	0.44	R/M	
17	53	262	RTYP AH-SUPRT BEARNG	1090.36	1.09	R/M	
18	53	271	RTYP AH-OIL PIPING	304.36	0.30	R/M	
19	53	274	OIL CIRCULATION UNIT	137.79	0.14	R/M	
20	53	301	RTYP AH-WASH.MANIFLD	125.00	0.13	R/M	
21	53	302	RTYP AH-WASH.MANIFLD	110.00	0.11	R/M	
22	53	316	RTYP AH-CLEANG EQPT	610.00	0.61	R/M	
23	53	988	RTYP AH COMMG SPARE	100.00	0.10	R/M	
			PG Weight				**78.32**
	FAN (Ranipet Supply)						
24	56	000	TOOLS & FIXTURE/CONT	300.00	0.30	R/M	
25	56	011	FD FAN FOUNDATION MA	1000.00	1.00	R/M	
26	56	051	GR FDN MATERIAL	1150.00	1.15	R/M	
27	56	091	RAD FAN-FIRST FILL L	6000.00	6.00	R/M	
28	56	115	FDFAN BC1S2000-2500	13000.00	13.00	R/M	
29	56	154	BAC 1 SUC GR FAN	11000.00	11.00	R/M	
30	56	650	GR FAN MOTOR	3500.00	3.50	R/M	
31	56	710	STM TURBINE - ID FAN	3000.00	3.00	R/M	
32	56	750	STM TURBINE - GR FAN	2500.00	2.50	R/M	
33	56	810	RADL FDFAN COUPLING	500.00	0.50	R/M	
34	56	850	GR FAN RADL-COUPLING	300.00	0.30	R/M	
35	56	910	RAD FDFAN ACCESSORY	1500.00	1.50	R/M	
36	56	911	FD FAN SILENCER	23000.00	23.00	R/M	
37	56	915	FD/SA FAN CLUTCH/STM	2500.00	2.50	R/M	
38	56	950	GR FAN ACCESSORIES	1500.00	1.50	R/M	
39	56	955	GR FAN SLOW TURN MEC	2500.00	2.50	R/M	
							73.25

40			FD Fan Motor	8500.00	8.50	R/M	
			SUB TOTAL E (Rotating Machines)	**166067.13**	**166.07**		
			GRAND TOTAL (A+B+C+D+E)	**3000384.13**	**3000.38**		

ESTIMATED WEIGHT OF VARIOUS PRODUCT GROUPS OF HRSG, CHIMNEY, PIPING INSULATION WITH CLADDING MATERIALS FOR OPaL DAHEJ

Sl No	PGMA	Description	Desn Wt, Kgs	Wt in MT	PKG
1) STRUCTURES					
1	35-010	BLR FNDN MATERIALS	16,330.711	16.331	STR
2	35-110	MAIN COLUMNS LEFT	42,000.792	42.001	STR
3	35-120	MAIN COLUMNS RIGHT	42,000.792	42.001	STR
4	35-131	INLET DUCT SUPPORTS	40,739.576	40.740	STR
5	35-140	AUXILIARY COLUMNS	5,261.612	5.262	STR
6	35-591	BOTTOM BRACING BEAM	7,675.760	7.676	STR
7	35-592	TOP BRACING BEAM	7,104.048	7.104	STR
8	35-593	BASE BEAMS	2,056.416	2.056	STR
9	35-594	STIFFENER BEAMS	14,558.700	14.559	STR
10	35-595	LATERAL SUPP BEAM FR	4,470.257	4.470	STR
11	35-596	LATERAL SUPP BEAM RR	5,760.449	5.760	STR
12	35-597	MODULE AND DRUM SUPPORT STRUCTURE	4,388.240	4.388	STR
13	35-220	PIPING SUPPORT - STRUCTURE	3,000.000	3.000	STR
14	35-540	COLUMN BRACINGS	6,000.000	6.000	STR
15	36-240	MAIN FLOOR 4TH LEVEL	4,000.000	4.000	STR
16	36-390	MISCELLANEOUS PLATFORMS	2,000.000	2.000	STR
17	36-820	STAIRS AND LADDERS	7,500.000	7.500	STR
18	37-810	OUTER CASING SHEET	2,900.000	2.900	STR
19	35-610	BOILER ROOF STRUCTUR	22,000.000	22.000	STR
20	35-611	BOILER ROOF SHEETING	3,000.000	3.000	STR
21	36-210	MAIN FLOOR 1ST LEVEL	8,000.000	8.000	STR
22	36-220	MAIN FLOOR 2 LEVEL	10,000.000	10.000	STR
23	36-230	MAIN FLOOR 3RD LEVEL	4,000.000	4.000	STR
24	36-250	MAIN FLOOR 5TH LEVEL	7,000.000	7.000	STR
25	36-810	FLOORGRILLS AND GUAGES	25,000.000	25.000	STR
26	36-850	HANDRAILS AND POSTS	12,000.000	12.000	STR
27	97-457	ANGLES AND CHANNELS	4,800.000	4.800	STR
		SUB TOTAL - 1 (STRUCTURE)	**313,547.353**	**313.547**	
2) PRESSURE PARTS INCL. HEAT TRANSFER MODULES					
01	04-116	BOILER DRUM WITH INTERNALS	50,528.282	50.528	PP
02	04-148	DRUM SLIDE BEARING PLATES	128.000	0.128	PP
03	04-158	FASTENERS FOR DRUM SADDLE	23.280	0.023	PP
4	HL-102	EVAPORATOR MODULE ASSY.- MIDDLE	37,536.985	37.537	PP
5	HL-103	EVAPORATOR MODULE ASSY.- REAR	18,711.344	18.711	PP

6	HL-201	LINKS FOR EVAP. MODULES- FRONT	928.720	0.929	PP
7	HL-203	LINKS FOR EVAP. MODULES- REAR	145.680	0.146	PP
8	07-504	DISC SPRING FOR MODULES SUPPORT	171.134	0.171	PP
9	07-505	EVAP. MODULE SUPPORTS-FRONT	316.748	0.317	PP
10	07-506	EVAP. MODULE SUPPORTS-MIDDLE	593.790	0.594	PP
11	07-507	EVAP. MODULE SUPPORTS-REAR	297.430	0.297	PP
12	07-993	ERECTION MATERIALS	296.464	0.296	PP
13	12-900	DESUPERHEATER	457.196	0.457	PP
14	19-852	ECO-I TO II INTERCONNECTING LINKS	242.225	0.242	PP
15	19-912	ECO MODULES SUPPORTS	292.312	0.292	PP
16	19-913	ECO MODULES SUPPORTS	511.512	0.512	PP
17	19-914	ECO MODULES SUPPORTS	216.873	0.217	PP
18	HL-151	ECONOMISER MODULES	15,020.736	15.021	PP
19	33-975	SEALING COMPONENTS	150.000	0.150	PP
20	HL-098	COLUMN-CASING BRIDGING COMPONENTS	10,850.000	10.850	PP
21	HL-101	EVAPORATOR MODULE ASSY.- FRONT	15,000.000	15.000	PP
22	HL-202	LINKS FOR EVAP. MODULES- MIDDLE	8,500.000	8.500	PP
23	HL-302	EVAPORATOR BAFFLES & SPACERS-MIDDLE	1,400.000	1.400	PP
24	HL-331	SUPERHEATER BAFFLES & SPACERS	1,300.000	1.300	PP
25	HL-351	ECO BAFFLES & SPACERS	1,500.000	1.500	PP
26	07-206	RISER PIPES	3,500.000	3.500	PP
27	07-210	RISER HEADERS & LINKS	2,000.000	2.000	PP
28	07-411	DOWNCOMER SUSPENSIONS	500.000	0.500	PP
29	07-992	IMPORTED ELECTRODES	25.000	0.025	PP
30	08-910	EXPANSION MOVEMENT MEASURING COMPONENT	100.000	0.100	PP
31	10-135	DESH INLET HEADER	500.000	0.500	PP
32	10-221	SH OUTLET HEADER	500.000	0.500	PP
33	10-235	DESH OUTLET HEADER	500.000	0.500	PP
34	12-850	SAT. STEAM CONNECTION LINKS	1,100.000	1.100	PP
35	12-852	DESH INLET AND OUTLET LINKS	3,300.000	3.300	PP
36	12-901	SUPPORTS FOR SAT. LINKS	750.000	0.750	PP
37	12-902	SUPPORTS FOR MS LINE	400.000	0.400	PP
38	12-912	SH MODULES SUPPORTS	1,100.000	1.100	PP
39	12-992	ELECTRODES	10.000	0.010	PP
40	12-993	ERECTION MATERIALS	400.000	0.400	PP
41	19-702	ECO. OUTLET HEADER	250.000	0.250	PP
42	19-850	ECONOMISER FEED PIPE	300.000	0.300	PP
43	19-851	ECONOMISER LINK TO DRUM	850.000	0.850	PP
44	19-901	SUPPORTS FOR ECO. INLET LINE	250.000	0.250	PP
45	19-902	ECO TO DRUM LINK SUPPORTS	250.000	0.250	PP

46	19-908	SUPPORTS FOR CPH LINKS	150.000	0.150	PP
47	19-911	WPH MODULE SUPPORTS	500.000	0.500	PP
48	19-992	ELECTRODES	5.000	0.005	PP
49	19-993	ERECTION MATERIALS	250.000	0.250	PP
50	24-400	HP Drains, vents & Fittings	10,000.000	10.000	PP
51	24-401	BLR Trim piping supports	2,400.000	2.400	PP
52	24-460	BHEL Valves	8,400.000	8.400	PP
53	24-465	SUB Delivery valves	3,000.000	3.000	PP
54	24-473	HP DWLG	420.000	0.420	PP
55	24-475	HP Drain headers	1,000.000	1.000	PP
56	24-480	HP Saafety valves	700.000	0.700	PP
57	24-485	HP Safety valve silencer supp	5,000.000	5.000	PP
58	24-490	HP Startup vent silencer	1,150.000	1.150	PP
59	24-955	Lapping tools for safety valves	42.000	0.042	PP
60	24-960	Lapping tools-Conv.valves	300.000	0.300	PP
61	24-992	Welding Consumables	50.000	0.050	PP
62	24-993	Erection materials	250.000	0.250	PP
63	97-401	LOCAL GAUGES	100.000	0.100	PP
64	HL-131	SUPERHEATER-II MODULES	14,900.000	14.900	PP
65	HL-132	SUPERHEATER-I MODULES	14,900.000	14.900	PP
66	HL-152	ECONOMISER MODULES	26,000.000	26.000	PP
67	HL-153	ECONOMISER MODULES	11,200.000	11.200	PP
68	HL-171	WPH MODULE ASSY.	11,200.000	11.200	PP
69	HL-231	SH-II MODULE CROSS OVER & LINKS	750.000	0.750	PP
70	HL-232	SH-I MODULE CROSS OVER & LINKS	950.000	0.950	PP
71	HL-251	LINKS FOR ECO MODULES	500.000	0.500	PP
72	HL-252	LINKS FOR ECO MODULES	500.000	0.500	PP
73	HL-253	LINKS FOR ECO MODULES	450.000	0.450	PP
74	HL-271	LINKS FOR WPH MODULES	350.000	0.350	PP
75	HL-303	EVAPORATOR BAFFLES & SPACERS-REAR	1,500.000	1.500	PP
76	HL-371	WPH BAFFLES & SPACERS	1,500.000	1.500	PP
77	HL-606	TOP & BOTTOM CASING S6 - S7	2,300.000	2.300	PP
		SUB TOTAL - 2 (PRESSURE PARTS)	**302,420.711**	**302.421**	
3) NON PRESSURE PARTS					
1	HL-501	SIDE CASING S1 - S2	4,300.000	4.300	NPP
2	HL-502	SIDE CASING S2-S3	3,850.000	3.850	NPP
3	HL-503	SIDE CASING S3 - S4	3,750.000	3.750	NPP
4	HL-504	SIDE CASING S4 - S5	3,450.000	3.450	NPP
5	HL-505	SIDE CASING S5 - S6	3,450.000	3.450	NPP
6	HL-506	SIDE CASING S6 - S7	3,450.000	3.450	NPP
7	HL-601	TOP & BOTTOM CASING S1 - S2	3,150.000	3.150	NPP

8	HL-602	TOP & BOTTOM CASING S2- S3	2,000.000	2.000	NPP
9	HL-603	TOP & BOTTOM CASING S3 - S4	2,050.000	2.050	NPP
10	HL-604	TOP & BOTTOM CASING S4 - S5	1,900.000	1.900	NPP
11	HL-605	TOP & BOTTOM CASING S5 - S6	2,300.000	2.300	NPP
12	24-420	HP Safety valve escape piping	6,900.000	6.900	NPP
13	24-425	HP Safety valve silencer supp	8,600.000	8.600	NPP
14	24-994	NAME PLATES	100.000	0.100	NPP
15	41-130	Duct Burner Assy	14,000.000	14.000	NPP
16	41-390	Oil gun vice & rack	200.000	0.200	NPP
17	41-450	Pipe type Gas Ignitor	750.000	0.750	NPP
18	41-988	Commissioning Spares	25.000	0.025	NPP
19	41-997	Mandatory Spares	300.000	0.300	NPP
20	42-001	Pneumatic fittings	100.000	0.100	NPP
21	42-002	Steam Blow materials	150.000	0.150	NPP
22	42-005	Instrument Fittings	200.000	0.200	NPP
23	42-072	Skid Assy - Burner Valves (LO_AIR)	1,000.000	1.000	NPP
24	42-076	Skid Assy - Burner Valves (FG_PG)	3,500.000	3.500	NPP
25	42-152	Operating Floor – LO	1,000.000	1.000	NPP
26	42-155	Operating Floor - FUEL GAS	3,000.000	3.000	NPP
27	42-156	Operating Floor - PILOT GAS	500.000	0.500	NPP
28	42-157	Operating Floor - Atm. Air	1,000.000	1.000	NPP
29	42-270	SD - FF SKIDS	1,000.000	1.000	NPP
30	42-988	Commissioning Spares	100.000	0.100	NPP
31	42-997	Mandatory Spares	200.000	0.200	NPP
32	43-002	Scanner Cooling Air Piping	1,200.000	1.200	NPP
33	43-003	Augmenting air piping	6,500.000	6.500	NPP
34	43-008	Seal Air Piping	3,000.000	3.000	NPP
35	43-202	SD - Scanner Air system	1,500.000	1.500	NPP
36	43-203	SD - Augmenting Air system	2,000.000	2.000	NPP
37	43-208	SD - Seal Air system	750.000	0.750	NPP
38	48-200	INSTRUMENT TAPPINGS	2,100.000	2.100	NPP
39	48-422	HRSG INLET DUCT	37,400.000	37.400	NPP
40	48-424	EXP. JOINT – INLET	500.000	0.500	NPP
41	48-452	DUCT BOILER OUTLET	4,000.000	4.000	NPP
42	48-454	EXP.PIECES – OUTLET	1,000.000	1.000	NPP
43	48-482	DISTRIBUTION GRID	1,400.000	1.400	NPP
44	48-700	BULKED BPS COMPONENTS	100.000	0.100	NPP
45	80-992	Welding Consumables	3.000	0.003	NPP
		SUB TOTAL - 3 (NON-PRESSURE PARTS)	**137,728.000**	**137.728**	
4) Integral Piping , TANKS AND VESSELS ETC					
1	12-851	MAIN STEAM LINE	3,000.000	3.000	PCP

2	19-101	WPH INLET LINE	350.000	0.350	PCP
3	19-102	WPH OUTLET LINE	300.000	0.300	PCP
4	80-145	BD tank exhausts & vents	3,600.000	3.600	PCP
5	80-219	HP Dosing system	4,000.000	4.000	PCP
6	80-273	BLOW DOWN SYSTEM VALVES	300.000	0.300	PCP
7	80-274	CBD tank safety valve	30.000	0.030	PCP
8	80-600	HP Dosing piping	300.000	0.300	PCP
9	81-005	IBD tank	3,000.000	3.000	PCP
10	81-411	BDT tubular level gauge	120.000	0.120	PCP
11	81-413	BDT control valve (SD)	240.000	0.240	PCP
12	81-011	CBD tank	2,000.000	2.000	PCP
		SUB TOTAL-4 (PCP, REGENERATIVE PPG, TANKS AND VESSELS)	**17,240.000**	**17.240**	
5) LINING & INSULATION					
1	32-010	CLADDING SHEET INLET DUCT	5,375.536	5.376	INSU
2	28-700	CLADDING SHEET FIXING PINS, NUTS& WASHER	5,900.000	5.900	INSU
3	32-020	CLADDING SHEET BURNER OUTLET DUCT	6,500.000	6.500	INSU
4	32-055	EXTERNAL INSULATION -PIPING	2,300.000	2.300	INSU
5	32-110	CLADDING SHEET - MODULE AREA	9,800.000	9.800	INSU
6	32-810	CLADDING SHEET - OUTLET DUCT	1,000.000	1.000	INSU
7	32-993	ERECTION MATERIALS	400.000	0.400	INSU
8	33-021	CERAMIC WOOL	33,500.000	33.500	INSU
9	33-621	MINERAL WOOL FOR PIPING	8,500.000	8.500	INSU
10	33-970	WIRE MESH	320.000	0.320	INSU
	xx-xxx	CLADDING SHEET, INSULATION MATERIALS (HYDERABAD SUPPLY)- THIS SHOULD BE INCLUDING OF TG SIDE EQUIPMENTS, PIPING, and VALVE etc. TURBINE DRAIN PIPING, GLAND /SEAL STEAM PIPING & COMMON SYSTEM ETC WHICH WILL BE ERECTED BY OTHER TG ERECTION AGENCY OF RESPECTIVE UNITS.	6000.00	6.00	INSU
		SUB TOTAL - 5 (LINING & INSULATION)	**79,595.536**	**79.596**	
GRAND TOTAL HRSG (Each Unit)				**850.53**	

ESTIMATED WEIGHT OF HRSG CHIMNEY FOR EACH UNIT (Ranipet Supply)

PGMA	Description	Design Wt (MT)
87010	CHIMNEY FDN MATERIAL	24.7
87100	CHIMNEY SHELL	270.0
87150	CHIMNEY STRAKES	52.0
87200	PAINTER TROLLEY	1.0
87300	PLATFORMS & LADDERS	20.0
87930	AVIATION LAMPS	1.0
87950	CHIMNEY INSULATION	12.5
87960	CHIMN INS FIX COMP	8.8
CHIMNEY TOTAL WEIGHT FOR EACH		**390.0**
TOTAL FOR 2 UNITS		**780.0**

Note:

The OPAL-Dahej, HRSG chimney (ID-3.5 mtr, Ht-80.0 mtr) details are as follows:

- Total no. of shell involved in one steel stack - 32 no.s
- ID, OD & weight of bottom most shell and confirm whether it is supplied in single piece or two half - Bottom shell ID=5.6m, OD=5.664m, Wt. of each half shell=6.5MT (Maximum wt.), shells will be supplied in two halves.
- ID, OD & weight of Top most shell - Top shell ID=3.5m, OD=3.52m, Wt. of each half shell=1.5MT (Minimum wt.), shells will be supplied in two halves.
- Heaviest weight shell - Bottom most shell, Wt. of each half shell=6.5MT (Maximum wt.), shells will be supplied in two halves.
- Chimney height/Elevation of top most shell - Chimney height=80.0m, Elevation of top most shell=80.5m.
- Chimney configuration - Flared with bottom ID 5.6m, ID gradually reduces to 3.5m @ 50.0m height, top 30.0m is cylindrical with ID 3.5m.

SUMMARY OF TENTATIVE WEIGHT OF SYSTEMS/EQUIPMENTS INVOLVED IN ERECTION, TESTING & COMMISSIONING SCOPE FOR ONE UNIT OF UB AND 2 UNIT OF HRSG FOR EACH BLOCK:

S.N.	Package/Equipments	Weight (Kg)	Approx. WT.(MT)
A	**One Unit of Utility Boiler with associated Equipment & Aux. :**		
	Structure	1,531,500.00	1,531.50
	Pressure Part	916,980.00	916.98
	Non Pressure Part	223,987.00	223.99
	Insulation	161,850.00	161.85
	Rotating Machines (Inc. FD Fan motor IS supply)	166,067.13	166.07
	Sub Total A	**3,000,384.13**	**3,000.38**
B	**One Unit of HRSG with associated Equipments & Aux. :**		
	Structure	313,547.35	313.55
	Pressure Parts including Heat Transfer Modules	302,420.11	302.42
	Non Pressure Part	137,728.00	137.73
	Integral Piping Tanks and Vassels etc.	17,240.00	17.24
	Lining & Insulation	79,595.54	79.60
	Sub Total B	**850,531.00**	**850.53**
C	**One Unit of HRSG with associated Equipments & Aux. :**		
	Structure	313,547.35	313.55
	Pressure Parts including Heat Transfer Modules	302,420.11	302.42
	Non Pressure Part	137,728.00	137.73
	Integral Piping Tanks and Vassels etc.	17,240.00	17.24
	Lining & Insulation	79,595.54	79.60
	Sub Total C	**850,531.00**	**850.53**
D	**HRSG Chimney/Steel Stack for 2 Units of HRSGs**	780,000.00	780.00
	Sub Total D	**780,000.00**	**780.00**
	Grand Total (A+B+C+D)	**5,481,446.13**	**5,481.45**

NOTES:

1. Besides product groups indicated herein, there is likelihood of addition of new product groups by BHEL' s unit for release of some items, integral to this work. Tenderers' quoted unit rates shall be applicable for such product groups also.

2. The weights given against PGMA's listed above are tentative. It may change after detailed engineering is done. Rate quoted by the Contractor shall not change due to variation in weight.

3. Rate Schedule Identified for PGMAs of Piping and Insulation are Indicative only and based on envisaged material specification. Payment shall be made on the basis of material specification of actual material received and erected at site.

4. BHEL's decision with regard to classification of a particular product group for applicable rate category shall be final & binding on the Contractor.

5. Besides the above, weight of all temporary piping, valves, pumps, tanks and other miscellaneous equipments etc for carrying out hydraulic test, chemical cleaning, steam blowing and other tests, as stated elsewhere will get added.

6. Electrical & C&I items of handling system is excluded from the scope of work.

Estimated weight of various systems in scope of work for one Unit of STG and 2 Units each of Fr6 B Gas Turbine involved for each block:

AA) ESTIMATED WEIGHT OF VARIOUS SYSTEM IN SCOPE OF WORK FOR EACH BLOCK

SL.No.	ITEM DESCRIPTION	DIMENSIONS (mm) LxWxH (Approx.)	QTY.	TOTAL WEIGHT (Kgs)	Total WT (MT)
Steam Turbine & Auxiliaries:					
1.	Turbine assembly	6300x5300x3450	1	78500	78.5
2.	Lube oil console package-I (Tank)	5750x2500x3200	1	7500	7.5
3.	Lube oil console package-II (Pump Assembly)	3500x4000x1500	1	5950	5.95
4.	Jacking oil pump	1000x500x700	1	700	0.7
5.	Emergency oil pump assembly.	3500x4000x1500	1	5950	5.95
6.	Oil purification unit	1700x2000x1800	1	1700	1.7
7.	Oil accumulators	1200x800x2300	1	1000	1
8.	Turbine enclosure	5000x1000x1000	1	12000	12
9.	Governing console	1500x1500x1500	1	1500	1.5
10.	Gear box	1900 X 2000 X 2200	1	10000	10
11.	Input Coupling	Dia 480 X 1100	1	300	0.3
12.	Output Coupling.	Dia 620 X 1000	1	500	0.5
				Total Weight for one unit	125.6
BFP Drive Turbine (TDBFP):					
1.	Turbine assembly	3200x2700x1400	1	14000	14
2.	Lube oil console package-I	2500X3500X3000	1	4000	4

3.	Lube oil console package-II+EOP	3000X3500X1000	1	5000	5
4.	Over head oil Tank	Dia 1200x2000	1	2500	2.5
5.	Oil purification unit	1200x1500x1500	1	1000	1
6.	Oil accumulators	500x500x2000	1	200	0.2
7.	Turbine enclosure.	500x500x2000	1	5000	5
8.	Governing console	1500x1500x1500	1	1500	1.5
9.	Gear box	700x800x700	1	500	0.5
10.	Input Coupling	Dia 220 x 550	1	40	0.04
11.	Output Coupling.	Dia 150 x 280	1	10	0.01
				Total Weight for one unit	**33.75**

Steam Turbine Generator (STG):

SL.No.	ITEM DESCRIPTION	DIMENSIONS (mm) LxWxH (Approx.)	Total WT (MT)
1	GENERATOR PACKAGE	7400x3200x2800	81
2	AIR DUCT ITEMS	6000x1700x2400	2
3	FOUNDATION ITEMS	loose items	5
4	BASE PLATE	loose items	1.5
5	ROTOR INSERTION AND WITHDRAWAL ITEM	loose items	0.175
6	ERECTION FIXTURE	loose items	0.2
7	GENERATOR RELAY PANEL	2000x1000x2325	1
8	CO2 Equipment's	500x500x350	3
		Total Weight for one unit	93.875

Weight and Dimentions details of Heat Exchangers:

Sl.No	Equipment	Overall Dimensions (in mm)	Qty	Dry Wt (in kgs)
1	***Surface Condenser (one for each unit)***			
a.	Shell Assly (with shell, tubes, tube sheet, support plates, spacers etc)	L 8700 x W 4000 x H 4500	1 no.	54000
b.	Tubes	OD 22 x Thk 1 x L 6000	6410	21665.8
c.	Hot Well Assly	L 2000 x W 2400 x H 1900	1 no.	3000
d.	Misc (Stand pipes, surge pipes etc)	-	1 no.	2000
2	***Steam Jet Air ejector (one for each unit)***			
a.	Assly	L 6100 x W 1000 x H 1500	2 nos.	7200
b.	Misc (Starting ejector)	-	1 no.	300
3	***Gland Steam Condenser Assly (one for each unit)***			
a.	Gland steam Condenser	Ø 500 x L 2600	1 no.	1400

b.	GSC Ejector assly	L 2700 x W 1200 x B 1200	1 no.	300
4	***ST oil Cooler (one for each unit)***			
a.	Per Cooler	Ø 610 x L 4600	2 nos.	7400
5	***STG Air Cooler (one for each unit)***			
a.	Per Element	L 4300 x W 700 x H 450	8 nos.	7680
6	***ST oil Cooler (Per BFPDT Set)***			
a.	Per Cooler	Ø 350 x L 3800	2 nos.	1200
9	**Water to Water Heat Exchanger (total 4 nos.-1 no. per GT) (2 nos. for each Block)**			
a.	Per Cooler		2 nos.	6800
			Total Wt in KG	112945.8
			Total Wt in MT	112.9458

WEIGHTS AND DIMENSIONS OF GAS TURBINE AND AUXILIARIES (Two sets in each Block scope of work):

SL.No.	ITEM DESCRIPTION	Length (m)	Width (m)	Height (m)	WT (MT)	Remarks
1	Gas Turbine Package (Flange to Flange)	7.38	3.6	3.93	64	
2	Load Coupling	2.1	0.6	0.75	0.3	
3	Accessory Base	6	3	4.5	30	
4	Load Coupling Guard	2.2	1.5	1	0.22	
5	Accessory Coupling	1.5	0.5	0.5	0.1	
6	Accessory Coupling Guard	1.5	0.6	0.6	0.05	
7	GT Walkway+Ladders	3	1	1.5	5	
8	(Walkway is split into pieces)					
9	CO2 bottle Racks-1	2	1	1	1	
10	CO2 bottle Racks-2	2	1	1	1	
11	Main Filter House (will be shipped loose)	6	3	3.5	60	Distributed In many boxes.
13	Tools & Tackles					
14	Turbine Vent Fans (6 Nos)	2.5	2.5	2	8	Distributed in approx 16 boxes
15	Air Processing Skid	3	1	2.5	1	
16	Air processing skid panel	3	0.5	2	0.2	
17	APU cooler	3	0.5	2	0.5	

18	Compressor Water Washing skid	6.5	3	3.2	5	
19	Lube oil Centrifuge	3	1.5	1.8	1.5	
20	Field Inter connection piping	6	3.5	3	25	Distributed In many boxes.
22	Foundation Bolts and Misc.Hardware	-	-	-	5	
23	GT off-base Enclosures	7	3	3	110	
24	Gas valve module	6	3.6	4.5	8	
25	Exhaust frame blowers (2 nos)	3	3	1.5	2	
26	**Inlet Ducting**					
	--Inlet Duct Transition Pieces	4	4	3	35	
	--Inlet Duct Expansion Pieces	4	0.5	4		
	--Inlet Duct Elbow No.1	4	4	4		
	-- Inlet Duct Elbow No.2	4	4	4		
	--Silencer	4	2	8		
	--Straight Duct No.1	4	3	3		
	--Straight Duct No.2	4	3	3		
	--Support Structure	6	3	8		
27	**Exhaust Ducting**					
	--Expansion Joints (Total 4)	4.4	4	0.5	1.2	
	--Silencer Duct SL1	4.7	5.1	3.2	10.173	
	--Silencer Duct SL2	4.3	4.7	1.6	5.118	
	--Diverter Damper	4	4	4	20	
	--Guillotine Damper	6	0.4	4	12	
	--Horizontal Duct D1	4.5	4.1	3.85	9.732	
	--Horizontal Duct H1	4.1	2.5	2.8	4.653	
	--Horizontal Duct D5	3.9	3.9	0.6	1.827	
	--Horizontal Duct D6	4.1	4.1	1.1	2.918	
	-- Transit Duct D2	4.7	4.3	2.6	5.139	
28	Plenum Covers	4	3	2	10	
29	-- Transit Duct D3	4.5	4.3	2.1	4.102	
30	--Vertical Duct VD8 (4 NOS.)	4.3	4.3	3.35	4.66	
31	-- Vertical Duct VD9	4.5	4.5	3.4	5.009	
32	Stack support Structure (columns beams, angles)	6	3	3	33	
33	GD & GFD Seal Air Fan Assy	3	2	2	1	
34	Miscellaneous Item (Ladders ,Platform ,Bolts)	-	-	-	4	
35	Lube Oil Mist Eliminator	1.5	1.5	1	1	
36	Water Injection Skid	6	3.2	3.5	5.5	

37	Portable LO Drain Pump	1	1	0.8	0.2	
TOTAL WEIGHT FOR ONE UNIT						**504.101**
TOTAL WEIGHT FOR TWO UNIT						**1008.202**

Weight & Dimension of Fr6 Load Gear Box (LGB):one for each unit (2 sets in each Block)			
SL.No.	**ITEM DESCRIPTION**	**DIMENSIONS (mm) LxWxH (Approx.)**	**Total WT (MT)**
1	Fr6 Load Gear Box (PGMA: 97610)	2280x2100x2750	20
	TOTAL WT FOR TWO UNIT		**40**

Weight and Dimensions details of 33.75 MW GTG (2 sets in each Block)

SL. No.	**DESCRIPTION OF EQUIPMENT**	**OVERALL DIMENSIONS IN mm**			**WEIGHT IN MT**
		L	**B**	**H**	
1.	GENERATOR PACKAGE	7500	3600	3200	93
2.	AIR DUCT ITEMS	6000	1700	2400	2
3.	AIR FILTER	4000	3500	3000	3.5
4.	GENERATOR ENCLOSURE	AS PANELS			10
5.	FOUNDATION ITEMS	LOOSE ITEMS			7
				Total WT for One unit	**115.5**
				Total WT for two Unit	**231**

WEIGHTS AND DIMENSIONS OF FR6 BYPASS STACK (Two Bypass Stack in each Block)

SL. NO.	**DESCRIPTION**	**QTY**	**L (M)**	**W (M)**	**H (M)**	**WT (KG)**
1	HOR. DUCT H1	1	4.5	2.4	1.65	3858
2	HOR. DUCT D1	1	4.8	4	3.7	9199
3	HOR. DUCT D5	1	4	4	0.57	2010
4	HOR.DUCT D6	1	4.2	4.2	1.1	2542
5	TRANS. DUCT D2	1	4.7	4.3	2.6	5319
6	TRANS. DUCT D3	1	4.5	4.3	2.1	4274
7	SILENCER DUCT SL1	1	4.7	5.1	3.2	10362
8	SILENCER DUCT SL2	1	4.3	4.7	1.6	5308
9	VERT. DUCT D9	1	4	4	3.33	5009
10	VERT. DUCT D8	4	4	4	2.73	4136

11	EXPANSION JOINTS	4	4.4	4	0.5	1200
12	PLENUM TOP COVER	1	4.5	2.5	1.1	2310
13	GT SIDE EXTN	1	3.5	2	0.5	1275
					Total Weight of One Stack (MT)	**56.802**
					Total Weight of Two Stack (MT)	**113.604**

BOP Fuel System Supply will be done by BHEL Hyderabad (PED) (each Block)

Sl No	Equipment description	Qty (no)	Dimenssions in mm			Wt. of each equipment in kg.	Total Wt MT	Remarks
			L	W	H			
1	Fine Filter skids	2	5600.0	2600.0	4000.0	8140.00	16.28	Fine Filter Skid for GT- 2 & 4 (Total 4 nos and 2 for each Block)
2	NAPHTHA Forwarding Skid for HRSG-1No.+Long Recirculation Orifice-1No.	2	5000.0	2500.0	2800.0	12750.00	25.50	2 nos. for each Block (Total 4 nos.)
3	Naphtha Forwarding Skid for GT-1No.+Long Recirculation Orifice-1No.	2	4900.0	3300.0	2800.0	12750.00	25.50	2 nos. for each Block (Total 4 nos.)
4	HSD Forwarding Skid for GT-1No.+Long Recirculation Orifice-1No.	2	4900.0	3300.0	2800.0	12750.00	25.50	2 nos. for each Block (Total 4 nos.)
5	Lubricity Additive Dosing Skid	2	3100.0	2100.0	2000.0	3000.00	6.00	Lubricity Additive Dosing Skid(1No.)+Injection Quill(1No.)+Motorised Unloading Pump (1No.)+VFD Panel(1No.) (2

								nos. for each Block and Total 4 nos.)
6	HSD 25 µ DUPLEX FILTER SKID	2	2200.0	2100.0	2000.0	3350.00	6.70	As per specification GT 57955,REV:00 &Var.No: 01 (2 for each Block total 4 nos.)
7	NAPHTHA 25 µ DUPLEX FILTER SKID	2	2200.0	2100.0	2000.0	3350.00	6.70	As per specification GT 57955,REV:00 &Var.No: 02 (2 for each Block total 4 nos.)
8	Fheater	2	2450.0	2100.0	2000.0	3350.00	6.70	As per specification GT 57955,REV:00 &Var.No: 03 (2 for each Block total 4 nos.)
9	MAGNETIC FILTER SKID	2	2600.0	1550.0	2000.0	1150.00	2.30	(2 for each Block total 4 nos.)
10	NAPHTHA 6 µ DUPLEX FILTER SKID	2	2450.0	2100.0	2000.0	3350.00	6.70	As per specification GT 57955,REV:00 &Var.No: 04 (2 for each Block total 4 nos.)
11	2 m3 HSD/ NAPHTHA/ GAS CONDENSATE DRAIN TANKS	3	6800.0	2700.0		Test Wt. 5000.00	15.00	Buried Tank (3 nos. for each Block total 6 nos.)
12	Accumulators	7	500.0	500.0	2500.0	2.50	0.02	7 nos. for each Block toal 14 nos.
						Total WT in MT	**142.90**	

Common Fuel System/Equipment's within two GT:

Sl No	Equipment description	Qty (no)	Dimensions in mm			Wt. of each equipment in kg.	Total Wt MT	Remarks
			L	W	H			
1	Natural Gas Electric Heater Skid(550KW) along with Thyristor control panel	1	9600.0	2600.0	4000.0	41900.00	41.90	Natural Gas Electric Heater Skid (550KW) for GT 2&4 (Total 2 nos. and 1 for each Block)
2	Natural Gas Steam Heater (1*100) Skid for GT's	1	6600.0	2400.0	4000.0	15300.00	15.30	Natural Gas Steam Heater (1*100%) skid for GT 2&4 (Total 2 nos. and 1 for each Block)
3	HSD Forwarding Skid for HRSG-1No.+Long Recirculation Orifice-1No.	1	5000.0	3300.0	2800.0	12750.00	12.75	three pumps on one skid (Total 2 skid and 1 for each Block)
						Total WT	**69.95**	

PUMPs for each Block (HYD Supply)

SL NO.	NAME OF THE PUMP	DIMENSIONS OF PUMP+DRIVE (PER UNIT) L x B x H in mm	NO OF PUMPS	WEIGHT OF PUMP+DRIVE (PER UNIT) Kg	Wt in MT	Remarks
1	BFP FOR HRSG-MOTOR DRIVEN	7500X3000X3000	3(2W+1S)	16000	48	3 nos. for each Block total 6 nos

2	LO SKID FOR BFP-HRSG	2200X2200X 1000	3(2W+1 S)	2800	8.4	3 nos. for each Block total 6 nos
3	BFPS FOR UB-STEAM TURBINE DRIVEN (TURBINE IN T&C ENGG SCOPE)	4000X3000X 3000 (PUMP ALONE)	1(1W)	10000 (PUMP ALONE)	10	1 nos. for each Block total 2 nos
4	BFPS FOR UB-MOTOR DRIVEN	8000X3000X 3000	1(1W)	27500	27.5	1 nos. for each Block total 2 nos
5	LO SKID FOR BFP UB	2200X2200X 1000	1(1W)	2800	2.8	1 nos. for each Block total 2 nos
6	MUH TRANSFER PUMPS-MOTOR DRIVEN	4500x2000x1 500	1(W)	7500	7.5	1 nos. for each Block total 3 nos
7	CONDENSAT E TRANSFER PUMP-MOTOR DRIVEN	4500x2000x1 500	1(W)	7500	7.5	1 nos. for each Block total 3 nos
8	LP HEATER CONDENSAT E DRAIN TRANSFER PUMPS	2500x1200x1 200	1(1W)	2000	2	1 nos. for each Block total 2 nos
9	COND EXTRACTION PUMPS-MOTOR DRIVEN (VERTICAL PUMPS)	750X750X50 00	2(1W+1 S)	2000	4	2 nos. for each Block total 4 nos
10	BLACK START COOLING WATER PUMPS-MOTOR	2200X1000X 1000	1(1W)	1500	1.5	1 nos. for each Block total 2 nos

	DRIVEN					
11	BLOW DOWN TRANSFER PUMPS FOR UB AREA-MOTOR DRIVEN (VERTICAL PUMPS)	750x750x5500	2(1W+1S)	1000	2	2 nos. for each Block total 4 nos
12	BLOW DOWN TRANSFER PUMPS FOR HRSG AREA-MOTOR DRIVEN (VERTICAL PUMPS)	750x750x5500	2(1W+1S)	1000	2	2 nos. for each Block total 4 nos
13	DM WATER PUMPS FOR ATOMISING AIR PRE-COOLER OF GT-MOTOR DRIVEN	2200X1000X1000	4(2W+2S)	1000	4	4 nos. for each Block total 8 nos
14	DEWATERING PUMPS	500X500X600	1 Nos.	25	0.025	1 no. for each Block total 2 nos.
		Total WT (MT)			**127.225**	

MISC. CRANES & HOISTS, CHAIN PULLEY BLOCKS WITH ASSOCIATED ACCESSORIES,

S No.	Descrip[tion	Area	Capacity	Qty	Remark
1	Manual Hoist with travelling trolley	Compressor House	5 T	1 No.	1 no. only in BLOCK I
2	Manual Hoist with travelling trolley	Switch gear Building	3 T	2 No.	2 nos. for each Block (Total 4 Nos.)

NOTE :

1. THE LIST IS **FOR ONE BLOCK** & TENTATIVE AND HAS BEEN GIVEN TO ENABLE THE CONTRACTOR TO STUDY THE NATURE OF WORK TO BE DONE IN THIS CONTRACT. THERE MAY BE VARIATION IN SIZE, WEIGHT ETC. AND NO CLAIM, WHATSOEVER, WILL BE ENTERTAINED ON ACCOUNT OF THIS BY BHEL.
2. SOME OF THE PACKAGES MAY BE SENT IN PARTS TO SUIT THE SITE CONDITION / TRANSPORTATION, THE SAME IS TO BE ASSEMBLED AT SITE WITHOUT ANY EXTRA COST, LIKEWISE THE PACKAGE MAY BE ASSEMBLED TOGETHER AND SEND AS A SINGLE ASSY. CONTRACTOR MAY HAVE TO DISMANTLE AND ERECT OR, ERECT AS SINGLE ASSEMBLY AS PER THE INSTRUCTION OF BHEL ENGINEERS WITHOUT ANY EXTRA COST.

BB) Common Fuel System/Equipments- Work to be executed by the Block I Agency (Block I Scope)

Sl No	Equipment description	Qty (no)	Dimensions in mm			Wt. of each equipment in kg.	Wt in MT	Remarks
			L	W	H			
1	Filter Separator (2*100%) Skid	1	9600.0	2000.0	4000.0	30700.00	30.70	common for 4GT's & 4 HRSGs
2	Natural Gas Scrubber (2*50%)	1	9600.0	1800.0	5000.0	30700.00	30.70	Common for 4GT's &4 HRSG's
3	Natural Gas Scrubber (2*50%) skid for Ubs	1	9600.0	1800.0	6000.0	30700.00	30.70	For 2 UB's
4	Complex Gas Scrubber (1 x 100%) skid for Ubs	1	7200.0	5000.0	6000.0	75000.00	75.00	For 2 UB's
5	30m3 GAS CONDENSATE DRAIN TANK	1	9000.0	4800.0	48000.0		0.00	Buried Tank
6	30m3 HSD/NAPHTHA DRAIN TANK NEAR STORAGE FAM AREA	1	9000.0	4800.0		48000.00	48.00	Buried Tank
7	30m3 HSD/NAPHTHA Unloading vessel with hose pipes	1	9000.0	4800.0		48000.00	48.00	Buried Tank
8	HSD Centrifuge Skid	1	5900.0	2500.0	2500.0	6500.00	6.50	(consisting of 2 nos of centrigue modules of min.50m3/hr

								capacity)
9	**LP Heater (1 no.)**							
a	Per Heater	1 no.	L 14000 x W 1300 x H 1400			12000.00	12.00	
b	Misc (Stand pipes etc)	1 set.				800.00	0.80	
10	**Flash tank for LP Heater (1 no.)**							
a	Per Heater	1 no.	D 1500 x H 3000			3000.00	3.00	
11	MUH TRANSFER PUMPS-MOTOR DRIVEN	1 (stand by)	4500x2000x1500			7500.00	7.50	
12	CONDENSATE TRANSFER PUMP-MOTOR DRIVEN	1 (stand by)	4500x2000x1500			7500.00	7.50	
13	Off-base compressor cleaning and washing skid for off-line/on-line cleaning (one number common for 4 GTs)							
14	Mobile Lube oil centrifuge - 1000 LPH (one number common for 4 GTs)							
15	Lube oil drain pump (2 m3) (one number common for 4 GTs)							
16	**LP Dosing Skids**							
a	LP Dosing System(**Hydrazine at Deaerator outlet**)- Skid Dimensions: 3.6X2.5X5m(LXBXH) and Operating Weight is 3500kg.							
b	LP Dosing System(**Morpholine at Deaerator outlet**)-Skid Dimensions: 5.5X3.5X7m(LXBXH) and Operating Weight is 5000kg.							
c	LP Dosing System(**Morpholine in Condensate Storage Tank**)-Skid Dimensions: 4.0X3.0X6m(LXBXH) and Operating Weight is 4000kg.							

Note:

The above Common Fuel System/Equipments-to be executed by the Block I agency.

SUMMARY OF TENTATIVE WEIGHT OF SYSTEMS/EQUIPMENTS INVOLVED IN ERECTION, TESTING & COMMISSIONING SCOPE FOR BLOCK - I :

S. No.	Package/Equipments	Approx. WT.(MT)
1	Steam Turbine & Aux.(one set)	125.60
2	Steam Turbine Generator (STG) (one set)	93.88
3	BFP Drive Turbine (TDBFP)	33.75
4	**Heat Exchangers:**	

a	Surface Condenser	80.67
b	Steam jet Air ejector	7.50
c	Gland Stem Condenser assy	1.70
d	ST oil Cooler	7.40
e	STG Air cooler	7.68
f	ST oil cooler (per BFPDT set)	1.20
g	Water to water Heat exchanger	6.80
5	Gas Turbine & Aux. (2 set)	1008.20
6	GTG (2 set)	231.00
7	Fr6 Load Gear Box	40.00
8	Fr6 Bypass Stack (2 nos.)	113.60
9	BOP Fuel System	142.90
10	Common fuel system within two GT	69.95
11	Pumps	127.23
	TOTAL WT	**2099.05**

S. No.	**Package/Equipments**	**Approx. WT.(MT)**
1	Common Fuel System/Equipments within the Block I&II **(BOLCK I Scope)**	320.00

NOTE:

a. THE WEIGHT INDICATED ABOVE FOR BLOCK I ONLY.

b. THE WEIGHT INDICATED ABOVE IS APPROXIMATE AND THERE MAY BE A VARIATION IN WEIGHT OF EQUIPMENT / PACKAGE. NO CLAIM, WHATSOEVER, WILL BE ENTERTAINED BY BHEL ON ACCOUNT OF VARIATION IN WEIGHT QUANTITIES.

SUMMARY OF TENTATIVE WEIGHT OF SYSTEMS/EQUIPMENTS INVOLVED IN ERECTION, TESTING & COMMISSIONING SCOPE FOR BLOCK - II :

S. No.	**Package/Equipment's**	**Approx. WT.(MT)**
1	Steam Turbine & Aux.(one set)	125.60
2	Steam Turbine Generator (STG) (one set)	93.88
3	BFP Drive Turbine (TDBFP)	33.75
4	**Heat Exchangers:**	
a	Surface Condenser	80.67
b	Steam jet Air ejector	7.50
c	Gland Stem Condenser assy	1.70
d	ST oil Cooler	7.40
e	STG Air cooler	7.68
f	ST oil cooler (per BFPDT set)	1.20
g	Water to water Heat exchanger	6.80

5	Gas Turbine & Aux. (2 set)	1008.20
6	GTG (2 set)	231.00
7	Fr6 Load Gear Box	40.00
8	Fr6 Bypass Stack (2 nos.)	113.60
9	BOP Fuel System	142.90
10	Common fuel system within two GT	69.95
11	Pumps	127.23
	TOTAL WT	**2099.05**

NOTE:

a. THE WEIGHT INDICATED ABOVE FOR BLOCK II ONLY.

b. THE WEIGHT INDICATED ABOVE IS APPROXIMATE AND THERE MAY BE A VARIATION IN WEIGHT OF EQUIPMENT / PACKAGE. NO CLAIM, WHATSOEVER, WILL BE ENTERTAINED BY BHEL ON ACCOUNT OF VARIATION IN WEIGHT QUANTITIES.

Shall be issued during Execution

PAINTING SCHEME: Applicable for each Block

PAINTING SCHEME AS PER OPaL/EIL SPECIFICATION FOR SHOP & FIELD PAINTING **SECTION C: 4.9, SPECIFICATION No. 6987-0642-PT-F09 Rev 0**

OPaL/EIL Specification for Shop & Field Painting **SECTION C: 4.9, SPECIFICATION No. 6987-0642-PT-F09 Rev 0** with regard to surface preparation and final painting with colour codes / scheme for surface preparation and finish paints coating including primer coating for shop and field painting is attached separately along with this tender specification for ready reference. Contractor shall carry out surface preparation and final painting works as per customer specification and instruction of BHEL engineer at site.

All the primer, thinner & paints for final painting and all other consumables like brush, cleaning agents etc and all T&P including scaffolding materials, manpower, supervision is in contractor's scope.

GENERAL REQUIREMENTS – COMMON TO ALL WORK

11.1
The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

11.2
The terminal points decided by BHEL shall be final and binding on the Contractor for deciding the scope of work and effecting payment for the work done.

11.3
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Contractor and his personnel shall cooperate with personnel of BHEL, BHEL'S Customer, Customer's consultants and other Contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.

11.4
The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The Contractor should ensure proper planning and successful & timely completion of the work to meet the overall project schedule. The Contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

11.5
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

11.6
The Bidder shall at his cost perform any services, tests etc., although not specified but nevertheless required for the completion of work.

11.7
Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the Contractor. No claims for extra payment from the Contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

11.8
All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory/ local authorities are to be arranged by the Contractor at his cost in time to ensure smooth progress of work.

11.9
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, leveling, 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.

11.10
The boiler shall be erected as per relevant provisions of latest Indian Boiler Regulations (IBR) and amendments/addendums thereof, if any.

11.11
The terminal points as decided by BHEL shall be final and binding on the Contractor.

11.12
The indicative schedule of weight of major equipment's given in relevant appendices is meant for providing a general idea to the Contractor about the magnitude of the work involved.

11.13
The work shall conform to dimensions and tolerances specified in the various drawings / documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to Contractor's fault, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the Contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.

11.14
The Contractor shall perform any services, tests etc, which may not be specified but nevertheless, required for the completion of work within quoted rates.

11.15
All necessary certificates and licenses required for carrying out this work are to be arranged by the Contractor expeditiously.

11.16
The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.

11.17
BHEL reserves right to recover from the Contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to Contractor's lapse during any stage of work. Any loss to BHEL due to Contractor's lapse shall have to be made good by the Contractor.

11.18
All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables etc, except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by Contractor unless otherwise specified in the relevant clauses. The Contractor's quoted rates should be inclusive of all such contingencies.

11.19
During the course of erection, testing and commissioning certain rework / modification / rectification / repair / fabrication etc may become necessary on account of feed back / revision of drawing etc. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc shall be maintained by the Contractor for such reworks. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.

11.20
All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of structures, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the Contractor as part of the work within the quoted rates.

11.21
The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel for such usage. Only the steel for making temporary structure (cat head) for drum lifting will be provided by BHEL in random sizes materials available at site.

11.22
The Contractor shall take delivery of the components, equipments, chemicals, and lubricants etc from the BHEL stores/ storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically.

11.23
Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to

congestion at site of work. Materials shall be stacked neatly, preserved and stored in the Contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by Contractor most expeditiously as incidental to work.

11.24
Plant materials should not be used for any temporary supports / scaffolding/ preparing pre-assembly bed etc.

11.25
The details of equipments to be erected under this contract are generally as per the schedule given in relevant appendices. These details are approximate and meant only to give a general idea to the tenderer about the magnitude of the work involved. Actual quantum and type of equipments will be based on the relevant erection documents which will be furnished to the Contractor in due course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.

11.26
Hangers & suspensions, supports etc for tubes, piping, & ducts etc will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required.

11.27
Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/locks, cutting of excess thread length of hanger tie-rod etc have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/instructions, during various stages of erection & testing and after floating of piping/ducting during cold and hot condition will have to be done as part of work. This exercise may have to be repeated till satisfactory results are achieved.

11.28
Contractor shall lay/install the field-routed/small-bore pipelines to suit site condition/ requirement. Before laying/installing such pipelines, the contractor shall prepare necessary sketch for routing these pipe lines and get the same approved by BHEL. Contractor must take care of the location/layout of other systems and equipment before preparing such sketch to avoid interference. There is a possibility of minor change in routing such pipelines even after completion of erection; contractor shall carry out the same without any extra cost to BHEL.

11.29
Welding of necessary instrumentation tapping points, thermowell, thermocouple pad, metal temp pad and clamps, root valve including reducer (to suit Control & Instrumentation Impulse Piping requirements), condensing vessel, flow metering & measurement devices, and control valves to be provided on boiler & its auxiliaries and piping are covered within the scope of this specification. The installation of all the above items will be Contractor's responsibility even if:

a) Items are not specifically indicated under the respective product groups as given in the technical specifications.
b) Items are supplied by an agency other than BHEL.

Pre-heating, NDE, and Post weld heat treatment for above shall be done as per the specifications as part of work.

11.30
Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/speed switches of motors, accumulators etc are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to BHEL. C & I erection agency will do storage / re-erection calibration etc.

11.31
Fixing and seal welding of thermowells & plugs before Hydro test/ steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermowells after hydro test/steam blowing of lines as part of work.

11.32
Actuators/drives of valves, dampers, gates, powered vanes etc may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.

11.33
All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. BHEL will provide the motorized insulation testers.

11.34
In installation of various equipments it may become necessary to install these on temporary supports/ hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions/hangers and later on shift the relevant equipments to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free -returnable basis which shall be returned to BHEL after the use.

11.35
The work shall be carried out strictly in accordance to the “Field Quality Plan” approved by BHEL/client. Contractor, jointly with BHEL, shall prepare all necessary records of measurements/readings/ protocols etc.

11.36
All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per the general engineering practice and as per BHEL engineers instructions at site, cutting, weld desposing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scraping, lapping, fitting up etc as may be applicable in such erection works and which are treated incidental to the erection work and necessary to complete the work satisfactorily shall be carried out by the Contractor as part of the work.

11.37
Interconnection/ hookup, if any, with the existing system shall form part of work. Such interconnections, hookups may require shut down of running plant and the relevant work have to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.

11.38
Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.

11.39
It may so happen that certain components like manhole doors, hanger etc may be supplied in loose items. They need to be assembled as per relevent drawings or as per advice of BHEL engineer prior to erection. This forms the part of the scope of work.

11.40
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.

11.41
BHEL is operating web based computerized site operation management system (SOMS) that includes, inter-alia, issue of materials, daily progress reporting, Contractor's running monthly billing and material reconciliation through a computerized data management system. Contractor shall install necessary hardware to hook-up with the BHEL's system and use the same for his scope of work.

11.42
In the event the computerized SOMS is inoperative for any reasons, the Contractor shall take delivery of materials from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer. All these records however shall be updated in the SOMS as and when the SOMS is reactivated/ normalized.

11.43
All lubricants and chemicals required for testing, preservation, chemical cleaning / acid cleaning, oil flushing, and the lubricants for trial runs of the equipments and trial operation of the unit will be supplied by BHEL free of charges.

11. 2) COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

11.2.1
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.

11.2.2
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.

11.2.3
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.

1.3 TEST TAPPING POINTS

11.31
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.

11.3.2
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.

11.3.3
All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established upto National Physical Laboratory.

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

11.4 GENERAL

11.4.1
During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer.

11.4.2
Erection and welding of stainless steel fittings including supply of necessary stainless steel welding electrodes is within the scope of the work/specification.

11.4.3
No temporary supports should be welded on to the piping.

11.4.4
Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. This facility shall be provided by the contractor till the commissioning and handing over of the equipment to the customer. Preservative and touch up painting on equipments covered under this specification stored at stores/storage yard shall also be carried out by the contractor.

11.4.5
Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor.

11.4.6
The contractor shall return to BHEL the excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (vee), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.

11.4.7
Wherever the equipments are erected by the contractor and connected piping is done by other agency, contractor shall weld / tighten the incoming pipes to either the equipment or the counter flange provided on the equipment.

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 25mm for achieving proper levels will be within the scope of work/specification.

12.2
All minor foundations and anchor points required for installing erection equipments like winches, anchors etc. are to be cast by the contractor.

12.3
The complete work of secondary grouting of equipments is included in the scope of work/specification. Contractor shall arrange all manpower, T&P, form work 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 following BHEL approved vendors:

1. M/S FOSROC CHEMICALS (INDIA) PVT LTD;
2. M/S SIKA INDIA PVT LTD;
3. M/S PAGEL CONCRETE TECHNOLOGIES PVT LTD;
4. M/S PIDILITE INDUSTRIES LTD.

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

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.

DETAILS OF SCOPE OF WORK OF ERECTION, TESTING, COMMISSIONING OF ONE UNIT OF CAPACITY 220 TPH UTILITY BOILER (UB) + 2 UNITS EACH OF 110 TPH HEAT RECOVERY STEAM GENERATORS (HRSG) ALONG WITH THERE AUXILIARIES, STEEL STACK WITH COMPLETE PLATFORMS ETC INCLUDING ELECTRICAL WORK OF STACK, 2 UNITS EACH OF Fr6 B GAS TURBINE, GAS TURBINE GENERATOR SETS & RELATED AUXILIARIES, BYPASS-STACK, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, CONDENSER WITH R.E. JOINTS, STEAM TURBINE-ONE UNIT, TURBO-GENERATOR AND RESPECTIVE ASSOCIATED AUXILIARIES, POWER CYCLE PUMPS INCLUDING CW PUMPS,HEAT EXCHANGERS, INTEGRAL PIPING, BOUGHT OUT ITEMS, BALANCE OF PLANTS EQUIPMENTS / PACKAGES LIKE MISC. PUMPS, MISC. CRANES AND HOISTS, TANKS & VESSELS ETC., APPLICATION OF THERMAL INSULATION OF UB AND HRSG WITH AUXILIARIES, STEEL STACK, AND APPLICATION OF THERMAL INSULATION OF EQUIPMENTS/PIPING/ & VESSELS, PIPING WITH VALVES & FITTINGS INCLUDING GAS TURBINE AND STEAM TURBINE SET EQUIPMENTS – HEATERS, DE-AERATOR, TANKS, VESSELS & PIPING ETC FOR OPaL (ONGC PETRO ADDITIONS LIMITED) STEAM AND POWER GENERATION SYSTEM PACKAGE FOR DAHEJ PETROCHEMICAL COMPLEX, (Block I) UB1, HRSG 2&4 + STG1, GT/GTG 2&4, (Block II) UB2, HRSG 1&3 + STG2, GT/GTG 1&3.

A) DETAILS OF SCOPE OF WORK OF ERECTION, TESTING, COMMISSIONING OF ONE UNIT OF CAPACITY 220 TPH UTILITY BOILER (UB) + 2 UNITS EACH OF 110 TPH HEAT RECOVERY STEAM GENERATORS (HRSG) ALONG WITH THERE AUXILIARIES, STEEL STACK WITH COMPLETE PLATFORMS ETC INCLUDING ELECTRICAL WORK OF STACK

The scope of work is further detailed in the specifications hereinafter.

13.1 PRESSURE PARTS

A) Fabrication and installation of **temporary structure** for erection of Boiler Drum is in the scope of the contractor's work. BHEL will issue the required Structural Steel for this purpose free of charges. Contractor shall have to fabricate Built Up Beams and other structural members that are required for supporting the drum lifting equipment. Contractor shall erect, fasten, weld these structures and carry out NDE as per relevant codes and practices as part of work. After completion of drum erection activity, contractor shall dismantle these structures and return to BHEL stores. Contractor shall repair the areas of permanent equipment/ structures as well as Built-Up Structural Beams affected due to installation of temporary structures and finish as per relevant codes of practice or as instructed by BHEL. Payment for installation of temporary structures as aforesaid will be made at the rate accepted for Structures; no separate payment will be made for fabrication, dismantling and finishing work and return of materials.

B) Pressure parts components like headers, panels, coils, loose tubes etc have to be flushed/blown with compressed air, checked for dimensional accuracy and configuration and minor rectifications, if necessary will have to be done before erection.

This will involve making appropriate bed of steel structures over the concrete blocks/ steel pedestals. Necessary steel, concrete blocks shall be arranged by the Contractor. bed shall be fabricated as per BHEL requirement.

C) Normally the high pressure valves will have prepared edges for welding. But, if it becomes necessary, the Contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. No gas cutting will be permitted. All fittings like "T" pieces, weld neck flanges, reducers, etc shall be suitably matched with pipes for welding (This is applicable to piping work also).

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

E) Surfaces inside seal box and other areas that are to be applied with castable refarctory lining shall be painted with black bitumen paint before boxing up and application of refractory. Seal boxes need to be partially cut open in order to pour refractory. Contractor shall carry out necessary cutting and seal welding of such cutouts. Contractor shall provide the black bitumen paint of required specification for such applications.

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

G) If required, the pressure parts, after initial erection and tests, will have to be preserved by either dry or wet preservation procedure. Contractor shall erect the piping & valves and provide necessary assistance for the same. Required piping, valves and preservative (gas / chemicals) will be provided by BHEL as free issue.

H) The drum internals, if already installed, may have to be removed to facilitate inspection by statutory authorities and chemical cleaning. The drum internals are to be preserved properly and re-fitted at appropriate stage as part of work.

I) Superheater and/or re-heater system will have HP butt weld joints. Welding of these HP joints shall involve pre-heating and post heating by resistance heating, argon purging of joints during welding process and full TIG weld. Contractor should follow required procedure welding NDT, etc.

J) **BOILER DRUM**:

- All the required T & Ps and arrangements required for Drum lifting is in the contractor scope. The entire activities of drum lifting are to be carried out as per instructions of BHEL / Customer Engineers.

- Contractor shall collect, load, transport / shift the Boiler Drum from the storage yard / identified location to the cavity of boiler, upload & handle further as required for its erection. Contractor shall make all necessary arrangements like arranging and laying of sleeper bed, steel structures, steel plates & rails etc for transport of Boiler Drum.

  Boiler Drum is to be erected by using Winch method. Contractor may engage specialized agency to erect the Boiler Drum by this method. Contractor shall deploy the agency and other resources well in time to suit the milestone schedule.

- BHEL shall arrange to unload boiler drum in a convenient location nearer to Boiler Foundation. Transportation of the same to erection site for erection shall be within the scope of work of the contractor.

- Drum lifting structures shall be fabricated by the contractor at site according of BHEL drawing. Necessary steel for the same shall be arranged by BHEL. Fabrication, erection and complete installation of drum lifting arrangements, including supply of consumables and anchoring for diversion pulleys shall be carried out by the contractor at no extra cost.

- HSFG bolts of boiler supporting structure are to be tightened, by turn of nut method / Torque Wrench, as per the instructions of BHEL Engineer. The bolted Joints should be jointly checked by the BHEL/customer and contractor's personnel for the required tightness and retightened wherever necessary. The tightened bolts should be identified by colour paints. Facility for random checking with calibrated torque wrenches shall also be provided by contractor.

  After completion of drum lifting, erection and alignment, the drum lifting arrangements shall be dismantled by the contractor and returned to BHEL stores in good condition and to the satisfaction of BHEL Engineer.

- Corrections in the profiles of scalloped plates/bars, skin casing, seal plates etc. for proper matching with mating parts, wherever required, shall be done as incidental to the work.

13.2 TRIM & INTEGRAL PIPING OF BOILER

13.2.1
The work on piping systems will include cutting to required length, edge preparation, laying, fixing & welding of the pipes / elbows / fittings/ valves etc. in the pipeline, fixing & adjustment of supports / anchors / shock absorbers and carrying out all other activities / work to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineers instructions and / or as per approved drawings / documents.

13.2.2
Tubes or pipes wherever deemed convenient, will be sent in random lengths. These shall be cut and edge prepared to suit the site conditions and the layouts. Fittings like bends tees, elbows, reducers, flanges etc will be supplied as loose items. However, bends of tube size up to NB. 65 mm will have to be formed at site as incidental to work.

13.2.3
Connection (either flanged, bolted or welded) of piping to the terminal points/equipments etc is in the scope of work even though such terminal point/equipment may not form part of this work. All NDE including radiography of joints so made, post-weld-heat-treatment if any, are also within the scope of work/specification. The terminal points work is inclusive of cutting of existing lines, if required, edge preparation, welding/blanking and hook up work.

13.2.4
It should be ensured that all the terminal point connections are done without transferring any undue load or strain to the other equipments. Necessary protocols have to be prepared for such fit-up along with BHEL/customer representative before connecting. All NDE including radiography of joints so made, post weld heat treatment if any, is also within the scope of work/ specification.

13.2.5
Mechanical freeness of valves has to be ensured prior to erection.

13.2.6
The above provisions shall be applicable, mutatis - mutandis, to other piping systems e.g. Boiler front Naphtha piping, Fuel Gas piping from boiler front and up-to burner wind box including control valves, trip valves and conventional valves (as shown in the scheme of fuel gas system), HP auxiliary steam piping from boiler front row column to drive turbine of (i) FD fan (II) GR fan and (iii) Fuel oil pump, Fuel oil piping, Lub oil piping of rotating M/c etc.

13.2.7
Main Steam pipeline up to turbine including the strainer and terminal joint with turbine is included in the scope of work. Bidder shall follow BHEL approved procedure for welding, pre-heating. Detailed procedure will be issued to the contractor. The main steam pipeline between strainer and turbine does not undergo steam blowing, therefore this pipeline must be thoroughly cleaned of dust, scale, burr, any foreign materials and deposits by manual and mechanical cleaning method. Contractor shall take at most care in the cleaning activity so as to ensure that no undesirable particle enters inside the turbine. Contractor shall obtain specific written clearance from BHEL before and after the cleaning activity.

Contractor shall take atmost care and work in co-ordination with BHEL's turbine erection agency to ensure that no undesirable stress/force/load gets transferred to turbine or any other rotating machine that is connected to the pipelines in scope of this contract.

13.2.8 Following items of work shall also form part of piping erection:

a. Installation & removal of isolating devices/ NRVS and removal & re-fixing of internals required for hydraulic testing, pre-commissioning and commissioning activities. Required gaskets will be supplied by BHEL free of cost.

b. Matching of flanges for achieving parallelism and alignment resorting to heat correction or other suitable methods as per instructions of BHEL Engineers.

c. To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc., of suction, discharge, re-circulating and other connected piping and its supports at a number of places.

d. Fabrication and erection of racks and steel supports for all the piping including critical piping. Steel for this purpose will be supplied by BHEL.

e. Erection, welding, NDE and stress relieving of certain equipments, e.g. flow nozzles, control valves etc, after completion of certain activities e.g. chemical cleaning, steam blowing etc is part of work. This may involve removal of portions from the already erected pipelines in order to introduce these equipments and resultant edge preparation etc shall be incidental to work. No separate/ additional payment is envisaged for cutting, welding and edge preparation in this regard. The removed pieces of pipes shall be returned to BHEL stores with proper cleaning, dressing and identification marking.

f. Welding of root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping.

g. Opening of valve actuators, dismantling of actuators from the valves, refitting and rendering assistance connected with the electrical and mechanical problems.

h. Fixing and welding including due NDE & PWHT etc of carrier plates on to the pipes.

13.2.9
As far as possible pre-assy of piping on ground is to be done. The erection of various piping may have to be started from any random reference instead of the terminal points inorder to meet certain completion commitments.

13.2.10
The location of drain headers, valves, stations, steam traps of piping as indicated in the BHEL drawings are suggestive only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, it has to be erected so as to provide easy accessibility and free path for the purpose of easy operation and

maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be changed as per the site conditions. All such works shall be carried out expeditiously as per the instructions of BHEL Engineer. The decision of BHEL Engineer is final and binding on the Contractor.

13.2.11
The rate quoted in rate schedule is also inclusive of pre-heating, welding, post heating, post weld heat treatment/ stress relieving and NDE of piping.

13.2.12
Erection of piping systems shall involve co-ordination with the erection of the turbine, turbo-generator, condenser, boiler, boiler feed pumps and other major equipments. Wherever required, approval of concerned BHEL Engineer/other erection agency must be obtained prior to making piping interface connections to such equipments. Sequence of work shall be carefully planned to minimize interference with other groups working in the same area. Actual sequence to be followed shall be subject to the approval of BHEL Engineer and BHEL Engineer may direct the Contractor to reschedule his work to suit the status of the site work.

13.2.13
While erecting the field run pipes, the Contractor shall check the accessibility of valves, instruments tapping points and maintain minimum head room requirement and other necessary clearance from the adjoining work areas to avoid interferences.

Steam Turbines and all Steam line drain headers will be operate from common steam header; Contractor under this Tender specification shall carried out the main steam piping works as per instruction of BHEL Site in charge.

13.2.14
All pipelines shall be given proper slope towards the drain points during erection. For maintaining the slopes as given in the drawings for larger thickness and larger dia pipelines, edge preparation for welding may have to be altered suitably to achieve the slope.

13.2.15
All pipelines shall be provided, as per the instructions of BHEL Engineer, with suitable Vent and the drain points with valve (s) on the highest and lower points of the pipe run although may not be specifically mentioned in the drawing.

13.2.16
It may become necessary to make & install temporary spool pieces for certain process requirements. Contractor's scope shall include preparation, erection, fit-up, welding, NDE etc and dismantling of such spool pieces at appropriate stage without any additional payment.

13.2.17

Normally, setting of hangers in cold condition is done by simulation adding additional temporary weight, which will be roughly equal to the weight of the insulation. Attachment of temporary weights and floating of the joints in the simulation test is to be treated as part of contractual work. Hanger settings may have to be repeated till free-floating joints are achieving. Hanger adjustments to be repeated for steam blowing by resetting hot and cold values if required. This may have to be repeated several times after steam blowing and synchronization. The weights will be supplied by BHEL. Contractor has to transport from BHEL stores and return the same after completion of work. No extra claim on this account will be entertained.

13.3 ROTATING MACHINERY

a Specifications covered under the following para and also other relevant specifications contained in other paras elsewhere in this tender document will be applicable for rotating machines like FD-**Radial Forced draft fan** (with silencer and dual drives) / GR - **Radial Gas Recirculation fan** with dual drives, Bi-sector regenerative air heater, Seal air fans, Blowers, HP & LP dosing pump skids and other similar auxiliaries.

b All lubricants for testing, preservation and lubricants for Trial runs of the equipments shall be supplied by BHEL as free issue. All services including labour shall be provided by the Contractor for drawing these from BHEL / customer's stores, transporting, handling, filling, emptying, re-filling, accounting and return of surplus lubricants / empty containers / old & used lubricants after draining etc. Contractor should clean the spilled / leaking lubricants thoroughly, consumables for such cleaning will be in Contractor's scope.

c All rotating machinery and equipments shall be cleaned, lubricated, checked for their smooth rotation, if necessary, by dismantling and re-fitting before erection. Also, the equipments may have to be checked for clearances, tolerances at any stage of the work including during testing, commissioning etc. shaft of the rotating machines shall be rotated periodically to avoid damages. All these shall be part of work.

d Trial run of the drives in un-coupled state and then coupled with equipment has to be done after necessary alignment & coupling. Forced lube oil systems including lube oil piping of drives, rotating equipments etc form part of the work under these specifications. Hydraulic test of oil coolers, oil piping etc is in the scope of work. Where required cooler may have to be dismantled for hydraulic test and re-erected thereafter as part of work.

e Certain rotating machinery, after testing, pre-commissioning may have to be re-aligned/hot aligned and vital clearances re-set. This may necessitate disconnection of cabling, removal of certain instruments etc and restoration thereafter.

f Protective lubricant coats / fill provided on / in the critical area of equipments have to be removed at appropriate stage and regular lubricants, after removal / cleaning of

protective coat / fill, as per specifications should be filled / applied. Cleaning / flushing agents / oils will be provided by BHEL.

g Chemical cleaning, steam blowing and air drying of the connecting pipes for the lube oil system has to be carried out wherever required as per instruction manuals / drawings. Chemicals, suiting BHEL specification, for such chemical cleaning is in the scope of Contractor.

h Even though rotating machines may be grouted to foundation using non-shrink grout mix, blue matching of packer plates / shims with foundation / between packers / equipment base should be done as incidental to work wherever instructed by BHEL Engineer.

I) Skid mounted equipments may need checking, re-setting due to various reasons as incidental to work.

13.4 MAIN SUPPORTING STRUCTURES, EXTERNAL STRUCTURES, ELEVATOR STRUCTURES, STAIRWAYS, GALLERIES & PLATFORMS & HANDLING ARRANGEMENT

13.4.1
Contractor shall supply and erect one number passenger cum goods elevator of 1.5 MT capacity to reach up-to the boiler drum level to facilitate erection, movement of person and goods etc. the arrangement shall confirm to applicable safety norms. Contractor shall dismantle and take the elevator back after completion of work. The elevator shall be made ready at the time of drum lifting.

13.4.2
Boiler main supporting structures have to be erected in a sequential manner.

13.4.3
Quality norms with regard to verticality of column, inter-alia, have to be adhered to strictly, at various stages of erection.

13.4.4
Stiffening / strengthening of main supporting structure, if any, due to deviation in verticality of columns post drum lifting, shall be carried out, including fabrication, if any. Necessary steel for this will be provided in random sizes by BHEL as free issue. Payment for such stiffening/ strengthening shall be made for weight certified by BHEL engineer at the item rate applicable to structures, provided the deviation has occurred for the reasons not attributable to the Contractor.

If the deviations are attributable to Contractor, the materials required for Rectification / Stiffening / Strengthening, fabrication, erection of the same shall be to the Contractors account.

13.4.5
Each ceiling girder will be supplied in pieces and ceiling girders are to be pre-assembled at site and welding & ndt tests are to be carried out, including 100% radiography for the welded joints in ceiling girders on ground prior to their erection in position.

13.4.6
It is likely that, in deviation from prescribed sequence, erection of certain elements of structure may be deferred for later stage, to facilitate, say crane boom reach to higher elevation, passage of drum during drum lifting etc. this may necessitate temporary installation of some structural steels at appropriate locations to keep the stability of structure intact. such temporary installations shall be removed subsequently and returned to BHEL stores/ storage yard. Finishing work in the related permanent structures shall be done as per the instruction of BHEL engineer. BHEL will provide necessary steels on free issue basis in random sizes for such installations, which shall be fabricated by the Contractor to suit the requirement.

Payment for such installations shall be made on the accepted tonnage rate of structures. No separate payment will be made for fabrication, removal & return of the materials to BHEL stores.

13.4.7
In some cases, the structural material will be supplied in random lengths, which have to be fabricated to suit the requirement as incidental to work. Also, it may sometimes be necessary to remove some of the erected members to facilitate erection of bigger/ pre-assembled equipments. In such cases, the removal and re-erection of such members as agreed by the BHEL Engineer will have to be done by the Contractor as incidental to work.

13.4.8
Contractor shall arrange materials required for temporary cat ladders & working platforms during erection of columns, platforms and other structural components. Such arrangements shall, as far as possible, be only of clamping & bolting type, as welding on columns etc will not be permitted. After the completion of work these shall be removed.

13.4.9
All the hand rails and toe guards shall be provided as per drawings and site requirement. hand rails supplied in running lengths shall be suitably cut, edge prepared and welded. Also, hand rails/ guards may have to be provided from the safety point of view in certain places though not indicated in the erection drawings. The weld joints of hand rails shall be ground smooth to flush finish.

13.4.10
Electro forged floor grills will be supplied for this project. These may have to be cut to suit requirement. Cutting shall be done only by mechanical cutters **and not by gas cutting**. Cold galvanizing compound is to be applied on the cut surface/edge. Supply of Cold galvanizing paint in contractor's scope.

Fixing of floor grills shall be done by self-tapping screws **and not by weldable studs.** Special purpose electrically operated hand tools are available in the market for this, which drills, taps and fixes the screws in a single operation. BHEL will supply the necessary self-drilling-cum-tapping screws and fixing clips. Contractor shall deploy the **drilling cum fixing machine** required for this purpose as a regular scope of work.

13.4.11
The Contractor shall also install additional platforms of permanent nature for approaching different equipment as per the site requirement and to meet O&M requirements, though these may not indicated in the erection drawings. Materials required for such platforms will be supplied by BHEL in random sizes on free issue basis. These have to be fabricated to suit the requirement. Payment only for erected weight as certified by BHEL engineer shall be made at the rate applicable for structures. No payment is envisaged for fabrication of structures.

13.4.12
All relevant provisions as above shall apply, mutatis-mutandis, to the work of external structures, interconnecting structures, elevator structures, ESP stairways and gallaries & equipment handling system etc.

13.5 OTHER PRODUCTS AND SYSTEMS AND COMMON REQUIREMENTS

C) Certain structural items like silencer supports, roof cladding structure, platform etc will be supplied in running lengths which shall be cut to required suitable sizes and adjusted/trimmed as part of work.

D) Contractor has to make canopies for motors, actuators, lube oil units, control valves, etc. Material for this will be supplied in random lengths / sizes. No separate payment for fabrication is envisaged. Only the erection tonnage rate applicable for structure will be paid for this work.

E) BHEL will supply **Metapoly Sheets** for roof and side cladding of Boiler and elevator structure. These sheets are to be fixed with self tapping screws (supplied by BHEL) in similar manner as in case of Galvanized floor grills. Contractor shall deploy the **drilling cum fixing machine** required for this purpose as a regular scope of work.

F) In case the fans (FD/GR) are provided with variable frequency drive, Contractor has to erect & commission the mechanical components of the fan. Electrical/ Electronic Panels, transformers, cabling etc are not in this work specification. However in case of Hydraulic Coupling, the coupling shall be in scope of this contractor.

G) Actuators / drives of dampers, gates etc may have to be serviced, lubricated before erection, during pre-commissioning and commissioning, including carrying out adjustments required as incidental of the work.

H) All welded joints should be painted with anticorrosive paint/primer immediately after completion of all work. Necessary paints and other consumables for the above work are in the scope of the contractor.

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

J) Hangers and suspensions, support steels for ducts and other equipments, piping etc will be supplied in running/random lengths/ sizes, which shall be cut to suitable sizes and adjusted as required.

K) Air leak test is to be conducted for the cold & hot secondary air ducts, primary air ducts. Also gas tightness test is to be done for the flue gas ducts. In addition to this, leak tests are to be done for the furnace, skin casing works carried out in the boiler roof, furnace bottom etc to the satisfaction of BHEL/Customer.

L) Touch up and preservative painting of all components issued to and/or erected by contractor shall form part of scope of work. The contractor shall arrange all paints, primer and consumables, T&P and facilities.

M) Feed Storage Tank of Deaerator will be shipped in three sections apart from heater, loose parts and structural steel for approach platform. The complete FST Sections and heater will be required to be lifted and place at its designed platform. Contractor shall carry out all the works of lifting, placement, assembly, welding, Post & Pre-heat treatment, NDE / NDT, Radiography, Hydraulic testing, flushing etc. as scope of work as per drawings & documents requirement and instructions of BHEL Engineer at site.

There may be access / approach limitations to place & erect the FST sections & Heater of Deaeartor and it may be necessary to make temporary platform / approach to access the desired location / foundation and erect the equipemnts. Conatrctor shall make such temporary approach platform & ladders etc as scope of work including providing structural steel, rails and other members etc.

13.6 DETAILS OF SCOPE OF WORK FOR HRSG, AUXILIARIES & PIPING

The scope of work is further detailed in the specifications hereinafter.

ERECTION OF HRSG, ITS AUXILIARIES

3.6.1 HRSG RECEIPT, UNLOADING, STACKING AND ERECTION OF MODULES:

13.6.1.1 ERECTION OF HEAT TRANSFER MODULES:

The heat transfer modules will be sent loose, 2-3 Nos. with intermediate wooden packing, in light crating-cum-arrestor arrangement welded to the trailer bed. The crate-arrestor has to be cut at site for unloading the modules one-by-one. For unloading the modules special unloading frames have to be used as the modules being flexible have propensity to bending. Utmost care is, therefore, essential while unloading the modules and a special frame will have to be used for unloading supplied by BHEL, manufacturing unit.

These modules will be unloaded directly at site and only 2-3 modules, with wooden packing between them at appropriate locations, shall be kept in each stack.

For erection of these modules yet another frame, for making the module vertical, will be required. Frame will have to be fabricated at site by the contractor.

Required materials for fabrication of special frames for unloading as-well-as vertical frame shall be issued in random sizes by BHEL on free-returnable basis. No separate payment is envisaged for this fabrication.

In all these handling of modules polyester flat webbing sling shall be used. These slings shall be arranged by Contractor.

There are 44 modules per HRSG total 88 modules for both the units, dimension of each module is 3715mm x 127mm x 11400mm, and each module weighs 3.7 MT approx.

13.6.1.2 ERECTION OF HRSG DRUM:

The tentative weight and dimensions respectively are as under:

HRSG Drum: 1 no- weight – 55.4 MT, Dia.-1900 mm (Approx), length- 9600 mm (approx), ID 1676 mm. The elevation of Centre Line of HRSG Drum is 19550 mm.

These have to be erected with the help of adequate capacity crane from the side of HRSG after the erection of casing and heat transfer modules of respective circuits.

13.6.1.3
It shall be the responsibility of the contractor to provide temporary ladders on columns, chimney etc in a manner prescribed by BHEL using their own material till such time as permanent stairways are completed.

13.6.1.4
Pressure Parts components like Headers, Modules, loose tubes / links etc. have to be checked for dimensional accuracy and configuration and minor rectifications, if necessary will have to be done before erection. This will involve making appropriate bed of steel structures over the concrete blocks. Steel, in random sizes, for this purpose will be provided by BHEL from the packing materials / scraps etc., where as necessary concrete blocks shall be arranged by the contractor. Bed shall be fabricated as per requirement. These shall be dismantled & returned to BHEL at appropriate stage. No separate payment for making / dismantling such bed is envisaged.

13.6.1.5
Normally the high pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like “T” pieces, weld neck flanges, reducers, etc., shall be suitably matched with pipes for welding (this is applicable to piping work also).

13.6.1.6
Tubes or pipes wherever deemed convenient, will be sent in random lengths. Tubes / pipes sent in standard/ random length shall be cut and edge prepared to suit the site conditions and the layouts. Bends of tubes up to OD 65 mm will have to be formed at site as incidental to the work. This is applicable to piping work also.

13.6.1.7
Welding of all attachments, including those of stainless steel hooks/ pins on casing & inlet duct, non-pressure parts, pressure parts/ piping including those required for insulation work of HRSG with aux, steel stack and equipments, tanks / vessels, heaters, deaerator etc. of Gas Turbine set, piping’s is in the scope of work.

13.6.1.8
Furnace area and Heat recovery area of flue gas passage has to be made leak proof by seal welding. Air leak test by pressurization has to be conducted to prove effectiveness of the seal weld and bubble / soap test will have to be carried out for the entire seal welds to ascertain the effective sealing is achieved. The tests may have to be repeated till satisfactory result achieved.

13.6.1.9
If required, the pressure parts, after initial erection and tests, will have to be preserved by either dry or wet preservation procedure. Contractor shall render all assistance for this and erect temporary piping with valves wherever necessary. Required material will be provided by BHEL.

13.6.1.10

Any fixtures, concrete block supports, steel structures, required for temporary supporting for pre-assembly or checking and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor.

13.6.1.11
The drum internals, if already installed, may have to be removed to facilitate tube expansion, inspection by statutory authorities and chemical cleaning. The drum internals are to be preserved properly and refitted afterwards as part of work.

13.7
PIPING (INTEGRAL PIPING)

13.7.1
The work on piping systems will include cutting to required length, edge preparation, laying, fixing & welding of the pipes / elbows / fittings/ valves etc. in the pipeline, fixing & adjustment of supports / anchors / shock absorbers and carrying out all other activities / work to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineers instructions and / or as per approved drawings / documents.

13.7.2
Laying of pipelines as per the specifications, between equipments constituting terminal point, 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 both ends for all the piping schemes covered in the specification.

13.7.3
Aligning, matching and welding of piping to the terminal points (such as stubs, on terminal equipments, stubs on headers, battery limits etc), even if these terminal equipment/point do not form part of this scope of work / specification, and stress relieving and NDE of joints so made is also within the scope of work / specification. Also, where the piping connection to the terminal points involves flanged joints, mounting and welding of flanges on piping as well as terminal equipment matching of flanges as specified elsewhere herein, fixing of gaskets, bolting and tightening as per BHEL engineer's instruction is also in this scope of work / specifications. required fasteners and gaskets will be supplied by BHEL free of cost.

13.7.4

Following items of work shall also form part of piping erection:

1) Installation & removal, as applicable, of isolating devices/ NRVS and removal & re-fixing of internals required for hydraulic testing, pre-commissioning and commissioning activities. Required gaskets will be supplied by BHEL free of cost.

2) Matching of flanges for achieving parallelism and alignment resorting to heat correction or other suitable methods as per instructions of BHEL Engineers.

3) To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc., of suction, discharge, re-circulating and other connected piping and its supports at number of places.

4) Increase or decrease in length of piping including change in layout to suit site conditions.

5) Fabrication and erection of racks and steel supports for all the piping including of system piping. Steel for this purpose will be supplied by BHEL in random sizes.

6) Erection, welding, NDE and stress relieving of certain equipments, e.g. flow nozzles, control valves etc, after completion of certain activities e.g. chemical cleaning, steam blowing etc is part of work. This may involve removal of portions from the already erected pipelines in order to introduce these equipments and resultant edge preparation etc shall be incidental to work. no separate/ additional payment is envisaged for cutting, welding and edge preparation in this regard. the removed pieces of pipes shall be returned to BHEL stores with proper cleaning, dressing and identification marking.

7) Matching of all fittings like tees, bends, flanges, reducers, valves, socket fittings, etc with pipes for welding. This may involve weld build up, edge preparation, etc.

8) Cleaning of all pipes as prescribed, flushing by compressed air etc.

9) Welding of root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping.

10) Welding of weld blanks with due NDE & PWHT, if required, on a temporary basis.

11) Opening of valve actuators, dismantling of actuators from the valves, refitting and rendering assistance connected with the electrical and mechanical problems.

12) Fixing and welding including due NDE & PWHT etc of carrier plates on to the pipes.

13.7.5
On all steam piping, water piping, oil piping, air piping, etc, where butt welding is involved, root TIG welding and subsequent arc welding shall be adopted as instructed by BHEL

engineer. The decision of BHEL engineer regarding welding procedure for welding of above lines will be binding on the contractor.

13.7.6
Pipes / tubes / structural materials, which are issued in running meters, may not be sent in standard lengths. These have to be cut to suit site conditions.

13.7.7
certain pipe lines of oil, air, steam and water will be field routed as per schemes approved at site or as per the instructions of BHEL engineer, and will be supplied in random lengths / running lengths. The contractor shall lay the piping according to instructions at sites, after carrying out the necessary fabrication, edge preparation, routing, supporting etc, in best professional manner and as per instructions. The supports for field-routed piping shall be fabricated and erected as per the requirement of the work. The steel required for the supports will be provided by BHEL free of cost at their stores.

13.7.8
All weld joints on piping shall be ground or filed on completion of welding and before radiography as per instructions BHEL engineer so as to achieve smooth surface free of notches, ripples, undulations, etc. and to limit the reinforcement as per the codes.

13.7.9
Contractor shall erect the piping by doing pre-assemble on ground if possible at the first instance. 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 spring compression achieved in the case of spring hangers.

13.7.10
Contractor shall carryout edge preparations for welds joints in accordance with BHEL drawings / BHEL standards / BHEL engineer's instruction.

13.7.11
The location of drain headers, valves, stations, steam traps of piping as indicated in the BHEL drawings are suggestive only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, it has to be erected so as to provide easy accessibility and free path for the purpose of easy operation and maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be changed as per the site conditions. All such works shall be carried out expeditiously as per the instructions of BHEL engineer. The decision of BHEL engineer is final and binding on the contractor.

13.7.12
The rate quoted in rate schedule is also inclusive of pre-heating, welding, radiography, post heating, post weld heat treatment/ stress relieving and NDE.

13.7.13
Hanger rods shown in the piping arrangement drawing may have to cut and welded to suit site condition. The contractor shall do cutting and welding of these hanger rods. The NDE & stress relieving required on welded hanger rods shall be carried out. The hanger for piping will be tested for even distribution of load with the help of torque wrench.

13.7.14
The piping may be provided with hand holes. The hand holes will be opened up for inspection and seal welded prior to operation.

13.7.15
Structural materials required for the supporting / operating platforms required for the valves/equipments at various levels for the safe operation will be issued in random sizes to the contractor free of cost. however, the contractor's quoted rate shall include fabrication and erection of all such of platforms at site and no extra payments shall be allowed for this and only tonnage rate applicable for structures only will be payable.

13.7.16
Erection of piping systems shall be coordinated by the contractor as required, with the erection of the Gas Turbine, Steam Turbine, GT & STG generators, condenser, Boiler feed pumps and other major equipments, approval must be obtained from the concerned BHEL engineer and other agencies concerned prior to making piping interface connections to the aforementioned equipments. Sequence of work shall be carefully planned to minimize interference with other groups working in the same area. Actual sequence to be followed shall be subject to the approval of engineer and engineers may, at time, direct the contractor to reschedule his work as per status of the site work.

13.7.17
While erecting the field run pipes, the contractor shall check the accessibility of valves, instruments tapping points and maintain minimum head room requirement and other necessary clearance from the adjoining work areas to avoid interferences.

13.7.18
All pipelines shall be given proper slope towards the drain points during erection.

13.7.19
All pipe lines shall be provided with suitable vent and the drain points with valve (s) on the highest and lower points of the pipe run although may not be specifically mentioned in the drawing as per the instructions of BHEL engineer.

13.7.20
For instrument connections, pipe stubs including the instrument tubing up to the root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) shall be installed by the contractor. Root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) shall be located in the convenient location / place as required by the customer to facilitate easy operation as per the decision / instruction of BHEL engineer.

13.7.21
The contractor shall be responsible for correct orientation of all valves so that flow direction, seats, stem and hand wheel are in desired locations. Information regarding orientation of valves, not fully located on drawings, may be obtained from the BHEL engineers.

13.7.22
The piping systems, which come under the purview of IBR, should meet the requirement of IBR. The contractor shall be well versed with all the latest amendments of Indian boiler regulations.

13.7.23
All piping shall be grouped wherever practicable and shall be routed to present a neat appearance.

13.7.24
For field run piping, contractor shall fabricate and erect all hangers and supports as required with due regard to general arrangement layout of other pipes, hangers, cable trays, ducting, structural members, etc.

13.7.25
For maintaining the slopes as given in the drawings for larger thickness and larger dia pipelines, edge preparation for welding may have to be altered suitably to achieve the slope.

13.7.26
it may become necessary to make & install temporary spool pieces for certain process requirements. Contractor's scope shall include preparation, erection, fit-up, welding, nde etc and dismantling of such spool pieces at appropriate stage without any additional payment.

13.7.27
In pipelines like re-heater lines, CRH lines, extraction lines, HP/IP & LP bypass lines etc., the NRVS and valves will also be erected by contractor under this tender specifications. though these NRVS & valves may be supplied from different units / different sources, the erection, alignment, welding, NDE test, heat treatment, radiography, supporting etc. along with their control/ governing oil system piping with tanks, pumps, power cylinders etc.

including the oil flushing & commissioning of these valves shall be carried out by contractor as per instruction of BHEL engineer and drawings / documents requirement. Similarly erection / fixing, welding etc. of strainers, dummy devices in various lines, valves and their subsequent removal & re-fixing during pre-commissioning / commissioning stages of steam blowing, flushing etc. shall be carried out by contractor under these tender specifications.

13.7.28
All temporary lines required for chemical cleaning, hydraulic testing, steam blowing, etc., shall be supplied in 'as is where is' condition. The contractor shall arrange to carry out the required fabrication, dressing, grinding, cleaning, cutting, edge preparation etc., while carrying out erection. No extra claim on this account will be entertained. For human protection, temporary insulation over piping to be applied at no extra cost.

13.7.29
Before laying the piping on supports, the coordinates and elevations of all supports shall be checked by the contractor for correctness. Discrepancies from the execution drawings, if any, shall be promptly brought to the notice of BHEL engineer in writing and correction shall be carried out as per his instructions.

13.7.30
Normally, hangers setting in cold condition are done by simulation adding additional temporary weight, which will be roughly equal to the weight of the insulation. Attachment of temporary weights and floating of the joints in the simulation test to be treated as part of job. Hanger settings have to be repeated for achieving free-floating joints. Hanger adjustments to be repeated for steam blowing by resetting hot and cold values if required. This may have to be repeated several times after steam blowing and synchronization. The weights will be supplied by BHEL. Contractor has to transport from BHEL stores and return the same after completion of work. No extra claim on this account will be entertained.

13.7.31
All the instrumentation tap-off points like thermo-wells, root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements), impulse lines, nipples etc., shall also be erected and welded by the contractor irrespective of whether such materials are supplied by BHEL or any other agency.

13.7.32
The weld grooves of MS line, HRH line, CRH line, BFD lines and other pipes will be as per BHEL standard specifications. Further, the edge preparation shall be done as per instruction of BHEL site engineer and same shall be binding on the contractor.

13.7.33
All equipments / works shall be preserved and protected properly during and after erection. Instructions / directions given by BHEL in this connection will have to be observed by the contractor.

13.7.34
The location of tanks, vessels, valves, stations etc in the pipelines indicated in the BHEL drawings may be indicative only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, they have to be erected so as to provide easy accessibility and free path for the purpose of easy operation and maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be modified as per the site conditions. All such work shall be carried out expeditiously as per the instructions of BHEL engineer. The decision of BHEL engineer is final and binding on the contractor.

13.7.35
All G.I. pipelines shall be joined by threaded (screwed) joints. Pipes and fittings will be supplied by BHEL as commercially available. Contractor shall arrange to check and clean and ream the existing threads if necessary, by running thread cleaning die/tap or by machining. Fresh threading shall be done in case existing thread is found damaged beyond repair after cutting off the damaged portion within the quoted rates. Fresh threading shall also be done in G.I. pipe ends cut to suit site layout.

13.7.36
Both male and female threads shall be cleaned of oil, grease etc, with appropriate solvent etc. prior to joining. Joints shall be sealed by applying Teflon tape on male thread. All joints shall be tightened adequately so as to achieve leak-proof joint. Exposed portion of the external threads shall be coated with zinc silicate paint. Contractor shall arrange all consumables for cleaning, sealing and painting.

13.7.37
Pressure testing with compressed air and external application of soap solution or flame or any other BHEL-approved method shall be done on all joints. Such tests may have to be repeated several times to ensure a leak proof system. Leakages if any shall be repaired by the contractor promptly according to the BHEL-approved procedure/method. Any additional expenses for repair attributable to contractor shall be borne by the contractor.

13.8 OTHER PRODUCTS AND SYSTEMS

13.8.1
Ducts / expansion bellows are normally supplied in loose wall plates / segments and these are to be assembled and welded at site before erection. All joints connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be tested by LPI and made leak proof as per technical instruction / requirement.

13.8.2
Certain structural items like silencer supports, roof cladding structure, platform etc., will be supplied in running lengths which shall be cut to required suitable sizes and adjusted/trimmed as part of work.

13.8.3
Additional platforms of permanent nature for approaching different equipments like actuators, valves, instruments etc. as per site / BHEL client's requirements, which may not be indicated in drawings, but essential for safe access, shall be made by the contractor from structural steel / materials supplied in random lengths / sizes. The contractor will be paid for this work on accepted erection tonnage rate for structures.

3.9 HRSG STEEL STACK/ CHIMNEY ERECTION

13.9.1 THE DETAILS OF HRSG CHIMNEY (ID-3.5 M, Height - 80.0 M) IS AS FOLLOWS:

- Total no. of shell involved in one steel stack - 32 nos., each shell will be supplied in two halves. The total number of half shells per chimney will be 64 and each shell height (vertical) will be 2.5m.

- Bottom shell ID=5.6m, OD=5.664m, Wt. of each half shell=6.5MT (Maximum wt.), shells will be supplied in two halves.

- ID, OD & weight of Top most shell - Top shell ID=3.5m, OD=3.52m, Wt. of each half shell=1.5MT (Minimum wt.), shells will be supplied in two halves.

- Heaviest weight shell - Bottom most shell, Wt. of each half shell=6.5MT (Maximum wt.), shells will be supplied in two halves.

- Chimney height/Elevation of top most shell - Chimney height=80.0m, Elevation of top most shell=80.5m.

- Chimney configuration - Flared with bottom ID 5.6m, ID gradually reduces to 3.5m @ 50.0m height, and top 30.0m is cylindrical with ID 3.5m.

All shells are to be welded as per erection detail. Flange holes are given for locating/ erection/ alignment purpose only.

13.9.2
Welding of chimney joints shall be carried out by certified welder. Wherever necessary, radiography has to be taken to meet the BHEL/statutory requirements.

13.9.3
Chimney has to be insulated up to full height and approximate. Insulation thickness: is 80mm LRB wool mattress, however actual insulation thickness shall be as per drawings which will be provided during execution of work at site.

13.9.4
Helical strakes as indicated in the erection drawings are to be welded onto the chimney.

13.9.5
Chimney base will be supplied in two halves, which will have to be assembled at site.

13.9.6
Painter's trolley will be supplied in parts and will have to be assembled.

13.9.7
All electrical works such as lightening arrestors, earthling and aviation lights etc. are in the scope of work.

13.9.8
Stack/ chimney have to be painted as per the requirement of aviation / Relevant BIS standards.

(B)

ERECTION OF Fr6 B GAS TURBINE, GAS TURBINE GENERATOR SET & RELATED AUXILIARIES, BYPASS-STACK, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, CONDENSER WITH R.E. JOINTS, STEAM TURBINES, TURBO-GENERATOR AND RESPECTIVE ASSOCIATED AUXILIARIES, POWER CYCLE PUMPS INCLUDING CW PUMPS, HEAT EXCHANGERS, INTEGRAL PIPING WITH ASSOCIATED VALVES, FITTINGS & SUPPORTS, BOUGHT OUT ITEMS, BALANCE OF PLANTS EQUIPMENTS / PACKAGES LIKE MISC. PUMPS, MISC. CRANES AND HOISTS, TANKS & VESSELS ETC., AND APPLICATION OF THERMAL INSULATION OF EQUIPMENTS/PIPING/VESSELS & TANKS ETC. AND ALL OTHER EQUIPMENTS / AUXILIARIES / ACCESSORIES / SYSTEMS AS PER TENDER SPECIFICATIONS FOR OPAL (ONGC PETRO ADDITIONS LIMITED) STEAM AND POWER GENERATION SYSTEM PACKAGE FOR DAHEJ PETROCHEMICAL COMPLEX, (Block I) UB1, HRSG 2&4 + STG1, GT/GTG 2&4 , (Block II) UB2, HRSG 1&3 + STG2, GTG/GTG 1&3.

13.10.1
Any fixtures, concrete block supports, steel structures, required for temporary supporting for pre-assembly or checking and welding for lifting and handling during pre-assembly and erection shall be arranged by the contractor.

13.10.2
It shall be the responsibility of the contractor to provide temporary ladders on columns, Ducting etc in a manner prescribed by BHEL using their own material till such time as permanent stairways are completed.

13.10.3
Piping, ducts, enclosures and other fabricated/pre-fabricated parts/ components etc. have to be checked for dimensional accuracy, configuration, proper matching and minor rectifications, wherever necessary will have to be done before erection. This will involve making appropriate bed of steel structures over the concrete blocks. Steel, in random sizes, for this purpose will be provided by BHEL from the packing materials / scraps etc., where as necessary concrete blocks shall be arranged by the contractor. Bed shall be fabricated as per requirement. These shall be dismantled & returned to BHEL at appropriate stage. No separate payment for making / dismantling such bed is envisaged.

13.10.4
Normally the high pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like “T” pieces, bends, weld neck flanges, reducers, etc., shall be suitably matched with pipes for welding (this is applicable to piping work also).

13.10.5
Pipes / Tubes wherever deemed convenient, will be sent in random lengths. Tubes / pipes sent in standard/ random length shall be cut and edge prepared to suit the site conditions and the layouts. Bends of tubes up to OD 65 mm will have to be formed at site as incidental to the work. This is applicable to all piping work also.

13.10.6
Welding of all attachments on casing, non-pressure parts, pressure parts/ piping, equipments, tanks, vessels etc. including those required for insulation work is in the scope of work.

13.10.7
The work on piping systems (air, water, fuel, oil/lube oil, steam, gas etc.) will include cutting to required length, laying, edge preparation, fixing & welding of the pipes / elbows / fittings/ valves etc. In the pipeline, fixing & adjustment of supports / anchors / shock absorbers and carrying out all other activities / work to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL engineers instructions and / or as per approved drawings / documents.

13.10.8 Fittings like bends tees, elbows, miter bends, reducers, flanges etc., will be supplied as loose items. However, bends of tube size up to OD 65 mm will have to be formed as part of work.

13.10.9
All drains / vents / relief/ escape / safety valve piping to various tanks / sewage / drain canal / flash box / sump / atmosphere etc. from the stubs on the piping and equipments erected by the contractor/ battery limit points as specified in drawings/ instructions of BHEL site in charge is completely covered in the scope of work. The matched flanges including at battery limit points will be provided by BHEL. This is applicable to all piping including Integral Piping also.

13.10.10
Connection (flanged, bolted, welded) of piping to the terminal points/equipments etc. is in the scope of work even though such terminal point/equipment may not form part of this work. All NDE including radiography of joints so made, post-weld-heat-treatment if any is also within the scope of work/specification. Terminal points works of various piping schemes with customer lines and other contractor's lines. The terminal points work is inclusive of cutting of existing lines, edge preparation, welding/blanking and hook up work.

13.10.11
It should be ensured that all the terminal point connections are done without transferring any undue load or strain to the other equipments. Necessary protocols have to be prepared for such fit-up along with BHEL /customer representative before connecting. All NDE including radiography of joints so made, post weld heat treatment if any, are also within the scope of work / specification.

13.10.12
The non-IBR piping will be sent as plain pipes. The attachments for tapping points and / or supports will be sent as loose items. Site work will involve fabrication, drilling, fitting, pre-heating, welding, NDE & PWHT as per applicable BHEL documents. Rate quoted shall take account of all these work as no separate payment is envisaged for such work.

13.10.13
For integral piping all attachments etc will be supplied as loose items and are to be welded to the main pipes at site as per instructions. Necessary drilling of holes on main pipe for welding stub shall also be done at site by the contractor.

13.10.14
For the skid mounted equipment, the checking and realignment required at site is in the scope of work.

13.10.15
Components like turbine with casings, rotor, girders, side walls, base plates, bearings & other associated parts / components, GT Air Filter, Inlet ducting, Off base enclosure, Exhaust ducting & diffuser, Ventilation ducting, BFP with Booster Pumps & Hydraulic coupling, Coolers, Integral piping, suction strainers etc., CEP pumps with Motors, canister, foundation rings etc., CW pumps with parts like suction casing, impeller casing, pump casing, impellers assemblies, discharge elbow, motor, motor stool, thrust block, shafts, thrust bearings foundation parts etc., Condenser with dome assemblies, hot-well assemblies, water boxes and water chambers, bottom plates, foundation springs, tubes, air extraction pipes, stiffeners etc, Gas turbine Generator with end shields, rotor, slipring shaft, terminal bushings, seals, rotor, bearings etc., heaters, fittings and approach platform, Fine Filter Skids, NAPHTHA forwarding skid for HRSG, NAPHTHA forwarding skid for GT, HSD forwarding skid for GT, Lubricity Additive Dosing skid, HSD 25 µ Duplex filter skid, NAPTHA 25 µ Duplex filter skid, HSD 6 µ duplex filter skid, Magnetic filter skid, NAPTHA 6 µ duplex filter skids, heaters drain tank, coolers etc. Misc. crane hoists & cranes etc., Generator auxiliary compartment, load gear and enclosures etc and integral piping etc. received loose are to be erected in position by contractor.

13.10.16
Air filter, inlet ducting, exhaust ducting will be supplied in individual assembled sections with inside insulation. Site job involves complete assembly and erection.

13.10.17
Overhauling, cleaning, revisioning, servicing of pumps, governing system, equipments, valves etc. During erection and commissioning stages, are in the scope of work. Gaskets/packing for replacement will be provided by BHEL free of cost. All equipments shall be preserved and protected periodically before and after erection as per the advice of BHEL engineer at no extra cost. All HT motors should be, if necessary, serviced and reassembled before erection as per the advice of BHEL engineer.

13.10.18
Certain instrumentation like pressure switches, air sets, filter regulators, pressure gauges, and junction boxes, power Cylinders, dial thermometers, flow meters, valve actuators, flow indicators etc. are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to C & I erection agency of BHEL. Mounting of such instruments will be done by the C&I erection agency.

13.10.19
Contractor shall provide the following for GTG system, STG system, Power Cycle Pumps including CW pumps, Misc. Pumps, Horizontal & Vertical pumps and sump pumps, all rotating Equipments and Balance of plant equipments, Fuel System and other related equipments with auxiliaries' erection:

1) Temporary bolts of required size for honing of couplings

2) Spanner & torque wrench/bolt stretching device for Tightening of load and accessories coupling bolts.

13.10.20
Rain hood protection shall be provided for the equipments e.g. Fuel/HSD/, Naphtha forwarding skid and other skids etc. located outside/ in open space as per drawings & instructions.

13.11 ERECTION OF GAS TURBINE, GAS TURBINE GENERATOR, STEAM TURBINES , TURBO GENERATOR WITH THEIR RESPECTIVE, AUXILIARIES, PUMPS, CONDENSER AND ALL ROTATING EQUIPMENTS WITH AUX.,TANKS, VESSELS INCLUDING FLASH TANKS, MISC.TANKS, MISC. PUMPS, INTEGRAL PIPING ETC.

13.11.1
Filling of lubricants for purpose of oil flushing, initial fill up and subsequent topping up during various stages is part of scope of work of contractor.

13.11.2
All works such as cleaning, leveling, 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.

13.11.3
Cleaning, servicing, lubrication of actuators, pumps, headers, governing system, HP Valves, IP Valves, LP Injection valves, LP injection bypass valves, IP Bypass valves, Steam Strainers and their control valves with power cylinders and other valves, tanks, vessels etc. during erection and commissioning stages is in the scope of work. However, gaskets/packing's/lubricants for replacement will be provided by BHEL free of cost.

13.11.4
All equipments 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.

113.11.5
Trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment.

13.11.6
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.

13.11.7
All racks or assembled units, 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.

13.12 PIPING INSTALLATION

13.12.1
The scope of work in integral piping system (air, Gas, Water, Oil, Steam, Governing oil/Control oil, HSD & NAPHTHA, Natural Gas 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.

~~All Pipes are supplied in Single commercial lengths, with edge preparation by EMRP. Cutting into required spool lengths, edge preparation of spools, welding of Stubs & support attachments are to be done at Site by Agency. Mitre Bends, Reducers in Cooling Water Piping are to be fabricated at Site by Erection Agency using the pipe supplied by EMRP.~~

~~Buried Piping in CW system; Coal tar tape to be arranged by Erection Agency & wrapped on pipe before burying. Cathodic protection as per EIL's specification is required for all underground piping; PE&SD will supply the material required, Erection Agency to provide lugs on pipe~~

~~Weld joints and NDT requirement for all Integral piping, Central Lube Oil piping, Service Water Piping, TG Auxiliaries Cooling water piping (DMCW system, which includes some lines Hotwell make (50NB), Solution preparation NaoH dosing (25 NB), Return line form NaoH dosing system (25 NB), Emergency make from CEP discharge (50 NB) and from DMCW tank to DM cooling water piping (100NB) are of stainless steel), CW/Main circulating water piping & ACW Piping including buried piping / underground piping and other related 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.~~

~~Contractor to note that TG Auxiliaries Cooling water (called DMCW system piping) will also be extended to some of the Auxiliaries/equipments of HRSG area and other relevant equipments. Contractor shall carry out erection, testing, NDE requirements and commissioning of entire system TG Auxiliaries piping of per drawing requirement and instruction of BHEL Engineer at site.~~

13.12.2
Carrying out of piping as per the specifications between equipments constituting terminal points, whether the terminal equipments fall within the scope of the work/specification or not, is within

the scope of the work/ specification. The contractor shall complete terminal joints at either ends, with due NDE & PWHT if applicable, for all the piping schemes covered in the scope of work.

13.12.3
Fit up and welding/bolting/fastening of piping to the terminal points (such as stubs, valves, flanges on terminal points/equipments, stubs on headers, battery limits etc) forming part of the scope of work/specification and stress relieving and radiography of joints so made are also within the scope of work. Permanent fasteners and gaskets will be supplied by BHEL.

13.12.4
Interconnection/Hook-up, if any, with the existing system shall form part of work. Such interconnections, hook-ups may require shut down of running plant and the relevant work has to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.

13.12.5
All drains / vents / relief / escapes / safety valve piping to various tanks/ sewage / drain canal / flash box / condenser / sump / atmosphere etc. from the stubs on the piping and equipments erected by contractor is completely covered in the scope of this tender specification.

13.12.6
The following items of work shall be incidental and forming part of piping fabrication and erection:

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

13.12.7
Pipelines will be field routed as per schemes/ suggestive layout or as per the instructions of BHEL engineer. Pipes & tubes will be supplied in random lengths and running lengths. The contractor

shall have to lay the piping after carrying out the necessary fabrication, edge preparation, routing etc to suit site requirement in best professional manner.

13.12.8

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

13.12.9

~~The detail of Condensate & Feed water piping, Cooling water piping, Plant air & Instrument air piping, HSD & NAPHTHA piping, Natural gas piping, DM water piping, to be erected under this contract is generally as per the indicative weight given in relevant APPEXDIX. These details are approximate and meant only to give a general idea to the bidder about the magnitude of the work involved, actual quantum and type of equipments will be based on the erection documents, which will be furnished in the course of erection.~~

~~The CW / Main circulating water piping will run in excavated trenches underground as well as over the ground. The length of CW piping is about 200 meter. Further the actual works shall be as per drawing requirement. The Excavation of trenches, construction of ducts is not in the scope of work. The protection of all above buried piping with anti-corrosive tape of minimum 4 mm thick conforming to IS-10221 and AWWA C-203-93 along with supply of related materials shall be carried out by contractor as scope of work under these tender specifications. The pipe surfaces shall be cleaned by shot blast / sand blasting before application of anti-corrosive taping. Contractor shall also carry out the Bond / Adhesion test and Holiday test on anti-corrosive applied portion of piping as part of scope of work to prove the satisfactory completion of anti-corrosive taping. The payment for Anti-corrosive tapping work including surface preparation & supply of all materials and related works will be made for actual quantum of work carried out at site as per accepted item rate of Sl. No. "DD" of rate schedule.~~

~~These pipes will be supplied with internal surface coated with one coat of Epoxy based Zinc rich primer and subsequent finish coat with Coaltar Epoxy paint to the DFT from 125 t0 150 microns. Contractor after completion of welding of site weld joints including the bends etc. shall carry out the zinc rich primer coating and Coltar Epoxy coating to the DFT requirement of 125 to 150 microns of site weld joints internal surface area as scope of work including surface preparation & supply of all required materials and any other extra payment for such work shall not be entertained.~~

~~The complete Main CW piping supply piping from CW Pumps to Condenser including the BF vales & R.E. Joints / Rubber expansion joints with spool / make pieces at both the ends and return piping from condenser with R.E. Joints and BF Valves to Cooling Tower (CW~~

~~PH) & all branches to terminal points/ Battery limits as per respective drawing with all associated accessories, fittings, valves / relief valves etc. is included under these tender specifications. Complete TG Auxiliaries Cooling Water piping as per respective drawings and up-to battery limits are also included under these tender specifications.~~

13.12.10
The work on piping systems include laying, edge preparation, fixing & welding/ bolting of the elbows/fittings/valves of all types and sizes/ strainers (e.g. Self-cleaning strainers etc)/ Duplex filter and any other equipment shown in the drawing/documents etc coming in the pipelines, fixing & adjustment of supports/angles shock absorbers and carrying out all other activities/work to complete the erection and also carrying out all pre-commissioning/commissioning operations mentioned in the specification as per BHEL engineers instructions and / or as per approved drawings / documents.

13.12.11
Fittings like bends tees, elbows, miter bends, reducers, flanges etc, will be supplied as loose items.

13.12.12
Certain adjustments in length may be necessary while erecting pipelines. The contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges afresh at no extra cost.

13.12.13
Minor adjustment like removal of ovality in pipes is in the scope of work.

13.12.14
All drains / vents / relief tubes / escape pipes / air relief valves/ safety valve/ piping to various tanks / sewage / drain canal / flash box / sump / atmosphere etc from the piping and equipments erected by the contractor is completely covered in the scope of work.

13.12.15
Connection (either flanged/bolted or welded) of piping to the terminal points/ equipments etc is in the scope of work even though such terminal point/ equipment may not form part of this work. All NDE including radiography of joints so made, is also within the scope of work/specification.

13.12.16
Hydraulic test of piping assembly shall be conducted after completion of certain number of weld joints as instructed by BHEL. Supply of suitable blanks/ dished ends, welding/ bolting the same, removal of blanks and fresh edge preparation/ restoration of pipeline after successful completion of hydraulic test is to be carried as part of the work. No separate payment shall be made for this work.

13.12.17
Manhole door openings have to be cut on the main piping and necessary attachments such as access pipe, flange, pad plates etc is in the scope of work. The access pipe may have to be suitably cut in length and in profile to suit the requirement. Blind/blank flanges have to be bolted later on to close the access opening. Materials, fasteners etc for these permanent installations will be provided by BHEL free of charge.

13.12.18

De-watering of pits and shuttering to avoid land-slide:

de-watering of pits excavated by the respective agency have to be done periodically to ensure safe and proper working condition. Similarly, contractor shall arrange shuttering with props of side walls to avoid land slide in the pit wherever required for work.

13.13 CONDENSER INSTALLATION

13.113.1
The condenser will be dispatched in loose parts mainly comprising of tubes, front water box assembly, Rear water box assembly, front water chamber assembly, rear water chamber assembly, Hot-well assembly, bottom plate assembly, support plate assembly, side wall assembly, dome assembly, dome stiffeners, dome stiffeners plates, Air evacuation pipes, Super structure, Condenser Springs and loose items etc. The condenser is to be assembled at site in position by welding the different parts/components. Condenser tubing and tube expansion is to be done at site by the contractor, after taking due care to clean all the tube holes. After final alignment and leveling of turbine, the condenser neck to be welded with turbine and followed by fixing & welding of extraction pipes between turbine and Condenser. **Contractor shall follow the procedure of condenser neck welding as per instruction of BHEL engineer at site. Condenser Tubes plate material SA 516 Gr.70 and Condenser tubes material is S.S. SA 249 TP 304. Condenser Tubes (OD 22 x Thk 1 x L 6000) outside dia. is 22 mm and thickness is 1 mm.**

13.13.2
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.
13.13.3
The tubes shall be expanded using an Automatic Electronic Torque Controlled Tube Expanding unit or Pneumatic Tube Expander. Tube expansion shall be checked with dial bore gauge. The total set up including tube expanders and tube cutting tools etc. for carrying out the complete condenser tube expansion works shall be provided by the contractor.

13.13.4
As such no EOT crane will be available for erection of condenser and contractor shall make suitable arrangements for erection of condenser without hampering the progress of work. However on

readiness of EOT crane, contractor will be permitted to make use of same as per instruction of BHEL Engineer at site.

13.13.5
The contractor shall carry out the condenser neck welding with cylinder exhaust hood only after final installation of casing. Neck welding shall be subjected to specified non-destructive testing.

13.13.6
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.

13.13.7
Work of painting of condenser surfaces in various areas and at various stages of works are specified elsewhere in these specifications.

13.13.8
Contractor shall carry out checking and setting of pre-compression of foundation springs as scope of work.

13.13.9
Complete welding, NDE/NDT and die-penetration tests etc. during welding work of surface condenser work shall be carried out by contractor as scope of work.

13.13.10
Contractor shall carry out the surface preparation and painting of Water Space of Condenser with one coat of chemical resistant Epoxide Primer paint and two Coats of High Build Black Coaltar Epoxide Paint including supply of paints and Shell side surface will be painted with two coats of steam washable paints along with supply of paints. All these shall be carried out as scope of work.

13.14 GAS TURBINE GENERATOR STATOR LIFTING & PLACEMENT

13.14.1
The Gas Turbine Generator comprising of Generator Stator, Generator Rotor, End Shields, Bearings & Brushgear, HV Busing, Sliprings shaft assembly, Seal Rings, Oil catcher etc. The Generator Stator weight is 93 MT (approx.). Contractor shall carry out all the works of unloading from Road Transport Trailer, Handling, Lifting and placement to designed foundation at designed elevation and further works of leveling, centering, generator rotor insertion, assembly of loose items like end shields, HV bushings and other activities of generator rotor alignment, Electrical tests and other tests on Generator, Generator stator Air Leak tests, Leak test of complete generator system with seal oil system etc. in service as per Field Quality plan and requirements at site.

Contractor shall carry out the removal of Generator Hydrogen Coolers which have come as assembled to carry out necessary hydraulic tests and necessary inspection as part of scope of work as per instruction of BHEL Engineer at site.

BHEL will provide 250 T Capacity crawler crane for unloading and placement of Gas Turbine Generator to nearest location of designed foundation subject to its capacity, reach, accessibility and approachability. All other works of shifting, leveling, centering and alignment etc. will be carried out by contractor as scope of work. There is restricted space for movement of this BHEL crane. Contractor shall have to provide his own for boom extension, reduction, insertion, plates etc. for above BHEL crane including the required suitable capacity of crane, arrangements, trailers & assist crane for above as required during handling, transportation of all desired items / components of this crane from stores to site for lifting and placement of Gas Turbine Generator as scope of work.

Contractor shall provide the fuel, lubricants and all other consumables for above BHEL Crane and all other cranes deployed by contractor. BHEL will provide Operator for above BHEL Crane and contractor has to provide crew for BHEL crane during operation. Contractor shall provide the operators and other crew for all his cranes.
Cranes provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor. Cranes will be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose.

13.15 GAS TURBINE LIFTING & PLACEMENT

13.15.1
The Gas Turbine (Frame-6 B) weighing about 64 MT is supplied in assembled condition. However its field piping and inter connecting piping shall be supplied loose and erection, testing, welding and NDE/NDT along with radiography etc. shall be carried out by contractor at site.

BHEL will provide crawler crane for unloading and placement of Gas Turbine to nearest location of designed foundation subject to its capacity, reach, accessibility and approachability. All other works of shifting, leveling, centering and alignment etc. will be carried out by contractor as scope of work. There is restricted space for movement of this BHEL crane. Contractor shall have to provide his own for boom extension, reduction, insertion, plates etc. for above BHEL crane including the required suitable capacity of crane, arrangements, trailers & assist crane for above as required during handling, transportation of all desired items / components of this crane from stores to site for lifting and placement of Gas Turbine Generator as scope of work.

Contractor shall provide the fuel, lubricants and all other consumables for above BHEL Crane and all other cranes deployed by contractor. BHEL will provide Operator for above 600 T Capacity BHEL Crane and contractor has to provide crew for BHEL crane during operation. Contractor shall provide the operators and other crew for all his cranes.
Cranes provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor. Cranes will be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose.

13.16 STEAM TURBINES AND STEAM TURBINE GENERATOR STATOR LIFTING & PLACEMENT

13.16.1

The Steam Turbine weighing 79 MT (approx.) will be dispatched in assembled condition as module and Steam Turbine Generator weighing 81 MT (approx.) will also be dispatched in fully assembled condition with generator stator & generator rotor in threaded condition to site by Road on transport trailers.

The EOT (capacity : Main Hook - 35 T; Aux Hook – 5 Tones) available in TG hall shall not be suitable for lifting of these Steam Turbine & Steam Turbine Generator and these Equipments shall be lifted by Strand & Jacks / Lift & Shift arrangement method. The Scope of contractor shall take complete responsibility and carry out the liaison and follow up with transporters, filling of ditches/leveling etc. for marching of trailers to unload at suitable location/point of lifting near the TG building, Shifting of same providing required arrangements to suitable locations / point of lifting etc. (as per requirement), arranging the Strand & Jacks/Lift & Shift arrangements, making resting Foundations /Footings to suit the installation of his Strand & Jacks arrangements (as required) & their assembly /installation with expert supervision till lifting & placement of these equipments to required / designed foundation / elevation. Contractor's responsibility shall also to carry out all related civil works/ footings / foundations with providing of all materials for his strand & jacks / Lift & shift arrangements as scope of work.

13.16.2

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

13.16.3

For lifting and placement of these equipments, it may require to hold the some of structures / casting of certain foundations. Contractor shall visit site and study & discuss with BHEL Engineer at site and submit his plan (which shall not affect the project schedule) for deployment of these arrangements at site for lifting of these equipments along with Technical Bid. Contractor shall deploy these Strand and Jacks arrangements & other resources well in advance to suit the site requirement so as to lift & place these equipments on required foundations in minimum possible time. Some of the renowned agencies such as (1) **M/s. Fagioli PSE India Pvt. Ltd.(203,Krishna Bhavan, Govandi Station Road, Deonar, Mumbai-400088,Tel.No. 022-25564388, Fax No. 022-25562565),** (2) **M/s. Freight Wings (P) Ltd.(309, Rex Chambers, Walchand Hirachand Marg. Ballard Estate, Mumbai-400001,Tel. No.022-22631714/22619988)**, (3) **M/s. Dorman Long Technology Ltd.(233, Bharat Industrial Estate, Lal Bahadur Shashtry Marg, Bhandup-West, Mumbai-400078, Tel No. 022-25961960, Cell No. 09820192807**), (4) **M/s. Basu & Basu Engineers (Pvt.) Ltd.(Kolkata, Tel. No. 033-24642967/24664069, Fax No. 033-24664621**) who are in this field in the country, can be contacted (if required) by contractor along with other agencies known to contractor.

Contractor may contact above agencies or any other similar agencies known to contractor and have tie up for lifting & placement of these equipments. The lifting and placement of these equipments shall be required to be done 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.

Lifting of these equipments by Jacks and Sleeper method is not permitted.

13.16.4
The Steam Turbines and Steam Turbine Generator shall have to be placed on designed foundation at an elevation of about 11.5 Meters inside the TG building and have to be handled & lifted from transport carrier / trailer etc. Contractor shall take note of same.

13.16.5
Immediately after completion of lifting of these Steam Turbines and Steam Turbine Generator 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.

13.16.6
The Air Coolers of Steam Turbine Generator will be supplied loose with related Frames etc.. Contractor shall carry out hydraulic testing, assembly and erection of these air coolers as per instruction of BHEL Engineer & requirements of drawings / documents.

13.16.7
The field test to be conducted on Gas Turbine Generator and Steam Turbine Generator at site at various stages as per requirement at site and instruction of BHEL Engineer shall include but not limited to those listed below by contractor as scope of work with providing all necessary testing & measuring instruments, T&Ps and skilled manpower / experts resources / agencies.

(i) Measurement of Insulation Resistance of the Stator and the Rotor windings to the frame and between phases, after drying out the machine, and measurement of Polarization Index.
(ii) Measurement of the DC resistance of all windings and embedded temperature detectors.
(iii) Measurement of insulation resistance of bearings.
(iv) Capacitance measurement and dissipation factor between the winding and body.
(v) Open circuit and short circuit tests.
(vi) Measurement of temperature rise at the rated load.
(vii) Performance capability of the machine.
(viii) Line charging capacity.
(ix) Short Circuit tests on Generator end.
(x) Hydrogen leakage test
(xi) Vibration test.
(xii) Over speed test.

(xiii) Hydraulic tests on coolers.
(xiv) Bearing and shaft current test.

13.17 HANDLING OF HEAVIER EQUIPMENTS

All other Heavy and voluminous Equipments/consignments like Gas Turbine Generator Rotor, Steam Turbine, Gas Turbine Accessory Base, Water Wash Skid and other equipments / skids etc. along with other Equipments shall be handled carefully by providing contractor's his own lifting Crane and T&P with manpower arrangements. BHEL shall not provide any T&P other specifically indicated in relevant appendix. However contractor will be permitted to use the special erection devices / special erection tools which have been supplied along with main equipments from works and contractor shall return these erection devises / tools in perfectly working condition after completion of work.

13.18 OTHER PRODUCTS AND SYSTEMS

13.18.1
Ducts / expansion bellows are normally supplied in loose wall plates / segments and these are to be assembled and welded at site before erection. All joints connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be tested by LPI and made leak proof as per technical instruction / requirement.

13.18.2
Certain structural items like silencer supports, roof cladding structure, platform etc., will be supplied in running lengths which shall be cut to required suitable sizes and adjusted/trimmed as part of work.

13.18.3
The platforms of permanent nature for approaching different equipments like actuators, valves, instruments etc. as per site / BHEL client's requirements, which may not be indicated in drawings, but essential for safe access, shall be made by the contractor from structural steel / materials supplied in random lengths / sizes as per scope of work as per instruction of BHEL Engineer at site.

13.18.4
There is provision of EOT crane of capacity 35 MT (Main Hook - 35 T; Aux Hook – 5T) in STG hall for maintenance work, EOT Carne for Deaerator-BFP Structure- 15 T for maintenance work. On readiness of these cranes, contractor will be permitted to use these cranes for erection works as per prior permission of BHEL Engineer at site. Contractor shall have to provide skilled crane operator for operation of these crane and shall carry out the routine maintenance like maintaining the cleanliness, changing the Gear Box Oil, applying the cadmium compound on slings etc. of these cranes as per instructions of BHEL Engineer at site as scope of work. Contractor shall also provide manpower assistance as scope of work for holding the trailing cables during operation of these EOT cranes till permanent DSL systems are commissioned. BHEL will provide the consumable for these EOT cranes free of charges.

13.18.5
The weight of integral piping and central lube oil system piping indicated in relevant appendix with relevant system is tentative. Contractor shall carry out erection, welding, testing along with radiography and NDE/NDT works as drawings requirement as scope of work. Any other separate payment on account of any variation in weight & welding joints for these integral piping shall not be entertained.

13.19 SECURITY, HOUSE KEEPING & OTHER RESPONSIBILITIES OF THE CONTRACTOR

13.19.1
The contractor shall have total responsibility for all equipment and materials in his custody at contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/finished surfaces should be greased and covered.

13.19.2 Preservation & Protection of components

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

13.19.3
The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.

13.19.4
Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. In case of failure of contractor in compliance of this requirement, BHEL will make suitable arrangement at contractor's risk and cost.

13.19.5
The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc., shall be returned to BHEL stores by the contractor.

13.19.6
The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilization 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.

14 HYDROSTATIC TESTING, PRESERVATION & OTHER TESTS

14.1
Contractor shall carry out the following tests required to complete the erection and commissioning of the GTT and STG Sets along with related systems & equipments:

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

(2) Ultrasonic test
(3) Dye Penetrant test
(4) Magnetic Particle Test.

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

14.2
Contractor shall lay all necessary temporary piping, welding, supports, install pumps, valves, pressure gauges, electric cables and switches etc, required for the Hydro test, Air leak test, Chemical cleaning, Steam blowing etc.. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting above tests will be done by the contractor. No separate payment shall be made for this purpose.

14.3
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.

14.4
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**.** After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

14.5
Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

14.6
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.

15 WELDING, RADIOGRAPHY AND OTHER NON-DESTRUCTIVE TESTING, POST WELD HEAT TREATMENT

15.1 WELDING

15.1.1
Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc. Contractor's personnel engaged should have adequate qualification on the above works.

15.1.2
The method of welding (viz) arc, TIG or other method will be indicated in the detailed drawing/documents. BHEL Engineer will have the option of changing the method of welding as per site requirement.

15.1.3
Welding of high pressure joints shall be done by IBR certified high pressure welders who have been permitted by CIB of state concerned for deployment at the site of work.

15.1.4
Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.

15.1.5
Before any welder is engaged on work, he shall be tested and qualified by BHEL/ customer, though they may possess the IBR/other certificate. BHEL reserves the right to reject any welder without assigning any reason. All the expenditure in testing/qualification of the Contractor's welder shall be borne by Contractor.

15.1.6
Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.

15.1.7
The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint /primer etc will be in the Contractor's scope.

15.1.8
HP joint fit-up, should be protected, where required, by use of tapes/protective paint as may be prescribed by BHEL. The Contractor shall arrange consumables like protective paints/tapes etc.

15.1.9
The Contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability of the welds shall be final.

15.1.10
In the case of P-91 pipe welding, Contractor shall deploy welders having experience in welding of P-91 material. The welders engaged by Contractor if not qualified for P-91 welding will be trained by BHEL at BHEL welding research institute (WRI) Trichy and allowed to work only after passing the required test arranged by BHEL. All the expenditure towards such qualification including cost of training, traveling expenses, stay etc., shall be borne by the Contractor.

15.1.11
Joint fit up will be a stage of inspection. Where required, joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

15.2 SOCKET WELDING:

In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The tenderer shall take notice of this while quoting as no extra claim on this account will be entertained. The socket welding on HP parts/ HP piping shall be done by the IBR qualified welders. Contractor has to adhere to the procedures/specification as indicated in the drawing for socket welding.

15.2.1
Welding electrodes have to be stored in enclosures having temperature and humidity control arrangements. This enclosure shall meet BHEL specifications.

15.2.2
Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens.

15.3 HEAT TREATMENT:

15.3.1
For the purpose of temperature recording of stress relieving process, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations shall be as per the standards of BHEL. Thermocouples have to be attached using capacitor discharge type portable thermocouple attachment unit. Contractor shall arrange sufficient number of thermocouple attachment units.

15.3.2
Contractor should provide temperature indicator / temperature recorder for measuring temperature during pre-heating for welding or for controlling temperature of metal for hot correction etc. The temperature recorders should be preferably of solid state type.

15.3.3
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 labourer required for the same as per directions of BHEL.

15.3.4
In certain cases only the pre-heating of weld joints may be called for.

15.3.5
For weld joints of heavy structural sections, if heat treatment is required, the same shall be carried out as part of the work.

15.3.6

Checking effectiveness of stress relieving by hardness tests (by digital 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.

15.3.7
Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions. Where the electric resistance heating method is adopted Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chalks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

BHEL will provide the induction heating equipment set for SA 335 P-91 materials piping only. The set will comprise of following:

(i) Main panel
(ii) Capacitor panel
(iii) Interconnection power & control cables between above panels
(iv) 185 sq mm special connecting cable from capacitor panel output – 5m length.

Contractor shall provide the input electrical power connection including arrangements such as DB, cables etc, thermocouple pads, thermocouples and compensating cables, induction heating annealing cables (from the capacitor panel to joint and for wrapping around the weld joint) (spec: single core 240 sq mm, 1200a, 3khz), ceramic wool and other consumables etc as may be required. Quantum of annealing cable requirement will depend on many parameters e.g. weld joint size, heat input, type of connection i.e. series or parallel etc.
Likely supplier: Mansfield Cable Co. Noida (UP).

15.3.8
All the recorded graphs for heat treatment shall be handed over to BHEL/ IBR authorities and due clearances obtained.

15.3.9
During welding & post weld heat treatment of main stream piping (P-91 material), the induction heating process shall continue un-interrupted. Therefore, contactor shall arrange back-up DG set to take care of power interruptions during the process.

15.3.10
Results of these processes shall be verified/ validated as per requirements of BHEL/client.

15.4 NON DESTRUCTIVE EXAMINATION:

15.4.1
Contractor shall provide all resources and make all arrangements for the radiographic examination of welds for this work. for reasons of safety, invariably the radiography work will be carried out after the normal working hours and close of other site activities only. in this regard, the Contractor has to adhere to the safety rules / regulations laid by barc authorities from time to time.

15.4.2
Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL Engineer. The minimum quantum of radiographic inspection shall be as per provision of IBR/BHEL's erection documents. They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer/Boiler inspecting authority. Bidder shall also arreage the UT equipment with recording facility at his own cost. Usage of UT equipment shall be as per direction of BHEL engineer. Records of UT shall be produced as per site requirement.

15.4.3
All X-Ray / Gamma Ray films of weld joints shall be preserved properly and be handed over to BHEL/ IBR authorities and requisite clearances shall be obtained by the Contractor.

15.4.4
The field welded joints shall be subject to Dye-penetrant/MPT/RT/ other non-destructive examination as specified in the respective engineering documents/ as instructed by BHEL.

15.4.5
Wherever required, surface preparation, like smooth grinding of welded area, prior to Radiography shall be done. It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/ technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The Contractor shall take all this into account in his offer. The required NDT method/procedure will be decided by BHEL engineer at site.

15.4.6
Tenderer shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found by BHEL Engineers 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 / rejecting the joints will be final and binding on the Contractor.

15.4.7
100% radiograph of certain sizes in piping have to be taken as per BHEL standards/ drawings.

15.4.8
For carrying out ultrasonic testing of welding joints of large size tubes and pipes, it will be necessary to prepare surface by grinding and buffing a smooth finish and contour as necessary. The Contractor's scope of work includes such preparation as incidental to work.
15.4.9
After stress relieving 5% of UT for all critical lines and 2% of UT for other alloy steel lines to be taken to ensure soundness of joints particularly stress relieving cracks. No separate payment will be made.

15.4.10
Contractor may have to undertake radiography with cobalt-60 isotope camera in certain cases. However, for any reason if use of Cobalt-60 is not possible then these joints shall be checked by radiography after completion of welding up to suitable part of thickness with IR–192 other suitable

source subsequently after completing the joint UT to be done. For this Contractor has to deploy level–II operator certified by BARC.

15.4.11
In the case of P-91 piping wherever radiography is not possible, alternatively ultrasonic test has to be carried out apart from other nde checks.

15.4.12
For piping of thickness less than 25 mm no radiography plugs will be provided radiography shots to be taken by double wall technique or any other method to be adopted in consultation with BHEL engineer at site.

15.4.13
No separate payment for any NDE activities (including radiography) will be made.

16 ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

16.1
Contractor shall lay and erect temporary pipelines with fittings and accessories and also erect/commission the chemical cleaning/ circulating pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing of piping and shall provide all other arrangements as per requirement as part of scope of work.

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

16.2
After the chemical cleaning/ flushing have 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.

16.3
Preservation of the cleaned surfaces will be the responsibility of contractor under the guidance of BHEL engineer.

16.4
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.

16.5
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.

16.6
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.

16.7
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.

16.8
Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge should be carried out.

16.9
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.

16.10
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 mobilized by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decision 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.

16.11
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.

16.12
After acid cleaning/pickling of lubricating system (including oil piping of lube oil system, HP Oil supply system, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems, LP Bypass systems etc as per instructions of BHEL Engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machineries, cooler etc before and after oil flushing is the responsibility of the contractor.

16.13
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.

16.14
Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load shall be the responsibility of contractor as part of scope of work.

17 TOOLS AND TACKLES, MEASURING AND MONITORING DEVICES

17.1
The contractor shall provide all (except those indicated in BHEL scope) required tools and plants, monitoring and measuring devices (MMD) and handling & transportation equipments for the scope of work covered under these specifications. Contractor has to provide suitable cranes for material handling at BHEL/client's stores/storage yard. BHEL's crane will not be available for this purpose. Please refer relevant appendix for the list of T&P being provided by BHEL free of charges on sharing basis.

17.2
All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification. Indicative list of major T&P to be arranged by contractor has been furnished in relevant appendix. Contractor shall also mobilize all other T&P necessary for timely and satisfactory completion of the work in scope.

17.3
Contractor shall carry out installation, commissioning, testing and dismantling of the 360 ton portal gantry crane, if provided by BHEL. Contractor's scope shall also include to & fro transportation of the portal gantry crane between BHEL stores and site of work and shall provide T&P including crane etc required for assembly and dismantling of above portal gantry crane.

17.4
Contractor shall provide all required suitable cranes and trailers for materials handling during collection from BHEL/ client's stores/ storage yard, transportation to site of work and at work site for all equipments and consignments including heavy and voluminous equipments/ components/ consignments like Turbine, rotor, generator rotor, brushless exciter, HP heaters, etc. BHEL/customer shall not provide any T&P other than mentioned in relevant appendix for the purpose identified.

17.5
Contractor shall provide the complete operating crew like operator, helpers for handling trailing cable for EOT & portal gantry cranes. It may be specifically noted that the EOT crane/ gantry crane shall be shared by many other agencies working within the TG hall. The contractor shall have to extend the services of the EOT crane operation to all such other agencies as instructed by BHEL; the operation cost (for crew) will be shared proportionately amongst the beneficiary agencies on mutually agreed terms and rate.

Portal gantry crane will be issued in parts/ components and are to be assembled at site by the contractor as per the instructions of BHEL engineers/ erection manual. The scope includes receipt of the materials from BHEL stores, transportation to site, servicing of the components/ drives / pulleys etc,, checking and lubricating wire ropes , pre assembly and assembly of components, preparation of foundation, erection of crane on the foundation, grouting of crane base plates, cabling, pre-commissioning and commissioning of drives, load testing , checking of over-load protection , regular maintenance etc. a qualified / experienced operator is to be provided by the contractor. After erection of the generator stator, the contractor has to dismantle the crane in sequence as instructed by BHEL and apply preservatives / touch-up paints, wherever required and return the same to store

in good condition. Necessary consumables, tools and plants including gas welding m/c etc. are to be provided by the contractor. There is no separate rate for the above and quoted rates shall be inclusive of this.

The required loads will be provided by BHEL free of charges for load testing of portal cranes.

17.6
Contractor has to provide spanners of all sizes for carrying out the complete erection / commissioning works. No spanners will be provided by BHEL to the contractor.

17.7
Contractor has to arrange slings of all sizes for completing the works covered under these specifications except the special slings for generator stator lifting/handling, which will be provided by BHEL free of charges on returnable basis.

17.8
All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification.

17.9
Timely deployment of adequate quantity of T&P is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned program and to achieve the milestones.

17.11
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, the contractor shall arrange hydraulic jacks of 100 tonnes and 63 tonnes capacity along with long high pressure hoses of suitable length for generator erection and alignment. These jacks shall be 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.

17.12
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.

17.13
Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.

17.14
In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternative arrangement at the risk and cost of the contractor.

17.15
The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Contractor shall obtain prior approval of BHEL for all the T&P before deploying in actual work. The movement of cranes and other equipment should be such that no damage / breakage occur to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.

17.16
Normally, use of welding generators only is permitted for welding. The use of welding transformers will be subject to prior approval of BHEL.

17.17
The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring & monitoring devices (MMD). Test / calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL. All calibration shall be traceable to national or international standards.

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

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

2) Two coats of steam washable paints shall be applied on steam side of Turbine and condenser components, as advised by BHEL. The steam washable paints, primer and thinner will be provided by contractor as part of scope of work along with other like arrangements for surface preparation and paint application like sand/shot-blasting, consumables like surface cleaning agents, paint brush, brush cleanser, labour and necessary tools and plants as required for completion of work.

3) The water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter apply two coats of primer paint followed by two/three coats of alloyed resin machinery enamel paints as approved by BHEL. Contractor shall submit manufacturer's batch test certificate / test certificate from BHEL approved laboratory for the primers and paints. Prior approval of BHEL for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing, number of coats may be applied and method of application shall be as recommended by the paint manufacturer. Required paints & primers and other consumables shall be arranged by contractor.

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

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

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

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

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

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

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

LINING AND INSULATION

Application of thermal insulation/ spray insulation, finishing, cladding and outer casing etc of the following:

1. Utility Boiler
2. Boiler auxiliaries including, but not limited to, ducts, fuel oil Equipments, fans etc
3. Boiler integral piping and tanks & vessels
4. Integral piping including vessels and tanks & other equipments
5. LP piping and other equipments
6. Other equipments including BOIs, though not listed above but required for completion
7. TG integral piping and tanks & vessels
8. Other equipments including BOI's, though not listed above but required for completion
9. ST-TG auxiliaries including, but not limited, to heat exchangers, pumps, tanks and vessels and other equipments
10. TG integral piping including condensate and extraction system piping.
5. Application of thermal insulation with retainers, fixing components, cladding sheet etc. of Gas Turbine Ducts and related items to the extent as supplied from BHEL Hyderabad and other associated components covered under these specifications

19.1
The work shall conform to dimension and tolerances specified in the various drawing and documents that will be provided during the execution. if any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies or departmentally and recoveries will be deducted from Contractor's bills towards expenditure incurred including 30% departmental charges.

19.2
The terminal points as decided by BHEL shall be final and binding on the Contractor.

19.3
All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc required will be supplied by BHEL and the same have to be erected/ applied as per the drawings and specifications of BHEL by the Contractor.

19.4
The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, gratings etc) shall be of light weight construction. Contractor shall arrange steel pipes & clamps with

accessories like base plate attachment, fixing pins, struts etc for scaffolding required for this work. However, BHEL's decision in this regard shall be final and binding. Contractor shall arrange the scaffolding materials in sufficient quantity.

The Contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.

19.5
Contractor shall observe all precaution for laying, curing etc of pourable insulation. the Contractor at his own cost shall redo any defective works found.

19.6
Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipments. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipments/ systems covered under the scope of work.

19.6
Cutting & dressing of insulation bricks to suit the site area of application is incidental to work.

19.7
Removable type of insulation has to be provided for valves fittings, expansion joints etc as per drawing or as directed by BHEL Engineer.

19.8
The cladding and outer casing are aluminium sheets. All relevant specifications and procedures with regards to beading, sealing etc for alunimium sheets have to be adhered to.

19.9
Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather.

19.10
The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by BHEL free of cost.

19.11
To take care of bimetal corrosion due to variety of metals in contact of each other viz retainer to support, support to outer casing/cladding, cladding-to-cladding etc, suitable paints specified by BHEL, to be applied and/or neoprene rubber packing/strips or any other insert may have to be fixed as required.

19.12
The Contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL Engineer to facilitate inspection by boiler inspector or during commissioning to fix gauges, fittings, instruments etc. these gaps will have to be finished as per drawings at later date by the Contractor at his cost.

Contractor shall cut open works in 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.

19.13
A log book shall be maintained by the Contractor for the clearance of the area for application of refractory and insulation. Where the Contractor does the work on his own accord without prior permission, the work should be re-done, at his own cost, where necessitated.

19.14
Wastage allowances for the material issued are envisaged as follows:

➢	a	Pourable & castable insulation	-	2%
➢	b	Insulation bricks and motor	-	2%
➢	c	Wool mattresses	-	2%
➢	d	Cladding sheets	-	2%

The wastage allowance will be applicable on the net issued quantity i.e. total quantity issued reduced by the quantity returned to stores as unused/fresh item. Contractor shall reconcile the material issues periodically as prescribed by BHEL site
19.15
The following works are also included in the scope of this contract.

Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint will be supplied by Contractor.

Cutting of the wool mattresses to the required shape and application of finishing cement of required thickness wherever required.

19.16
Insulation work of temporary piping for alkali boil out, steam blowing and chemical cleaning has to be carried out at site. The same have to be removed and returned to the BHEL stores after the completion of activity. Rates quoted for application of wool for boiler and auxiliaries will be applicable for this work also. No separate payment will be made for removal of temporary insulation and return of the same to BHEL stores/yard.

19.17
In certain instances, co-ordinated/phased application of castable refractory/ insulation on pressure parts etc may be necessitated in consideration of sequence of activities of other erection agencies. Contractor shall do such phased work as may be directed by BHEL.

19.18
Prior to application of refractory bituminous painting on the pressure parts and other area is under Contractor scope. The bituminous paint will be supplied by Contractor. No separate payment will be made for application of paint.

19.19
HRSG casing, inlet and outlet ducts have to be fully insulated at site with ceramic wool and SS cladding on gas flow path side.

19.20
application of wool insulation, sheet metal cladding, welding of hooks/supports to hold insulation covered under this contract, shall include, but are not limited to, the following :-

a) Where indicated, removable type of insulation to be provided for valves, expansion joints, etc. as per the drawings or as directed by BHEL engineer.

b) Wool insulations are received at site as bonded and unbounded mattresses in standard sizes. These are to be dressed / cut to suit work by the contractor.

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

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

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

f) Painting the inner side of aluminum/GI/steel cladding, with anticorrosive paint as specified. The required paint and thinner is in the contractor's scope. Also, all other accessories consumables for painting, cleaning the surfaces etc shall also be arranged by the contractor.

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

h) The skin casing plate's scalloped bars and other materials that are to be matched with the erected components have to be cut and re-welded from the fabricated pieces as incidental to work.

i) wastage allowance for the materials issued shall be as under :-

- Refractory 2%
- Wool insulation 2%
- Cladding sheets 2%

j) The cladding inside the inlet duct, casings etc are of stainless steel material. Some trimming/ finishing required at site during fixing shall also be done as part of work.

19.21

Application of lining and insulation on all piping covered under this Specification is also the part of this work. Similarly, it is applicable for Lining and insulation of TG side auxiliaries such as heaters, de-aerators Etc. However, application of spray insulation on turbine is not in the scope of work.

20 PAINTING

OPaL/EIL Specification for Shop & Field Painting **SECTION C: 4.9, SPECIFICATION No. 6987-0642-PT-F09 Rev 0** with regard to surface preparation and final painting with colour codes / scheme for surface preparation and finish paints coating including primer coating for shop and field painting is attached separately along with this tender specification for ready reference. Contractor shall carry out surface preparation and final painting works as per customer specification and instruction of BHEL engineer at site.

20.1
All the primer, thinner & paints for final painting and all other consumables like brush, cleaning agents etc and all T&P including scaffolding materials, manpower, supervision is in contractor's scope.

20.2
Components of the boiler & auxiliaries will in general be supplied painted by BHEL manufacturing units as per their standard applicable painting schemes. Contractor shall carry out primer and finish painting coats and DFT requirement with colour codes & specifications as per requirement of customer.

All exposed metal parts of the equipment including piping, structures, railings etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by BHEL engineer for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints.

20.3
Painting of 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.

20.4
The scope of work includes painting of colour bands, lettering, marking and signs for 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. Applicable paints and primer shall be supplied by BHEL.

20.5
All exposed metal parts of the equipment including piping, structures, hand railing, grating etc shall be thoroughly cleaned off dust, rust, scales and other foreign materials by manual or mechanized wire brushing, scrapping, sand blasting etc and the same being inspected and approved by BHEL/customer engineer before application of primer. Afterwards, the above parts shall be finish painted with specified number of coats as per specification.

20.6
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.

20.7
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.

20.8
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.

20.9
Specified drying time shall be permitted from one to another coat.

20.10
This work requires working at higher altitudes from ground level to as high as 90 m and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

20.11
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.

20.12
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.

20.13
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/equipments 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, air at one point will be made available by BHEL free. Laying of air hose pipe and any other line required shall be done by Contractor at his cost. The Contractor shall provide spray equipment set.

20.14
The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during execution of the work.

20.15
Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

20.16 RIMER AND PAINTS FOR FINAL PAINTING

Supply of Paints/Primer/Thinner and application of paints for final painting and all other consumables like brush, cleaning agents etc and all T&P including scaffolding materials, manpower, and supervision is in contractor's scope.

21.1
Testing, pre-commissioning, & commissioning will involve, though not limited to these, various testing e.g. hydro-static pressure, pressure decay tests, leak test, trial runs of equipments; flushing by air, water, oil, steam as applicable; checking/setting various clearances/ parameters, ensuring operation of various equipments free of undue restrictions, chemical **(EDTA)** cleaning & alkali boil out of boiler, steam blowing of the boiler and the critical piping, floating of safety valves, coal firing, trial operation and loading etc are some of these activities, flushing of the lines by air, water, oil/lube oil, gas, steam as the case may be; chemical cleaning of various systems & piping; steam blowing of the pipe lines; floating of safety valves, cranking of GT, FSNL run, Barring Gear operation, Synchronization, Trial operation, combined cycle operation and reliability run etc., are some of these activities. All the activities for commissioning of the set, as informed by BHEL from time to time shall be completed.

21.2
All these tests should be repeated till all the equipments satisfy the requirement / obligations of BHEL to their client and also the relevant statutory authority.

21.3
Contractor shall lay / install necessary temporary piping, pumps, valves, blanks, gauges, cables, switches etc for conduct of hydraulic / pressure test, chemical cleaning, steam / air blowing etc. this may involve cutting of some portion of existing piping / valves, placing of rubber wedges / blanks in the valves and other openings, fabrication and installation of temporary tanks for chemical mixing, temporary access platforms to mixing tanks etc. Where required, bends have to be fabricated / formed at site from random length / size of pipes / structural steel. Temporary installation itself has to be tested, tried, and subject to non-destructive examinations as per the instructions of BHEL as part of work**.**

No payment will be made for temporary installations made for hydraulic testing of various systems & piping. Similarly no payment will be made for electrical installations made for any temporary system.

21.4
All materials, equipments necessary for installation of temporary system as above will be supplied by BHEL as free returnable issue in random sizes / lengths. However, servicing, fabrication, erection, dismantling of the same after completion of the process, and handing over back to BHEL stores will be the responsibility of the Contractor.

In accounting of materials following wastage allowances are provided:

1. Structural items : 5%
2. Pipes : 3%

No wastage allowance for valves & other equiptments.

21.5
Fabrication, fit-up, pre-heating, welding, post-weld heating and post-weld-heat treatment if any, of requisite blanks for conduct of hydraulic test / leakage test is part of work. Similarly, removal of blanks, restoration and normalization of the concerned system / line is to be done as part of work.

BHEL will provide the material for blanks free of charge. No separate payment is envisaged for these activities.

21.6
Overhauling, cleaning, servicing of tanks, pumps, equipments, valves, during erection and commissioning stages are in the scope of work. Gaskets, packing & spares for replacement will be provided free of charges by BHEL.

21.7
After chemical cleaning / pickling of lubricating system (including oil piping, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems as per instructions of BHEL engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machinery before and after oil flushing is in the scope of work.

21.8
Transportation of oil drums from customer's / BHEL's stores, filling of oil for flushing, first fill of lubricants and subsequent topping up during trials, tests and commissioning is included in the scope of this contract. The Contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly, for various pre-commissioning / commissioning activities / processes mentioned in various clauses, transport of chemicals from BHEL / customer's stores, charging of chemicals into the system and returning of remaining chemicals and the empty containers of the chemicals to customer / BHEL stores is the responsibility of the Contractor.

21.9
During trial runs/ tests, pre-commissioning / commissioning, replacing / changing mechanical / other seals of equipments like pumps, removal and cleaning / replacing of filters etc is within the scope of work. Replacement spares for this purpose will be provided by BHEL.

21.10
In case any defect is noticed during tests, trial runs of all equipments and their auxiliaries, such as interferences, rubbing, loose components, abnormal noise or vibration, strain on connected equipment etc the Contractor shall immediately attend to these defects and take necessary corrective measures. Readjustment and/or realignment, if necessary, shall be done as per BHEL engineer's instructions. Claim, if any, for these works shall be governed by relevant clauses of 'General Conditions of Contract provided the cause of such work is not attributable to the Contractor.

21.11

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

- ✓ Similarly, during the course of erection, if certain portion of equipments erected by the Contractor has to be undone for enabling other Contractors / agencies of BHEL / customer to carry out their work, Contractor shall carry out such jobs expeditiously and promptly and make good the job after completion of work by other Contractors / agencies of BHEL / customer as per BHEL engineer's / agencies of BHEL / customers instructions. Claims, if any, in this regard shall be governed relevant clauses of 'General Conditions of Contract

21.12

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

21.13
Commissioning activities will continue till the completion of trial operation. During this period Contractor shall make available the services of separate dedicated workforce comprising of suitable skilled and semi-skilled / un-skilled workmen and supervisory staff alongwith necessary tools and plants, consumables etc.

21.14
It shall be specifically noted that the Contractor may have to work round the clock during the pre-commissioning and commissioning period alongwith BHEL Engineers and hence considerable overtime payment is involved. The Contractor's quoted rates shall be inclusive of all these factors.

21.15
The Contractor shall carry out any other tests as desired by BHEL engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or whole of work performed by the Contractor.

21.16
At various stages of completion boiler has to be preserved against corrosion either by wet preservation or by dry preservation as per the requirement of BHEL Engineer. Contractor shall carry out the entire incidental jobs like filling up of water, dozing of chemicals and pressurizing the system to the required pressure, change of gas refills etc. The boilers have a permanent N_2 blanketing arrangement.

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

21.17
Commissioning activities will continue till the completion of trial run, trial operation. During this period Contractor shall make available the services of separate dedicated labor force comprising of suitable skilled and semi/un-skilled hands along with necessary tools and plants, consumables etc.

21.18
It shall be specifically noted that the Contractor may have to work round the clock during the pre-commissioning and commissioning period along with BHEL engineers and hence considerable overtime payment is involved. The Contractor's quoted rates shall be inclusive of all these factors.

21.19
Conducting of performance guarantee test is in the scope of work. Contractor shall install all necessary tapping points, instruments etc and provide necessary assistance in this regard**.**

In case PG test is getting delayed beyond the contract period (normal plus extension if any) due to reasons not attributable to the Contractor, PG test issue will be mutually discussed and decided.

However installation of necessary tapping points, impulse pipes, approaches etc are to be completed by the Contractor.

21.20
The Contractor shall carry out any other tests as desired by BHEL engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or whole of work performed by the Contractor.

18.2 PRESERVATION & PROTECTION OF COMPONENTS

At all stages of work, equipments/materials in the custody of Contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents including the primer & paint, for the above work shall be provided by the Contractor.

18.3
The Contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.

18.4
Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. In case of failure of Contractor in compliance of this requirement, BHEL will make suitable arrangement at Contractor's risk and cost.

18.5
The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc shall be returned to BHEL stores by the Contractor.

18.6
The Contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilization 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.

18.7
For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.