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NOTICE INVITING TENDER

(Document No PS:MSX:NIT)

TENDER NO.: BHEL/NR/SCT/PANKI/STG/1180

NAME OF WORK: ERECTION, TESTING, COMMISSIONING, TRIAL/INITIAL OPERATION AND HANDING OVER OF STEAM TURBINE, GENERATOR, INTEGRAL PIPING AND OTHER AUXILIARIES OF THE SYSTEM INCLUDING BOIs, PUMPS, INSULATION etc. AND FINAL PAINTING OF THE UNIT INCLUDING SUPPLY OF PAINTS OF 1X660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR, U.P.

Bharat Heavy Electricals Limited

Ref: BHEL/NR/SCT/PANKI/STG/1180 **Date: 29/11/2019**

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NOTICE INVITING E-TENDER (NIT)
BIDDER TO SUBMIT OFFERS ON PORTAL
https://bhel.abcprocure.com

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To

Dear Sir/Madam

Sub : NOTICE INVITING E-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. **Salient Features of NIT**

SL NO	ISSUE	DESCRIPTION	
i	**TENDER NUMBER**	**BHEL/NR/SCT/PANKI/STG/1180**	
ii	**Broad Scope of job**	**ERECTION, TESTING, COMMISSIONING, TRIAL/INITIAL OPERATION AND HANDING OVER OF STEAM TURBINE, GENERATOR, INTEGRAL PIPING AND OTHER AUXILIARIES OF THE SYSTEM INCLUDING BOIs, PUMPS, INSULATION etc. AND FINAL PAINTING OF THE UNIT INCLUDING SUPPLY OF PAINTS OF 1X660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR, U.P.**	
iii	**DETAILS OF TENDER DOCUMENT**		
a	Volume-IA	*Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc*	*Applicable*
b	Volume-IB	*Special Conditions of Contract (SCC)*	*Applicable*
c	Volume-IC	*General Conditions of Contract (GCC)*	*Applicable*
d	Volume-ID	*Forms and Procedures*	*Applicable*
e	Volume-II	*Price Schedule (Absolute value).*	*Applicable*
iv	**Issue of Tender Documents**	**From BHEL website (www.bhel.com) and *https://bhel.abcprocure.com*** Tender documents will be available at website till due date of submission.	*Applicable*
v	**DUE DATE & TIME OF OFFER SUBMISSION**	***Date : 10/12/2019 , Time : 15:00 HRS*** ***Place : on https://bhel.abcprocure.com***	*Applicable*
vi	**OPENING OF TENDER**	***At due date / time*** ***Date : 10/12/2019 , Time : 15:30 HRS*** *Notes:* *(1) In case the due date of opening of tender becomes a non-working day, then the due date & time of offer submission and opening of tenders get*	*Applicable*

		extended to the next working day. *(2) Bidder may depute representative to witness the opening of tender.* ***However it being an e-tender it shall be opened online***	
vii	**EMD AMOUNT**	*Rs. 17,04,000/-*	*Applicable*
viii	**COST OF TENDER**	*Rs 2000/-.*	*Applicable*
ix	**LAST DATE FOR SEEKING CLARIFICATION**	***Five days before bid submission due date****.* *Along with soft version also, addressing to contact address given below* ***1)*** *Name:* ***G.V. RAJA SEKHAR*** *Designation: Sr. Manager* *Deptt: SCT* *Address: BHEL-PSNR, PLOT NO. 25, SECTOR – 16A, NOIDA - 201301* *Phone: (Landline) 0120-2416232* *Email : gvr@bhel.in* ***2)*** *Name:* ***DESHRAJ YADAV*** *Designation: Sr. Engineer* *Deptt: SCT* *Address: BHEL-PSNR, PLOT NO. 25, SECTOR – 16A, NOIDA - 201301* *Phone: (Landline) 0120 - 2416261* *Email : deshraj@bhel.in*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**		*Not applicable.*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	*Please refer clause no.15a.*	*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) & portal https://bhel.abcprocure.com **and not in the newspapers**. Bidders to keep themselves updated with all such information	
xiii	**Tender submission**	on portal https://bhel.abcprocure.com	

2. 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, **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. 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 Noida 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 Noida, Sundays and second/ last Saturdays.

As this tender is an E-Tender and no paper bids will be accepted therefore the scanned copy of the Demand Draft or the Cash Receipt issued by BHEL PSNR should be uploaded in the E procurement portal. Hard Copy of the demand draft should reach BHEL PSNR HQ Noida before the due date and time of bid submission. BHEL shall not be responsible for postal or any other delays in this regard.

4. Unless specifically stated otherwise, tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described in Clause no. 1.9 of General Conditions of Contract.

'One Time EMD' will not be considered for this tender. All the bidders who have 'One Time EMD' with BHEL and want to participate in this tender, would also submit the requisite amount of EMD as mentioned in Clause No. 1, Salient Features of NIT, Sl. No. (vii) above.

However, the One Time EMD can be adjusted against the EMD applicable against this tender on specific request of bidder.

For Electronic Fund Transfer the details are as below-:

a) Name of the Beneficiary -: Bharat Heavy Electricals Limited

b) Bank Particulars

i).	Bank Name -:	STATE BANK OF INDIA
ii).	Bank Telephone No.(with STD code)-:	011-23475566
iii).	Branch Address-:	CAG II BRANCH, NEW DELHI 4th & 5th FLOOR, REDFORT CAPITAL, PARASNATH TOWERS, BHAI VEER SINGH MARG, GOLE MARKET, NEW DELHI-110001
iv).	Bank Fax No. (with STD code) -:	011-23475566
v).	Branch Code -:	17313
vi).	9 Digit MICR Code of the Bank Branch -:	110002562
vii).	Bank Account Number -:	10813608647
viii).	Bank Account Type -:	CASH CREDIT
ix).	11 Digit IFSC Code of Beneficiary Branch-:	SBIN0017313

(Note-: In case of E-Tenders, no paper bids shall be accepted, therefore, the scanned copy of the Banker's Cheque/ Demand Draft/ Pay Order/ Details of payment made through Electronic Fund Transfer/ Fixed Deposit Receipt (FDR) / Bank Guarantee should be uploaded in the E-Procurement Portal and hard copy of the same should reach BHEL-PSNR HQ Noida before the due date and time of bid submission. BHEL shall not be responsible for postal or any other delays in this regard.)

5. **Procedure for Submission of Tenders**: This is an E-tender floated online through our E-Procurement Site ***https://bhel.abcprocure.com***. The bidder should respond by submitting their offer online only in our e-Procurement platform at ***https://bhel.abcprocure.com*****.** Offers are invited in two-parts only.

Documents Comprising the e-Tender

The tender shall be submitted online ONLY EXCEPT TENDER FEE & EMD (in physical form) as mentioned below:

a. Technical Tender (UN priced Tender)

All Technical details (eg. Eligibility Criteria requested (as mentioned below)) should be attached in e-tendering module, failing which the tender stands invalid & may be REJECTED. Bidders shall furnish the following information along with technical tender (preferably in pdf format):

- **i.** Tender Cost and Earnest money Deposit (EMD) furnished in accordance with NIT Clause 3.0 & 4.0.
- **ii.** Technical Bid (without indicating any prices).

b. Price Bid:

i. Prices are to be quoted in the attached Price Bid format online on e-tender portal.
ii. The price should be quoted for the accounting unit indicated in the e-tender document.
iii. Note: It is the responsibility of tenderer to go through the Tender document to ensure furnishing all required documents in addition to above, if any. Any deviation would result in REJECTION of tender and would not be considered at a later stage at any cost by BHEL.
iv. A person signing (manually or digitally) the tender form or any documents forming part of the contract on behalf of another shall be deemed to warrantee that he has authority to bind such other persons and if, on enquiry, it appears that the persons so signing had no authority to do so, the purchaser may, without prejudice to other civil and criminal remedies, cancel the contract and hold the signatory liable for all cost and damages.
v. A tender, which does not fulfil any of the above requirements and/or gives evasive information/reply against any such requirement, shall be liable to be ignored and rejected.
vi. In case offer is sent through hard copy/fax/telex/cable/electronically in place of e-tender, same shall not be considered.

DO NOT"S

Bidders are requested NOT to submit the hard copy of the Bid. In case offer is sent through hard copy/fax/telex/cable/electronically in place of e-tender, the same shall not be considered. **Also, uploading of the price bid in prequalification bid or technical bid may RESULT IN REJECTION of the tender**.

Digital Signing of e-Tender

Tenders shall be uploaded with all relevant PDF/zip format. The relevant tender documents should be uploaded by an authorized person having Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION digital signature certificate (DSC).

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The Requirement:

1. A PC with Internet connectivity &
2. DSC (Digital Signature Certificate)(**Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION**)

BHEL has finalized the e-procurement service Provider-:

M/s AbcProcure, Ahmedabad

A-202/208, Wall Street-II, Opp. Orient Club, Nr. Gujarat College,

Ellis Bridge, Ahmedabad-380006

The contact details of the service provider are given below:

Name	Contact Nos.	e-mail ID	Role	Location
Swapnil Hamilton	+91 79 40270549	swapnil.h@eptl.in	Support Executive	HO – Ahmedabad
Hardik Oza	+91 79 40270560	Hardik.oza@eptl.in	Support Executive	HO – Ahmedabad
Ankur Bhatt	+91 79 40270590	ankur.bhatt@eptl.in	Support Executive	HO – Ahmedabad
Prashant Rajyaguru	+91 79 40270545 / 9016859416	prashant@eptl.in	Ast. Manager – Implementation & Support	HO – Ahmedabad
Dharam Rathod	+91 79 40270596 / 9374519754	dharam@eptl.in	Manager – Implementation & Support	HO – Ahmedabad
Pradip Parmar	+91 79 40270532 / 9328657215	pradip@eptl.in	Sr Manager – Implementation & Support	HO – Ahmedabad
Devang Patel	+91 79 40270576 / 99983 05442	devang@eptl.in	Sr Manager – Implementation & Support	HO – Ahmedabad

The process of utilizing e-procurement necessitates usage of **DSC (Digital Signature Certificate) (Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION)** and you are requested to procure the same immediately, if not presently available with you. Please note that only with DSC, you will be able to login the e-procurement secured site and take part in the tendering process.

1. The contact details of the DSC Certifying Authority as given below

1	**GNFC**	www.ncodesolutions.com
2	**e-Mudhra**	http://www.e-Mudhra.com
3	**Safescrypt**	www.safescrypt.com

Vendors are also requested to go through seller manual available on ***https://bhel.abcprocure.com***.

6. **Not Used**

7. 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. 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. **Assessment of Capacity of Bidders:**

Bidder's 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 cut off month for reckoning 'Load' shall be the 3rd Month preceding the month corresponding to the 'latest date of bid submission', in the following manner -

(**Note:** For example, if latest bid submission is in Jan 2017, then the 'load' shall be calculated up to and inclusive of Oct 2016)

Total number of Packages in hand = Load (P)

Where 'P' is the sum of all unit wise identified packages (refer table-1) under execution with BHEL Regions as on the cut off month defined above, including packages yet to be commenced, excepting packages which are on Long Hold.

II. **PERFORMANCE**: Here 'Monthly Performance' of the bidder for all the packages (under execution/ executed during the 'Period of Assessment' in all 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 and including the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the 3rd Month preceding the month corresponding to 'latest date of bid submission', in the following manner:

(**Note**: For example, if 'latest date of bid submission' is in Jan 2017, then the 'performance' shall be assessed for a 6 months' period up to and inclusive of Oct 2016 (i.e. from May 2016 to Oct 2016), for all the unit wise identified packages (refer Table -1))

i). Calculation of Overall 'Performance Rating' for 'Similar Package/Packages' for the tendered scope under execution at Power Sector Regions for the 'Period of Assessment':

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

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. $\mathbf{T_T} = T_1 + T_2 + T_3 + T_4 + \ldots T_N$)

c) Sum 'S_1 'of 'Monthly Performance Evaluation' Scores ($S_{1\text{-}1}$, $S_{1\text{-}2}$, $S_{1\text{-}3}$, $S_{1\text{-}4}$, $S_{1\text{-}5}$…. $S_{1\text{-}T1}$) for similar package P_1, for the 'period of assessment' 'T_1' (i.e. $S_1 = S_{1\text{-}1} + S_{1\text{-}2} + S_{1\text{-}3} + S_{1\text{-}4} + S_{1\text{-}5} + \ldots S_{1\text{-}T1}$). 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 '$\mathbf{P_T}$' for all Regions (i.e. 'S_T '$= S_1 + S_2 + S_3 + S_4 + S_5 + \ldots S_N$.)

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

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

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

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 → (under execution/ executed during period of assessment)	P_1	P_2	P_3	P_4	P_5	…	P_N	Total No. of similar packages for all Regions = $\mathbf{P_T}$ i.e. 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 Packages (as in row 1)	T_1	T_2	T_3	T_4	T_5	…	T_N	Sum (Σ) of columns (iii) to (ix) = $\mathbf{T_T}$

Sl. No.	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
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 corresponding period (as in row-3)	S_1	S_2	S_3	S_4	S_5	…	S_N	Sum (Σ) of columns (iii) to (ix) = $\mathbf{S_T}$

ii). Calculation of Overall 'Performance Rating' ($\mathbf{R_{BHEL}}$) in case at least 6 evaluation scores for 'similar Package/Packages' for the tendered scope ARE NOT AVAILABLE, during the 'Period of Assessment':

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for ALL the packages, divided by the total number of Package months for which evaluation should have been done. 'R_{BHEL}' shall be calculated subject to availability of 'performance scores' for at least 6 'package months' in the order of precedence below:

a) 'Period of Assessment' i.e. 6 months preceding and including the cut-off month
b) 12 months preceding and including the cut-off month
c) 24 months preceding and including the cut-off month

In case, R_{BHEL} cannot be calculated as above, then Bidder shall be treated as 'NEW VENDOR'. Further eligibility and qualification of this bidder shall be as per definition of 'NEW VENDOR' described in 'Explanatory Notes'.

iii). Factor "L" assigned based on Overall Performance Rating (R_{BHEL}) at Power Sector Regions:

Sl. no.	Overall Performance Rating (R_{BHEL})	Corresponding value of 'L'
1	=60	NA
2	> 60 and ≤ 65	0.4
3	> 65 and ≤ 70	0.35
4	> 70 and ≤ 75	0.25
5	> 75 and < 80	0.2
6	≥ 80	NA

III. 'Assessment of Capacity of Bidder':

'Assessment of Capacity of Bidder' is based on the Maximum number of packages for which a vendor is eligible, considering the performance scores of similar packages, as below:

Max number of packages P_{Max}= (R_{BHEL} - 60) divided by corresponding value of 'L', i.e. (R_{BHEL}- 60)/L

Note:

i). In case the value of P_{Max} results in a fraction, the value of P_{Max} is to be rounded off to next whole number
ii). For R_{BHEL} = 60, P_{Max} = '1'
iii). For R_{BHEL} ≥ 80, there will be no upper limit on P_{Max}

The Bidder shall be considered 'Qualified' as per 'Assessment of Capacity of Bidder' for the subject Tender if $P \leq P_{Max}$
(Where P is calculated as per clause 'I' above)

Note: For the transition period of 1 year (i.e. for all the NITs floated between 11th May 2019 to 10th May 2020), in addition to above, 'Assessment of Capacity of Bidder' shall also be calculated considering 'performance scores' till 36 months as per Sl. no II ii).

Higher of the results obtained out of both shall be considered for 'Assessment of Capacity of Bidder'.

IV. **Explanatory note**:

i). Similar package means Boiler or ESP or Piping or Turbine or Civil or Structure or Electrical or C&I 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, C&I, 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 (i.e. Boiler, ESP and Power Cycle Piping) and finally the Bidder's capacity to execute the tendered scope is assessed in line with III above.

ii). Identified Packages (Unit wise)

Table-1

Civil	Electrical and C&I	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). C&I iii). Others (Elect. and C&I)	i). Boiler & Aux (All types including CW Piping if applicable) ii). Power Cycle Piping/Critical Piping iii). ESP iv). LP Piping 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 Management x). Others (Mechanical)

iii). Bidders who have not been evaluated for at least six package months in the last 24 months preceding and including the Cut-off month in the online BHEL system for contractor performance evaluation in BHEL PS Regions, shall be considered "NEW VENDOR".

A 'NEW VENDOR' shall be considered qualified subject to satisfying all other tender conditions.

A 'NEW VENDOR' if awarded a job (of package/packages identified under this clause) shall be tagged as "FIRST TIMER" on the date of first LOI/LOA from BHEL.

The "FIRST TIMER" tag shall remain till completion of all the contracts against which vendors has been tagged as First Timer or availability of 6 evaluation scores within last 24 months preceding and including the cut-off month in the online BHEL system for contractor performance evaluation in BHEL PS Regions.

A Bidder shall not be eligible for the next job as long as the Bidder is tagged as "FIRST TIMER" excepting for the Tenders which have been opened on or before the date of the bidder being tagged as 'FIRST TIMER'.

After removal of 'FIRST TIMER' tag, the Bidder shall be considered 'QUALIFIED' for the future tenders subject to satisfying all other tender conditions including 'Assessment of Capacity of Bidders'.

iv). Consequent upon applying the criteria of 'Assessment of Capacity of Bidders' detailed above on all the bidders qualified against Technical and Financial Qualification criteria, if the number of qualified bidders reduces to less than four, then for further processing of the Tender, BHEL at its discretion reserves the right to also consider the bidders who are "not qualified" as per criteria of 'Assessment of Capacity of Bidders' and for this, procedure described in following three options shall be followed:

a) All the bidders having Overall Performance Rating ('R_{BHEL}') ≥60 shall be considered qualified against criteria of 'Assessment of Capacity of Bidders'.
b) If even after using option "a", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a", "First timer" bidders having average of available performance

scores ≥60 upto and including the Cut Off month shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.

c) If even after using option "a" and "b", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a" and "b", "First timer" bidders for whom no performance score is available in the system upto and including the Cut Off month, shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.

Note:- In case, the number of bidders qualified against Technical and Financial Qualification criteria itself is less than four, then all bidders (a)- having Overall Performance Rating ('R_{BHEL}') ≥60, (b)- First timer" bidders having average of available performance scores ≥60 upto and including the Cut Off month, (c)- "First timer" bidders for whom no performance score is available in the system upto and including the Cut Off month, shall be considered qualified against criteria of 'Assessment of Capacity of Bidders' for further processing of tender.

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

a. Up to execution of 90% of anticipated Contract Value in case of Civil, MM, Structural and Turbo Blower Packages

b. Up to Steam Blowing in case of Boiler/ESP/Piping Packages

c. Up to Synchronization in all Balance Packages

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

vi). Contractor shall provide the latest contact details i.e. mail-ID and Correspondence Address to SCT Department, so that same can be entered in the Contractor Performance Evaluation System, and in case of any change/discrepancy same shall be informed immediately. Login Details for viewing scores in Contractor Performance Evaluation System shall be provided to the Contractor by SCT Department.

vii). Performance Evaluation for Activity Month shall be completed in Evaluation Month (i.e. month next to Activity Month) or in rare cases in Post Evaluation Month (i.e. month next to Evaluation Month) after approval from Competent Authority. In case scores are not acceptable, Contractor can submit Review Request to GM Site/ GM Project latest by 25th of Evaluation Month or 3 days after approval of score, whichever is later. However, acceptance/rejection of 'Review Request' solely depends on the discretion of GM Site/GM Project. After acceptance of Review Request, evaluation score shall be reviewed at site and the score after completion of review process shall be acceptable and binding on the contractor.

viii). Project on Hold due to reasons not attributable to bidder -

a. **Short hold:** Evaluation shall not be applicable for this period, however Loading will be considered.

b. **Long hold:** Short hold for continuous six months and beyond or hold on account of Force Majeure shall be considered as Long Hold. Evaluation as well as Loading shall not be considered for this period.

ix). 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. 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. For any clarification on the tender document, the bidder may seek the same over e-procurement portal 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. 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. 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. Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.

15. 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 Clause No. 1, Salient Features of NIT, Sl. No. (xi) above.**

15a **Integrity Pact (IP)**

i) IP is a tool to ensure that activities and transactions between the Company and its Bidders / Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitor (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl. No.	IEM	Address	Email
1.	Shri Arun Chandra Verma, IPS (Retd.)	Flat No. C -1204, C Tower, Amrapali, Platinum Complex, Sector 119, Noida (U.P.)	acverma1@gmail.com
2.	Shri Virendra Bahadur Singh, IPS (Retd.)	H. No. B-5/64, Vineet Khand, Gomti Nagar, Lucknow - 226010	vbsinghips@gmail.com

ii) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

iii) Please refer Section-8 of the IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to the above IEM. All correspondence with the IEM shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are as per **Clause No. 1, Salient Features of NIT, Sl. No. (ix) above.**

16. 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. In case BHEL decides on a `Public Opening', the date & time of opening of the 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. 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. (a) BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

(b) Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

(c) The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. **The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.**

(d) If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

(e) If reverse auction process is unsuccessful, sealed envelope price bids of all the techno-commercially qualified bidders shall be opened and the tender shall be processed accordingly. However, the envelope sealed bid(s) of techno-commercially acceptable bidder(s) who had agreed to participate in the RA and had failed to submit the online sealed bid shall not be opened.

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

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

23. **Not Applicable**

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

26. It may please be noted that guidelines/rules in respect of Suspension of Business dealings', 'Vendor evaluation format', 'Quality, Safety & HSE guidelines', milestone/ completion certificate, etc may undergo change from time to time and the latest one shall be followed. The abridge version of extant 'Guidelines for suspension of business dealings with suppliers/ contractors' is available on www.bhel.com on "**supplier registration page**".

27. The offers of the bidders who are on the banned/ hold list as also the offer of the bidders, who engage the services of the banned/ hold firms, shall be rejected. The list of **banned/ hold firms** is available on BHEL web site www.bhel.com

27.1 Integrity commitment, performance of the contract and punitive action thereof:

27.1.1 **Commitment by BHEL:**
BHEL commits to take all measures necessary to prevent corruption in connection with the tender Process and execution of the contract. BHEL will during the tender process treat all Bidder(s) in a transparent and fair manner, and with equity.

27.1.2 **Commitment by Bidder/ Supplier/ Contractor:**

(i) The bidder/ supplier/ contractor commit to take all measures to prevent corruption and will not directly or indirectly influence any decision or benefit which he is not legally entitled to nor will act or omit in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India.

(ii) The bidder/ supplier/ contractor 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 and shall adhere to relevant guidelines issued from time to time by Govt. of India/ BHEL.

(iii) The bidder/ supplier/ contractor will perform/ execute the contract as per the contract terms & conditions and will not default without any reasonable cause, which causes loss of business/ money/ reputation, to BHEL.

If any bidder/ supplier/ contractor during pre-tendering/ tendering/ post tendering/ award/ execution/ post-execution stage indulges in mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the prices or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India, then, action may be taken against such bidder/ supplier/ contractor as per extent guidelines of the company available on www.bhel.com and / or under applicable legal provisions.

28. **NOT APPLICABLE.**

29. The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

30. **PREFERENCE TO MAKE IN INDIA:**
For this procurement, Public Procurement *(Preference to Make in India), Order 2017 dated 15.06.2017 & 28.05.2018* and subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/ PO/ WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable.

31. Order of Precedence

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

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

for BHARAT HEAVY ELECTRICALS LTD

(SCT)

Enclosure:-

(i) Annexure-1: Pre Qualifying criteria.
(ii) Annexure-2: Check List.
(iii) Annexure-3: Authorization of representative who will participate in the online Reverse Auction Process
(iv) Annexure-4: Feedback form
(v) Annexure-5: Integrity Pact.
(vi) Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFYING REQUIREMENTS

JOB	**ERECTION, TESTING, COMMISSIONING, TRIAL/INITIAL OPERATION AND HANDING OVER OF STEAM TURBINE, GENERATOR, INTEGRAL PIPING AND OTHER AUXILIARIES OF THE SYSTEM INCLUDING BOIs, PUMPS, INSULATION etc. AND FINAL PAINTING OF THE UNIT INCLUDING SUPPLY OF PAINTS OF 1X660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR, U.P.**
TENDER NO.	BHEL/NR/SCT/PANKI/STG/1180

SL NO	NAME AND DESCRIPTION OF PRE QUALIFICATION CRITERIA	
A	Submission of Integrity Pact	Applicable
B	Assessment of Capacity of bidder to execute the work as per clause 9.0 pf NIT	Applicable – by BHEL
C	**TECHNICAL :** Bidder who wish to participate should have **EXECUTED One STG job of ≥400 MW.**	Applicable
D	**FINANCIAL :**	Applicable
D-1	**TURNOVER:** Bidders must have achieved an average annual financial turnover (Audited) of Rs. 255.60 Lakhs or more over last three Financial Years (FY) i.e. (2016-2017, 2017-2018, 2018- 2019). Bidder shall submit audited accounts (balance sheets and profit & loss account) in support of this. In case audited financial statements have not been submitted for all the three years as indicated 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 If Financial Statements are not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by Charted Accountant.	Applicable
D-2	**NET WORTH** Net worth (only in case of companies) of the Bidder based on the latest Audited Accounts as furnished for 'D-1' above should be positive. Net Worth = Paid up share capital* + Reserves. (*: Share Capital OR Partnership Capital OR Proprietor Capital as the case may be.)	Applicable
D-3	**PROFIT** Bidder must have earned profit in any one of the three financial years as applicable in the last three financial years defined in 'D-1' above. PROFIT shall be PBT earned during any one year of last three financial years as in 'D-1' above.	Applicable

D-4	Bidder must not be under Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR, which will render him ineligible for participation in this tender, and shall submit undertaking to this effect.	Applicable
E	**Approval of Customer**	**Applicable**
F	**Consortium Criteria**	**Not Applicable**

Explanatory Notes for QR 'C'

1. For evaluation of PQR, the credentials of the bidder alone, and not that of the Group Company shall be considered.
2. Completion date for achievement of the Technical Criteria should be in the last 7 years ending on the 'latest date of Bid Submission' of Tender irrespective of date of start of work.
3. '**EXECUTED**' means **"SYNCHRONISATION"**. The bidder should have achieved this criteria, even if the total contract has not been completed or closed.

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 ORDER AND WORK COMPLETION CERTIFICATE ETC IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

ANNEXURE - 2

CHECK LIST

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

1	**Name of the Tenderer**	
2	**Address of the Tenderer**	
3	**Type of the Firm/ Company**	
(i)	In case of Individual Tenderer	His / her full name, address and place & nature of business shall be furnished along with the offer.
(ii)	In case of Partnership Firm	The names of all the partners and their addresses, A copy of the partnership deed/instrument of partnership dully certified by the Notary Public shall be furnished along with the offer..
(iii)	In case of Companies	a) Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished). b) Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.
4.a	**Details of Contact person for this Tender**	Name : Mr/ Ms Designation: Telephone No: Mobile No: Email ID: Fax No:
4.b	**Details of alternate Contact person for this Tender**	Name : Mr/ Ms Designation: Telephone No: Mobile No: Email ID: Fax No:
5	**EMD DETAILS**	Mode of payment: Demand Draft/ NEFT/ RTGS/ OTHER Details of Transaction:
6	**Validity of Offer**	TO BE VALID FOR **SIX MONTHS** FROM DUE DATE

	DESCRIPTION	**APPLICABILITY (BY BHEL)**	**ENCLOSED BY BIDDER**
7	Whether all pages of the Tender documents including annexures, appendices etc are read and understood	Applicable	YES / NO
8	Whether the format for compliance with **PRE QUALIFICATION CRITERIA** (ANNEXURE – 1) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
9	Audited Balance Sheet and profit & Loss Account for the last three years	Applicable	YES / NO
10	Copy of PAN Card	Applicable	YES / NO
11	Copy of GST registration	Applicable	YES / NO

SL. NO.	DESCRIPTION	APPLICABILITY (BY BHEL)	ENCLOSED BY BIDDER
12	Organization Chart of the tenderer's organization, including the names, addresses and contact information of the Directors/Partners shall be furnished along with the offer.	Applicable	YES / NO
13	Integrity Pact	Applicable	YES / NO
14	Offer forwarding letter / tender submission letter ***[Form No. F-01 (Rev 00)]***	Applicable	YES / NO
15	Declaration by Authorised Signatory ***[Form No: F-02 (Rev 00)]***	Applicable	YES / NO
16	Declaration by Authorised Signatory regarding Authenticity of submitted documents ***[Form No: F-02A (Rev 00)]***	Applicable	YES / NO
17	No Deviation Certificate ***[Form No: F-03 (Rev 00)]***	Applicable	YES / NO
18	Declaration confirming knowledge about Site Conditions ***[Form No: F-04 (Rev 00)]***	Applicable	YES / NO
19	Declaration for relation in BHEL ***[Form No: F-05 (Rev 00)]***	Applicable	YES / NO
20	Non-Disclosure Certificate ***[Form No: F-06 (Rev 00)]***	Applicable	YES / NO
21	Bank Account Details for E-Payment ***[Form No: F-07 (Rev 00)]***	Applicable	YES / NO
22	Format for seeking clarification ***[Form No: F-08 (Rev 00)]***	Applicable	YES / NO
23	Capacity Evaluation of Bidder for current Tender ***[Form No: F-09 (Rev 00)]***	Applicable	YES / NO
24	Power of Attorney for Submission of Tender/Signing Contract Agreement ***[Form No: F-25 (Rev 00)]***	Applicable	YES / NO
25	Analysis of Unit rates ***[Form No: F-26 (Rev 00)]***	Applicable	YES / NO
26	Tie Ups/Consortium Agreement are submitted as per format ***[Form No: F-22 (Rev 00)]***	Not Applicable	YES / NO

NOTE : STRIKE OFF 'YES' OR 'NO', AS APPLICABLE. TENDER NOT ACCOMPANIED BY THE PRESCRIBED **ABOVE APPLICABLE DOCUMENTS** ARE LIABLE TO BE SUMMARILY REJECTED.

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

ANNEXURE - 3

Authorization of representative who will participate in the on line Reverse Auction Process;

1	NAME & DESIGNATION OF OFFICIAL	
2	POSTAL ADDRESS (COMPLETE)	
3	TELEPHONE NOS. (LAND LINE & MOBILE BOTH)	
4	FAX NO.	
5	E-MAIL ADDRESS	
6	NAME OF PLACE/ STATE/ COUNTRY, WHEREFROM S/HE WILL PARTICIPATE IN THE REVERSE AUCTION	

ANNEXURE – 4

Feedback Form: From where did you get information reg. this tender

1	NEWSPAPER ADVERTISEMENT (NAME)	
2	BHEL WEBISTE (TENDER NOTIFICATION)	
3	CENTRAL PUBLIC PROCUREMENT PORTAL OF GOVERNMENT OF INDIA (CPP PORTAL)	
4	EMAIL COMMUNICATION FROM BHEL	
5	ANY OTHER SOURCE	

BHEL-IP

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 or 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 self 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)/ Contractor(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 Indian Penal Code (IPC) and Prevention of Corruption 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 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(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.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion 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 the separate "Guidelines on Banning 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 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 this 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 Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.

6.2 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 /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, 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)/ Contractor(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) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings 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 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

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

8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.

8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption 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.

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

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

Section 9 - Pact Duration

9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.

9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified 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 remainder 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

(Office Seal)

For & On behalf of the Bidder/ Contractor

(Office Seal)

Place----------

Date----------

Witness:_____

(Name & Address) _____

_____

Witness:_____

(Name & Address) _____

_____

वी. के. गुप्ता/V. K. GUPTA
अपर महाप्रबंधक (उप संविदा एवं क्रय)
Addl.General Manager (SCP)
भारत हेवी इलेक्ट्रिकल्स लिमिटेड, पावर सेक्टर-उत्तरी क्षेत्र
Bharat Heavy Electricals Ltd., Power Sector-Northern Region
प्लॉट सं.25, सेक्टर-16ए, नोएडा/Plot No.25, Sec.16A, Noida

TECHINICAL CONDITIONS OF CONTRACT

OF

ERECTION, TESTING, COMMISSIONING, TRIAL/INITIAL OPERATION AND HANDING OVER OF STEAM TURBINE, GENERATOR, INTEGRAL PIPING AND OTHER AUXILIARIES OF THE SYSTEM INCLUDING BOIs, PUMPS, INSULATION etc. AND FINAL PAINTING OF THE UNIT INCLUDING SUPPLY OF PAINTS

OF

1X660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR, U.P.

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
Power Sector – Northren Region,
Plot No. 25 , Sector - 16A,
Distt. Gautam Buddh Nagar,
NOIDA – 201 301 (INDIA)

TECHNICAL CONDITIONS OF CONTRACT (TCC)
INDEX

Sl. No.	Title	Description
1	Owner	**UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED (UPRVUNL), LUCKNOW**
2	Project Title	Panki Thermal Power Station (1X660 MW)
3	Project Site Location	Panki, Kanpur, U.P., India
4	Nearest Railway Station	Panki (5 Km.)
5	Nearest Airport	Kanpur (25 Km.), Lucknow (80 Km.)
6	Extreme Recorded DBT	Maximum (47.3^{o}C) , Minimum (-0.9^{o}C)
7	Average Relative Humidity	Annual Average (65%)
8	Rainfall	Annual Average (832.6 mm)
9	Nearest Water Body	Lower Ganga Canal (adjacent to site)
10	Basic Wind Speed	47.0 m/s (As per IS: 875 Part-III)
11	Seismic Data	Zone-III (As per IS: 1893)

2.0 SCOPE OF WORK

2.1 BHEL has been awarded the work of Design, Engineering, Supply, Erection, Testing & Commissioning of 1X660 MW Panki Thermal Power Station Extension at Panki, Kanpur, U.P. by **UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED (UPRVUNL)**.

2.2 Scope of work under this tender specification consists of Handling and collection of material from BHEL/client's stores and storage yard, Transportation to site, inspection, preparation of foundation, erection, levelling, centering, alignment, final alignment of Steam turbine, Turbo generator and auxiliaries including associated BOI, preassembly, erection, alignment, welding, NDT, fixing hangers & supports, oil flushing, water flushing, hydro testing, & steam blowing of integral piping, oil piping and Oil Room, H2, CO2, Water cooling system, Pre assembly, erection, welding, NDT of water cooled Condenser, feed water storage tank, de-aerator etc., Erection of LP/HP heaters, GSC & other coolers, flash tanks etc., CW piping from (Terminal point is appx 15 metre outside A-Row) including RE joints, bellows, BFVs, COLTCS & associated equipment/systems of condenser, CW, erection and commissioning of Motor Driven & Turbo Driven Boiler feed pumps, Motor driven Condensate Extraction Pumps, CW pumps, ECW pumps, ACW pumps, Firefighting Pumps, Misc Pumps, Misc Cranes, Hoists, Workshop equipment & associated surface finish, supply & application of primer & finish paints / Anti corrosive / steam wash paints including labelling on equipment & piping, pre-commissioning, commissioning, trial/initial operation & handing over of Steam Turbine, Generator and Auxiliaries of **1x660 MW Panki Thermal Power Project at Panki, Kanpur.**

2.3 **The scope of the work under these specifications broadly consists of but not limited to following:**

1. Transportation of materials from site store/yard, place of unloading, safe storage with watch & ward, erection and commissioning of the system.
2. Checking, Dressing, Chipping, Leveling of foundations
3. Pre-assembly, Erection, Alignment of various equipment and machining.
4. Welding, Heat Treatment, Radiography, UT and Non-Destructive Tests, as per approved documents / FQP.
5. Erection and commissioning of Main Turbine (HP, IP, LP (02 No.'s)) with all auxiliaries.
6. Erection and Commissioning of Generator and Auxiliaries.

7. Erection and Commissioning of all BFPs (Turbine-driven + Motor Driven) and auxiliaries.
8. Erection and commissioning of all CEPs along with suction strainers, Motors and other auxiliaries.
9. Erection and commissioning of all MISC pumps including CW, DMCW, ACW pumps, Drip pumps, Firefighting pumps etc.
10. Erection and commissioning of Gland Steam Condenser, Drain Cooler, LP Heaters, HP Heaters.
11. Erection and Commissioning of Condenser with extraction steam piping and air extraction piping inside condenser steam space up to condenser walls, including Erection, Commissioning & load testing of Condenser water box handling arrangement.
12. Erection, Commissioning of Condenser on load tube cleaning systems and self-cleaning strainers including interconnecting piping, skids and Panels.
13. Generator Stator shifting from Trailer / Outside A-row to the foundation on TG floor with the help of Portal Gantry Crane.
14. Erection (Shifting, Assembly, Welding and NDT) and Commissioning of De-aerator and Feed Storage Tank with platform and accessories.
15. Erection and Commissioning of associated integral Piping of all auxiliaries such as BFP's Lube Oil, Working Oil and control Oil piping for TD BFP's, other interconnecting piping along with valves, fittings, H&S & insulation etc.
16. Assistance in Grouting of all equipment's as per requirement.
17. Insulation of all equipment's covered under this scope as per Drawing/ design requirement, machineries and other resources as required to carry out the job. The insulation of HWR supplied equipment and piping (chapter-X) is not in the scope of this contract. Though for Haridwar scope of equipment and piping, the application of insulation is not in the scope of this contract, but the transportation of the HWR scope insulation material and arrangement of scaffolding for the insulation of equipment and integral piping is in the scope of this contract.
18. Erection and Commissioning of Auxiliaries of Turbine, Generator, BFPs and other systems.
19. Erection, Commissioning of Turbine and Generator Integral piping such as lube oil, governing oil, Generator seal oil system, gas system, Overload pipelines, Jacking oil system, control fluid system, Primary Water system, dirty/ waste fluid system, Chemical dosing system, Gland steam system - for main turbine (for Hardwar portion of supply) and drive turbines of BFPs (for Hyderabad portion of Supply),

Water drainage system, Turbine Governing System with Valves and their Actuators, LP Bypass System with Valves and control system, CRH NRV's with servomotors/actuators and integral piping of other systems, tanks and equipment's as per scope.

20. Condenser Evacuation system for the 02 condensers of each Unit i.e. 04 x100% Vacuum pumps for 01 Unit, with connected piping and other integral piping for each condenser such as Vacuum Breaker line with Valves.
21. Erection and Commissioning of PHE's, Coolers, chemical dosing skids such as NaOH, Oxygen, Ammonia, Hydrazine etc., Self-cleaning strainers, Erection, Welding and NDT of Extraction piping such as LP Extraction A1,A2,A3 with sheathing and compensators etc.
22. Erection and commissioning of HT and LT motors of the equipment's and auxiliaries, inclusive of CT mounting, testing etc. The greasing of these motors is in the scope of this contract. Complete Field Testing as per requirement of these motors is also in the scope of this contract including supply of the test kits and reqd. equipment and consumables.
23. Assistance during Chemical cleaning of 80 Group piping and associated testing plus related activities of different system and normalization.
24. Arrangement of fixing of steam blowing and hydro-test blanks and restoration in Valves/strainers including removal / restoration in ESV-CV, IV-CV and Over Load lines etc. The assembly and dis-assembly of strainers in valves is also in the scope.
25. Erection of Platforms (with grating, railing, toe-guards and stairs) for safe approach and operation of auxiliaries and valves, as per BHEL and customer requirement etc.
26. Erection of equipment handling systems, other than that supplied by MU's/Vendors.
27. Flushing, cardboard blasting, steam blowing/washing, acid prickling, hydro-test related testing, pre-commissioning, commissioning activities of lube oil system, governing oil, gas systems, water lines and other systems of Turbine, Generator, Condenser, BFP and other auxiliaries. This includes preparation for flushing, hydro-test, chemical cleaning, steam blowing, other cleaning activities, actual execution of the activities, normalization etc.
28. Setting and commissioning of governing system of Main Turbine and Drive Turbines.
29. Erection and commissioning of drive turbine BFP's with associated auxiliaries such as Gear Box, Lube Oil Consoles, EOP,JOP systems, centrifuge, Oil Accumulators,

Governing Consoles ,transition Pieces and enclosure etc. Erection, welding and NDT of ME Joints (Bellows) and BF Valves of exhaust system of drive Turbine.

30. Erection and commissioning of Single girder EOT/HOT Misc cranes, Electric Hoists, Chain pulley blocks , Workshop equipment.
31. Preparation of MIRs, following of safety and quality norms and documentation, preparation of material status and up-gradation of activities, networks at regular intervals.
32. Erection and commissioning of all miscellaneous tanks of water/ oil/ steam /waste systems.
33. **Assistance during PG testing of main equipment along with all auxiliaries,** Supply of Manpower during PG Test for installing of Temp and Pressure gauge Sensors, Mounting of thermo-wells etc.
34. Completion of punch points and assistance for handing over of unit (s) to customer. Execution of all Mechanical jobs identified during OWNER Technical audits, check list of pre-commissioning and commissioning. Erection of additional supports required to restrain pipe movement avoiding interference with nearby structural / piping.
35. Unit trial/initial operation of equipment, systems, of 660 MW Unit as a whole, resolving any deficiencies observed and handing over of **1x660 MW Panki Thermal Power Project at Panki, Kanpur, U.P.**
36. Dewatering inside Power house building / CW/CEP pit, TG building, Pumphouse or any other erection area under scope for equipment erection facilitating is in contractor scope, inclusive of providing de-watering pump.
37. Arranging statutory co-ordination for IBR related activities, if any.
38. Insulation, Touch up and finish painting include supply of paints, etc.
39. Assistance during chemical cleaning , alkali boil out, acid cleaning and passivation, PG test as per scope given in the tender
40. Steam Blowing and Safety Valve Floating including Erection and Dismantling of all temporary Piping, Valves, etc required for above operations and other commissioning activities including post commissioning operations and stabilization of the unit.
41. Unit Trial/Initial Operation, resolving any deficiencies observed and Handing over of Power Cycle Piping, LP Piping and all associated piping at **1x 660MW Panki TPS, Panki, Kanpur, UP.**
42. For further detailed scope of works refer relevant chapters in this book

2.4 **CONTRACTOR SCOPE OF WORKS ALSO INCLUDES THE FOLLOWING**

2.4.1 The scope also includes erection and commissioning of Piping including pipes, valves, flanges, fittings, fasteners etc. as required, making the system complete.

2.4.2 Preassembly, erection, testing, commissioning, trial/initial operation and reliability operation of equipment.

2.4.3 Lifting, laying, erection, bolt tensioning, bolt torque tightening, supporting and installation, pre and post weld heat treatment, inspection, non-destructive testing including radiography and hydrostatic test, water / steam flushing, air drying, nitrogen purging of all valves and other miscellaneous in line / on line items is also included. Open ends and other testing of piping installations, above and below ground (if any).

2.4.4 Cleaning, pickling, if required, water / steam flushing, air drying disposal of fluids offsite, reinstatement, preservation of piping and miscellaneous items following hydro test, nitrogen purging, cleaning, chemical cleaning, painting, insulation, as per specifications.

2.4.5 Execute painting and Labelling/stencilling of all equipment, piping (including small bore piping), and structures like platform, pipe rack.

2.4.6 Execute all mechanical jobs identified during OWNER / Licensors check list, Technical audits, pre-commissioning and commissioning, including additional supports required to restrain pipe movement avoiding interference with nearby structural / piping.

2.4.7 Obtain clearances and approvals as and when required from applicable statutory / Government agencies under the scope of this contract.

2.4.8 Installation of any necessary blind or additional valves to isolate lines to facilitate phased commissioning and start-up.

2.4.9 Testing of welds/flanged joints.

2.4.10 Preparation of As-Built Drawings.

2.4.11 Execute final painting including supply of paints, painting of all equipment, piping, and structures like platforms, structures etc.

2.4.12 Temporary lines for chemical cleaning shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification.

2.4.13 Temporary lines for Steam blowing shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding has to be arranged by the contractor at the within quoted rate. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.

2.4.14 Necessary Statutory clearances and co-ordination with statutory body is within the scope of contractor. BHEL will provide only relevant drawings & documents for the above.

2.4.15 The following materials that will go as a part of the permanent system of the plant will be supplied by BHEL at free of any charges: Pipes, valves, flanges, fittings, fasteners.

2.5 The quantities indicated in the tender specification are approximate and are liable for variation and alteration at the discretion of BHEL. The quoted unit rate shall be applicable for any additional product group also, if included at a later date integral to the main scope of work / package envisaged. The work executed shall be measured and priced as per the unit rate arrived at for each work area as mentioned in the relevant clauses.

2.6 **System wise break up of package is tentative as indicated under Chapter-X, Annexure-A.**

Regarding the tonnage indicated, the decision of the BHEL Engineer with respect to scope, and keeping the work suitability, quality and time schedule will be final and binding on the contractor.

Tentative weight to be erected for the TG Package and all associated system shall be indicated in Annexure-A.

Contractor is required to erect actual tonnage (irrespective of any variation plus or minus) which may be necessary to complete their work and commissioning the above systems

and complete the work in all respects as detailed in tender specifications, for which payments shall be released on finally accepted tonnage rates. Contractor undertakes to erect/ commission actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments will also be regulated for the same.

Customer, M/s UPRUVNL and / or their Consultant (NTPC & DCPL) may depute their representative for checking and supervision of important stages of work. The contractor shall be required to provide all facilities for inspection of works, without any cost implications to the BHEL. Any defect in quality of work or deviations from drawings/ specifications pointed out during such inspection shall be made good by the contractor in the same way as if pointed out by the BHEL Engineer, without any cost implication to BHEL.

2.7 Supervisors / Engineers, consumables etc., required for the scope of work shall be provided by the contractor. All the expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor's quoted rates should be inclusive of all such contingencies.

2.8 It shall be specially noted that the contractor's labour and staff may have to work round the clock to meet the completion schedules / plans, which may involve payment of considerable overtime. The contractor's quoted rates should be inclusive of all such contingencies.

2.9 The terminal points shall be decided from the relevant drawings of the work scope and any further clarifications can be obtained / decided by BHEL. BHEL decision in this regard shall be final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipment constituting terminal points, whether the terminal equipment fall within the scope of work/specification, contractor shall carry out the terminal joints at either end including edge preparation. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

2.10 The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be effected from contractor's bill towards expenditure incurred including BHEL's overhead charges.

2.11 Contractor has to work in close co-ordination with other erection agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less/more at a particular given time. Activities and erection program have to be planned in such a way that the milestone events like boiler light up, steam blowing, SV Floating, Synchronisation etc., are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

2.12 No member of the already erected structure/ platform, pipes, grills, platform, other component and auxiliaries should be cut without specific approval of BHEL engineer.

2.13 The storage yard is located within the plant boundary. ODC consignments will be unloaded near to erection site as per the space availability. Some other materials may also be unloaded near to erection site as per space availability. All other materials have to be transported from storage yard to construction area by the contractor at his own cost.

2.14 **SITE VISIT**

Contractor should visit site and acquire full knowledge & information about site conditions and in & around the plant premises, together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid. Post Award of work NO claim shall be admissible in this regard.

2.15 **SITE ORGANISATION**

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

1. Overall planning, monitoring & control.
2. Quality control and quality assurance.
3. Materials management.
4. Safety, fire & security.
5. Industrial relations and fulfilment of labour laws and other statutory obligations.

2.15.2 Contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent Project Manager having sufficient authority to take decisions at site.

2.15.3 On award of contract, the contractor shall submit to BHEL its site organization chart indicating the various levels of experts to be deployed on the job. BHEL reserves the right to reject or approve the list of personnel proposed by the Contractor. The persons, whose bio-data have been approved by BHEL, will have to be posted at site and deviations in this regard will not generally be permitted.

2.15.4 Contractor should also submit a list of construction equipment, erection tools, tackle etc., with proper valid test certificates, to BHEL for approval prior to commencement of site activities. These tools & tackles shall not be removed from site without written permission of BHEL.

2.15.5 Organization chart for site should indicate the various levels of experts to be posted for supervision in the various fields in erection, commissioning etc as applicable. For proper supervision of the work, the contractor shall ensure providing one qualified supervisor against deployment of every 15 workmen.

2.16 ERECTION SCHEDULE

2.16.1 Within 15 days of LOI date Contractor shall submit detailed program (L2 schedule) of construction / erection / commissioning, along with matching resources, T&P deployment and manpower deployment schedule for approval to BHEL Site In-Charge/Project manager-Noida. L2 schedule shall be the working level document demonstrating contractor's ability and methods of completing the work within the key milestones

identified in the tender specification. This program shall be further detailed showing start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring. The three monthly rolling program with the first month's program being tentative based on the site conditions would be prepared based on these program. The Contractor shall also be involved along with the Customer/BHEL to tie up detailed resource mobilization plan over the period of time of the contract matching with the performance targets. Other requirements are as per Clause No. 2.9 of GCC.

2.16.2 Program shall be jointly finalized by the site in-charge of the contractor with BHEL/Customer's project coordinator as well as the site planning representative. The erection program will also identify the sequential erectable tonnages.

2.17 DEWATERING

2.17.1 Contractor shall ensure at all times that his work area & approach/access roads are free from accumulation of water, so that the materials are safe and the erection/progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchment water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.

2.17.2 Contractor shall make necessary arrangements to ensure that the atmosphere in working area (under the scope of work in this tender) and on roads is free from particulate matter like dust, sand etc. by keeping the top surface wet for ease in breathing. Provision of required tanker with spraying arrangement has to be ensured by contractor within the quoted rates, at no extra cost to BHEL Contractor shall ensure following:

1. Contractor has to maintain contact with local hospital having scanning & other ultra-modern medical facilities required during emergency including Ambulance.
2. Contractor has to ensure pre-employment medical check for all staff &workers.
3. Contractor has to ensure that adequate First Aid facilities with trained nurse & ambulance are available at work site for emergency purpose. This emergency set-up should include, but not limited to, following

   - Male nurse (in shifts)
   - Oxygen set up
   - Breathing apparatus

- Eye washing facility
- Stretcher
- Trauma blanket
- Medicines.

Contractor against this contract is required to arrange and maintain ambulance at site for entire contract period including extended period, if any. The above emergency facility set up including ambulance, male nurse etc. will be shared by BHEL and its other contractors working at this project at no extra cost to BHEL and its sub-contractors. In case, under unavoidable circumstances, if the ambulance is not available / being used elsewhere, the contractor will have to arrange for the same as under clause Sl. No. 1 of Cl no 2.17.2

In the event of the failure of contractor to bring ambulance and other facilities as above, BHEL will be at liberty to arrange the same at the risk and cost of contractor including transportation cost and **overhead at the rate of 5 % of the total cost** incurred by BHEL and shall be deducted from contractor bill. Till the time BHEL is unable to provide ambulance with above facility a lump sum amount Rs. 40,000 per month or part there of (considering 30 days/month) shall be deducted from the bill of the contractor for the period for which ambulance is not deployed. Decision of BHEL in this regard shall be final and binding on contractor.

2.18 **The contractor shall comply with following towards Social Accountability;**

a) The contractor shall not employ any employee less than 15 years of age in pursuant to ILO convention. If any child labour were found to have been engaged, the Contractor shall be levied with expenses of bearing his education expenditure which will include stipend to substantiate appropriate education or employ any other member of family enabling to bear the child education expenditure.
b) The contractor shall not engage Forced/ Bonded Labour and shall abide by abolition of Bonded Labour System (Abolition) Act, 1976.
c) The contractor shall maintain Health & safety requirement as stipulated in the Contract and Contract Labour (Regulation & Abolition) Act, 1970.
d) The Contractor shall abide by UN convention w.r.t. Human Rights and shall be liable for Discrimination/ Corporal Punishment for failure in meeting with relevant requirements.
e) The Contractor shall abide the requirement of Contract Labour (Regulation & Abolition) Act, 1970 for working hours.

f) The Contractor shall abide by the Statutory requirement of Minimum Wages Act 1948, payment of Wages Act 1936.
g) The Contractor shall arrange potable drinking water to its employees & workers.

2.19 Contractor shall ensure daily housekeeping and keep proper cleanliness of work place and do the disposal of wastes to certified area.

2.20 Approach and access to erection area is in the scope of contractor.

2.21 BHEL shall recover the amount of compensation paid to victim(s) towards loss of life/ permanent disability due to an accident which is attributable to the negligence of the contractor, agency or firm or any of its employees as detailed below:

a) Victim: Any person who suffers permanent disablement or dies in accident as defines below:

Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories/ offices and precincts maintenance, trouble shooting, servicing, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works/ during working at BHEL Units/ Offices/ townships and premises/ Project sites.

b) Compensation in respect of each of the victims:
   I. In the event of death or permanent disability resulting from Loss of both limbs: Rs10,00,000/- (Rs Ten Lakhs)
   II. In the event of other permanent disability: Rs 7,00,000/- (Rs Seven Lakhs)

c) Permanent Disablement: A disablement that is classified as a permanent total disablement under the provision to Section 2(l) of the Employee's Compensation Act. 1923.

2.22 **Painting (Applicable in entire scope of work):** All structures/ components shall be supplied from BHEL units/ workshops with finish coats of paint. Painting (wherever required), incidental to the work, shall be in the scope of the contactor, including supply of the required paints and primers and associated consumables.

Any shop painted structure/component is required to be repainted due to the various reasons such as Mishandling, damage during erection process, other reasons incidental to the work etc, such re-painting/finish painting of the components/structures shall be in the scope of the contractor including the supply of paints and primers along with all required consumables.

2.23 The contractor shall, at all stages of work deploy skilled/semi-skilled tradesman/worker who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training Institute / National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesman along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesman are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesman within two days of written notice from Engineer-in-charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesman will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

2.24 **Brief description of major equipment to be Installed, Tested and Commissioned under this specification is given below:**
However, changes in design may occur as is usual in any such large scale work for which no compensation will be payable and contractor shall complete the entire work as detailed in tender specifications within finally accepted rates / prices.

Below mentioned details are general and some sub-systems may have been left out. Omission of any system will not absolve contractor from erection and commissioning work of such systems, which are required for the completion and smooth running of the TG package as per customer contract of the TG scope.

2.24.1 **STEAM TURBINE**

a) High Pressure(HP), Intermediate pressure(IP) and Low pressure(LP) steam turbine(02 No.s) complete with sole plates, foundation bolts, holding down bolts, casings, bearings, bearing pedestals, rotors, couplings, steam gland seals, electric/hydraulic turning gear etc.

b) Emergency stop(ESV) and control valves(CV), Reheat stop interceptor and control valves, overload valve etc. with their servomotors/HP Governing Actuators, steam strainers & blanking arrangement (strainers may be supplied already erected in the valve) for main and reheat steam lines etc., LP bypass stop and control valves along with their HP Actuators.

c) Cold Re-heat and extraction NRVs along with their servomotors / Actuators, necessary supports, Platforms and secondary structure if required.

d) Complete installation of necessary blanking to protect the valves and turbine internals during hydraulic testing and steam blowing. If required CRH NRV may have to be dismantled and replaced with a spool during steam blowing. It will be re-installed after completion of steam blowing.

e) **Electro –hydraulic governing system** for the turbine including governing control rack, LP bypass control rack, valve test devices and racks, turbine gland sealing system complete with converters, associated piping, valves and fittings, specialties, fire protection valves and devices, hangers and supports to make the system complete in all respects.

f) Erection, welding and NDT of Complete Cross Over piping along with their supports from IP turbine to LP turbines.

g) Extraction piping along with their supports and protective covers from LP turbines to condenser dome walls. The integral and package piping of this contract scope has to be erected, welded, tested along with respective H&S and valves.

h) Complete Overload piping (SA335P91 Material) of overload valve of Hardwar scope. The seal steam and Drain piping is also of the same material. The detailed approx. weights of P91 grade piping is given in **Annexure A.14**.

i) For SA335P91 material piping, the induction heating machine and associated auxiliaries along with DG set shall be supplied by BHEL. All consumables for the process has to be supplied by Contractor/bidder including the welding electrodes and filler wire, ceramic pads, induction coil, insulation for Indn. heating, thermocouple. **BHEL will NOT supply the electrodes/Filler for P-91 welding, as per the clause of Chapter–IV (Clause 4.14) of SCC. The contractor has to procure P91 electrodes/ filler wire for use at site only of BHEL's approved brand.**

j) Turbine Lube Oil System consists of main oil tank, oil coolers, centrifuge, MOP, AOP, AC and DC JOP, DC driven EOP, Leak & Dirty oil tank with pumps, Duplex Filter, vapour fans

and auxiliaries, clean oil tank, oil, connected oil piping, valves, H&S etc. The pumps and their motors may be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.

k) Governing system skids: 100% Control oil pumps, control oil tank, filters, control oil purification system, Accumulators etc. HP governing consists of HPSU skids along with accessories and piping.

2.24.2 **GENERATOR**

Hydrogen Cooled Main Generator Consisting of the following:

a) Stator
b) Rotor
c) End Shields & Bearing, Cooler Housing
d) Exciter with Coolers, Enclosures etc.
e) Seal Oil System
f) Primary Water System including Tanks and Piping
g) H2 Cooling System
h) CO2 System
i) Seal Oil Storage Tank
j) PW Tank & Alkaliser Unit/Demineraliser Unit (Ion Exchange Unit)
k) Generator package piping along with cooling water and N2 piping.
l) Other Accessories
m) **ALL WORKS OF SHIFTING THE STATOR TO FOUNDATION, LEVELLING, CENTERING AND ALIGNMENT ETC. WILL BE CARRIED OUT BY CONTRACTOR WITHIN THE SCOPE OF THIS WORK.**

i. **LIFTING OF GENERATOR STATOR (316 MT): THE STATOR SHALL BE LIFTED WITH THE HELP OF PORTAL GANTRY CRANE (BHEL T&P).**

ii. **Handling of Stator**- The contractor has to place & install the stator on generator foundation with Portal Gantry crane. Scope under this tender includes shifting of the generator stator from the place of unloading outside A-row or trailer to the Turbo-Generator Deck. For lifting of the stator, Portal gantry crane is to be erected and commissioned. The contractor has to shift the lifting beam, generator lifting slings from storage yard to the bay, and shall assemble and make ready the Portal Gantry Crane, lifting beams and slings to the satisfaction of BHEL engineer. The dismantling of Terminal box or any other fitting of generator may also be required to be carried out before lifting, with no extra cost to BHEL. Matching with base plate/sole plate etc., if required has to be completed before lifting as per BHEL instruction.

iii. The Stator weighing about 316 MT (Approx.) will be transported by road and received at site in a special type of low bed high payload hydraulic carrier from BHEL Hardwar. The Stator will be duly supported and lashed to ensure safe and secured transportation.

iv. The unloading of stator from trailer to ground near A-row is in the scope of contractor. For unloading purpose either sleeper jack method or suitable crane can be used by the contractor at no extra cost to BHEL.

v. Transportation of Portal Gantry crane from BHEL Store to site, assembly, erection, dismantling and return to BHEL store, including slings, in good condition is in the scope of contractor.

vi. Civil works of Portal Gantry foundations (outside A-row and on TG Deck) including supply of bolts and grouting is not in the scope of this contract.

vii. BHEL will provide Stator to nearest location along the side of 'A' row and parallel to the foundation axis across the column of 'A' row of the TG Deck on the trailer for onward handling. The Stator is to be rested on Temporary stools placed over foundation using appropriate means and trailer is to be released. The Stator is to be rested on Temporary stools with adequate ground clearance (approx. 500 MM) so that blue matching of mating surfaces can be carried out before shifting to its foundation on TG Floor at the indicated elevation.

viii. Temporary stools – These stools shall be shifted from BHEL stores/ yard to site by the contractor. Any modification in the stools, as required for loading and preparatory works, shall be carried out by the contractor within the lumpsum quoted price. Material shall be issued by BHEL free of cost. The stools shall be returned back to BHEL yard in good condition.

2.24.3 **CONDENSER- 02 Nos.**

Condenser mainly comprising of the following parts:

a) Bottom Plate
b) Hot Well
c) Turbine & generator End side Wall
d) Dome Walls
e) Front & Rear Water Boxes with Tube Plates
f) Tube Support Plates
g) Springs / Bearings

h) Steam Dump devices
i) Air Extraction Pipe & Baffle Plates
j) Stiffening/Support Pipes/Rods, Bars etc.,
k) Misc. Fittings & Loose items
l) Condenser Water Box handling system with crane facilities for maintenance/ withdrawal of tubes and structures, steel columns, beam, bracing, foundation bolts etc.
m) Condenser Tubes- (WELDED AUSTENITIC S.S. TUBES, Approx. 48,312 No.'s)

2.24.4 **AUXILIARIES**

a) HP, LP & Unit Flash tanks, DM Water Tanks, Steam Drain tanks, FWSVD tanks, Oil Unloading Vessel and all other misc. tanks with drains & vents, platforms and stairs. The handling system for all auxiliaries as per site requirement will also have to be erected, within this contract.
b) Erection, Preassembly, fit-up, Welding, NDT, Hydro-test and Insulation and Cladding of De-aerator & feed storage tank (in 5 sections), complete with ladders platform and other accessories.
c) GSC, Drain coolers along with fittings, flash boxes, piping, steam traps and gland steam condensers and air exhausters with motor and fittings, associated piping, hangers and supports etc. to make the system complete in all respects.
d) LP and HP heaters, all fittings, group protection device, safety valves, stand pipes along with fittings including gauge glasses for level indication, safety valves etc. to make the equipment complete in all respects. The handling system for all auxiliaries as per site requirement will also have to be erected, within this contract.
e) CW piping (Inlet and Outlet) from terminal point (Appx 15 metre outside A-Row) including of RE Joints , Butterfly valves with Actuators, Bellows, flanges, Blanks and tie rods and spool pieces, H&S etc. to make system complete in all respect. NDT requirements also to be met as per Drawing.
f) The erection of Self-cleaning strainers (SCS) along with its integral piping, panels, gauges etc. is also in the scope of the contract.
g) Suction strainers for boiler feed and condensate extraction pumps along with supports and other fixtures.
h) Turbine oil coolers, seal oil coolers, along with stand pipes and fittings including gauge glasses for level indication, safety valves etc. to make the equipment complete in all respects.
i) Oil strippers, strainers, oil injectors, Oil centrifuge and duplex oil filters.

j) Main oil, drain oil along with fittings including gauge glasses for level indication, platforms and staircases to make the equipment complete in all respects.
k) Coolers , Tank , Filters, skids, Accumulators etc of Control Fluid System
l) Hydraulic coupling, working oil and lubricating oil coolers of Boiler feed pumps and governing systems and other accessories of TD-BFP.
m) Seal oil storage tank, LLD Racks, CO_2 Vaporisers, Ion Exchange Unit, magnetic Filters, H2 drier, seal oil unit, pre-chambers, gauge glasses along with stand pipes, gauge glasses for level indication etc. etc. to make the system complete in all respects.
n) Hydrogen cooling system, Nitrogen and carbon dioxide systems including H2 dryers, gas control units and gas stands, gas cylinders and racks and distributors to make the system complete in all respects.
o) Exciter air cooler.
p) Turbine Central oil purification system consisting of clean oil storage tank, dirty oil storage tank, central oil purifier, dirty & clean oil transfer pumps, drain oil return pumps, oil unloading vessel & interconnecting piping.

2.24.5 **PUMPS AND MOTORS**

a) Boiler Feed Pumps (1 Motor Driven & 2 Turbine Driven)
b) 2 Drive Turbine for TD BFP Consists of :
- Turbine Assembly
- Governing Valve Assembly
- Oil Pumps
- Lube Oil Console
- Gear Box
- Connecting Couplings
- Oil Coolers etc.
- The Metallic expansion joints and BF valve of Drive Turbine Exhaust.

c) Hydraulic coupling, HT Motor for MD BFP
d) Booster Pumps for BFP's
e) Lube Oil Piping, Working Oil & Cooling Systems & other Accessories for 03 no.'s BFP's – 01 No.'s Motor driven and 02 No. Turbine driven
f) Condensate Extraction Pump – 3 no.'s
g) Motors for CEP- 3 no.'s
h) Air evacuation pumps (Vacuum Pumps) for each condenser, including priming pumps for maintaining condenser vacuum, along with motors and its accessories, to make the

equipment complete in all respects. 02 Vacuum Pumps for each condenser (Total 04 No. Vacuum pumps / Unit)

i) A.C. and DC motor driven lubricating oil pumps including DC motors starters along with resistance box.

j) Seal oil pumps with drives and fittings to make the system complete in all respects

k) SG-DMCW (02 nos.) & TG-DMCW Pumps (03 nos.)

l) CW Pumps (03 nos.) and ACW Pumps (02 nos.)

m) Hydraulic Units of CW Pumps (03 nos.)

n) Firefighting & Foam System:-

i. Main Hydrant Pumps - 02 nos.
ii. Diesel Engine Hydrant Pumps - 02 nos.
iii. Main Spray Pump - 01 no.
iv. Diesel Engine Spray Pump - 01 no.
v. Jockey Pumps - 02 nos.
vi. Main Booster Pump - 01 no.
vii. Diesel Engine Booster Pump - 01 no.
viii. Foam Tanks - 02 nos.
ix. Main Foam Pump - 01 no.
x. Diesel Engine Foam Pump - 01 no.

o) Water System:

i. Raw Water Intake pumps - 02 nos.
ii. Raw Water Discharge Pumps - 02 nos.
iii. Ash Water Make Up Pumps - 02 nos.
iv. DM Feed Pumps - 02 nos.
v. FGD Make-up Pumps - 02 nos.
vi. Service Water pumps - 02 nos.
vii. APH/ESP Water Washing Pumps - 02 nos.
viii. CW Make-up Pumps - 03 nos.
ix. AHP/CHP Pumps - 02 nos.
x. Boiler Fill Pumps - 02 nos.
xi. Condensate Transfer Pumps - 02 nos
xii. DM Make Up Pumps - 02 nos.
xiii. Hotwell Make Up Pumps - 02 nos.
xiv. Storm Water Pumps - 02 nos.

p) HT Motors for all above pumps & other HT and LT Motors. The greasing, mounting of CT's, testing and commissioning is in the scope of the contractor including of the grease guns, testing kits.

q) The erection and commissioning of the actuators of this contract scope. The commissioning of actuators of valves erected in the TG and auxiliaries is also under this contract scope.

2.24.6 **BOUGHT OUT ITEMS**

a) Turbine Integral Piping Consists of :
- Lube Oil Piping
- Control Oil Piping
- Seal Oil Piping
- Gland Seal Piping
- Equipment Drains & Vents
- Cross Over Piping
- Air & Gas System Piping
- ACW piping for H2 Coolers including Temp. control Valve
-Overload Piping.
-Other Misc. System/package Piping Etc.

The erection/commissioning of integral piping has to be completed in all respects by the contractor. It may also be required to erect Valves/control valves/Bellows/ steam-traps, fittings, H&S etc. of PEM/ Trichy scope for completion of the system, with no extra cost to BHEL.

b) Air evacuation System (Vacuum Pumps and system)
c) Oil Centrifuge, Portable Lube Oil Purification Unit & Associated System
d) Control Fluid Purification Unit with pumps, Vapour exhauster etc.,
e) 3 Way Control Valves
f) Drain Valves
g) Hangers & Supports
h) Pumps with Accessories (JOP, AOP, EOP, ACW, DMCW, Drip pumps, etc)
i) Springs & Hanger supports
j) Dampers (Vacuum Breaking Device)
k) H2 & CO2 Cylinders, N2 Cylinders
l) Fixing of Pick-Ups, Probes & Accessories for Vibration Monitoring System
m) Bearing Vapour Exhauster
n) Coupling Covers

o) RE Joints & Stretching Bolt Assembly
p) Flash Tanks and Flash Box
q) Butterfly Valves of CW piping (Dia. 2600)

2.24.7 **PEM supplied Packages to be erected & commissioned under this scope of work.**

a) Plate heat Exchangers (PHEs) (05 nos.)
b) Condenser on load tube cleaning system
c) Wet steam washing system.
d) Simplex strainers, Self-cleaning strainers
e) Misc. Pumps such as ACW and ECW/DMCW pumps
f) Drip pumps with Motor and accessories
g) Miscellaneous electric hoists/Cranes, Single Girder EOT/Hoist, and Chain Pulley Blocks (Mech. & Electrical). Mono-Rails of the equipment.
h) Workshop Equipment
i) Lube Oil Pumps.
j) Valves and other fittings of PEM scope which are required to complete integral piping.
k) Chemical dosing system such as NaOH, Oxygen, Ammonia, Hydrazine etc. with the integral piping of the skid.
l) Metallic expansion bellows of PEM supply. The erection, welding and NDT of these with the equipment or piping is also in the scope of contractor.
m) Erection, welding and NDT of Butterfly valves of Drive Turbine exhaust system with the piping.
n) Insulation for all rotating and static equipment, de-aerator, heaters, strainers, piping and other auxiliaries erected under this scope, except for insulation for equipment supplied by Haridwar for Turbine, ESV & IV Valves and integral piping etc.

2.25 **Miscellaneous equipment drain & vent line according to layout- These are to be completed as per Customer/BHEL's instruction, with no extra cost implication to BHEL.**

3.0 FACILITIES IN THE SCOPE OF BHEL/ CONTRACTOR

S.No.	Description	Scope		Remarks
		BHEL	Contractor	
	PART-I			
1.1	**ESTABLISHMENT**			
1.1.1	**FOR CONSTRUCTION PURPOSE**			
A.	Open space for office	**YES**		Limited space (Free of charge inside premises). As and where made available by customer M/s UPRVUNL /BHEL
B.	Open space for storage	**YES**		Limited space (Free of charge inside premises). As and where made available by customer M/s UPRVUNL/BHEL
1.1.2	**FOR LABOUR COLONY**			
A.	Open space		**YES**	To be arranged by Contractor outside plant premises.
1.2	**ELECTRICITY**			
1.2.1.	Electricity for construction purposes (chargeable/free)			**Chargeable** As per UPRVUNL/ UPPCL standard rates Contractor shall install calibrated energy meter for metering electricity consumption.
1.2.1.1	Single point source	**YES**		
1.2.1.2	Further distribution for the work to be done which include supply of materials & execution		**YES**	

S.No.	Description	Scope		Remarks
		BHEL	Contractor	
1.2.2	**Electricity for the office, stores, canteen etc of the bidder which include:**			
1.2.2.1	Distribution from single point including supply of materials & service		YES	
1.2.2.2	Supply, Installation & connection of material of energy meter including operation & maintenance		YES	
1.2.2.3	Charges, Duties & deposits including statutory clearances for above		YES	
1.2.2.4	Demobilization of the facilities after completion of works		YES	
1.2.2.5	Electricity for living accommodation of the bidder's Staff, engineers, supervisors etc. on the above lines	NA	YES	**No Accommodation inside premises.**
1.3	**WATER SUPPLY**			
1.3.1	**FOR CONSTRUCTION**			
1.3.1.1	Making the water available at single point	YES		Shall be provided at single point source as per availability. **However, Bidder has to ensure an alternative arrangement for construction water at his own cost by resorting to the methods like bore well, water tankers, etc**.
1.3.1.2	Further distribution as per the requirement of work including supply of materials & execution		YES	
1.3.2	**Water supply for bidder's office, stores, canteen etc**			
1.3.2.1	Making the water available at single point	YES		

S.No.	Description	Scope		Remarks
		BHEL	Contractor	
1.3.2.2	Further distribution as per the requirement of work including supply of materials & execution		YES	
1.4	**LIGHTING**			
1.4.1	For Construction work (supply of all materials) 1. At office storage area 2. At Yard or any other places where material is unloaded/stored 3. At the construction site /area		YES	
1.4.2	For Construction work (Execution of lighting work/arrangements) 1. At office storage area 2. At Yard or any other places where material is unloaded/stored 3. At the construction site /area		YES	
1.4.3	Providing the necessary consumables like bulbs, tube lights, Switches, etc. for maintaining the lighting system		YES	
1.5	**Communications facilities for site operations of the bidder**			
1.5.1	Telephone, fax, internet, intranet, email etc.		YES	
1.6	**COMPRESSED AIR SUPPLY**			
1.6.1	Supply of compressor and all other equipment is required for compressor & compressed air system including pipes, valves, storage system, etc		YES	
1.6.2	Installation of above system and operation & maintenance of the same		YES	

S.No.	Description	Scope		Remarks
		BHEL	Contractor	
1.6.3	Supply of all consumables for the above system during the contract period.		YES	
1.7	**TRANSPORTATION**			
1.7.1	For site personnel of the bidder		YES	
1.7.2	For bidder's equipment and consumables (T&P, Consumables etc)		YES	

S.No.	Description	Scope		Remarks
		BHEL	Contractor	
2.	**ERECTION FACILITIES**			
2.1	Providing the erection drawings for all equipment covered under this scope	YES		
2.2	Drawings for construction methods	YES	YES	In consultation with BHEL
2.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		YES	In consultation with BHEL
2.4	Shipping lists etc for reference and planning the activities	YES		Planning activity in consultation with BHEL
2.5	Preparation of site erection schedules and other input requirements		YES	In consultation with BHEL
2.6	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
2.7	Weekly erection schedules based on Sl No 2.5		YES	In consultation with BHEL

S.No.	Description	Scope		Remarks
		BHEL	Contractor	
2.8	Daily erection / work plan based on Sl No 2.7		**YES**	For daily monitoring meeting at site
2.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule.		**YES**	
2.10	Preparation of preassembly bay		**YES**	
2.11	Arranging the materials required for preassembly		**YES**	

3.1 **OPEN SPACE**:

3.1.1 Minimum Open space as made available by customer will be provided at free of charges to the contractor, for construction of temporary office shed, contractor's stores shed(s).

3.1.2 BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements. Contractor has to make his own arrangements for labour colony outside premises.

3.1.3 Location and area requirement for office / storage sheds / fabrication yard shall be discussed and mutually agreed to.

3.2 **ELECTRICITY**

3.2.1 The construction power (415V) will be provided at a single point for construction. Construction power shall be provided from the nearest Substation / tapping point which may be away from the erection site. For the purpose of measurement of power consumed, the contractor shall provide Energy meter with valid calibration certificate. Distribution from this source for different locations is to be arranged by the bidder at his cost.

3.1 Any duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards to contractor's office shed also, all such expenditure shall be borne by the contractor.

3.2 BHEL will not be responsible for any loss or damage to the contractor's equipment as a result of variation in voltage or frequency or interruptions in power supply.

3.3 The Contractor shall be responsible for providing all necessary facilities like residential accommodation, transport, electricity, water, medical facilities etc. at his own cost as required under various labour laws and statutory rules and regulations framed there under to the personnel employed by him.

3.4 Provision of distribution lines of electrical power from the central points to the required place with proper distribution boards observing the safety rules laid down by the electrical authorities of the state shall be done by the contractor, supplying all the materials like cables, distribution board, switch boards, TPN, CBS, ELCBS/ MCCBS/ Copper / Brass clamps, copper conductor, change over switches pipes etc. at his own cost. If any failure is caused in supply of the power and water, it is the responsibility of the contractor to make alternate arrangements at his cost. The contractor shall adjust his working shifts / hours accordingly and deploy additional manpower if necessary so as to achieve the targets. **The energy meter as required to be installed by the contractor & shall be tested and certified by State Electricity Board or any other agency approved by the customer at his cost.**

3.5 The contractor while drawing construction power supply from Distribution Board should strictly adhere to following points.

a) All electrical installations should be as per Indian Electricity rules.
b) All distribution Boards installed by the contractor should be constructed with fireproof materials viz. Steel frames, Bakelite sheets etc.
c) Connection for single phase should be taken from phase and neutral. Nowhere the connection should be taken with earth as neutral.
d) All electrical connections should be made through connectors, nuts and bolts, switches, plug and sockets. Loose connections or hooking up of wires shall not be permitted.
e) Contractors have to make their own earthing arrangement for their equipment / DB earthing.
f) All electrical equipment / tools and plants should be properly earthed. DBs to be earthed diagonally opposite at two points.
g) Contractor should use “MCCB” and “ELCB” either on incoming or outgoing connections to the DBs.
h) Contractor should ensure that all the CBs / TPNs/ Fuses/ MCCB / ELCB cables etc. should be of adequate rating/ capacity.
i) For permission of supply connections contractor has to submit a test report of their installations with a single line diagram of connected/ proposed loads.

3.6 ELCB will be tested once in a week or as directed by BHEL by actually simulating the earth leakage for all installations and the same shall be recorded in the logbook to be maintained by the contractor.

3.7 In case of power cuts / load shedding no compensation for idle labour or extension of time for completion of work will be given to contractor.

3.8 Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.8 shall be provided by the contractor at his cost. Penalty, if any levied by customer on this account, will be recovered from contractor's bills.

3.9 As there are bound to be interruptions in regular power supply, power cut/load shedding in any construction sites, contractor should make his own arrangement for alternative source of power supply through deployment of adequate number of DG sets at their cost during the power breakdown /failure to get urgent and important work to go on without interruptions. No separate payment shall be made for this contingency.

3.10 **DRINKING WATER -** Bidder shall provide drinking water at the work spot at their own cost.

3.11 On completion of work or as and when required by BHEL, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and levelled and debris shall be removed, as per instructions of BHEL, by the contractor at his cost. In the event of his failure to do so, the Engineer will get it done and expenses incurred shall be recovered from the contractor along with prevailing overheads. The decision of BHEL Engineer in this regard shall be final.

3.12 Compressor of required capacity for construction purposes shall be arranged by Contractor.

3.13 **ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM (SCMS):**
Contractor has to provide minimum 2 computers (along with one operator per PC) for online material management, reporting of daily progress, billing and other similar activities, within the quoted rate. Computers shall have minimum configuration of Windows 7 OS, 4GB RAM and Internet Explorer 8 or above.

3.14 **OTHER FACILITIES:** Adequate water less urinals, at least 2 nos, and toilets, at least 2 Nos., shall be arranged by the contractor within quoted rates, at site of construction with proper disposal arrangement.

3.15 **CONSUMABLES:**

3.15.1 Such of those consumables as indicated as consumables provided by BHEL alone will be provided to the contractor by BHEL free of charge for erection activities. Other required consumables like electrodes, all gases, and other materials for this scope of work are to be arranged by the contractor at their cost.

3.15.2 The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), all gases (inert, welding, and cutting), soldering material, dye penetrants, radiography films. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials, hardware items etc required for temporary works such as supports, scaffoldings, bed are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.

3.15.3 All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.

3.16 **GASES:**

3.16.1 All the required gases like Oxygen / Acetylene / Argon /Nitrogen etc. required for execution of work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non availability of gases cannot be considered as reason for not attaining the required progress.

3.16.2 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

3.16.3 However all gases required for commissioning/ equipment filling/operation of plant shall be provided by BHEL free of cost. Handling of filled/empty gas cylinders, transportation to yard, filling station inside/ outside power plant is in the scope of vendor.

3.16.4 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

3.16.5 The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

4.0 T&Ps AND MMEs DEPLOYED BY CONTRACTOR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
1.	Crawler/Tyre Mounted Crane	40 MT	1
2.	Tyre Mounted mobile Crane/ Hydra	14 MT	2
3.	Trailer with Pulling Unit	40 MT	1
4.	Low Bed Trailer	APR*	1
	*The scope of shifting of material from yard to site is in the scope of Contractor. Contractor has to arrange appropriate capacity trailer (as per requirement) for shifting of the material from stores/Yard/ place of unloading to site and vice versa (in case of material reconciliation and return to stores). The trailers are to be arranged as per handling requirement for the equipment detailed in **Chapter X** (of TCC). Cranes shall be provided for loading on trailers, only for material beyond handling capacity of 40 MT crane of the contractor.		
5.	Electric Winch	3/5/10 MT	APR
6.	Drilling Machines		APR
7.	Surface Grinder and other Workshop Equipment		1 set each
8.	Welding Sets, TIG welding machine with accessories and ovens for welding electrodes baking and holding.		APR
9.	Oxy- acetylene Gas Cutting Set		APR
10.	Hoisting & Pulling Devices/ Chain Pulley blocks of various & suitable capacities etc		APR
11.	Hydraulic Jacks	25/50/100 MT	APR
12.	Screw jacks	5/10/25/50T	APR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
13.	Welding sets with accessories and ovens for welding electrodes backing and holding		APR
14.	Heat Treatment and Stress Relieving sets including heating coils, panels, Recorders Etc		APR
15.	Industrial Vacuum Cleaner		02 no./APR
16.	Hydraulic Pipe Bending machine (Manual and Motorised) of various sizes		1 No each/ APR
17.	Torque Wrench Up to 4000 NM Range (Hydraulic)		APR
18.	Electronic / Electrical Tube Expander (With Tools)		6 no.
19.	Air Compressor	140 / 210 CFM	1 no.
20.	Profile making M/C		APR
21.	Nibbling M/C		APR
22.	Shearing M/C		APR
23.	Portable grinding M/C		APR
24.	Portable drilling M/C		APR
25.	Chain Pulley blocks	02 MT- 20 MT	APR
26.	Fire retardant Tarpaulins		APR
27.	Fire Extinguisher		APR
28.	**Radiography arrangement including source**		
	Iridium 192		2 source/ APR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
29.	Pipe Chamfering Machine/ Tube Cutting		APR
30.	Three phase DB with complete set up for drawl and distribution of construction power		APR
31.	Electrical cables for drawl and distribution of construction power, heating machines		APR
32.	Sleepers of suitable sizes		APR
33.	Concrete block for pre-assembly bed		APR
34.	Various sizes of clamps/ fixtures for assembling		APR
35.	Dewatering pumps		APR
36.	Recordable UT test Equipment suitable to meet the requirements (KRAUTKRAMMER MODEL USN 50 or EQUIVALENT)		APR
37.	Ultrasonic Hardness Testing Machine [Ultrasonic contact impedance (UCI)]		APR
38.	Annealing cables have to be arranged by the contractor within the quoted rates.		APR
39.	Long feeler Gauge set		APR
40.	Inside and Outside Micrometers, (With Calibration certificates and LC-0.01mm), Three Pin Micrometers	From 50 mm - APR	2 Nos.

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
41.	Inside - Outside Calipers, Precision Depth Gauges		APR
42.	Allen Key sets, Tape and die sets		APR
43.	Gas Cutting Sets		APR
44.	Pull Lifts - 3.6 / 6 / 10 T		APR
45.	Tools for Reaming and Honing		APR
46.	Hand Tool Sets		APR
47.	Taper Pin and straight Pin Reamers		APR
48.	Torque wrenches, Impact Drive Sockets.		APR
49.	Ratchet Square insert (MM size and Inch size)		APR
50.	Dry Paint thickness gauge ,Ultra sonic testing set		APR
51.	Double End,Single End,Ring, Box, Hammering spanners		APR
52.	Electrode drying cabinet (Master baking Oven)		APR
53.	Wire Rope Slings, D-Shackles, Belt Slings, Hook Chooks, Chain Pulley Blocks		APR
54.	Magnetic Base Drilling Machines, Grinding Machines, Cutting Machines, Argon Sets, Gas Cutting Machines		APR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
55.	Dial Gauges of different ranges and types including lever dial gauges(with LC 0.01mm)		APR
56.	Micro- ohmmeter for winding resistance of Rotor and other electric machines (HT/LT) of the contract scope- contractor has to arrange digital micro-ohmmeter.		APR
57.	Digital Megger	5KV	1 No.
58.	NDT test kits		APR
59.	DFT measurement (Alcometer)		APR
60.	Dumpy level	0 to 350 mm, LC-0.01	01 No.
61.	Surface plate	Up to 1.0 Sq. Mtr, Grade 1,2,3	APR
62.	Straight Edge	Up to 2 Mtr. Long, Grade 1,2,3	02 No.
63.	Hardness testing equipment (Equotip or Microdur make)		APR
64.	Digital Temperature Indicator.		APR
65.	Magnetic particle testing equipment DRY & WET Type		APR
66.	DPT Kit		APR
67.	Elcometer for paint thickness checking		APR
68.	Hand Operated Megger 500/1000V		APR
69.	Tong Tester 10,20 or 50 Amp +/-3% accuracy		APR
70.	Digital Multi meter 4½ digit		02 nos./APR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
71.	Scaffolding Pipes		Min. 1000 Nos/ APR
72.	Master Level		APR
73.	Pressure Gauges of multiple ranges	0-800 Kg/cm2	APR
74.	Hydro test Pump	250 Kg/cm2	APR
75.	Auto Continuous variable Transformer - VARIAC (measuring impedance of generator rotor)	minimum 310 V and 100 Amp rating	APR
76.	Formaldehyde Gas Analyser		APR
77.	Portable Gas Detector (Oxygen Analyser)		APR
78.	Temperature Gun		APR

Note: "APR" is defined as: - Contractor has to deploy T&P AS PER REQUIREMENT of BHEL site as decided by BHEL Engineer In-charge. The capacity, quantity, duration of deployment shall be decided by Engineer In-charge as per site requirement in view of the front availability and erection program. The requirement of the T&P/Crane etc. shall be recorded in the respective month Form-14 and accordingly deployment/non-deployment shall be recorded in next month's Form-14 of the contractor. Decision of BHEL Engineer In-charge with respect to requirement of particular T&P shall be final and binding on the contractor.

4.1 The above list specifies only major T&Ps (tentative, may not be complete) to be deployed by the contractor and is based on minimum requirement. All additional / other tools and plants including suitable capacity D shackles, slings, rails, sleepers, hydraulic / mechanical jacks etc which are required for satisfactory & timely completion of work shall also be deployed by the contractor within finally accepted rate / price. Any special testing kit/ MME/ T&P/ precision equipment, other than supplied by the MU/manufacturer (in case of BOI's) as special equipment for erection/testing or provided by BHEL, has to be arranged by the contractor within final accepted rates

4.2 **The above list is only indicative and these T&Ps may not be required for entire contract period but contractor shall ensure the availability of the T&Ps as per work requirement and T&P Deployment schedule.**

T&P Deployment schedule shall be finalized at site in consultation with BHEL Engineer, prior to commencement of work, based on the work fronts/work requirement. BHEL decision shall be final and binding regarding the T&P deployment schedule. Contractor shall mobilize / maintain the T&P's as per the deployment schedule notified time to time by BHEL Engineer.

4.3 If any one of T&P mentioned above is not needed for proper execution of scope of work, provided contractor has not utilized BHEL free issued T&P for completing such work, no recovery from contractor shall be applicable.

4.4 Any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL within two weeks.

4.5 Gas Burners arrangement with required gas for maintaining temperature in the event of power failure.

4.6 **CONSUMABLES FOR P91 WELDING – CONTRACTOR SCOPE:**

I. Glass Fibre Cloth -1mmx1000mm–Temp Rating 1260ºC.
II. Glass fibre cord Dia 3mm (twisted)- Temp Rating 1260ºC.
III. Ceramic Fibre Blanket -RT Grade, density 96 kg/m3 –Temperature rating 1260ºC.
IV. Ceramic fibre rope- Fibre Glass Braided, Dia 12 mm –Temperature rating 1260ºC
V. K Type Thermocouple- 0.5 mm Dia Single Strand individual fibre glass insulated.
VI. Heavy Duty TC connectors for K Type Thermocouple.
VII. All other consumables / equipment to carry out the work.
VIII. Compensating cable & Heating Elements (Annealing cables)
IX. Electrodes for P91 welding.

4.7 Special T&P or IMTE's requirement for tests like Helium leak detector test, Holiday testing, UV lamps for fluorescent dye Test of condenser shall be arranged by contractor as per site requirement.

4.8 Any T&P's, Cranes, Slings, D-shackles and other lifting tackles, Trailers required for shifting of material from store to site shall be arranged by contractor over and above T&P's/ crane provided by BHEL. The contractor has to arrange for trailers (Low Bed and normal) of required capacity for shifting of the material from stores, yard and any other place of unloading of material/equipment.

4.9 **In case the contractor does not deploy or delays deployment or deploys for a shorter period of major T&P with reference to schedule specified or T&P deployed is out of service/non-available for continuous more than 5 days or cumulative downtime/ non-availability of 10 days in a month, BHEL will recover non-refundable penalty per day in the following manner:**

a) 40 MT crane- @ Rs 5000/- per day
b) 14 MT hydra crane - @ Rs 3000/- per day
c) 40 MT Trailer - @ Rs 4000/- per day

For the daily recovery rate for other T&P/IMTEs BHEL Engineer decision shall be final and binding on the contractor.

4.10 In addition to the deduction mentioned in clause 4.9 above, if work gets delayed due to non-availability of any T & P, BHEL reserves the right to get the work done at the risk and cost of contractor.

4.11 In case BHEL had to deploy its own T&P, hire charges of T&P applicable for outside agencies as per extant guidelines for "Hire Charges on issue of Capital Tools & Plants" shall be recovered.

In case BHEL had to deploy the T&P from outside agency, actual hiring cost plus applicable overheads shall be recovered.

4.12 All the tools and tackles/measuring instruments shall be duly tested/calibrated and valid certificate to that effect should be submitted to BHEL site in-charge before the start of work.

4.13 If the work related to T & Ps mentioned above is completed then, BHEL can release that T & P during contract period / extended period, if any. However, written permission shall be taken by contractor from BHEL Site Construction Manager for releasing the T&P.

5.0 T&Ps AND IMTEs DEPLOYED BY BHEL ON SHARING BASIS

LIST OF T&P BEING PROVIDED BY BHEL ON FREE OF HIRE CHARGES AND ON SHARING BASIS				
Sl. No.	**Equipment**	**Capacity**	**Qty.**	**Remark**
1	**PORTAL GANTRY CRANE**		1 No.	For Stator Lifting
2	**CRAWLER CRANE**	250/ 270 MT	1 No.	On sharing basis as per requirement
3	**CRAWLER CRANE**	135 MT	1 No.	On sharing basis as per requirement
4	**CRAWLER CRANE**	75/100 MT	1 No.	On sharing basis as per requirement
5	**EOT Cranes at TG Hall without operator**	160 / 25 MT	1 No.	On sharing basis (Power is chargeable)
6	**EOT Cranes at BC bay for TDBFPs without operator**	35 MT	2 No.	
7	**Slings for lifting turbine rotors with lifting beam**		One Set	
8	**Slings for lifting generator stator with lifting beam**		One Set	
9	**Temporary stool for Stator Placement**		One Set	Modification/Fabrication APR in vendor scope.
10	**Digital Micro-ohmmeter for checking/measuring winding resistance of the Generator stator and HT Motors.**		APR	On sharing basis
11	**HT PUMP**	(0-20 Kg/cm^2)	1 No.	On sharing basis
12	**CHEMICAL CLEANING ARRANGEMENT**			By BHEL agency (Assistance by Bidder)

NOTES:

1. **Cl.4.2.2.16 c) of SCC** shall be read as:
   a. **For BHEL's cranes 75 MT & above:-** Day-today upkeep and running maintenance like filling topping up of lubricants, changing filters, etc. including repair of self-starter, batteries and dynamo of these cranes shall be excluded from the scope of the contractor.
   b. **For BHEL's cranes below 75 MT capacity:-** Day-today upkeep and running maintenance like filling topping up of lubricants, changing filters, etc. including repair of self-starter, batteries and dynamo of these cranes shall be responsibility of the contractor. If on checking it is found that the same is not followed, BHEL shall exercise its right to get the job/works done at the risk and cost of the contractor.
   c. **Common for above Sl. No. (a) & (b):-** In case of breakdown of crane, contractor shall provide the necessary manpower for maintenance of the BHEL owned crane to maintenance agency (deployed by BHEL), failing to do so BHEL will get the job done at the risk and cost of contractor. BHEL may also provide cranes through crane hiring agencies in which case the day-to-day upkeep and running maintenance shall also be excluded from scope of contractor. The contractor shall arrange fuel for the operation of hired & BHEL owned cranes also.

2. **Cl.4.2.2.16 e.) of SCC** shall be read as:-
   a. **For BHEL's cranes 75 MT & above:-** The operator, helper & maintenance personal (Engineer/Technician/OEM) for BHEL's cranes 75 MT & above capacity being provided by BHEL free of cost. Further fuel for operation of all BHEL cranes shall be provided by contractor without any extra cost.
   b. **For BHEL's cranes below 75 MT capacity:-** The operators for BHEL's cranes 75 MT below capacity shall be provided by the contractor free of cost. These operators should possess valid license for heavy vehicle. Further fuel for operation of all BHEL cranes shall be provided by contractor without any extra cost.

3. The Cranes at Sl No. 1, 2, 3, 4 & 5 will be provided as per requirement and availability at the sole discretion of the BHEL Engineer.

4. **EOT Crane –**Trained operators are to be arranged by the contractor within the quoted rates. Contractor has to plan the activities on item wise where the EOT crane is required to be used and submit to BHEL site for approval. In case the erection can be carried out by using other T&Ps, contractor shall make his own arrangement. The decision of BHEL engineer on this will be final and binding to contractor. In some cases EOT crane may have to be shared with other contractors of BHEL working in the Powerhouse for that Contractor has to manage and coordinate with them itself. Electricity for EOT crane usage shall be chargeable.

Providing manpower assistance required for free movement of trailing cable (BHEL provided) of EOT Crane is **included in the scope of contractor**. Contractor has to take due care of Trailing cable issued for EOT crane and is to be returned to BHEL in Good working condition after commissioning of EOT DSL.

BHEL will not provide crane operators for EOT cranes. Trained operators for EOT crane **to be arranged by the contractor** at his cost.

5. The contractor shall make necessary arrangement like laying of special sleeper beds, assembly & dismantling of heavy lift attachment, boom, jib etc. for movement and operation of crane.

6. Cranes are only for erection purpose and shall not be available for material transportation purpose. Contractor shall make their own arrangements for material transportation to erection site.

7. Other T&P mentioned above, contractor shall transport from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores or as specified by BHEL.

8. In case of non-availability of these equipment's, due to any reason i.e., unavoidable breakdown, major overhaul or any other reason etc., the contractor should make arrangement at his own cost to meet the erection targets. No extra claim will be admitted due to non-availability of any of the above equipment. No delay in execution of work shall be accepted on this account.

9. The Contractor shall be responsible for the safe and proper use of the above equipment issued to his. Day-to-day maintenance and operation of equipment's shall be the contractor's responsibility and shall be as per instructions / standard practice of BHEL Engineer.

10. The contractor shall return the T & P issued to him by BHEL in good working condition as and when so desired by BHEL. (Completion or reduction in work load) for diversion for other work. If such return is delayed by contractor due to his fault without written consent of BHEL, hire charges as applicable according to BHEL policy will be levied from such time it was requisitioned by BHEL to the time of actual return and the amount so decided and arrived at, will be recovered from the contractor's bill.

11. Contractor shall have at all times experienced operators and technicians for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant BHEL rectifying the defect and charging the cost to the contractor.

12. If at any time it is noticed that contractor is not using any of the T & P or equipment properly according to the instructions of BHEL, BHEL will have the right to withdraw any and all such equipment and any cost due to this shall be contractor's account.

13. All the T & P would be issued only at BHEL stores and it shall be the responsibility of the contractor to take delivery from BHEL stores, transport the same to site and return the same to BHEL stores in good condition after use.

14. Contractor shall make good any loss or damage to the equipment/EOT supplied to him and day to day maintenance and operations of equipment shall be borne by the contractor including all consumables like petrol, oil, air filters, contactors, bush, etc.

15. Any Loss / Damage of tools by the contractor, the same shall have to be replaced by the contractor or otherwise cost thereof shall be recovered from the contractor.

16. Any loss / damage to any or part of the above equipment shall be to contractor's account and the expenditures on these account will be recovered from contractor's bills in case contractor fails to make good the loss.

17. Any other special T&P if supplied by the manufacturer and available with the customer may also be provided to the contractor free of hire charges as and when made available. Special tools and tackles are to be used only for the purpose for which these are meant and to be returned in good condition. However low height jack may not be made available and will have to be arranged for by the contractor.

18. Other terms and conditions regarding above items shall be as per T&P clause in SCC

Cranes provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of cranes shall be at 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. Augmentation of BHEL T & P under special circumstances shall be discretion of BHEL

6.0 TIME SCHEDULE

6.1 INITIAL MOBILIZATION

After receipt of LOI, contractor shall discuss with Project Manager / Construction manager regarding initial mobilization. Contractor shall mobilize necessary resources within **15 days of issue of LETTER OF INTENT** or as per the directive of BHEL. Such resources shall be progressively augmented to match the schedule of milestones and commissioning. However, BHEL Engineer will certify the actual date of start of work after adequate mobilization of manpower, major equipment and other T&P by the contractor.

6.2 AUGMENTATION OF MOBILISATION

Contractor shall subsequently augment his resources in such a manner that daily erection activities shall be completed on daily basis and the entire work is completed within the time schedule/contract period. Mobilization of contractor's resources shall be made and augmented from time to time in such a manner that the work in scope is carried out in an uninterrupted manner.

6.3 CONTRACT PERIOD

Entire work as detailed in the tender specifications shall be completed within **24 (Twenty Four) months** from the Zero date as per program / milestones indicated by BHEL Engineer. Contractor has to mobilize adequate resources to meet BHEL's commitments to their customer as indicated from time to time.

6.4 Entire work under this specifications shall be carried out in accordance with the broad schedule as furnished below, within the stipulated completion period. This schedule will undergo review and based on progress vis-à-vis project requirement, contractor shall submit revised schedule for approval of BHEL/Customer M/s UPRVUNL:

MILESTONES	MONTH	REMARKS
Start of Erection	ZERO DATE / 1st month	
Commencement of Condenser Erection	1st month	
Commencement of Turbine Erection	3rd month	
TG Box-Up (LPT)	12th month	M1
Completion of Oil Flushing	15th month	
Barring Gear	16th month	M2
Rolling & Synchronization	16th month	
Trial/Initial Operation	20th month	
Completion of facilities	24th month	

Provision of Penalty in case of slippage of Intermediate Milestones:

M1 & M2 are the intermediate LD milestone. Milestones LD shall be applicable if the delay in achieving the milestone solely attributable to the contractor.

1. In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones
2. In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld.
3. In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value , will be withheld.
4. Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone.
5. Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (corresponding RA Bill) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.
6. Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion/ closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.
7. In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery

**** Executable Contract Value - Value of work for which inputs/ fronts were* made *available to contractor and were scheduled for execution till the date of achievement of that milestone.***

6.5 Contractor shall plan their work in such a manner so as to meet the above project schedule, in consultation with BHEL/ customer. To achieve the above schedule contractor shall work in the all the available fronts concurrently and be prepare for working in the shift operation as per the instruction of BHEL Engineer.

6.6 Completion of facilities shall be completed in all respects only when on successful erection, trial run of individual equipment's and successful commissioning, trial/initial operation, attending punch points, handing over of the STG & auxiliaries to the customer.

6.7 Work under the scope of this contract shall be deemed to have been completed in all respects only when so certified by BHEL. The decision of BHEL shall be final and binding on the contractor.

6.8 If the completion of work as detailed in the scope of work gets delayed beyond the contract/ completion period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the contract as per the GCC clause 2.11.

6.9 Commencement of performance guarantee shall be as per clause no.2.24 (Performance Guarantee for Workmanship) of General Conditions of Contract. **The commencement of guarantee period for the quality of the workmanship shall start from the date of trial/initial operational acceptance of facilities OR handing over to the customer, whichever is earlier**.

7.0 TERMS OF PAYMENT

7.1 BHEL Engineer will certify regarding the actual work executed in the measurement books and bills, which shall be accepted by the contractor in measurement book.

7.2 Contractor shall submit bills for the work completed under the specification, once in a month detailing work done during the month. The format for billing shall be approved by BHEL before raising invoices.

7.3 Subject to any deduction, which BHEL may be authorized to make under the contract, the contractor on the certificate of the Engineer at site be entitled for payment as explained hereunder.

7.3.1 PROGRESSIVE PAYMENT ON PRORATA BASIS

(I) 85% of Lump sum Price

A	**CONDENSER* (Weightage 20% = 2x10%)**	**%**
1	Preparation of Foundation ,Erection and Alignment of condenser supports	2%
2	Placement, Alignment, Pre-Assembly and welding of Bottom Plate segments, Hotwell and NDT	8%
3	Assembly and positioning of water chamber, side walls, Welding and NDT	12%
4	Assembly, Erection, alignment and welding & NDT of Tube support plates and condenser internals like Baffle Plates, Air Evacuation pipes etc.	15%
5	Transportation, Hole cleaning, Insertion, Expansion, Cutting etc. of Condenser Tubes	13%
6	Assembly, Welding & NDT of Lower and Upper Dome Walls and Dome Stiffeners, Extraction Piping and Steam Dump Device, LPH with Supports etc.	12%
7	Hydro Test of Water Side, Fluorescent dye Test, Water fill Test,	10%
8	Condenser Floating, Welding of Condenser Neck Joint and NDT & Completion of Balance works as erection of stand pipes and vacuum breaker valves etc.	10%
9	Erection, Commissioning, Load Testing of Condenser Water Box Handling System.	3%
10	**Sub- Total for Condenser**	**85%**
B	**TURBINE (1HP+ 1IP+ 02 LPs* = 18%)**	
1	Preparation of Foundation, Placement and Alignment of Turbine Bearing Pedestals and Base Plates of LPC.	5%
2	Placement, Alignment ,welding of Centre Guide Pins, LPT Front and side walls to form Outer Casing Bottom Portion	7%

3	Assembly, welding of Casing Frame Section and bracing pipes in LPT outer casing bottom half and complete NDT.	9%
4	Erection, Alignment of Inner Casing, Placement of LP Rotor and checking of Blade Clearance, axial and radial flow paths.	7%
5	Fitment, Assembly and Welding of LPT Outer Casing Upper Part	2%
6	Erection of shaft seal assembly and expansion joints	1%
7	Boxing up of LP Inner casing and all associated checks.	2%
8	Final Box up of LP Turbine No.1 and No.2	5%
9	Erection ,Placement, alignment, Box-Up and all checks of IP Turbine such as centering, Horn drop, Roll Checks etc.	10%
10	Placement of HP Turbine, Lowering of HP Rotor on Bearings and Checking of Clearances , Roll check, centering, Erection of Turning Gear assembly.	7%
11	Alignment of All Rotors including Reaming, Honing and Fixing of permanent Coupling Bolts, CRO and swing check	9%
12	Erection and commissioning of HPSU ,LPBP control Unit System/Equipment, skids with all accessories	5%
13	Installation and alignment of ESVS, IV&CV, LPBP Valves, Overload valve along with supports and Actuators	9%
14	Erection, Alignment and Welding, NDT of Cross Over Piping and Over Load piping.	5%
15	Assembly of Hydro Test and Steam Blowing Devices in ESV,IV and LPBP valves, and Normalisation etc.	0.50%
16	Final Boxing Up of Pedestals after Oil Flushing Completion	1.50%
17	**Sub- Total for Steam Turbine**	**85%**
C	**TURBO GENERATOR (14%)**	
1	Preparation of Foundation, Levelling and Matching of Foundation Plates.	4%
2	Lifting, Levelling, centering and Alignment of STATOR	15%
3	Fixing of End Shields of upper and lower half	4%
4	Rotor Threading and Air gap Checking	8%
5	Final Boxing Up of Generator ,completion of all works as erection of seal ring holder and seal ring on both sides, Generator coolers	12%
6	Alignment of Generator Rotor with LP Turbine Rotor, Run-out checks and Reaming, Honing of Coupling holes and Fixing of Coupling Bolts	9%
7	Erection of Excitation Equipment & Alignment of Gen-Exciter Rotors including swing check and completion of Balance Works	10%
8	Completion of Generator and exciter integral piping in all respect including of PW system including Stator Primary Water Piping system, CO_2 ,N_2 purging system , H_2 Filling system inclusive of all accessories as driers, LLD racks, skids etc.	10%
9	Final Bolt stretching of Generator Base plates and Exciter	5%
10	Final Gas Tightness Test of Stator with complete system and Helium Leakage test	5%

11	Assembly of Terminal Bushings in terminal box and electrical checks of stator and rotor before rotor Insertion	3%
12	**Sub- Total for Turbo Generator**	**85%**
D	**PUMPS & AUXILIARIES (15%)**	
1	Erection/testing, Commissioning of Lube Oil Skid, Main Oil Pumps, JOP, EOP, AOP, Oil coolers, Centralized Lube Oil Purification System along with all auxiliaries such as Dirty Oil tank ,Clean Oil tank etc	7%
2	Erection, Testing, Commissioning of 01 No.'s Motor Driven BFP along with all auxiliaries.	15%
3	Erection, Testing, Commissioning of 02 Nos. Turbine Driven BFP along with all auxiliaries and systems.	20%
4	Erection, Testing, Commissioning etc. of all CW Pumps	13%
5	Erection, Testing, Commissioning etc. of all miscellaneous ACW,DMCW Pumps and Vacuum Pumps etc.	8%
6	Erection, Testing, Commissioning etc of Condensate Extraction Pumps & Drip Pumps	6%
7	Erection, Testing, Commissioning etc of Firefighting System Pumps, Foam Tanks & Pumps	4%
8	Erection, Testing, Commissioning etc of Water System Pumps	12%
9	**Sub-Total for Pumps & Auxiliaries**	**85%**
E	**HEATERS & DEAERATORS (10%)**	
1	Erection, testing & commissioning of HP & LP Heaters (outside condenser), with all fittings and Handling system.	18%
2	Erection, testing & commissioning of Gland Steam Condenser, Drain Coolers and flash Boxes, inclusive of insulation, supports.	12%
3	Erection, testing & commissioning of De-aerator, Feed Storage Tank and associated approach platform with ladders etc	55%
4	**Sub-Total for Heaters & Deaerators**	**85%**
F	**MISCELLANEOUS ITEMS (16%)**	
1	Erection, welding and NDT of BF valves, Metallic expansion Joints of TD BFP exhaust ,Enclosures, Erection CO2/H2 Cylinder racks and cylinders etc	**7%**
2	Complete Erection, welding, NDT of CW inlet and outlet piping from terminal point (Appx 15 metre outside A-Row), Debris Filters, RE Joints, ME Bellows, BF Valves, H&S of CW, Blanks and Tie rod arrangements.	**33%**
3	Erection, testing & commissioning of Chemical & Oxygen dosing skids.	**3%**
4	Erection, testing & commissioning of DMCW tanks, Flash Tanks and other Miscellaneous tanks of TG scope.	**12%**

5	Erection, testing & commissioning of Plate Heat Exchanger Package	**3%**
6	Erection, testing & commissioning of Condenser on Load Tube Cleaning Package	**3%**
7	Erection, testing & commissioning of Self Cleaning Strainer Package and all others strainers.	**2%**
8	Erection, testing & commissioning of electric hoists/Cranes, Single Girder EOT/Hoist, Chain Pulley Blocks (Mech. & Electrical), Mono-Rails of the equipment & other BOIs.	**7%**
9	Erection, testing & commissioning of Workshop Equipment	**10%**
10	Erection of approach platforms (For Materials which are free issued from BHEL site; apart from those received from MUs)	**5%**
11	**Sub-Total for Misc. Items**	**85%**
G	**INTEGRAL PIPING (7%)**	
1	Turbine Integral Piping and Generator Integral and Package Piping consisting of Lube Oil, Jacking oil, Oil vapour extraction, Control oil, Seal Oil system, seal steam, Condensate spray /Exhaust Hood Spray, Turbine water drainage etc. complete in all respects, including all accessories like thermo-wells, probes, orifices etc. and hangers and supports (Erection and commissioning on prorata basis)	**85%**
2	**Total for Integral Piping**	**85%**
	NOTES:	
	* The payment for 2 Nos. Condensers and 02 Nos. LP Turbines will be divided equally.	

(II) Stage/Milestone Payments (15%)

H	Milestone/ Stage	Condenser	Turbine	Turbo Generator	Pump & Aux.	Heaters & Deaerators	Misc. Items	Integral Piping
1	Oil Flushing (TG)	1%	1%	1%	1%	1%	1%	1%
2	Barring Gear (TG)	1%	1%	1%	1%	1%	1%	1%
3	Rolling & Synchronization	2%	2%	2%	2%	2%	2%	2%
4	Full Load	2%	2%	2%	2%	2%	2%	2%
5	Initial/Trial Operation of unit	2%	2%	2%	2%	2%	2%	2%

H	Milestone/ Stage	Condenser	Turbine	Turbo Generator	Pump & Aux.	Heaters & Deaerators	Misc. Items	Integral Piping
6	Painting (including arrow marking, nomenclature etc)	3%	3%	3%	3%	3%	3%	3%
7	Area cleaning, temp. structure cutting/removal and return of scrap	1%	1%	1%	1%	1%	1%	1%
8	Punch list points/ pending points liquidation	1%	1%	1%	1%	1%	1%	1%
9	Material Reconciliation	1%	1%	1%	1%	1%	1%	1%
10	Completion of contractual obligations	1%	1%	1%	1%	1%	1%	1%
11	**Total for Milestone/Stage payments (15%)**	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**

Note:

1. The Terms of payment is only for enabling release of payments through RABs and is not indicative of the actual quantum or value of work

2. If the commissioning activities could not be carried out due to no fault of contractor, BHEL Site in-charge, at his discretion, after recording reasons for exercising such option, can split and release payment up to 50% of milestone payment on completion of work, to the extent possible, required for carrying out that particular milestone/ commissioning activity.

3. In line with GCC clause 2.23.1.(v) to facilitate part payment, BHEL Site Engineer at his discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work.

8.0 TAXES & DUTIES

8.1.1 Price quoted should be inclusive of all applicable Taxes/charges but **Excluding GST**. The Contractor shall pay all other taxes, fees, royalty, commission etc. which may be levied on the contractor in executing the contract. In case BHEL is forced to pay any of such taxes, it shall be recovered from Contactor's bills or otherwise as deemed fit.

GST Shall be payable extra as per following:

8.1.2 Contractor/Vendor has to issue invoice indicating HSN/SAC code, Description, Value, Rate, applicable tax and other particulars in compliance with the provisions of relevant GST Act and Rules made thereunder. With the implementation of e way bill provisions, contractor shall comply with same as applicable.

8.1.3 Vendor has to submit GST compliant invoice within seven days from the due date of invoice as per GST Law. In case of delay, BHEL reserves the right of denial of GST payment if there occurs any hardship to BHEL in claiming the input thereof. In case of goods, vendor has to provide scan copy of invoice & GR/LR/RR to BHEL before movement of goods starts. Special care should be taken in case of month end transactions.

8.1.4 GST amount claimed in the invoice shall be released on fulfilment of all the following conditions by the Contractor : -

a. Supply of goods and/or services have been received by BHEL.
b. Original Tax Invoice has been submitted to BHEL.
c. Respective invoice has appeared in BHEL's GSTR - 2A for the month corresponding to the month of invoice. Alternatively, BG of appropriate value may be furnished which shall be valid at least one month beyond the due date of confirmation of relevant payment of GST on GSTN portal or sufficient security is available to adjust the financial impact in case of any default by the contractor.

8.1.5 TDS under GST law as applicable shall be deducted.

8.1.6 Contractor shall be solely responsible for discharging his GST liability according to the provisions of GST Law and BHEL will not entertain any claim of GST/interest/penalty or any other liability on account of failure of contractor in complying the provisions of GST Law or discharging the GST liability in a manner laid down thereunder

8.1.7 In case declaration of any invoice is delayed by the vendor in his GST return or any invoice is subsequently amended/altered/deleted on GSTN portal which results in any adverse financial implication on BHEL, the financial impact thereof including interest/penalty shall be recovered from the Contactor's due payment.

8.1.8 Any denial of input credit to BHEL or arising of any tax liability on BHEL due to non-compliance of GST Law by the Contractor in any manner, will be recovered along with liability on account of interest and penalty (if any) from the payments due to the Contactor.

8.1.9 The admissibility of GST, taxes and duties referred in this chapter or elsewhere in the contract is limited to direct transactions between BHEL & its Contractor. BHEL is not

responsible for any liability that may arise due to any transaction beyond the direct transaction between BHEL & its Contractor.

8.1.10 **Variation in Taxes & Duties:**

Any upward variation in GST shall be considered for reimbursement provided supply of goods and services are made within schedule date stipulated in the contract or approved extended schedule for the reason solely attributable to BHEL. However downward variation shall be subject to adjustment as per actual GST applicability.

In case the Government imposes any new levy/tax on the output service/goods after price bid opening, the same shall be reimbursed by BHEL at actual. The reimbursement under this clause is restricted to the direct transaction between BHEL and its contactor only and within the contractual delivery period only.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer but before opening of the price Bid, 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.

8.1.11 **Modalities of Tax Incidence on BHEL:** Where GST law permits more than one option or methodology for discharging liability of tax/ levy/ duty; the contractor shall approach BHEL before choosing any option to discharge his tax liability. BHEL shall have the right to direct the contractor to adopt the appropriate option considering the amount of tax liability on BHEL 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 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:-

8.2.1 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 license 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 license / permission to BHEL within a period of one month from the date of award of contract.

8.2.2 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 gross payment made for value of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.

8.2.3 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.

8.2.4 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.

8.2.5 The contractor shall, however ensure before deposit of any BOCW Cess, that customer is not depositing the same in order to avoid excess deposit of cess.

8.2.6 The contractor shall bear cost of BOCW cess either by way of deposit or through recovery by BHEL in case the same is deposited by the customer.

8.2.7 In case of failure in above mentioned compliances, BOCW Cess @ 1% as well as applicable penalty as specified in BOCW Act/Rules shall be deducted from the contractor.

9.0 In order to give Phillip to Pradhan Mantri Kaushal Vikas Yojana:

"The contractor shall, at all stages of work deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute/ Industrial Training Institute/ National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/ certified by State/ Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/ semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

ANNEXURE- A

WEIGHT SCHEDULE OF STG & AUXILARIES AT 1X660 MW PANKI TPS

SUMMARY OF WEIGHTS

Brief description of Equipment in STG & Auxiliaries Package at 1x660 MW Panki TPP		
Sl. No.	**Description**	**Weight (MT)**
1	**Steam Turbine & Aux.**	**1124.50**
2	**Turbo Generator & Aux**	**580.86**
3	**Condenser & Aux**	**860.00**
4	**Heat Exchangers, Pumps and Motors (BFP, CEP, CW, Drip etc.,)**	
a	Heaters ,Deaerator & FST - HYD	**747.00**
b	BFP - TD - HYD	**78.35**
c	BFP - MD - HYD	**110.90**
d	CEP - HYD	**105.40**
e	Drip Pump - HYD	**64.30**
f	TDBFP Turbine - HYD	**268.38**
g	CW Pumps - HYD	**233.32**
h	Motors - Bhopal	**211.30**
5	**BOI Items (including turbine integral piping / valves, ME Bellows, PHE, RE Joints, flash tanks, butterfly valves, dosing skids, structural materials etc...)**	
a	Flash Tanks - BPL	**17.07**
b	Misc Tanks - BPL	**37.08**
c	BOIs - HWR	**947.84**
d	RE Joint - Bhopal	**67.50**
e	BFV - Bhopal	**159.00**
f	**BOIs - PEM**	
i	Pumps Horizontal	**53.00**
ii	Pumps Vertical	**162.00**
iii	Motors for Pumps	**0.00**
iv	BOIs-PEM Others	**108.00**
v	SINGLE GIRDER EOT/HOT MISC. CRANES	**42.00**
vi	CHAIN PULLEY BLOCKS	**3.50**

Brief description of Equipment in STG & Auxiliaries Package at 1x660 MW Panki TPP		
Sl. No.	**Description**	**Weight (MT)**
vii	ELECTRIC HOISTS	**14.00**
viii	WORKSHOP EQUIPMENT	**110.00**
ix	LUBE OIL TRANSFER PUMPS	**0.50**
x	Chemical & Oxygen Dosing - PEM	**13.74**
xi	Vacuum Pumps - HWR	**45.00**
g	**Structural Works - approach platforms (Other than supplied from BHEL MUs)**	**50.00**
6	**CW Piping**	**288.59**
7	**Fire Fighting Pumps & Motors**	**30.00**
8	**Foam Pumps, Motors and Tanks**	**13.00**
	Total (MT)	**6546.15**

Notes:

1. Weight mentioned in the **Annexure-A** are tentative only and based on the engineering /drawings /documents available as on date of NIT and liable for variation.
2. The contractor is required to erect actual tonnage (irrespective of any variation plus or minus) which may be necessary to complete their work and commissioning the Power Cycle Piping and Auxiliaries in all respects as detailed in tender specifications and as per the drawings/ documents for which payments shall be released on finally accepted tonnage rates.
3. The contractor undertakes to erect / commission actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually erected at site and payments will also be regulated for the same.

Details of Major Systems are as follows:

ANNEXURE- A.1

A. Weight Schedule for CONDENSER

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
1	78001/1	HOTWELL - I (CONDENSER-1)	10178	2952	1416	7952
2	78001/2	HOTWELL - II (CONDENSER-2)	10178	2672	1416	7947
3	78004/1	FRONT END BOTTOM PLATE	7860	2380	1129	5750
4	78004/2	FRONT END BOTTOM PLATE	7860	2380	1129	5750
5	78005/1	REAR END BOTTOM PLATE	7860	2380	1247	6031
6	78005/2	REAR END BOTTOM PLATE	7860	2380	1247	6031
7	78006/1	MIDDLE BOTTOM PLATE-1	7860	3700	1036	8013
8	78006/2	MIDDLE BOTTOM PLATE-1	7860	3700	1036	8013
9	78007/1	MIDDLE BOTTOM PLATE-2	7860	1840	1050	4153
10	78007/2	MIDDLE BOTTOM PLATE-2	7860	1840	1050	4153
11	78008/1	MIDDLE BOTTOM PLATE-3	7860	3700	1084	8137
12	78008/2	MIDDLE BOTTOM PLATE-3	7860	3700	1084	8137
13	78010/1	BOTTOM PLATE (LOOSE ITEMS)	950	450	400	303
14	78010/2	BOTTOM PLATE (LOOSE ITEMS)	950	450	400	303
15	78014/1	LOOSE ITEMS (COND.SUPPORT)	3000	1100	1100	1760
16	78014/2	LOOSE ITEMS (COND. SUPPORT)	4000	1200	1200	3150
17	78018/1	LOOSE ITEMS(COND. SUPPORT)	1750	1200	1200	1455
18	78018/2	LOOSE ITEMS(COND SUPPORT)	1750	1200	1200	1455
19	78019/1	LOOSE ITEMS(COND SUPPORT)	1300	1300	950	3265
20	78019/2	EARTH QUAKE PROTECTION DEVICE	1300	1300	950	3265
21	78021/1	FRONT WATER BOX AND WATER CHAMBER(GEN.SIDE)	6886	3210	4030	27384
22	78021/2	FRONT WATER BOX AND WATER CHAMBER (GEN.SIDE)	6886	3210	4030	27384
23	78024/1	FRONT WATER BOX AND WATER CHAMBER (TUR.SIDE)	6886	3210	4030	27384
24	78024/2	FRONT WATER BOX AND WATER CHAMBER (TUR.SIDE)	6886	3210	4030	27384
25	78027/1	REAR WATER BOX AND WATER CHAMBER (GEN.SIDE)	6886	3210	4030	27489
26	78027/2	REAR WATER BOX AND WATER CHAMBER (GEN.SIDE)	6886	4610	4030	32172

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
27	78030/1	REAR WATER BOX AND WATER CHAMBER (TUR.SIDE)	7044	4470	2890	27939
28	78030/2	REAR WATER BOX AND WATER CHAMBER (TUR.SIDE)	6886	3210	4030	27489
29	78032/1	SIDE WALL(TUR.END-PLATES) CONDENSER-1	6930	1865	40	3770
30	78032/2	SIDE WALL(TUR.END-PLATES) CONDENSER-2	6930	2480	80	3770
31	78033/1	SIDE WALL(TUR.END-PLATES) CONDENSER-1	6930	2480	80	10792
32	78033/2	SIDE WALL(TUR.END-PLATES) CONDENSER-2	6930	2480	80	10792
33	78034/1	SIDE WALL(TUR.END-LOOSE ITEMS) CONDENSER-1	4750	450	350	638
34	78034/2	SIDE WALL(TUR.END-LOOSE ITEMS) CONDENSER-2	4750	450	350	638
35	78041/1	SIDE WALL(GEN.END-PLATES) CONDENSER-1	6930	1865	40	3770
36	78041/2	SIDE WALL(GEN.END-PLATES) CONDENSER-2	6930	1865	40	3770
37	78042/1	SIDE WALL(GEN.END-PLATES) CONDENSER-1	6930	2480	80	10792
38	78042/2	SIDE WALL(GEN.END-PLATES) CONDENSER-2	6930	2480	80	10792
39	78046/1	SIDE WALL(GEN.END-LOOSE ITEMS) CONDENSER-1	4750	450	350	638
40	78046/2	SIDE WALL(GEN.END-LOOSE ITEMS) CONDENSER-2	4750	450	350	638
41	78047/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
42	78047/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
43	78048/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
44	78048/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
45	78049/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
46	78049/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
47	78050/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
48	78050/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	4013
49	78051/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	3744

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
50	78051/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	3744
51	78052/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	3744
52	78052/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	3744
53	78053/1	SHELL INTERNAL STIFFENING RODS	3366	791	500	3744
54	78053/2	SHELL INTERNAL STIFFENING RODS	3366	791	500	3744
55	78054/1	SHELL INTERNAL STIFFENING RODS	1000	800	600	989
56	78054/2	SHELL INTERNAL STIFFENING RODS	1000	800	600	989
57	78055/1	SHELL INTERNAL STIFFENING RODS	3700	850	700	2650
58	78055/2	SHELL INTERNAL STIFFENING RODS	3700	850	800	2650
59	78056/1	SHELL INTERNAL STIFFENING RODS	3700	850	800	2650
60	78056/2	SHELL INTERNAL STIFFENING RODS	3700	850	800	2650
61	78057/1	SHELL INTERNAL STIFFENING RODS	3700	850	800	2650
62	78057/2	SHELL INTERNAL STIFFENING RODS	3700	850	800	2650
63	78058/1	AIR EXTRACTION PIPING CONDENSER-1	6000	1200	1200	2029
64	78058/2	AIR EXTRACTION PIPING CONDENSER-2	6000	1200	1200	2029
65	78059/1	TUBE SUPPORT PLATE	5800	3820	183	6200
66	78059/2	TUBE SUPPORT PLATE	5800	3820	183	6200
67	78060/1	TUBE SUPPORT PLATE	5800	3820	183	6200
68	78060/2	TUBE SUPPORT PLATE	5800	3820	183	6200
69	78061/1	TUBE SUPPORT PLATE	5800	3820	170	4750
70	78061/2	TUBE SUPPORT PLATE	5800	3820	170	4750
71	78062/1	TUBE SUPPORT PLATE	5800	3820	170	4750
72	78062/2	TUBE SUPPORT PLATE	5800	3820	170	4750
73	78063/1	TUBE SUPPORT PLATE	5800	3820	170	4750
74	78063/2	TUBE SUPPORT PLATE	5800	3820	170	4750
75	78064/1	TUBE SUPPORT PLATE	5800	3820	170	4750
76	78064/2	TUBE SUPPORT PLATE	5800	3820	170	4750
77	78065/1	TUBE SUPPORT PLATE	5800	3820	170	4750
78	78065/2	TUBE SUPPORT PLATE	5800	3820	170	4750
79	78066/1	TUBE SUPPORT PLATE	5800	3820	170	4750
80	78066/2	TUBE SUPPORT PLATE	5800	3820	170	4750
81	78067/1	TUBE SUPPORT PLATE	5800	3820	170	4750
82	78067/2	TUBE SUPPORT PLATE	5800	3820	170	4750
83	78068/1	TUBE SUPPORT PLATE	5800	3820	170	4750

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
84	78068/2	TUBE SUPPORT PLATE	5800	3820	170	4750
85	78069/1	SHELL INTERNAL DETAILS	1600	900	1000	2902
86	78069/2	SHELL INTERNAL DETAILS	1600	900	1000	2902
87	78070/1	SHELL INTERNAL DETAILS	6000	900	900	4607
88	78070/2	SHELL INTERNAL DETAILS	6000	900	900	4607
89	78071/1	SHELL INTERNAL DETAILS	1300	1200	900	2537
90	78071/2	SHELL INTERNAL DETAILS	1300	1200	900	2537
91	78072/1	SHELL INTERNAL DETAILS	1000	1000	800	1526
92	78072/2	SHELL INTERNAL DETAILS	1000	1000	800	1526
93	78075/1	LOWER DOME WALL(TS) (CONDENSER-	10760	2220	50	6396
94	78075/2	LOWER DOME WALL(TS) (CONDENSER-	7315	1897	500	3947
95	78076/1	LOWER DOME WALL(TS) CONDENSER-1	2350	3700	300	1556
96	78076/2	LOWER DOME WALL(TS) CONDENSER-2	12730	2500	750	8223
97	78078/1	LOOSE ITEMS(LOWER DOME WALL TS)CONDENSER-1	4500	500	800	2250
98	78078/2	LOOSE ITEMS(LOWER DOME WALL TS)CONDENSER-2	6700	3430	560	5268
99	78103/1	LOWER DOME WALL (GS) CONDENSER-1	12796	2700	600	7532
100	78103/2	LOWER DOME WALL (GS) CONDENSER-2	2350	3700	300	1566
101	78104/1	LOWER DOME WALL(GS) CONDENSER-1	7315	1826	300	3802
102	78104/2	LOWER DOME WALL(GS) CONDENSER-2	2315	3686	300	1637
103	78107/1	LOOSE ITEM L D WALL (FWB) CONDENSER-1	2850	2000	400	2015
104	78107/2	LOOSE ITEM L D WALL (FWB) CONDENSER-2	2850	2000	400	2015
105	78108/1	LOWER DOME WALL(FWB) CONDENSER-	7266	2870	950	4618
106	78108/2	LOWER DOME WALL (FWB) CONDENSER-2	7266	2870	950	4618
107	78109/1	LOWER DOME WALL (FWB) CONDENSER	6412	2430	220	3700
108	78109/2	LOWER DOME WALL (FWB) CONDENSER	6412	2430	220	3700
109	78110/1	LOWER DOME WALL(FWB) CONDENSER-	5615	300	180	403
110	78110/2	LOWER DOME WALL (FWB) CONDENSER	5615	300	220	403
111	78112/1	LOOSE ITEMS LOWER DOME WALL (FWB) COND.-1	2980	2480	220	1416
112	78112/2	LOOSE ITEMS LOWER DOME WALL (FWB) COND.-2	6750	3450	250	5530

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
113	78113/1	LOWER DOME WALL(RWB) (CONDENSER	7900	1639	500	3506
114	78113/2	LOWER DOME WALL(RWB) (CONDENSER	7900	1639	220	3506
115	78114/1	LOWER DOME WALL(RWB) (CONDENSER	7290	3400	1950	5400
116	78114/2	LOWER DOME WALL(RWB) (CONDENSER	7290	3400	1950	5400
117	78115/1	LOWER DOME WALL(RWB) CONDENSER-1	6025	1400	930	2780
118	78115/2	LOWER DOME WALL(RWB) CONDENSER-2	6025	1400	930	2780
119	78116/1	LOWER DOME WALL(RWB) CONDENSER-1	7900	1730	380	3615
120	78116/2	LOWER DOME WALL(RWB) CONDENSER-2	7900	1730	380	3615
121	78118/1	LOOSE ITEMS LOWER DOME WALL (RWB) COND.-1	2100	2100	2200	1350
122	78118/2	LOOSE ITEMS LOWER DOME WALL (RWB) COND.-2	2100	2100	2200	1350
123	78121/1	DOME INTERNAL STIFFENING CONDNSER-1	5350	1750	950	3736
124	78121/2	DOME INTERNAL STIFFENING CONDENSER-2	5350	1750	950	3736
125	78122/1	DOME INTERNAL STIFFENING CONDENSER-1	3050	1000	900	3005
126	78122/2	DOME INTERNAL STIFFENING CONDENSER-2	3050	1000	900	3005
127	78123/1	DOME INTERNAL STIFFENING CONDENSER-1	2700	1000	600	1110
128	78123/2	DOME INTERNAL STIFFENING CONDENSER-2	2700	1000	600	1110
129	78124/1	DOME INTERNAL STIFFENING CONDENSER-1	2000	1900	1300	4232
130	78124/2	DOME INTERNAL STIFFENING CONDENSER-2	2000	1900	1300	4232
131	78125/1	DOME INTERNAL STIFFENING CONDENSER-1	3000	1400	900	3378
132	78125/2	DOME INTERNAL STIFFENING CONDENSER-2	3000	1400	900	3378

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
133	78126/1	DOME INTERNAL STIFFENING CONDENSER-1	3000	1100	1400	4040
134	78126/2	DOME INTERNAL STIFFENING CONDENSER-2	3000	1100	1400	4040
135	78127/1	LOOSE ITEMS DOME INTERNAL STIFFENING COND.-1	3300	460	460	615
136	78127/2	LOOSE ITEMS DOME INTERNAL STIFFENING COND.-2	3300	460	460	615
137	78129/1	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	1750	1150	950	1035
138	78129/2	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	1750	1150	950	1035
139	78130/1	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	6500	1600	750	4381
140	78130/2	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	6500	1600	750	4381
141	78132/1	UPPER DOME WALL (TURBINE SIDE) CONDENSER-1	7632	650	300	1611
142	78132/2	UPPER DOME WALL (TURBINE SIDE) CONDENSER-2	7632	650	300	1611
143	78133/1	UPPER DOME WALL(GEN SIDE) CONDENSER-1	7632	650	300	1611
144	78133/2	UPPER DOME WALL(GEN SIDE) CONDENSER-2	7632	650	300	1611
145	78136/1	UPPER DOME WALL (FWB) CONDENSER-1	5494	650	300	1028
146	78136/2	UPPER DOME WALL (FWB) CONDENSER-2	5494	650	300	1325
147	78137/1	UPPER DOME WALL(RWB) CONDENSER-1	5494	650	300	1325
148	78137/2	UPPER DOME WALL(RWB) CONDENSER-2	5494	650	300	1325
149	78142/1	FRONT W/BOX HINGE ARRANGEMENT	2400	1300	1200	6533
150	78142/2	FRONT W/BOX HINGE ARRANGEMENT	2400	1400	800	2964
151	78143/1	REAR W/BOX HINGE ARRANGEMENT	1800	900	1200	2495
152	78143/2	REAR W/BOX HINGE ARRANGEMENT	1900	900	650	2688
153	78144/1	FRONT W/BOX HINGE ARRANGEMENT	850	850	600	400

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
154	78144/2	FRONT W/BOX HINGE ARRANGEMENT	850	850	600	400
155	78145/1	REAR W/BOX HINGE ARRANGEMENT	850	850	600	400
156	78145/2	REAR W/BOX HINGE ARRANGEMENT	850	850	600	400
157	78146/1	FRONT W/BOX HINGE ARRANGEMENT	2400	700	400	650
158	78146/2	FRONT W/BOX HINGE ARRANGEMENT	2400	700	400	650
159	78147/1	REAR W/BOX HINGE ARRANGEMENT	2400	700	400	650
160	78147/2	REAR W/BOX HINGE ARRANGEMENT	2400	700	400	650
161	78150/1	FRONT W/BOX HINGE ARRANGEMENT	1498	1240	400	1037
162	78150/2	FRONT W/BOX HINGE ARRANGEMENT	1498	1240	400	1037
163	78151/1	REAR W/BOX HINGE ARRANGEMENT	1492	1140	400	890
164	78151/2	REAR W/BOX HINGE ARRANGEMENT	1492	1140	400	890
165	78157/1	CONDENSER (LOOSE ITEMS)	1000	700	600	500
166	78157/2	CONDENSER (LOOSE ITEMS)	1000	700	600	500
167	78158/1	COND. LOOSE ITEMS (RUBBER CORD FOR BOTH CONDENSER)	1000	700	500	120
168	78158/2	COND. LOOSE ITEMS (RUBBER CORD FOR BOTH CONDENSER)	1000	700	500	130
169	78159/1	FASTENERS (CONDENSER)	1200	1100	850	2400
170	78159/2	FASTENERS (CONDENSER)	1200	1100	850	2400
171	78165/1	CONDENSER LOOSE ITEMS	4300	800	350	1950
172	78165/2	CONDENSER LOOSE ITEMS	500	00X	150	77
173	78166	CONDENSER STAND PIPE NO.1 LOOS E ITEMS (FOR BOTH COND)	3500	600	600	250
174	78167/1	STAND PIPE NO.1 (CONDENSER 1&2)	3350	550	500	354
175	78167/2	STAND PIPE NO.2 (CONDENSER 1&2)	3500	600	600	354
176	78169	CONDENSER STAND PIPES NO.2 LOO SE ITEMS FOR(FOR BOTH COND)	3500	600	600	250
177	78175/1	CONDENSER INSTRUMENTATION	1550	600	600	100
178	78175/2	CONDENSER INSTRUMENTATION	1550	600	600	100
179	78176/1	CONDENSER INSTRUMENTATION	1500	1300	700	730
180	78176/2	CONDENSER INSTRUMENTATION	1500	1300	700	730
181	78301	GLAND STEAM CONDENSER	1750	1700	1700	1610
182	78304	LOOSE ITEMS OF GSC	700	300	200	60
183	78305	LOOSE ITEMS OF GSC (FRAGILE)	600	500	350	35
184	78315/1	LP HEATER NO.1	17100	2200	2000	31500

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
185	78315/2	LP HEATER NO.2	17100	2200	2000	31500
186	78316/1	LP HEATER-1 STAND PIPE	2200	350	350	150
187	78316/2	LP HEATER-2 STAND PIPE	2200	350	350	150
188	78317/1	LP HEATER-1 LOOSE ITEMS	500	400	400	135
189	78317/2	LP HEATER-2 LOOSE ITEMS	500	400	400	135
190	78320/1	TROLLEY FOR LP HEATER-1	1350	800	200	332
191	78320/2	TROLLEY FOR LP HEATER-2	1350	800	200	332
192	78424	HYDROGEN COOLER	5200	1270	1300	4555
193	78425	HYDROGEN COOLER	5200	1270	1300	4555
194	78428	LOOSE ITEMS (HYDROGEN COOLER)	1270	1150	600	900
195	78431	EXCITER AIR COOLER	3450	900	760	1570
196	78432	EXCITER AIR COOLER	3450	900	760	1570
197		**TOTAL (MT)**				**860**

ANNEXURE- A.2

B. Weight Schedule for TURBINE

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
1	75001/1	ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	777
2	75001/2	ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	777
3	75001/3	ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	777
4	75001/4	ARRANGE.OF EMBED(ANCHOR POINT) ANCHOR BOX TYPE-A	2550	800	1000	777
5	75001/5	ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	777
6	75001/6	ARRANGE.OF EMBED(ANCHOR POINT)	3350	800	1000	955
7	75001/7	ARRANGE.OF EMBED(ANCHOR POINT) EMBED.FOR LPC GUIDE BOLT	3350	800	1000	1323
8	75001/8	ARRANGE.OF EMBED(ANCHOR POINT) EMBED.FOR LPC GUIDE BOLT	3350	800	1000	1323
9	75001/9	ARRANGE.OF EMBED(ANCHOR POINT) LOOSE ITEMS	1350	1300	1250	790
10	75001/1	ARRANGE.OF EMBED(ANCHOR POINT) ANCHOR RODS/NUTS (L=3000)	1350	1300	1250	826

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
11	75001/1	ARRANGE.OF EMBED(ANCHOR POINT)	1350	1300	1250	797
12	75003/1	BASE PLATE ASSEMBLY	1500	800	500	1690
13	75003/2	BASE PLATE ASSEMBLY BASE PLATE ASSEMBLY	600	500	500	410
14	75004	BASE PLATE ASSEMBLY	2800	1600	600	5100
15	75102/1	CASING UPPER PART	8600	3000	3000	14060
16	75102/2	CASING UPPER PART	8600	3000	3000	14060
17	75103/1	CASING UPPER PART	8600	3000	3000	13370
18	75103/2	CASING UPPER PART	8600	3000	3000	13370
19	75104	RUPTURE DIAPHRAGM ASSEMBLY	2800	2400	1600	2224
20	75107/1	CASING SIDE WALL (LEFT)	5330	5040	600	7680
21	75107/2	CASING SIDE WALL (LEFT)	5330	5040	600	7680
22	75108/1	CASING SIDE WALL (RIGHT)	5030	5040	600	7680
23	75108/2	CASING SIDE WALL (RIGHT)	5330	5040	600	7680
24	75109/1	FRONT WALL LP-1(TS)	8000	5040	1200	14857
25	75109/2	FRONT WALL LP-2(TS)	8000	5040	1200	14857
26	75110/1	FRONT WALL LP-1(GS)	8000	5040	1200	14857
27	75110/2	FRONT WALL LP-2(GS)	8000	5040	1200	14857
28	75111/1	LP SHAFT SEAL CASING - TS	2000	1650	750	1130
29	75111/2	LP SHAFT SEAL CASING - TS	2000	1650	750	1130
30	75112/1	LP SHAFT SEAL CASING - GS	2000	1650	750	1130
31	75112/2	LP SHAFT SEAL CASING - GS	2000	1650	750	1130
32	75113/1	LP SHAFT SEAL COMPENSATOR (TS)	2800	2800	800	1504
33	75113/2	LP SHAFT SEAL COMPENSATOR (TS)	2800	2800	800	1504
34	75114/1	LP SHAFT SEAL COMPENSATOR (GS)	2800	2800	800	1504
35	75114/2	LP SHAFT SEAL COMPENSATOR (GS)	2800	2800	800	1504
36	75115/1	GRATING COVERING FOR LP	3500	2000	1500	1640
37	75115/2	GRATING COVERING FOR LP	3000	1000	1000	695
38	75116/1	CASING FRAME SECTION	8200	4900	250	6927
39	75116/2	CASING FRAME SECTION	8200	4900	250	6927
40	75116/3	CASING FRAME SECTION	2100	1900	1900	3584
41	75116/4	CASING FRAME SECTION	2000	700X	1100	5222
42	75201	HP/IP BEARING PEDESTAL	4300	1800	2100	10475
43	75202	HP/IP BEARING PEDESTAL (PARTS)	1000	600	600	350
44	75301	MOUNT.FRAM FOR BEARINGS SHELL	1000	750	750	350

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
45	75302	ALIGNMENT SHAFT FOR IP TURBINE	4050	600	900	1350
46	75303	SUPPORT FOR ESV AND IVCV &	1800	750	750	650
47	75304	TURNING-OVER DEVICE FOR HP-CASING & SUPPORT	3800	2500	1300	15000
48	75305	ASSLY. FIXTURE FOR HP TURBINE1	2300	2100	900	5000
49	75306	ASSLY. FIXTURE FOR HP TURBINE2	3300	1800	1300	5000
50	75308	LP-SHAFT SUPPORT	3750	1000	1000	4700
51	75311	LIST OF TOOLS	1700	800	400	1300
52	75312	I.P. SHAFT SUPPORT	1200	500	550	1350
53	75313	BREECH NUT HEATING & STRETCHING DEVICE	1700	900	700	1300
54	75315	AUXILIARIES OF LP TURBINE	3000	1500	800	1042
55	75316	LIFTING SLINGS FOR HP/IP/LP TURBINE	1700	1700	300	3900
56	75319/1	STEAM BLOWING AND HYDRAULIC TEST DEVICE FOR HP VALVE	3000	2000	1500	2285
57	75319/2	STEAM BLWOING DEVICE FOR OVERLOAD VALVE	1200	700	500	120
58	75319/3	STEAM BLOWING AND HYDRAULIC TEST DEVICE FOR IV VALVE	3500	3200	1200	4035
59	75320	TOOLS FOR GOVERNING SYSTEM	4200	3000	2000	660
60	75321	WIRE ROPES FOR HP,IP & OVERLOAD VALVE	3000	2000	1000	850
61	75322/1	ASSEMBLY DEVICE FOR HP VALVE	1500	1200	1200	1460
62	75322/2	ASSEMBLY DEVICE FOR OVERLOAD VALVE	1300	700	1000	640
63	75322/3	ASSEMBLY DEVICE FOR IP VALVE	1200	1000	600	1710
64	75323	SUPPORT OF BREECH BLOCK &MOUNT DEVICE FOR OVERLOAD VALVE	1500	750	750	650
65	75401	IP-LP BEARING PEDESTAL ASSLY	7100	1900	2400	23922
66	75402	BEARING PEDESTAL (PARTS)	2000	1000	600	1612
67	75501	LP/GEN. PEDESTAL ASSEMBLY	7100	1800	2400	19020
68	75502	BEARING PEDESTAL (PARTS)	1000	1000	650	651
69	75503	LP/LP PEDESTAL ASSEMBLY	6250	2000	2100	19560
70	75505	BEARING PEDESTAL (PARTS)	800	800	700	718
71	75601/1	FRONT BEARING PEDESTAL	XX		XX	5136
72	75601/2	HYDRALLIC TURNING MOTOR	1300	800	1500	653
73	75601/3	FRONT BEARING PEDESTALS(PARTS)	1000	600	600	200
74	75705/1	LP EXTRACTION A1	2700	1100	1000	654

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
75	75705/2	LP EXTRACTION A1	2700	1100	1000	654
76	75706/1	LP EXTRACTION A1	2700	1100	1000	654
77	75706/2	LP EXTRACTION A1	2700	1100	1000	654
78	75707/1	LP EXTRACTION A1	2800	1900	1000	1236
79	75707/2	LP EXTRACTION A1	2800	1900	1000	1236
80	75707/3	LP EXTRACTION A1	2000	1800	900	514
81	75707/4	LP EXTRACTION A2	2000	1800	1100	514
82	75708/1	LP EXTRACTION A2	2800	1900	1000	1236
83	75708/2	LP EXTRACTION A2	2800	1900	1000	1236
84	75709/1	LP EXTRACTION A2	2700	1900	1000	1138
85	75709/2	LP EXTRACTION A2	2700	1900	1000	1138
86	75710/1	LP EXTRACTION A2	2000	1800	900	538
87	75710/2	LP EXTRACTION A2	2000	1800	900	538
88	75711/1	LP EXTRACTION A3	3150	1900	1000	1507
89	75711/2	LP EXTRACTION A3	3150	1900	1000	1507
90	75712/1	LP EXTRACTION A3	3500	1900	1500	1450
91	75712/2	LP EXTRACTION A4	1600	800	700	630
92	75713/1	LP EXTRACTION A4	4250	1100	1100	1222
93	75713/2	LP EXTRACTION A4	4250	1100	1100	1222
94	75714/1	C-HOOK	351	121	156	1390
95	75714/2	C-HOOK	147	101	119	415
96	75714/3	C-HOOK	695	137	121	1525
97	75714/4	C-HOOK	457	183	138	2240
98	75716/1	EXTRACTION PIPE SHEATHING A3	2500	900	700	371
99	75716/2	EXTRACTION PIPE SHEATHING A3	2200	700	600	610
100	75716/3	EXTRACTION PIPE SHEATHING A3	1800	900	600	825
101	75716/4	EXTRACTION PIPE SHEATHING A3	2500	600	500	430
102	75716/5	EXTRACTION PIPE SHEATHING A4	2500	900	700	371
103	75716/6	EXTRACTION PIPE SHEATHING A4	2200	700	600	610
104	75716/7	EXTRACTION PIPE SHEATHING A4	1800	900	600	825
105	75716/8	EXTRACTION PIPE SHEATHING A4	1100	600	500	1163
106	75717/1	COMPENSATORS FOR CASING GUIDE	1600	1600	350	503
107	75717/2	COMPENSATORS FOR CASING GUIDE	1600	1600	350	440
108	75717/3	COMPENSATORS FOR CASING GUIDE	1600	1600	350	440

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
109	75717/4	LOOSE ITEMS FOR CASING GUIDE COMPENSATORS	1000	1000	1000	660
110	75720/1	LP INNER CASING (U/H)	XX		XX	25776
111	75720/2	LP INNER CASING (U/H)	XX		XX	25776
112	75721/1	LP INNER CASING (L/H)	XX		XX	54290
113	75721/2	LP INNER CASING (L/H)	XX		XX	53604
114	75722/1	ASSEMBLY OF GUIDE BLADE CARRIERS 2L&3L FOR LP1(U/H)	XX		XX	4430
115	75722/2	ASSEMBLY OF GUIDE BLADE CARRIERS 2R & 3R FOR LP1(U/H)	XX		XX	4430
116	75722/3	ASSEMBLY OF GUIDE BLADE CARRIERS 2L & 3L FOR LP2(U/H)	XX		XX	4430
117	75722/4	ASSEMBLY OF GUIDE BLADE CARRIERS 2R & 3R FOR LP2(U/H)	XX		XX	4430
118	75722/5	ASSEMBLY OF GUIDE BLADE CARRIER LPT1 (L) (U/H)	XX		XX	4000
119	75722/6	ASSEMBLY OF GUIDE BLADE CARRIER LPT1 (R) (U/H)	XX		XX	4000
120	75722/7	ASSEMBLY OF GUIDE BLADE CARRIER LPT2 (L) (U/H)	XX		XX	4000
121	75722/8	ASSEMBLY OF GUIDE BLADE CARRIER LPT2 (R) (U/H)	XX		XX	4000
122	75723/1	LP CASING ASSEMBLY PARTS	4200	600	500	850
123	75723/2	LP CASING ASSEMBLY PARTS	1500	1400	700	635
124	75723/3	LP CASING ASSEMBLY PARTS	500	500	400	37
125	75723/4	LP CASING ASSEMBLY PARTS	550	400	300	71
126	75724/1	LP INNER CASING ASSEMBLY(PARTS	3300	1850	300	1836
127	75724/2	LP INNER CASING ASSEMBLY(PARTS	3350	1850	400	1836
128	75801/1	LP ROTOR	XX		XX	80095
129	75801/2	LP ROTOR	XX		XX	80095
130	75901	IP ROTOR	XX		XX	38383
131	75902	IP OUTER CASING (U/H)	6040	4320	2200	30045
132	75903	IP OUTER CASING (L/H)	5300	5300	2200	39220
133	75904	IP INNER CASING (U/H)	3600	3300	1650	26000
134	75905	IP INNER CASING(L/H)	3600	3300	1650	30000
135	75906	SUPPORTING ARMS-IP OUTER CASING	1600	1400	1400	1924
136	75907	IP SHAFT SEALING	1000	1000	600	700

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
137	75908	IP TURBINE (PARTS)	3000	2000	1600	8600
138	75909	I.P. TURBINE PARTS	1200	1200	200	475
139	76104	ESV & CV CASING WITH VALVES	4700	4700	2700	35890
140	76105/1	MOUNTING SUPPORT FOR MS VALVE	1700	800X	1000	1100
141	76105/2	MOUNTING SUPPORT FOR MS VALVE	1700	800X	1000	1100
142	76108	ESV & CV CASING WITH VALVES	4700	4700	2700	33100
143	76112	OVERLOAD VALVE CASING WITH VALVE	3000	2000	1400	3400
144	76201	SUSPENSION OF OVERLOAD VALVE	3900	700	1150	1200
145	76202	IV & CV CASING WITH VALVES	6210	5625	3600	52000
146	76205/1	MOUNTING SUPPORT FOR HRH VALVE	2750	1750	900	2600
147	76205/2	MOUNTING SUPPORT FOR HRH VALVE	2750	1750	900	2600
148	76206	IV & CV CASING WITH VALVES	6210	5625	3600	52000
149	76301/1	SUSPENSION OF LPBP VALVE	3600	800	600	1186
150	76301/2	SUSPENSION OF LPBP VALVE	3600	800	600	1186
151	76412	LEAKAGE OIL TANK	1000	1000	3000	515
152	76413	WASTE OIL TANK	1000	1000	3000	515
153	76601	COMPONENTS OF COP ASSEMBLY	XX		XX	3700
154	76602	COMPONENTS OF COP ASSEMBLY	XX		XX	3200
155	76603	COMPONENTS OF COP ASSEMBLY	XX		XX	5500
156	76604	COMPONENTS OF COP ASSEMBLY	XX		XX	2200
157	76605	COMPONENTS OF COP ASSEMBLY	XX		XX	600
158	76606	COMPONENTS OF COP ASSEMBLY	XX		XX	12000
159	76607	COMPONENTS OF COP ASSEMBLY	XX		XX	3500
160	76608	COMPONENTS OF COP ASSEMBLY (PARTS)	XX		XX	3500
161	76801	RATING,COLLABORATION AND COMPANY'S MONOGRAM	1000	550	500	70
162	76914	COMPENSATOR	600	600	900	50
163	76921	VALVE BLOCK ASSLY	250	200	200	12
164		**TOTAL (MT)**				**1124.50**

ANNEXURE- A.3

C. Weight Schedule for GENERATOR

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
1	601	FOUNDATION PLATES	6600	1680	950	12764
2	602	FOUNDATION BOLTS	2540	600	655	1190
3	603	FOUNDATION ITEMS	5800	1120	520	2170
4	605	GENERATOR STATOR	9860	4440	260	316000
5	606/1	GENERATOR ROTOR	14140	1790	1760	85913
6	606/2	SKID PLATE	8050	855	335	818
7	607	END SHIELD LOWER HALF (TE)	3800	1500	2240	9883
8	608	END SHIELD UPPER HALF (TE)	3800	1500	2240	8883
9	609	END SHIELD LOWER HALF (EE)	3800	1500	2240	9933
10	610	END SHIELD UPPER HALF (EE)	3800	1500	2240	8933
11	611	GENERATOR BEARING (EE & TE)	1240	1050	1225	2191
12	612	BAFFLE RING CARRIER & AIR GAP SEAL ASSY.	2035	1885	1380	1714
13	613	TERMINAL BUSHINGS	1984	1856	680	1737
14	614	TERMINAL BUSHING BOX	3500	2600	1740	7337
15	615	SHAFT SEALS (EE & TE) & OIL CATCHER (INNER & OUTER)	2160	2160	730	1830
16	616	BAFFLE RING ASSY	1950	1950	1215	1420
17	617	GENERATOR ACCESSORIES	2200	2200	975	815
18	618	FLEXIBLE TERMINAL CONNECTIONS	1420	1020	540	774
19	619	GENERATOR ACCESSORIES	1210	1010	400	670
20	620	GENERATOR ACCESSORIES	1200	1010	820	985
21	621	GENERATOR ACCESSORIES	1710	1220	420	350
22	622	PRIMARY WATER TANK	10500	2400	1200	2040
23	624	PW TANK PIPE LINES	1200	600	715	277
24	625	PLATFORM FOR PW TANK	5000	1200	765	1727
25	626	COOLER HOUSING FRAME	4290	4450	428	21500
26	627	SEAL RINGS	830	830	315	165
27	628	CONNECTION PIECE ASSEMBLY	1880	1300	535	1088
28	630	GENERATOR-TERMINAL BOXES	1210	1010	800	340
29	631	DRY AIR BLOWER	1360	1190	1625	648
30	632	ERECTION PEDESTALS	6500	1500	1211	6543

Sl no	PACKAGE NO	DESCRIPTION	DIMENSIONS (IN MM)			GROSS WEIGHT (in Kgs)
			L	W	H	
31	633	ROTOR INSERTION DEVICES	2460	1170	1360	2320
32	634	WIRE ROPES FOR ROTOR	1800	1800	500	523
33	635	GENERATOR ERECTION DEVICES	3450	1630	795	1400
34	636	SPECIAL TOOLS AND TACKLES	800X	00X4	428	218
35	637	BRUSHLESS EXCITER SET	5900	2435	2910	30430
36	639	DRY AIR BLOWER AND ACCESSORIES	1800	1500	1258	1115
37	640	EXCITER BED PLATE ACCESSORIES	4500	1200	1408	3012
38	642	EXCITER ACCESSORIES	2200	2100	838	1500
39	643	EXCITER FOUNDATION ACCESSORIES	1150	750	988	768
40	644	RR WHEEL AIR GUIDE COVER	2300	2200	2088	3311
41	645	SEAL OIL STORAGE TANK	5000	1800	2000	2500
42	646	PW COOLER AND FILTER UNIT	4300	4000	3300	7065
43	648/1	SINGLE FLOW S.O.U.-PART I	3910	3100	3200	5300
44	648/2	SINGLE FLOW S.O.U. -PART II	2510	2500	3300	4525
45	649	LIQUID DETECTOR RACK	2132	840	2300	660
46	650	GAS UNIT	2550	1750	2560	1205
47	651	CO2 VAPOURISER	1520	840	840	250
48	652	H2 DISTRIBUTOR	3340	1425	800	333
49	653	CO2 DISTRIBUTOR	3700	1200	500	353
50	654	N2 DISTRIBUTOR	1400	1240	500	143
51	655	DRAIN OIL COLLECTOR	2000	550	550	139
52	656	RESINS	1200	600	600	100
53	657	TG SYSTEM INTEGRAL PIPING (VALVES)	2750	1400	1565	2346
54	658	TG SYSTEM INTEGRAL PIPING (INSTRUMENTS)	1000	940	1065	338
55	659	CONSUMABLES	1200	600	720	217
56	664	ROTOR FLUX MONITORING SYSTEM-1	1000	800	2400	80
57	664/1	ROTOR FLUX MONITORING SYSTEM-2	1500	1500	600	75
58		**TOTAL (MT)**				**580.86**

ANNEXURE- A.4

D. Weight Schedule for HEAT EXCHANGERS

Sl.NO	Equipment Name	Qty	Dimensions in mm (LXWXH)	Total Wt. (in Kgs)
1	Drain Cooler	1	9000 X 1500 X 1800	14000
2	LP Heater-3	1	14000 X 2200 X 2700	33000
3	LP Heater-4	1	13000 X 2200 X 2700	31000
4	LP Heater-5	1	13500 x 2100 x 2500	31000
5	HP Heater-7	1	12000 X 2700 X 3400	110000
6	HP Heater-8	1	15000 X 2900 X 3400	158000
7	HP Heater-9	1	13000 X 2700 X 3400	135000
8	De-superheater to HPH-7	1	7500 X 2000 X 2500	35000
9	BFPDT Oil Cooler	2	6000 X 700 X 3000	28000
10	Deaerator Heater	1	13000 X 3600 X 4000	50000
11	Deaerator FST-1	1	12300 X 4200 X 4800	40000
12	Deaerator FST-2	1	12700 X 4300 X 4800	42000
13	Deaerator FST-3	1	12300 X 4200 X 4800	40000
14	**TOTAL (MT)**			**747**

ANNEXURE- A.5

E. Weight Schedule for TBDFP - Pump

SL. No.	DESCRIPTION	QTY./UNIT	PACKING SIZE (mm)	Total Wt. (in Kgs)
		TD BFP- 2 NOs	(L x W x H)	
1	Turbine Driven Boiler Feed Pump (TD BFP) with Base Plate & Tubing	2	3500 x 3100 x 3000	54400
2	Turbine Driven Boiler Feed Booster Pump (TD BP) with Base Plate & Tubing	2	3000 x 2800 x 2000	13500
3	Recirculation Valve	2	1100 x 1100 x 2900	2650
4	Conical Suction Strainer at BFP suction	2	4000 x 1200 x 1200	2800
5	Basket type Suction Strainer at BP suction	2	1500 x 1500 x 2000	5000
6	**TOTAL (MT)**			**78.35**

ANNEXURE- A.6

F. Weight Schedule for MBDFP – Pump

SL. No.	DESCRIPTION	QTY./UNIT	PACKING SIZE (mm)	Total Wt. (in Kgs)
		MD BFP- 1 NOs	(L x W x H)	
1	Motor Driven Boiler Feed Pump (MD BFP) with Base Plate & Tubing	1	3500 x 3100 x 3000	26000
2	Motor Driven Boiler Feed Booster Pump (MD BP) with Base Plate & Tubing	1	3000 x 2800 x 2000	6500
3	Hydraulic Coupling	1	4000 x 3000 x 4000	22200
4	HC Working Oil Coolers & accessories	1 Sets	5000 x 1000 x 1000	4500
5	HC Lube Oil Coolers & accessories	1 Sets	2500 x 600 x 600	2500
6	Recirculation Valve	1	1000 x 1000 x 2800	1400
7	Conical Suction Strainer at BFP suction	1	3100 x 1000 x 1000	1800
8	Basket type Suction Strainer at BP suction	1	1500 x 1500 x 1600	2700
9	Connecting Coupling	1	1000x600x500	300
10	MD BFP Motor	1	4700 x 4500 x 3000	43000
11	**TOTAL (MT)**			**110.90**

ANNEXURE- A.7

G. Weight Schedule for CONDENSATE EXTRACTION Pump

SL. No.	DESCRIPTION	QTY./UNIT	PACKING SIZE (mm)	Total Wt. (in Kgs)
			(L x W x H)	
1	Condensate Extraction Pump	3	11000 x 3000 x 3000	57000
2	Sole plate	3	2200 x 2200 x 400	3000
3	Canister	3	7600 x 2200 x 2200	11200
4	Basket type Suction Strainer at CEP suction	3	1750 x 1750 x 2000	4500
5	Connecting Coupling	3	1000 x 600 x 500	900
6	CEP Motor	3	3500 (H) X Dia 2100	28800
7	**TOTAL (MT)**			**105.40**

ANNEXURE- A.8

H. Weight Schedule for DRIP Pump

SL. No.	DESCRIPTION	QTY./UNIT	PACKING SIZE (mm) (L x W x H)	Total Wt. (in Kgs)
1	Drip Pump	2	8500 x 3000 x 1600	30000
2	Sole plate	2	2200 x 2200 x 400	2200
3	Canister	2	7600 x 2200 x 2200	7000
4	Basket type Suction Strainer at Drip pump suction	2	1750 x 1750 x 2750	4500
6	Connecting coupling	2	1000 x 500 x 500	600
7	Drip pump Motor	2	2500 x 1900 x 3800	20000
8	**TOTAL (MT)**			**64.30**

ANNEXURE- A.9

I. Weight Schedule for TBDFP - Turbine

Sl.NO	Equipment Name	Qty/1 BFPDT	Dimensions in mm (LXWXH)	Total Wt. (in Kgs)
1	Steam Turbine	1	4700x5200x4250(with Gov Valves) 4700x5200x3500(without Gov Valves)	136000
2	Gear Box	1	1050x1250x1150	2200
3	Lube oil console Package –I (Lube Oil reservoir and Duplex filter with Piping)	1	5000X4000X3000	18000
4	Lube oil console Package –II (Pump assembly with Piping)	1	3000X3000X3500	12550
5	Lube oil console Package-III (Lube oil Coolers with Vent & Drain Piping)	1	3550X435X2700	11400
6	Emergency oil pump assembly	1	2000x1000x2000	3000
7	Jacking oil pump assembly	1	2000X800X600	400
8	Oil purification unit	1	1900x1800x1900	2400
9	Transfer Oil Pump Assembly	1	550X300X320	200

Sl.NO	Equipment Name	Qty/1 BFPDT	Dimensions in mm (LXWXH)	Total Wt. (in Kgs)
10	Oil accumulators	1	800x800x2200	700
11	Governing console	1	1600x1600x2000	1360
12	Transition piece	1	3235x 2035X 2185	14500
13	Turbine enclosure	1	5000X6600X4100	14000
14	ESV Assembly (Right & Left)	2	1500X1000X1000	6600
15	Servomotor Assembly	1	1500X1500X2000	700
16	Gland Steam Inlet Control Valve	1	570X200X1500	460
17	Gland Steam Dump Control Valve	1	450X350X1450	400
18	Lube Oil Temp Control Valve	2	370X470X1300	640
19	OIL VAPOUR FAN WITH IE2 Mtr	2		400
20	OIL ACCMULATOR SET IN SINGLE STAND	1		600
21	SERVO PRIME 46 TURBINE OIL MEDIUM GRADE	44000 L		38800
22	CHARGING KIT	1		20
23	TSI BFPDT Pkg 1 Imported ltms for 2 BFPDTs	1		350
24	TURBINE THERMAL INSULATION	1		2000
25	Governing Oil accumulator	1		700
26	**TOTAL (MT)**			**268.38**

ANNEXURE- A.10

J. Weight Schedule for CW - Pumps

S.NO	DESCRIPTION OF ITEM	QTY/ PUMP	Size (cu.m) (LxBxH) per Equipment	TOTAL QTY for 3 pumps	Total Wt. (in Kgs)
1	Suction Bell	1	3.0x3.0x0.8	3	4260
2	Impeller	1	2.0x2.0x1.0	3	7500
3	Discharge Bowl	1	3.0x3.0x2.0	3	21600
4	Discharge Elbow	1	3.8x3.8x3.5	3	25500
5	Stuffing Box	1	0.8x0.8x0.5	3	750
6	Bearing Box Upper	1	0.8x0.8x0.5	3	600

S.NO	DESCRIPTION OF ITEM	QTY/ PUMP	Size (cu.m) (LxBxH) per Equipment	TOTAL QTY for 3 pumps	Total Wt. (in Kgs)
7	Shafts	3	1.3x1.3x4.0	9	48600
8	Shaft Coupling	2	1.4x1.4x1.2	6	3600
9	Suction Liner	1	2.5x2.5x0.7	3	4200
10	Lifting Column pipe	1	3.8x3.8x1.8	3	21900
11	Column pipe (inter)	1	2.3x2.3x2.1	3	8400
12	Column pipe (lower)	1	2.5x2.5x1.8	3	8550
13	Motor pedestal	1	5.0x5.0x1.5	3	39600
14	Sole plate (Pump)	1	4.0x4.0x0.15	3	6900
15	Sole plate (Motor pedestal)	4	1.0x0.7x0.15	12	12000
16	Coupling cover	1	2.0x2.0x1.5	3	210
17	Thrust bearing pedestal	1	1.5x1.5x0.8	3	3300
18	Thrust bearing	1	1.5x1.5x1.5	3	4200
19	Connecting coupling	1	0.9x0.9x1.8	3	3750
20	Counter flange	1	2.8x2.8x0.15	3	4500
21	Hardware & Miscellaneous	1 SET	2.0x2.0x2.0	3	3000
22	**TOTAL (MT)**				**233.32**

ANNEXURE- A.11

K. Weight Schedule for HT – Motors

SL NO	KW	KV	DRIVE	QTY	Size L x Bx H (mm)	Total Wt. (in Kgs)
1	4650	11	CWP-V	3	5100X4400X4300	165000
2	225	3.3	Raw Water Intake-V	2	1810X1180X840	4400
3	315	3.3	Raw Water Pump-V	2	1985X1390X910	6000
4	300	3.3	APH/ESP wash-V	2	1810X1180X840	4500
5	1110	3.3	ACWP-V	2	2535X1550X1150	13600
6	315	3.3	DMCW-TG	3	1985X1390X910	9000
7	630	3.3	DMCW-SG	2	2125X1300X990	8800
8	**TOTAL (MT)**					**211.30**

ANNEXURE- A.12

L. Weight Schedule for FLASH TANKS

S.No.	Item	Total Qty.	Shipping Dimensions (in mm)	MT
1	Flash Tank A	1	5000 x 3500 x 3500	7.682
2	Flash Tank B	1	5000 x 3500 x 3500	7.884
3	Unit Flash Tank	1	2600 x 1700 x 1700	1.507
4	**TOTAL (MT)**			**17.07**

ANNEXURE- A.13

M. Weight Schedule for MISC. TANKS

S.No.	Item	Total Qty.	Shipping Dimensions (in mm)	UNIT Wt/Qty. (in kg)
1	Dirty Oil Tank	1	6400x3400x4200	10600
2	Clean Oil Tank	1	6400x3400x4200	10600
3	Oil Unloading Vessel	1	2240x1200x900	584
4	DMCW Tank	1	7150x 2380 X2800	6000
5	Portable Water Tank	1	2800X2800X2700	4000
6	Service Water Tank	1	4400X3400X2900	5300
7	**TOTAL (MT)**			**37.08**

ANNEXURE- A.14

N. Weight Schedule for HARIDWAR BOIs

SNO	ITEM DESC	Wt(Kgs)
1	HYDRAULIC UNIT ASSEMBLY	1300
2	LEAK STEAM CONTROL VALVE WITH	1700
3	MOTORISED TEMPERATURE CONTROL	2100

SNO	ITEM DESC	Wt(Kgs)
4	DRY AIR PRESERVATION SYSTEM	2600
5	OIL PURIFICATION UNIT	2900
6	OIL PURIFICATION SYSTEM (CENTR	2900
7	CONTROL FLUID (FRF)	3330
8	FLOW NOZZLES FOR PG TEST	3900
9	EMPTY CO2 CYLINDER	4920
10	EXCITER COVER COMPLETE WITH FA	4900
11	HYDRAULIC POWER SUPPLY UNIT FO	5932
12	LIFTING BEAM	7900
13	HYDROGEN COOLERS PIPING	7900
14	MULTI BALL BEARING SUPPORT FOR	8900
15	EMPTY H2 CYLINDER	10960
16	ELECTRO-HYDRAULIC ACTUATORS FO	12900
17	THERMAL INSULATION OF TIP	15900
18	GENERATOR INTEGRAL PIPING	18900
19	LP BYPASS STOP & CONTROL VALVE WITH EHA AND WATER INJECTION VALVE	41000
20	CONDENSOR AIR EVACUATION PACKA	33000
21	H & S FOR TURBINE INTEGRAL PIPING	36000
22	OIL MODULE	38000
23	TURBINE OIL	42000

SNO	ITEM DESC	Wt(Kgs)
24	THERMAL INSULATION OF TURBINE	44000
25	TURBINE INTEGRAL PIPING*	58000
26	800MW HPT,	130000
27	WELDED AUSTENITIC S.S. TUBES G	390000
28	Other Misc. small items	16000
29	**TOTAL (MT)**	**947.84**

*** P91 Piping in Integral Piping (Part of Turbine Integral Piping)**

S. No.	Item	Wt (MT)
1	Overload valve piping	13
2	Seal steam piping	5.1
3	Turbine drainage piping	4.7
4	**TOTAL (MT)**	**22.8**

ANNEXURE- A.15

O. Weight Schedule for RE JOINTS

S. No.	Item	Total Qty.	Shipping Dimensions (in mm)	MT
A	**RE Joint (Compensating Type) 2800 NB**			
1	Flange Assembly (Cond.W/Box side)	8	4500 x 4500 x 450	32
2	Flange Assembly (Piping side)	4	4500 x 4500 x 450	16
3	Bare Bellow with Retaining Ring	12	3500 x 3500 x 500	6
B	**RE Joint (conventional type) 2900 NB**			0
1	Bare Bellow with Retaining Ring	3	4300 x 4300 x 450	1.5
2	Flange	6	3500 x 3500 x 150	12
	TOTAL (MT)			**67.50**

ANNEXURE- A.16

P. Weight Schedule for BUTTERFLY VALVES

SR. NO.	SIZE OF BF VALVE (mm)	VALVE OPERATION	QUANTITY (Nos.)	APPROX DIMENSIONS OF EACH BOX L(mm)XB(mm)XH(mm)	MT
1	DIA. 2900	ELECTRICAL	3	4500 X 4000 X 1500	**75**
2	DIA. 2800	ELECTRICAL	4	3800 X 3200 X 800	**84**
3	**TOTAL (MT)**				**159**

ANNEXURE- A.17

Q. Weight Schedule for PEM PUMPS – VERTICAL, HORIZONTAL & OTHER BOIs

S.N	PACKAGE DESCRIPTION	QTY (Nos)	TOTAL FOR STATION (In Tonnes)		REMARKS
1	**Misc. Pumps (Vertical)**				
	RAW WATER INTAKE PUMPS	2	16	16	**WATER SYSTEM PUMPS**
	RAW WATER PUMPS	2	12	12	
	RAIN WATER HARV. PUMPS	2	12	12	
	AHP make-up Pump (V)	2	8	8	
	CW M/up Pumps (V)	3	18	18	
	APH/ESP Wash Pump (V)	2	12	12	
	AHP/CHP Pump (V)	2	8	8	
	Service Water Pumps(V)	2	10	10	
	FGD Pumps (V)	4	16	16	
	ACW Pumps (V)	2	20	20	
2	**Misc. Pumps (Horiz)**				
	DMCW-TG (H)	3	15	15	
	DMCW-SG(H)	2	10	10	
	Boiler Fill Pumps (H)	2	10	10	**WATER SYSTEM PUMPS**
	DM M/U Pumps (H)	2	8	8	
	CONDENSATE TRANSFER PUMPS	2	10	10	
3	**Sump Pumps (Vertical)**	15	2 T each pump	30	**WATER SYSTEM PUMPS**
4	**TOTAL (MT)**			**215**	

PEM- OTHER BOIs

S.N	PACKAGE DESCRIPTION	QTY (Nos)	TOTAL FOR STATION (In Tonnes)		REMARKS
1	**PHE**	5	12 T Each PHE	60	
2	**COLTCS**	2	9 T for each Ball separator weight (Max.) 14 T Total per COLTCS (including other items viz interconnecting piping, panel, skid etc)	28	
3	**SCS**	2	2.5 T for each shell (Max.) 4 T Total per SCS (including other items viz interconnecting piping, panel etc)	8	
4	**TWS**	2	6 T for each	12	
5	**TOTAL (MT)**			**108**	

ANNEXURE- A.18

R. Weight Schedule for PEM – SINGLE GIRDER EOT/HOT MISC. CRANES

S.N	Area description	Type	Qty	CAP (T)	Wt.
1	Workshop area	Overhead S/G crane	1	10	6T
2	CWPH (outside area for screens and gates)	Single girder Semi gantry crane	1	8	8T
3	Raw water Reservoir & Pump house	Single girder under slung crane	1	6	4T
4	Raw water Reservoir & Pump house (Outside area for gates)	Single girder Semi gantry crane	1	5	5T
5	Raw water Intake pump house	Single girder under slung crane	1	8	5T

S.N	Area description	Type	Qty	CAP (T)	Wt.
6	Raw water Intake pump house Outside	Single girder Semi gantry crane	1	5	8T
7	Clarified and Fire WPH	Single girder under slung crane	1	5	6T
8	**TOTAL (MT)**				**42**

ANNEXURE- A.19

S. Weight Schedule for PEM – ELECTRIC HOISTS

S.N.	AREA / EQUIPMENT DESCRIPTION	QTY (nos)	CAP(T)	Tentative weight per unit
1	ESP cum FGD Control Room	1	10	1.5T
2	Boiler MCC Room	1	10	1.5T
3	DMCW PUMPS(TG & SG) MOTOR HANDLING	1	5	600 KG
4	VACUUM PUMP	2	5	600 KG
5	CW BUTTERFLY VALVE	1	15	2 T
6	CONDENSATE TRNAFER PUMP HOUSE INCLUDING BOILER FILL PUMPS	1	2	500 KG
7	DM MAKEUP PUMP HOUSE	1	3	500 KG
8	TG HALL (Elevator M/C Room)	1	3	500 KG
9	Service building (Elevator M/C Room)	2	3	500 KG
10	Admin building (Elevator M/C Room)	1	3	500 KG
11	ESP cum FGD Control Room (Elevator M/C Room)	1	3	500 KG

S.N.	AREA / EQUIPMENT DESCRIPTION	QTY (nos)	CAP(T)	Tentative weight per unit
12	Raw water Intake Pump House (outside)	2	7	1 T
13	FOHS	1	2	500 KG
14	FIRE BOOSTER PUMP HOUSE	1	2	500 KG
15	**TOTAL (MT)**			**14**

ANNEXURE- A.20

T. Weight Schedule for PEM – CHAIN PULLEY BLOCKS

S.N.	AREA / EQUIPMENT DESCRIPTION	QTY (nos)	CAP(T)	Tentative weight per unit
1	General maintenance purpose(for handling requirement of items below 300 KG	5	1T	500 KG
2	OVERLOAD VALVES BELOW TG DECK	1	1T	500 KG
3	FOR HANDLING OIL BARREL IN CENTRAL LUBE OIL SYSTEM AT EL+0.0 M	1	1T	500 KG
4	**TOTAL (MT)**			**3.50**

ANNEXURE- A.21

U. Weight Schedule for PEM – WORKSHOP EQUIPMENT

S.N	Description	Qty (no.)	Total Weight(MT)
1	Vertical Turret Lathe M/C	1	

S.N	Description	Qty (no.)	Total Weight(MT)
2	Heavy Duty Lathe M/C	2	**110**
3	Medium Duty Lathe M/C	3	
4	Universal Milling M/C	1	
5	Surface Grinding M/C	1	
6	Cylindrical Grinding M/C	1	
7	Slotting M/C	1	
8	Radial drilling M/C	2	
9	Column Drill M/C	1	
10	Hydraulic Press M/C	2	
11	Plate Bending M/C	2	
12	Dynamic Balancing M/C	1	
13	Shaper M/C	1	
14	Pipe Bending M/C	2	
15	Tool & Cutter Grinding M/C	2	
16	Power Hackswa M/C	2	
17	Welding Generator supergen M/C	1	
18	Welding Transformer M/C	3	

ANNEXURE- A.22

V. Weight Schedule for Lube Oil Transfer Pumps

Lube Oil Transfer Pumps – 2 Nos. (Cap= 8250 LPH) – 500 Kg

ANNEXURE- A.23

W.Weight Schedule for Dozing System

a. **OXYGEN DOZING SYSTEM: - Total 2 skids, one for Dosing of oxygen at CEP discharge and other for Deaerator outlet; 30 days oxygen Cylinders i.e. 41 cylinder storage. Total weight 1 MT.**
b. **CHEMICAL DOSING SYSTEM: - 1 No Ammonia dosing skid (5.27 MT) + 1 No. NaOH dosing system (2.4 MT) + 1No hydrazine dozing skid (5.07 MT).**

ANNEXURE- A.24

X. Weight Schedule for Vacuum Pumps

Vacuum Pumps – Total 04 nos. – Total Weight 45 MT.

ANNEXURE- A.25

Y. Weight Schedule for Structural Works - approach platforms

Approach platforms (Materials which are free issued from BHEL site, apart from those received from MUs) – Total Weight 50 MT.

ANNEXURE- A.26

Z. Weight Schedule for CW Piping

S. N.	Description	Material	OD (mm)	THK (mm)	L (m)	Weight (MT)	Remarks
1	CW INLET TO CONDENSER FROM HEADER	CS (IS:2062) R&W TO IS:3589	2636	22	60	85.088	PUDDLE FLANGE ASSY. 2600 NB
2	CONDENSER-1 OUTLET TO CONDENSER-2 INLET	DO	2636	22	60	85.088	
4	CONDENSER-2 OUTLET TO CW RETURN HDR	DO	2636	22	65	92.179	PUDDLE FLANGE ASSY. 2600NB - 2 SETS
5	**TOTAL (MT)**					**288.59**	

ANNEXURE- A.27

AA. Weight Schedule for FIREFIGHTING SYSTEM - PUMPS

Sl. No	FIRE WATER PUMP HOUSE EQUIPMENT	Qty	Total Weight (T) (Tonnes)
1	Electric Motor Driven, Vertical, Centrifugal type Hydrant Pumpsets of Cap. 410 M3/Hr. x 125 MWC, complete with Electric Motor, Base plate and accessories - Main pump for Hydrant System	2	7.0
2	Diesel Engine Driven, Vertical, Centrifugal type Hydrant Pumpset of Cap. 410 M3 / Hr. x 125 MWC, complete with Diesel Engine and Accessories. - Standby	2	7.2
3	Electric Motor Driven, Vertical, Centrifugal type Spray Pumpset of Cap. 410 M3/Hr. x 125 MWC, complete with Electric Motor, Base plate and accessories - Main pump for Spray System	1	3.5
4	Diesel Engine Driven, Vertical Centrifugal type Spray Pumpset of Cap. 410 M3/Hr. x 125 MWC, complete with Diesel Engine and Accessories. - Standby	1	3.6
5	Electric Motor Driven, Vertical, Centrifugal type Jockey Pumpsets of Cap. 40 M3/Hr. x 125 MWC, complete with Electric Motor, Base plate and accessories - Main & Standby	2	2.2
6	Electric Motor Driven, Horizontal, Centrifugal type Hydrant Booster Pumpsets of Cap. 137 M3/Hr. x 50 MWC, complete with Electric Motor, Base plate and accessories - Main	1	2.2
7	Diesel Engine Driven, Horizontal Centrifugal type Hydrant Booster Pumpset of Cap. 137 M3/Hr. x 50 MWC, complete with Diesel Engine and Accessories. - Standby	1	2.5
8	**TOTAL (MT)**		**30**

ANNEXURE- A.28

BB. Weight Schedule for FOAM SYSTEM – PUMPS & TANKS

Sl. No	Detailed Description	Quantity	Total Weight (T)
1	Foam tanks and all its accessories 5000 ltr. Capacity (1 Working + 1 standby)	2	12.00
2	Foam Pumps with motor : 5 cum/hr @ 70 m head - Motor driven (Working)	1	0.35
3	Foam Pumps with Engine : 5 cum/hr @ 70 m head - Engine driven (standby)	1	0.40
4	**TOTAL (MT)**		**13**

THE SCOPE OF THE WORK WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

11.0 GENERAL

11.1 The intent of this specification is to provide services for execution of project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services/ facilities to complete the work or portion of work awarded to him. The quoted/ accepted rates/ lump sum price shall deem to be inclusive of all such contingencies.

11.2 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.

11.3 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost

11.4 The contractor shall carry out the work in accordance with standard practices / codes / instructions / drawings / documents / specification/ manuals supplied by BHEL from time to time.

11.5 The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during execution. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be affected from contractor's bills towards expenditure incurred including BHEL's usual overhead charges.

11.6 Following shall be the responsibility of contractor and have to be provided within finally accepted rates/ prices:

- Provision as required of all types of labour, supervisors, engineers, watch and ward, tool & tackles, calibrated inspection, measuring and test equipment as specified and otherwise required for the work, consumables for erection, testing and commission including material handling.
- Proper out-turn as per BHEL’s plan and commitment
- Completion of work as per BHEL schedule

- Good quality and accurate workmanship for proper performances of equipment
- Repair and Rectification
- Preservation/ Re-conservation of all components during storage/ reaction till handing over

11.7 The quantities indicated in the tender specification are approximate and are liable for variation and alteration at the discretion of BHEL. The quoted unit rate shall be applicable for any additional product group also, if included at a later date integral to the main scope of work/ package envisaged. The work executed shall be measured and price as per the unit rate arrived at for each work area as mentioned in the relevant clauses.

11.8 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.

11.9 The contractor shall carryout additional tests if any, which the Engineer feels necessary because of site conditions and also to meet system specification.

11.10 The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

11.11 Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.

11.12 Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.

11.13 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.

11.14 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.

11.15 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such

misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

11.16 After completing all the works, contractor shall hand over all remaining extra materials with proper identification tags in a packed condition to BHEL stores. In case of any use over actual design requirements, BHEL reserves the right to recover the cost of material used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.

11.17 The terminal points as decided by BHEL shall be final and binding on the contractor.

11.18 Contractor has to work in close co-ordination with other erection agencies at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and erection program have to be planned in such a way that the milestones are achieved as per schedule / plans. Contractor shall arrange & augment the resources accordingly.

11.19 **HOUSE KEEPING:** The contractor is supposed to carryout housekeeping of the work area on regular basis to keep the work place neat and tidy and available for the SAFE working. The scrap, generated daily during the Execution activities, is to be dumped at designated area as decided by BHEL/ customer on daily basis. The erection materials issued to the contractor and kept near the work are should also be staged properly at site. Compliance report on above shall be submitted by the contractor to BHEL on Daily basis. In case the contractor fails to do so, BHEL have rights to carry out the same from the other party at Risk & Cost of the contractor. The cost applicable with BHEL overheads shall also be recovered from the monthly running bills of contractor.

THE SCOPE OF THE WORK WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

12.0 CIVIL WORKS, FOUNDATION, GROUTING

12.1 BHEL/ Customer shall provide all equipment foundations. For the correctness of these foundation as per drawings, the contractor shall check the dimensions & locations of the foundations, pockets, anchor-bolt pitch. Further, top elevation of foundations shall be checked with respect to benchmark. All minor adjustments of foundation level, dressing and chipping of foundation surfaces up to 50mm, enlarging the pockets in foundations, cleaning using compressed air, etc., as may be required for the erection of equipment/ plants shall be carried out by the contractor.

12.2 While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping, contractor has to arrange additional packer plates as per requirements provided BHEL Engineer allows it. When required by manufacturers, the embedded sub-sole plates shall be scraped and checked with Prussian blue to get the required contact with frames. The required packer plates shall be provided by BHEL free of cost. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting / chiseling / grinding and de-burr the same. However, machining of the packers wherever necessary, shall be arranged by contractor.

12.3 Contractor shall ensure perfect matching of packer plates including machining, scraping and blue matching with foundation by dressing the foundation, as well as perfect matching between the packer plates and the base plate of equipment to the satisfaction of BHEL Engineer. If required the packer plates may have to be aligned and fixed on the foundations using special high strength, non-shrinking and quick setting grouts. The minimum thickness below the packer plate should be 20mm. The material required for this has to be arranged for by the contractor at his cost.

12.4 **Complete grouting of STG & Aux equipment as per the scope, including anchor/ foundation bolts, beneath base, base hollows etc as may be applicable, is EXCLUDED from the scope of contractor. The BHEL's Civil Contractor shall carryout and arrange for all materials required for carrying out the grouting including the supply of the Special Grout as indicated in the drawings and as approved by the BHEL Engineer.**

While grouting the contractor has to ensure that all the matching joints which are not to be grouted shall be kept free from the grouting mixture by applying tape or any other

alternative method approved by Engineer. If required, decoupling of equipment's has to be done for conducting the verification. In case any disturbance is noticed the cause, if any, shall be removed and re-alignment done as part of work**. Contractor shall check and verify the alignment of equipment. The contractor has to ensure that all the matching joints which are not to be grouted shall be kept free from the grouting mixtures by applying tape or any other alternative method approved by Engineer. All assistance required has to be provided by the contractor**.

12.5 Contractor shall check and verify the alignment of equipment, alignment of shafts of rotating machines, the slopes of all bearing pedestals, centering of rotors with respect to their sealing bores, coupling etc as applicable and the likes items to ensure that no displacement had taken place during post grouting check-up and verification. Such pre and post grout records of alignment details shall be maintained by the contractor in a matter acceptable to the Engineer.

The scope of the work will comprise of but not limited to the following:
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

13.1 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipment from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks/ slings/ tools and tackles / labor including operators, fuel, lubricants etc. for Loading & unloading of materials will be in the scope of contractor.

13.2 The storage yard is located inside the Main Plant Boundary, in more than one location.

13.3 Some consignments like ODC consignments may be unloaded near to erection site as per space availability.

13.4 Loading at storage yard and transporting to site, unloading at site / pre assembly area or at working area, is in the scope of work. Required cranes for loading & unloading of materials, trailer shall be in the scope of contractor. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, sandbags which are required for temporary supporting of the components at site.

13.5 The equipment / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

13.6 Contractor shall plan and transport equipment, components from storage yard to erection site in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.

13.7 Sometimes it may become necessary for the contractor to handle certain unrequited components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

13.8 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

13.9 All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

13.10 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.

13.11 The contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its sub-contractors with respect to the transport of Goods, Materials and Labor to the site do not interfere with local traffic in the vicinity of the site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.

13.12 All lifting tackles including wire ropes, slings, shackles etc. used by the contractor shall be got approved by BHEL Engineer at site before they are actually put on the work. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damage to other equipment and personnel. All piping shall be adequately supported and protected to prevent damage during handling and erection. The history cards for major equipment to be maintained by the contractor.

13.13 Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

14.0 ERECTION

14.1 All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out of all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include, Scaffolding and rigging operations,

a) Scaffolding and rigging operations,
b) Machine/ flame/ electric cutting, grinding, welding, radiography and stress relieving
c) Fitting, Fettling, Filing, Straightening, Chamfering, Chipping, Scrapping, Reaming as cleaning, checking, levelling, blue matching, aligning and assembly
d) Machining, Surface grinding, drilling, doweling, shaping
e) Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication
f) Insulation and painting

14.2 Any fixtures, scaffolding materials, approach ladder, concrete block supports, steel structures required for temporary supporting, pre-assembly or checking, welding, lifting and handling during pre-assembly and erection shall be arranged by contractor at his cost.

14.3 Contractor has to arrange required fire proof tarpaulins to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.

14.4 **Field Quality Assurance Formats:-** It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL and customer as token of their acceptance. Payment to the contractor will be linked with the submission of these FQA log sheets.

14.5 All tests required as per **FQP** (**Field Quality Plan**) will be in Bidder's scope. FQP shall be provided during execution time.

14.6 No members of any ladder/ structure/ platform should be cut without specific approval of BHEL. In case it is necessary to cut, the contractor shall rectify/ repair in a manner acceptable to BHEL/ Customer without any additional cost.

14.7 Contractor shall erect scaffolding/ temporary platforms for erection. These should be of adequate capacity and shall never be over loaded. These should be replaced when not found suitable during erection work and dismantled on work completion and removed from such site.

14.8 It shall be the responsibility of the contractor to provide ladders on columns for initial work till such a time stairways are completed. For this, the ladder should not be welded on the column and should be pre-fabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL. In case it is absolutely necessary then the contractor shall cut the temporary structure and rectify the column as directed by the engineer.

14.9 Contractor is strictly prohibited in using the Boiler/ Auxiliary Components for any temporary supporting or scaffolding works etc. In case of such misuse a sum of determined by Engineer will be recovered from the contractor's bills.

14.10 Corrections like straightening of ladders, tube support plates adjustment / removal of ovulates in pipes and opening or closing the fabricated bends of piping to suit the layout shall be considered part of the work and the contractor is required to carry out such work within finally accepted price / rate as per instructions of Engineer.

14.11 The contractor shall carry out assembly and erection of condenser components normally on the condenser foundation directly. This includes

- Assembly and welding of bottom plate, side plates, hot well, springs and steam throw device.
- Complete fabrication and welding of shell out of loose side-walls dome walls, and stand pipes.
- Assembly and welding of water chambers and water-boxes.
- Assembly and welding of support plates, baffles and stiffening structure,
- Tubes insertion, expansion and cutting/ trimming.
- Water Box Handling system
- The NDT requirement is to be met as per the FQP, Drawings. In addition to other NDT requirements, MPI of all field joints may be required to be carried out by the contractor for the condensers and auxiliaries.

Hydraulic test and water fill test and any other fitting/ assemblies required to complete the assembly. **Water fill test has to be carried out by filling the steam space with water**

up to 300 mm above the final joint of the condenser exhaust hood with turbine. It should be such as all field welding joints are covered in the test.

14.12 The contractor shall carry out the condenser tube insertion and expansion at site after the installation of condenser on its foundation. Condenser tubes shall be handled strictly as per instructions of BHEL Engineer. Before installation of tubes, the contractor shall check for any dents, mechanical damages or any other defects of tubes caused during storage. These should be thoroughly internally and externally cleaned for all extraneous matter as per the directions of the engineer.

14.13 Before insertion of tubes, the contractor shall clean the surface of the holes in the main tube plates and tube support plates for paint, corrosion spots oxide scale etc. as per the instructions of the engineer. R**eaming of support plates if required for smooth insertion of tubes is to be carried out by contractor at his cost and reaming and its arrangement is to be arranged by contractor.**

The contractor shall carry out the tube insertion & expansion of the condenser strictly in accordance with the instructions issued by the engineer. Tubes may require adjustment of length on both ends. The contractor shall ensure to provide covering above the top row of tubes to avoid any damage to the tubes prior to tube insertion as per instruction of BHEL Engineer at his cost. The equipment and consumables required for condenser tube cutting and expansion/flaring has to be arranged by the contractor, with no extra cost to BHEL.

Fluroscent dye test may be required to conduct after completion of tube expansion for detection of any leakages from the tubes. Contractor has to do all arrangement of filling of water to the condensers and then draining it as per customer Requirement. The supply of fluroscent dye (specification to be taken from BHEL Engineer) and the UV lamp for detection has to be arranged by contractor, with no extra cost to BHEL.

14.14 The contractor shall carry out the condenser neck welding with casing only after final installation of casing. However the contractor shall adjust the gap between condenser neck and LP exhaust hood uniformly by suitably lifting the condenser as directed by engineer. Also the makeup pieces required for this purpose shall be fabricated and welded to the dome walls by the contractor.

14.15 The feed water storage tank will be supplied in three sections with feed pipe, heating steam header, spray nozzles, supports etc., in loose components. These are to be erected, pre-assembled, aligned & welded in position. Welding, NDT & heat treatment if required shall be carried out by the contractor within quoted rate. IBR / statutory requirements, if any, shall be in the scope of contractor and necessary drawing/ details only will be given by BHEL.

14.16 Erection of platform and supporting structures around FST / Deaerator is covered in the scope of contract and shall be erected by the contractor within the quoted rate of Rate schedule. Any platforms supplied by the Manufacturing Units/vendors with the equipment, auxiliaries has to be erected within the quoted rates.

14.17 LP Heater No. 1 is to be erected inside the condenser in rear side, for which contractor may require to cut open the condenser dome plate already erected. After erection, condenser plates have to be strengthened / stiffened as per the instruction of BHEL Engineer.

14.18 Some of the rotating equipment and electrical motors are provided with protective greases only. Contractor shall arrange for cleaning of the same with petrol or some other reagent. If necessary, dismantling some of the parts of the equipment would be necessary. He shall arrange for re-greasing / lubricating them with recommended lubricants and for assembling back the dismantled parts, at quoted rate. Lubricants will, however, be supplied free of cost by BHEL.

All rotating machines and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary by dismantling and refitting before erection. If, in the opinion of Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.

14.19 The turbine Integral Piping and Overload piping of Turbine are of SA335P91 material specification. The erection, welding, heat treatment, NDT, H&S of these are in scope of this contract only. The contractor has to arrange for the IBR requirements. **Also, the consumables such as electrodes and filler wire, thermocouple, ceramic pads and insulation, induction coil etc. for SA335P91 welding has to be arranged by the contractor only**. **The contractor has also to arrange for spot welding of the thermocouples.** BHEL will only provide induction heating Machine and DG set with recorder.

For other integral piping of this contract scope of Haridwar and Hyderabad scope, all the consumables have to be supplied by contractor at no extra cost. BHEL may only supply any consumables which are supplied by the MU's and vendors as part of the package. **BHEL will NOT supply any electrode / filler for P91/T91 as per clause no. 4.1.4 of chapter IV (Obligation of Contractor) of SCC (Rev 02) of this contract**.

All the welding consumable such as electrodes/filler wires to be used in welding has to be of BHEL approved brand. Before procuring contractor shall ensure the same with BHEL.

14.20 All the shafts of rotating equipment shall be properly aligned to those of the matching equipment within design tolerances. All bearings, shafts and other rotating parts shall be thoroughly cleaned and suitably lubricated before starting.

14.21 All the motors and equipment shall be suitably doweled after alignment of shafts with taper / parallel machined dowels as per the direction of the Engineer. Dowel pins required are be machined by the contractor at his own cost. However the materials for dowel pins shall be issued by BHEL free of cost.

14.22 The bearings shells will be blue matched at site and checked for bearing clearances. The contractor shall carry out scraping of bearing housing, if required to any extent. No extra claim for blue matching of any two surfaces up to 1mm initial gap will be entertained. The contractor shall also check air gap and adjustment of stator/ rotor to magnetic center shall be carried out as part of erection.

14.23 Contractor shall carry out trial run of all motors including checking the direction of rotation in the uncoupled condition. Checking of alignment and re-coupling of the motor to the driven equipment as per instructions of BHEL engineer and to their satisfaction.

14.24 Contractor shall fabricate pipe, special bends etc, threading and welding as required for installing lube oil system and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system, carrying out the hydraulic test of oil coolers etc.

14.25 All electrical panels, control gears, motors and such other devices shall be properly dried by heating to improve IR valve before they are energized. Bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected.

14.26 The contractor shall completely erect and test all piping systems, covered in the specification including sampling lines up to and including sample coolers, hangers & supports, valves and accessories in accordance with the drawings furnished. This includes all necessary bolting, welding, pre-heating, stress relieving, testing, cleaning and painting. System shall be demonstrated in condition to operate continuously in a manner acceptable to the Engineer. Welding shall be used throughout for joining pipes except where flanged, screwed or other type joints are specified or sown on the drawings. All piping shall be erected true to the lines and elevation as indicated in the drawings.

14.27 Most of the pipes shall be supplied un-fabricated in running lengths without beveling. It shall be responsibility of contractor to carry out fabrication by cutting to size, bevel / prepare edges, fabricate support pads, drill holes for drains, vents and other stubs, welding, carryout NDT & SR as per site requirement & as directed by BHEL. Pipes sent in

standard length shall be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends upto 80 mm Nb will be fabricated at site wherever required.

14.28 The connection to the pipes terminal points including edge preparation, fit-up, welding applicable NDE etc are in the scope of work. 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. Minor adjustment like removal of ovality in pipes is in the scope of work. 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 equipment erected by the contractor is completely covered in the scope of work.

14.29 Certain adjustments in length may be necessary while erecting pipelines/ducts/ casings etc. The contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges afresh and adopting specified heat treatment procedures at no extra cost, wherever indicated.

14.30 It is possible that a few flanges may not be matching. The contractor shall be required to cut and re-weld the same as and when required without any additional cost.

14.31 The contractor shall be responsible for any modifications of shop fabricated pipes prior to installation to accommodate minor site alteration in pipe routing at no extra cost.

14.32 All vents and drains for piping equipment covered in the scope whether shown in the drawings or not, shall be terminated outside the TG hall in atmosphere and at sump-pit as directed by the engineer.

14.33 Wherever equipment/piping erected by the contractor is connected to equipment/ piping erected by the other agencies the joint at the connecting point shall be the responsibility of the contractor of this specification.

The erection, welding (Both joints) and NDT of all Metallic Expansion Joints, Butterfly valves of drive turbine exhaust system shall be the responsibility of the contractor of this specification only.

14.34 Normally the high-pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor will 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/valves for welding.

14.35 The valves will have to be checked, cleaned or overhauled (including lapping of seat) in full or in part before erection and/or after chemical cleaning and during commissioning.

14.36 The contractor shall be responsible for correct orientation of all valves so that seats, stems & hand wheels are in desired direction. It is the responsibility of the contractor to obtain the information regarding orientation of valves not fully located on drawings before the same are installed.

14.37 Steel for suspensions for piping, will be supplied in running lengths. These are to be cut to suitable sizes and adjusted as per requirement.

14.38 No temporary supports should be welded on the piping. In case of absolute necessity prior approval should be taken from BHEL Engineer. In such cases heat treatment, if required, shall be carried out by the contractor

14.39 All hangers, supports and anchors shall be installed as per drawing to obtain safe and reliable and complete pipe installation as per instructions of Engineer. Any additional support as called for by Engineer shall have to be fabricated and erected by the contractor. The raw materials required for fabricating such supports shall be supplied by BHEL free of cost.

14.40 Spring suspensions/ constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Any adjustments, removal of temporary arrestors / lockers etc., have to be carried out as and when required.

14.41 Contractor shall install piping in such a way that no excessive or destructive expansion forces exist either in the cold condition or under conditions of maximum temperature and pressure. All bends, expansion joints and any other special fittings necessary to take care of proper expansion shall be incorporated as per the advice of Engineer. During installation of expansion joints, anchors, care must be taken to see that full design movement is available at all times from maximum and minimum temperature.

14.42 The contractor shall carry out the tightening of the field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or the turn of part method. The procedure to be followed, the tools and the equipment deployed shall be subject to the approval of Engineer. All the torque wrenches shall be calibrated as per requirement and before they are put in use on any job.

14.43 The contractor shall ensure that all supporting elements, anchors & restraint have been installed and adjusted in accordance with the drawings / sketches & other written instructions of the Engineer. The contractor shall inspect the hangers associated with the piping systems as follows:

- After hydraulic test, with the piping in the cold position, with all travel stops removed, with the pipe completely insulated and complete in all respect ready for start up.
- Piping in the hot position with the unit operating at the maximum load.
- Piping in the cold position during the first complete shutdown.

14.44 The hanger assemblies shall not be used for attachment of rigging to hoist the pipes into position. Separate temporary supports shall be used to securely hold the pipe in position till pipe supports are completely assembled and attached to the building structure.

14.45 Layout of small bore piping as required shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines even after completion of erection or from aesthetic point of view. Contractor at no extra cost should carry this out.

14.46 Erection, testing and commissioning of power cylinders, electrically operated valves and their actuators etc. coming under various groups is covered under the scope of this specification.

14.47 All valves, including valves, flap valves, dampers and actuators, shall be serviced and lubricated to the satisfaction of Engineer before erecting the same and during pre-commissioning also. Welding or jointing of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rates.

14.48 The contractor shall also or grind the valve seat, if required, to ensure satisfactory performance of valves at no extra cost. All parts such as gaskets, gland packing which form the permanent part of equipment shall be supplied by BHEL free of cost.

14.49 Erection and welding of necessary instrumentation tapping points, thermocouple pads, thermo-wells, valves, battery of first root valves, condensing vessels, flow nozzles and control valves to be provided on TG, auxiliaries and pipe lines covered within the scope of this specification, will also be the responsibility of the contractor. The welding of all the above items will be contractor's responsibility even if the:

- Product groups, under which these items are released, are not covered in the scope of this tender.
- Items are supplied by any agency other than BHEL.

NOTE: ADDITIONAL THERMOWELLS AS REQUIRED FOR CONDUCTANCE OF THE PERFORMANCE GUARANTEE TEST ARE TO BE INSTALLED BY THE CONTRACTOR.

14.50 Erection of CO_2, N_2 and H_2 systems complete in all respects, including cylinders stands, connecting piping, valves, distribution headers, main control panels etc. is in the scope of contractor. The delivery of gas cylinders is to be taken from BHEL / its client stores, their handling and filling of gases in the system as and when required, till unit is commissioned

and handed over, shall be the responsibility of the contractor. The empty cylinders are to be returned to BHEL/its client stores. Filling / Refilling of CO_2, N_2 and H_2 cylinders shall be in the scope of BHEL but handling & filling of gases from yard/store/filling station and into the system shall be in the scope of contractor. After commissioning of Hydrogen plant located along the boundary of Powerplant the handling/filling/refilling of H_2 Cylinders shall be in the scope of contractor.

14.51 Additional platforms and ladders of permanent nature incidental to the job for approaching different equipment / valves as per site requirement, which may not be indicated in drawings, shall be fabricated and installed by the contractor. The materials required will be supplied by BHEL free of cost. The lump sum price quoted is inclusive of this price.

14.52 The contractor shall carry out Kerosene oil / dye penetration tests of all the bearing housing of turbine & generator. The Kerosene oil DPT kit for the tests shall also be arranged by the contractor at his cost.

14.53 The contractor is strictly prohibited in using the TG / Aux. Components for any temporary supporting or scaffolding woks etc. In case of such misuse a sum of determined by Engineer will be recovered from contractor's bills.

14.54 The calibration of skid mounted instruments shall be arranged by BHEL through other agency engaged for C&I. Contractor will be informed by BHEL engineer about the details of C&I agency. The contractor shall coordinate with the C&I agency for removal, calibration and re-installation of the instruments. Though C&I agency may remove and reinstall the instruments after calibration, the contractor for this package will maintain the list of all the instruments removed & reinstalled. Instruments prior to removal and after reinstallation shall be considered in custody of the contractor for this package.

14.55 For all other instrumentation, erection up to root valves (single/double), thermo-wells is the responsibility of this contractor.

14.56 The feed storage tank will be received in 3 pieces and is to be assembled, welded and tested at site. Besides the provisions under T&P Clause, all other arrangements for erection of feed storage tank and deaerator has to be made by contractor with in their finally accepted price.

14.57 The contractor shall assist BHEL in preparation of as built piping drawing.

14.58 Assistance in mechanical work associated with power cylinders, valves, valve actuators, etc, coming under various groups shall be provided by contractor within the finally accepted rates.

14.59 Whenever required the contractor shall arrange for pre-qualification of process task performers.

14.60 Non specified jobs at the interface/ terminal points like bolting welding, gasket changing etc have to be done by the contractor within the quoted price.

14.61 Instrument tapping coming wherever to be welded/ fitted by the contractor within the quoted price.

14.62 The terminal points decided by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

14.63 Instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/ speed switches of motors etc which are received in assembled condition as integral part of equipment shall be dismounted, calibrated and re-erected by the contractor as per requirement.

14.64 The contractor, at no extra cost to BHEL, shall carry out servicing and realignment of skid-mounted equipment.

14.65 Certain instruments like pressure gauges, pressure transmitters, temperature gauges, flow switches and indicators, etc .are received in assembled condition as integral part of equipment. Contractor shall be responsible for safe receipt, installation and custody of these instruments supplied mounted on skids/ equipment. The calibration of skid/ equipment mounted instruments shall be arranged by BHEL through other agency engaged for C&I. Contractor will be informed by BHEL engineer about details of C&I agency. The contractor shall coordinate with the C&I agency for removal, calibration and re-installation of the instruments. Though C&I agency will remove and reinstall the instruments after calibration, the contractor for this package will maintain the list of all instruments removed and reinstalled. Instruments prior to removal and after reinstallation shall be considered in custody of the contractor for this package. All instruments such as pressure gauges/ temperature gauges, switches etc forming part of product group (PG) are under the erection scope of this contract and shall be installed and commissioned by the contractor of this package at no extra cost to BHEL. However, the calibration of these instruments shall be done by C&I agency as above.

14.66 Pipes sent in standard length shall be cut to suit up the site conditions and the layouts. Tubes and pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends upto 65mm nominal bore will have to be fabricated at site. Only cold cutting methods are to be employed for cutting piped and tubes irrespective of the size and material. Gas cutting, if any, will be allowed only in CS LP piping.

14.67 Wherever piping erected by the contractor is connected to equipment/ piping erected by the other agencies the joint at the connecting point shall be the responsibility of the contractor who is erecting the piping under this specifications.

14.68 Normally, the high pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor will prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes within the scope of work.

14.69 All fittings like `T'-pieces, weld neck flanges, reducers etc., shall be suitably matched with pipes for welding. The valves will have to be checked, cleaned or overhauled in full or in part before erection after chemical cleaning and during commissioning.

14.70 Contractor shall be responsible for correct orientation of all valves so that seats, stems and hand wheels will be in the desired location. It is the responsibility of the contractor to obtain the information regarding orientation of valves not fully located on the drawings before the same are installed.

14.71 All the valves, including motorized valves, flap valves, dampers, actuators, etc shall be serviced and lubricated to the satisfaction of Engineer before erecting the same and during pre-commissioning also. Welding or jointing shall be part of erection work within the quoted rates.

14.72 Erection, testing and commissioning of all electrically operated valves, actuators and dampers is covered within the scope of this specification.

14.73 Welding of P91, T91, and T92 materials is to be carried out as mentioned in **clause no 15.38** of TCC.

14.74 Scope of work for chemical cleaning for the system has been covered under **clause no 15.39** of TCC.

14.75 All the equipment / material to be taken inside the plant building shall be cleaned thoroughly before taking them inside and erect. The contractor shall clean, wherever necessary and paint inside surfaces of the equipment like coolers, oil tanks, and other components as per instruction of BHEL Engineer during erection at the quoted rate. The necessary compressor for air cleaning is to be arranged by contractor at his cost.

14.76 During hydro test, pipe end dummy if required shall be supplied by BHEL, plates shall be cut for the requirement and shall be returned back to BHEL Stores.

14.77 Arrangements for providing required dewatering (in the area covered in this contract scope) during erection, by suitable dewatering pumps / Continuous Multi Point Dewatering etc , as per site requirement is included in the scope of work . Vendor has to arrange adequate no. of Diesel & electrical pumps suitable capacities ,diesel ,operators, necessary manpower with sufficient quantity of suction & discharges hoses, pipes, Clamps, cables, Electrical panels/starters, consumables without any extra commercial implication on BHEL treating as normal scope of work.

14.78 **CONCRETE ENCASED CW PIPING**

i. The pipe in general shall be laid on the bottom cement encasing and welded. After Hydro test clearance will be given for top end casing of CW piping.
ii. The scope, quantity & sizes of buried piping are as per BOM and the relevant drawings.
iii. The civil works for the buried piping are excluded for this scope of work. However the contractor has to ensure that the width of the trench shall be sufficient to give free working space on each side of the pipe.
iv. Access shall be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained. This type of incidental works are to be carried out by the contractor within quoted rates.
v. Prior to lowering and laying pipe in any trench, the contractor shall check & ensure for the backfilling and compaction the bottom of the trench or excavation in accordance with IS 5822 / as per drawing to provide an acceptable bed for placing the pipe. Necessary co-ordination with the BHEL's civil agency shall be carried out by the contractor for the same.

14.79 The entire civil work of CW Piping is excluded from the scope of contractor however the required dewatering well point dewatering to be carried out before and during erection of CW piping.

14.80 Contractor shall erect CW pipe line as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineer depending upon the availability of materials, fronts and other inputs etc. No claim for extra payment from contractor will be entertained on the grounds of deviation from the methods of erection adopted in erection of similar piping in other places.

14.81 The CW piping materials shall be supplied as per specification below:

a) Piping 200NB and above shall be carbon steel rolled & welded as per IS : 3589 from CS plates (IS : 2062), internally lined with corracoat/ polyurea coating inside of 2000micron DFT
b) All pipes above 50 NB shall be supplied with edge preparation.

14.82 The contractor may have to carry out fabrication of mitre bends, tees, reducer of sizes NB 250 and above for CW piping systems. Pipes will be supplied in running meters by BHEL free cost. Required number of mitre bends, tees is to be fabricated by the erection contractor without any extra claim.

14.83 Terminal point of CW piping is around 15m outside from center line of A-row axis.

14.84 Carrying out piping as per the specification between equipment constituting terminal points, whether the terminal equipment fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

14.85 Contractor has to draw the material either from BHEL store yard or fabrication yard and transport to his working place.

14.86 For CW Pipes Welders shall be qualified as per the welder qualification procedures of BHEL/ASME, applicable for this type of job. Only qualified welder shall be deployed for welding.

14.87 All dimensions / elevations refer to centerline of CW pipe unless otherwise specified and the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.

14.88 Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges, re-prepare the edges to suit site conditions, which shall be done by the contractor at no extra cost.

14.89 Contractor shall arrange all the equipment, alignment bolts, tools, consumables like welding rods, etc. for welding of pipes and consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are also in contractor's scope. All these shall be carried out with in the quoted rate.

14.90 Contractor shall use only bolted clamps for achieving alignment of piping, wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipment, the same shall be subjected to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., and not by hammer. Any burrs left on the equipment / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests

shall be carried out if necessary to detect surface and subsurface cracks in these ground areas.

14.91 All the weld joints on equipment and piping shall be ground or filed on completion of welding as per instructions of BHEL Engineer so as to achieve smooth surface devoid of ripples, undulations etc.,

14.92 Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required.

14.93 Temporary lugs / structures meant for transportation is to be removed by the contractor as and when instructed by BHEL Engineer.

14.94 Flame cutting of piping and other equipment shall be strictly done as per BHEL Engineer's instructions and in his presence only.

14.95 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.

14.96 On completion of bottom layer of pipes, contractor has to conduct hydraulic test. For conducting hydro – test both ends of each lines are to be blanked suitably. Raw materials for blanking such as plate / structural items will be given by BHEL on free of charges. Fabrication, welding of dummies and NDT and removal of dummies after successful completion of hydro – test and making edge preparation on the parent pipe after HT is in the scope of contract. For Hydro test to be conducted in stages or to be repeated, the same plates shall be used for blanking by suitably grinding.

14.97 Contractor shall arrange all temporary piping, pumps, etc required for the hydraulic test, pressure gauges etc. Required pipes, valves, etc., are to be brought /arranged by contractor. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him once the work is over and could be taken back. The pipes, fittings, valves, etc shall be suitable and withstand the rated hydro test pressure. The pump shall be suitable for pressurization to this test pressure and the volume of water to be used for sectionalized hydro test.

14.98 The contractor has to arrange (low pressure) hydro-testing pump for conducting hydraulic test on his own with in the quoted rate. The servicing, installation, electrical connection, erection, testing and dismantling after completion of hydrotest shall be carried out by the contractor as part of this work without any extra charge. The pump would be taken back after completion of the work as certified by BHEL engineer.

14.99 Required water filling pump is to be arranged by the contractor.

14.100 After completion of hydro test on bottom layer it is to be cleared for Civil agency, after de-watering and removing all temporary supports / scraps.

14.101 The BHEL supplied valves as part of CW system will have to be checked, lapped or serviced if required before / after erection. Contractor shall arrange experienced valve technician at his own cost. Any special tools required for lapping only will be arranged by BHEL.

14.102 All drains / vents/ relief line etc. from the stubs on the piping to be erected by the contractor, is completely covered in the scope of work.

14.103 The contractor shall conduct nondestructive tests like radiography ultrasonic test for weld defects etc., dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipment etc. as per BHEL Engineer's instructions / welding schedule.

14.104 The contractor shall arrange sufficient quantity of higher capacity pumps with all its accessories within the quoted rate to evacuate the percolating water from the CW trench during erection of piping systems. The water shall be discharged at a location identified by BHEL engineer.

14.105 Erection welding schedule shall be furnished during erection. 10 % Radiographic test shall be done.

14.106 Complete erection & commissioning of Firefighting system & Foam system equipment listed in contract is in the scope of contractor.

14.107 Complete erection & commissioning of Water system & Workshop equipment listed in contract is in the scope of contractor.

14.108 **Statutory Approval**

It shall be the responsibility of the Contractor to obtain the all necessary approvals/permits from the inspection/regulatory/statutory authorities etc. on behalf of the Employer, as may be required for design/calculations, manufacturing and erection procedure, testing etc. As called for under the statutes, regulations and the safety codes. All such documentation required to be submitted to the statutory authorities shall be submitted to the Employer for its review. **Cost of Approval & Inspection fee, if any, to be borne by Contractor without any extra cost to BHEL.**

15.0 **WELDING, HEAT TREATMENT, RADIOGRAPHY AND NDT**
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

15.1 The equipment and piping shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions and requirement.

15.2 Welding of equipment, piping, high tensile structural steel, piping shall be done by certified high pressure welders who possess valid certificate of CIB of the State in which equipment is erected as per the provision of IBR. The HP welder who possesses necessary certificate shall ensure re-validation as per relevant provision of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificate have expired shall not be utilized for high pressure works.

15.3 All welders including tack welders, structural and high pressure welder shall be tested as per ASME section IX / IBR and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid IBR certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.

15.4 Engineer may stop any welder from the work if his performance is unsatisfactory for any reason or if there is a high percentage of rejection in the joints welded by him. The welder having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.

15.5 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor’s expense. The Engineer, prior to any repair being made, shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the engineer.

15.6 The contractor shall carry out the root run welding of all HP / LP piping, valves by TIG welding method only. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall before and during welding have to purge the pipes with inert gas. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.

15.7 All expenses for testing of contractor's welders including destructive and nondestructive tests conducted by BHEL at site or at laboratory shall have to be borne by the contractor only. Limited quantity of raw material required for making test pieces will be supplied by BHEL free of cost.

15.8 The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.

15.9 **Only BHEL/ CUSTOMER approved electrodes and filler wire are to be arranged and used by the contractor, within the finally quoted price. BHEL/ CUSTOMER reserve the right to test from the certified lab of approved electrode being used by the contractor.** Testing charges for the same shall be borne by the contractor. All electrodes shall be baked and dried in the electric electrode-drying oven to the required temperature for the period specified by the Engineer before these are used in erection work. All welders shall have electrodes drying portable oven at the work spot. The electrodes brought to the site will have valid manufacturing test certificate. The test certificate should have a co-relation with the lot number/ batch number given on electrode packets. No electrodes will be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven will be also calibrated and test certificate from Govt. approved/ accredited test house traceable to National/ International standards will be submitted to BHEL before putting the oven in use. The contractor shall also arrange periodical calibration for the same.

15.10 All butt / fillet welds shall be subject to dye penetration test as per the instructions of the engineer at no additional cost. **10% RT will be applicable to all the circuits however applicable percentage of RT shall be guided by the field welding schedule.**

15.11 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld. He has to maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or other wise of the welds shall be final.

15.12 The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting should be done. Gas cutting will be allowed only wherever edge preparation otherwise is impractical. All slag / burrs shall be removed from the edge and all the hand cuts shall be ground smooth to the satisfaction of engineer.

15.13 All welds shall be painted with anticorrosive red oxide paint once radiography and stress reliving works are over. Necessary consumables and scaffolding etc including paints shall be provided by contractor at his own cost.

15.14 Pre-heating, radiography, UT and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary, are part of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

15.15 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor arrange for labour, heating elements, thermocouples, thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress relieving operations. The contractor should take a note of the following,

- Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL.
- All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost.

The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of SR operations.

15.16 The contractor shall also be equipped for carrying out other NDT like LPI / MPI/UT / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. For UT machine shall be used of recordable type.

15.17 The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR or ISO as specified by BHEL.

15.18 Contractor for radiography work shall use Iridium-192/Cobalt-60. The geometric un-sharpness shall not exceed 1.5 mm. The contractor should take adequate safety precautions while carrying out radiography. Contractor at his cost shall arrange necessary safe guards required for radiography (including personnel from BARC).

15.19 Low speed high contrasts, fine grain films (D-7 or equivalent) in 10 cm width only be used for weld joint radiography. Film density shall be between 1.5 to 2.0.

15.20 All radiographs shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetrometer as per ASME or ISO must be used for each exposure.

15.21 Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs. Contract number, joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.

15.22 Lead intensifying screens for front and back of the film should be used as per the above-referred ASME specification.

15.23 The joint is to be marked with permanent mark A, B, C to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the down streamside of the weld.

15.24 For multiple exposures on pipes, an overlap of about 25-mm of film should be provided.

15.25 Radiography personnel with sufficient experience and certified by M/s BARC for conducting radiographic tests in accordance with safety rules laid down by Division of Radiological protection only have to be deployed. These personnel should also be registered with DRP / BARC for film badge service.

15.26 All arrangements for carrying out radiography work including dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.

15.27 The contractor shall have a dark room fully equipped with radiography equipment, film (un-exposed), chemicals and any other dark room accessories.

4.28 Radiography inspection of welds shall be performed in accordance with requirement and recommendation of BHEL Engineer. The quantum of radiographic inspection shall be as per provision of ASME / BHEL/NTPC approved documents. However, minimum percentage of joints to be radiographed shall not be less than the requirement of BHEL welding schedule / IBR / Customer’s requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL.

Radiography on LP piping joints is not envisaged. However, other NDT test as called for in the FQP including LPI, MPI and HT will have to be carried out. Since, radioisotopes are being used, all precautions and safety rules as prescribed by BHEL/BARC/ Customer shall be strictly followed. BARC / DRP certificate to be provided before taking up the work.

15.28 The percentage of Radiography are tentative, which may be increased depending upon the quality of joints at the discretion of BHEL.

15.29 All the Radiographs shall be properly preserved and shall become the property of BHEL. They are to be reconciled with the work done, joints radio graphed and submitted to BHEL / customer.

15.30 Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of HP welders. If the performance of welder is unsatisfactory, he is to be replaced immediately.

15.31 Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re- submitted for evaluation.

15.32 However, if the defect persists after first repair, further repair work followed with radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radiographed at contractor's cost.

15.33 If the contractor does not carry out radiography work due to non-availability of source / film / chemical / operator etc., BHEL will get the work done departmentally or through some other agency at the risk and cost of the contractor.

15.34 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of progress. The contractor shall make all necessary arrangements including labour, supervisors/ Engineer required for the work as per directions of BHEL.

15.35 The contractor shall assist BHEL Engineer in preparing complete field welding schedule for all the field welding activities to be carried out in respect of piping and equipment erected by him involving high pressure welding at least 30 days prior to the scheduled start of erection work at site. The contractor shall strictly adhere to such schedules.

15.36 The equipment and piping shall be erected in conformity with the provisions of Indian Boiler Regulation and as may be directed by BHEL as per any standard / specification in practice in BHEL. The method of welding (arc, gas, TIG or other method) may be indicated in the detailed drawings / schedules. BHEL Engineer will have the option of changing the method of welding as per site requirements.

15.37 Check slots as per requirement BHEL/ Customer will be taken at contractor’s cost.

15.38 **Erection Welding Practice for Materials P91**

Special care is essential for carrying out the installation of this system and strict quality norms and welding procedure will have to be followed at site. The Contractor is advised to get familiarized with the work procedure. In addition to the general clauses for Welding, RT and NDT given under clause 15.0 of this tender, the following clauses will be

applicable. This welding is to be carried out strictly under the supervision of BHEL Engineer and all repairs etc will be carried out as per the laid out procedure.

Some of the salient details in regards to T91/P91 material are being indicated in the clauses mentioned below however the erection, welding and NDT process are to be done as per the procedure /specifications to be furnished by BHEL / as per the instructions by site engineer.

- Prior to erection, supplied pipes shall be inspected thoroughly and if any defect like crack, lamination, and deposit noticed, the same shall be confirmed by Liquid Penetrant Inspection (LPI). If confirmed, it shall be referred to BHEL.
- Cutting of T-91/P91 material shall be done by bandsaw / hacksaw /machining / grinding only.
- Edge preparation shall be done only by machining/ by chamfering machine. In extreme cases, edge can be prepared by grinding with prior approval of BHEL.
- During edge preparation care should be taken to avoid excessive pressure to prevent heating up of the pipe edges.
- All edge preparation done at site shall be checked by Liquid Penetration Test. Weld built-up on edge preparation is prohibited.
- The pipe fit-up for welds shall be carried out properly, as per drawing specifications, by using temporary pipe clamps arranged by the contractor to ensure proper alignment and root gap. Use of site manufactured clamps for fit-up is acceptable. Neither tack welds nor bridge piece shall be used to secure alignment. Partial root weld of minimum 20mm length by GTAW may be allowed with the prior permission of BHEL engineers.
- Suitable reference punch marks shall be made on both the pipes (at about 200 mm from the EP) at least on four axis to facilitate UT on weld joint.
- Provide Enclosure for Welding area suitable for guarding against cold draught, water and dust at all welding locations.
- No pre-heating is required for fixing Thermocouples (of Ni-Cr / Ni – Al of 0.5 mm gauge size) with resistance spot welding.
- Argon gas to be used both for purging as well as shielding shall be of 99.99 purity levels conforming to IS 5760-1998. Dry Argon gas with requisite quality shall be used for purging the root side of weld. The gas flow rate to be maintained during purging is 10 to 25 liters / minute and for shielding during GTAW is 8 to 14 liters / minute
- The purging dam (blank) shall be fixed on either side of the weld bevel prior to Pre-heating. The dam shall be fixed inside the pipe and it shall be located away from the heating zone. Purging is to be done for root welding (GTAW) followed by two filler passes of SMAW in case of butt welds.

- Wherever possible, solid purging gas chambers are to be used which can be removed after welding. If not possible, only water-soluble paper is to be used.
- Wherever possible, solid purging gas chambers are to be used which can be removed after welding. If not possible, only water-soluble paper is to be used.
- Purging is not required in case of nozzle and attachment welds, when they are not full penetration joints.
- Start purging from inside of pipe when root temperature reaches 220°C. Provide continuous and adequate Argon gas to ensure complete purging in the root area. The minimum pre-flushing time for purging before start of welding shall be 5 minutes, irrespective of the pipe size.
- Preheating: Prior to start of pre-heating ensure that surfaces are clean and free from grease, oil and dirt. Pre-heating temperature shall be maintained at 220°C by using induction heating. The temperature shall be ensured by using a calibrated autographic recorder and two calibrated thermocouples fixed at 0 and 180 degree positions on both pipes 50 mm away from the edge. The thermocouples shall be welded with spot welding machine. The pre-heating arrangement shall be inspected and approved by BHEL engineer. Alternate arrangements shall be made during power failure. Two numbers additional square thermocouple are to be fixed for emergency use. Gas burners shall be employed to maintain the temperature until the power resumes.
- Welding: Root welding shall be done using GTAW process (as per WPS) five minutes after the start of Argon purging. Filler wires shall be clean and free from rust or oil. Argon purging shall be continued minimum two filler passes of SMAW.
- Post Weld Heat Treatment: Heating shall be done by Induction heating only as per the procedure / specifications provided by the BHEL engineers. Generally the PWHT temperatures for T-91/P-91 with T- 91/P-91 material shall be 760 + 10°C and the soaking time shall be 2.5 minutes per mm of weld thickness, subject to a minimum of two hours. The rate of Heating / Cooling is to be strictly maintained.
- The PWHT temperature shall not deviate from the values specified in the chart range since any deviations to the specified holding temperature range, will adversely affect the mechanical properties of the weldment and may lead to rejection of the weldment. The weld joints should be kept dry. Under no circumstances any water / liquid is allowed to come in contact with weld as well as preheated portion of the pipe
- The recording of time and temperature shall be continuously monitored with a calibrated recorder right from pre-heating. This shall be ensured at every one hour by site-authorized personnel.
- The width of the thermal insulation beyond the heating band shall be at least two times the heating bandwidth on either side of the weldment.
- All equipment like recorder, thermocouple, compensating cable, oven, thermostat etc. should have valid calibration carried at BHEL approved labs. The calibrated reports should be reviewed and accepted by calibration In-charge at site prior to use.

- Same procedures of welding and heat treatments shall be followed for the weld joints repairs. The NDE shall be conducted for the entire weld joint.
- All the NDE i.e. LPI, MPI, UT and hardness shall be performed on the weld joints as per the standards/ specifications / direction of BHEL. The maximum allowable hardness at weld and parent metal shall be 300 HV10. Joints having hardness above 300 HV shall be re-heat treated and hardness shall be checked again.
- Welders qualified as per ASME Section – IX and IBR on T-91/P-91 material shall only be engaged for the welding of T91/P91 materials. Welders shall have to undergo all the training for above. The welders shall have to be tested and qualified by BHEL site. Contractor shall arrange for the same and entire expenditure towards this shall be borne by the Contractor.
- Contractor shall deploy exclusive Engineer and Supervisor who will be responsible for the completion of all activities from weld fit-up to final clearance of weld joints after satisfactory NDE and acceptance by BHEL / Customer / IBR.
- No interruption is allowed during preheating, welding and PWHT. Hence all equipment for the purpose of power supply, welding, heating etc. hence all alternative arrangements, (Diesel generator for providing power to the welding and heating equipment, reserve thermocouple connections, gas burner arrangement for maintaining temperature etc.) shall be arranged by the contractor within the normal scope of this contract. All the preventions / procedures to be ensured to avoid abruption to on going heating / cooling process. Before start of erection, welding and heat treatment process for P 91 materials all the associated persons shall acquire complete knowledge on the subject from BHEL site engineers to avoid metallurgical failures.
- The Induction heating equipment shall be drawn from BHEL stores, transported, installed and commissioned wherever required at site. For routine and breakdown maintenance, Contractor shall have to deploy sufficient Manpower, Tools & Plants within his quoted rate. The contractor shall provide electrical cables and switches required. All the equipment shall be protected by providing covers or sheds at site by the contractor within the quoted rate. Any loss / damage of equipment / tools by the contractor shall be recovered from the contractor.

All the consumables to carry out the work for the P91/P92 materials, required for welding and heating process i.e. K type thermocouples fiberglass insulated with heavy duty T/C connector, heating elements (annealing cables), compensating cables, insulating materials (glass fiber cloth temperature rating 1260°C, glass fiber cord dia 3 mm (twisted) temp rating 1260°C, ceramic fiber blanket RT grade density 96 kg / cub M temp rating 1260 °C, ceramic fiber rope fiber glass 12 mm dia.- temp rating 1260 °C), gas burner arrangement, all gases, purging dams, blanks, welding electrodes, filler wires, etc., except those consumables supplied by BHEL units, if any,, **shall be in the scope of contractor**.

For carrying out the installation, the following items are being provided by BHEL free of cost:

a) Induction Heating Machine
b) Suitable Power BackUp (DG Set)

The contractor shall be issued the above in line with the Special Conditions of Contract Clause.

The following will have to be provided by the Contractor:

a) Electrodes for P91/P92/T91/T92 welding
b) Spot welding machine
c) Qualified operator for Induction Machine and DG Set
d) All cables for connecting Induction Machine and DG Set to Main Supply along with Changeover System.
e) Welder Qualified as per ASME IX and IBR for T91/P91 Materials. Site Welder Qualification tests will be conducted also.
f) Exclusive Trained Welding Engineer for Supervising T91/P91 Welding and Heat Treatment
g) Qualified NDE Engineer (Level -II) and welding Supervisor (Level-I)
h) UT Testing and Hardness testing
i) Required GTAW and SMAW machines
j) Welding Machine for Demagnetizing along with cable and Residual Field Indicator
k) Providing Enclosure for Welding area suitable for guarding against cold draught, water and dust at all welding locations.
l) Providing of Argon purging for the welding operation (including supply of consumables ex. Water Soluble Paper / Aluminum Dam arrangement.)
m) Providing of Heating by Gas Burner as Standby Arrangement.
n) Providing of Baking ovens and portable ovens
o) Providing Band Saw/ hacksaw/ Grinder for Cutting with tools.
p) Providing machining for Edge preparation
q) Providing of LPI and MPI Facility as specified in the Welding process, including supply of all consumables.
r) Providing and applying insulation band as specified in the welding procedure.

The above comprise of the major requirements for the process. The Contractor has to provide all services and consumables for completion of the work.

DG set for backup power supply, provided by BHEL is to be operated by the contractor bi-weekly / as specified by the supplier to ensure its healthiness during exigencies of power

failure for heating processes of T91/P91/P92/T92 materials on account of power failures. Cables and switches, required fuels and other consumables & its operations and maintenance shall be in the scope of contractor within the awarded value.

The contractor shall arrange welding Machine for Demagnetizing material along with cable and Residual Field Indicator

15.39 **Chemical Cleaning**

Chemical cleaning will be carried by a separate agency appointed by BHEL. While the work of installation of tanks, Pumps, Piping and operation of the system is in the scope of that agency, the Contractor has to extend all assistance (including providing of a welding power point) and complete interface requirements for the completion of the work.

15.40 For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.

15.41 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 and quote the price inclusive of all such work and radiography.

15.42 The welded surface irrespective of place of welding shall be cleaned of slag and painted at the center with primer paint to prevent corrosion at no extra cost towards this.

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

16.0 **HYDRAULIC TEST**

16.1 The pressure testing for equipment & piping shall be carried out as per IBR / Customer / customers' consultant specification / BHEL. Customers' consultant specification forms the part of this tender specification.

16.2 All equipment and some of the Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall supply necessary labour and other services and make necessary arrangements to carry out the required tests as per the instructions and directions of the BHEL Engineers.

16.3 The contractor shall make all necessary arrangements including making of temporary closures on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost.

16.4 Soundness of the welds shall be tested hydraulically under the supervision of the BHEL Engineer and Customer, to the pressure indicated in the drawing. Prior to the test, the boiler / piping system shall be inspected by the BHEL Engineer to the extent necessary to ensure compliance with clearance for the test, which will be obtained by the contractor from the Engineer.

16.5 Hydraulic testing, as required shall be carried out by the contractor. The servicing, installation, electrical connection, erection, testing and dismantling of Hydraulic Test pump, temporary pipelines, fittings, etc. shall be carried out by the contractor as part of this work.

16.6 All the hydraulic tests shall be repeated till all the pipelines / equipment to satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of IBR inspectorate / BHEL / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost. The contractor shall carry out all the required tests and pre-commissioning and commissioning activities required for successful and reliable operation. These would include hydraulic test of piping, pre-boiler system detergent flushing/chemical cleaning, steam blowing, water washing etc. as instructed by BHEL.

16.7 Test records shall be made for pressure testing of above piping system. These records shall contain the following information:

a) Date of test
b) Identification of piping tested
c) Test fluid
d) Test pressure
e) Approval of the Engineer.

16.8 Contractor has to arrange required pumps with sufficient capacity for filling water in the tubes and pipes for conducting Hydraulic testing of LP lines. Contractor has to arrange Hydraulic Test pump / Hand Pump at his cost for Hydraulic testing of LP lines.

16.9 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.

16.10 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL. All thermowell points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded. Necessary blanks will be provided by BHEL.

16.11 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 / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL. Contractor shall cut steel blanks from steel provided without charging extra. 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 Engineer's instructions.

16.12 The contractor shall make all necessary arrangements including making of temporary closures / dummy on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost. Necessary blanks will be provided by BHEL.

16.13 Hanger adjustment / re-adjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.

16.14 In general Hydraulic testing of piping shall be performed after all eventual pipe branches have been completed and valves installed. Should it be required to hasten erection work, pressure tests may be performed by sections. For this scope of work, the erected pipe lines shall be hydraulically tested as per site requirement in segments. For conducting hydraulic test, both ends of pipe lines shall be blanked by welding of plates. Only one or two set of plates and structural materials for blanking required for one segment will be provided by BHEL free of charge. After completion of hydraulic test in one segment, the same plates are to be cut and removed and utilized / welded on the other segment of the pipe lines, to carry out the hydraulic test for the respective segments. No separate plates for blanking for each segment will be provided. After completion of Hydraulic test, the required edge preparations shall be carried out on the end of pipe lines and to be welded with the respective pipe lines. In such cases joint connection shall be checked during a final and additional test, if required. The contractor shall note this aspect and quote accordingly.

16.15 During hydraulic test, the pipes being tested shall be isolated from the equipment to which they are connected.

16.16 Openings on piping for pressure / temperature impulse connections shall be fully closed during the test to prevent dust or foreign matter entering into the instrument piping inadvertently.

16.17 During the initial stages of work, trenches for draining water may not be available after Leak test, Hydro test, Flushing or mass flushing. For discharging/ emptying the equipment, system and piping, necessary low point drains and temporary piping up to safe location are be erected by the contractor at his cost. The materials will be provided by BHEL.

16.18 In case any erection defect is detected during various tests / operations, trial runs as detailed above, such as loose components, undue noises, vibration, strain on connected equipment, steam / oil / water leakage, etc. the contractor shall immediately attend these defects and take necessary corrective measures. If any readjustment and re-alignments are necessary the same shall be done as per BHEL Engineer's instructions. If any part needs repairs rectification and replacement the same shall be done by the contractor at no extra cost. If insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.

16.19 Temporary blinds / lugs / caps of piping and associated equipment like tanks, pumps etc. required for oil flushing / alkali cleaning / acid cleaning of piping & other equipment

during erection & pre-commissioning shall be erected by contractor within the quoted rate.

16.20 During Commissioning, opening / closing of valves, changing of gaskets, attending to leakage and adjustments of erected equipment may arise. Contractor may have to replace old / damaged gaskets / packing etc. for equipment and the same shall be carried out by contractor as per requirement. The finally accepted price / rates shall also include all such work.

16.21 Replacing / cleaning of filters of the erected equipment and piping system etc., during pre-commissioning / commissioning stage is within the scope of work.

16.22 For conducting Hydro test / steam blowing of MS, CRH & HRH internals of valves and NRVs (LPBP, ESV, IV & LP BP Valves & NRVs) are to be removed, Hydro Test devices are to be fixed and after Hydro Test the internals are to be re-assembled by the contractor as instructed by BHEL without any additional cost.

16.23 The pressure testing for piping system shall be carried out as per IBR / Customer / customers' consultant specification / BHEL. Customers' consultant specification forms the part of this tender specification.

16.24 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.

16.25 Raw materials for all temporary piping necessary for conducting Hydraulic test, Chemical cleaning, Steam blowing, Flushing, effluent disposal, etc. will be provided by BHEL free of cost. However, fabrication, servicing, erection and dismantling the same and return of the temporary piping, flanges, valves etc. to BHEL stores is the responsibility of the contractor without any extra charges.

16.26 The following specifications shall also be completed with during hydrostatic test.

a) Vent nozzles with valves shall be provided at the highest point of the runs, to eliminate air pockets. At the lowest point drain nozzles, with valves shall be provided to drain water from pipes. The nozzles and valves shall be of the same materials as the pipe.
b) The lowest part of the pipe shall always be filled first with water.
c) Pressure shall be slowly increased (without shocks) to the stipulated value and maintained as long as required to visually check all joints.

d) Following the control specified above the pressure shall be slowly decreased to the design pressure after which the pipe shall be subjected to the peening test, applying knocks every 150 mm approx. especially in the welded joint areas, with a 0.5 – 1.5 kg. Hammer (depending on the pipe wall thickness). The hammer used shall be a round headed one.
e) Following the peening test, the pressure shall be increased to the stipulated value and all welded joints shall be visually inspected.
f) Following these test, the pipe shall be drained or pumped out to the other section to be hydro test using the drain out pump to be provided by Contractor and wherever necessary shall be flushed with air for all pipes.
g) The pressure test is considered satisfactory if no cracks, unjustified pressure reductions, leakages, seepages etc., appear.
h) Should defects be found, these shall be repaired in the same manner as these during radiographic examination. Hydraulic test shall be repeated after defects have been repaired.

17.0 APPLICATION OF INSULATION

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

17.1 All attachment welding, including welding of hooks/ supports as per pitch both on equipment and piping shall be done as directed by Engineer. Attachment welding shall have to be done by certified welders. If necessary contractor may have to cut the hooks to correct length. Application of red oxide paint including supply of paint on welded portions as directed by BHEL is also included in the scope of work.

17.2 The contractor has to supply and apply heat resistant primer on welded portions before application of insulation.

17.3 The mineral wool mattresses (bonded/ un- bonded)/ LRB mattresses are received at site in standard sizes. These are to be dressed/ cut to suit site requirements by the contractor.

17.4 The number of layers/ thickness of mineral wool/ LRB mattresses for auxiliaries, pipe lines, valves and other vessels shall be as per various drawings and as directed by Engineer. For applying the mineral wool mattress, the required holding materials, if necessary by fabrication of rings/ hooks shall be fixed as directed and as per drawings and spec.

17.5 Contractor should ensure, proper finishing surface of the insulation, sheeting and cementing.

17.6 Contractor should ensure that the finished surface of the insulation works conforms to the dimensions and tolerances given in the drawings. Aesthetic finish and accuracy of work are most important.

17.7 It is the responsibility of the contractor to ensure that the insulation materials and sheet metal covering issued to him for application are well protected against loss or damage from weather conditions. Closed/ semi-closed sheds or any other arrangements required for this will by him at his cost. If any damage occurs to the material due to improper storage or due to any causes attributable to the contractor except for normal breakage or damages allowed in such cases, the cost of such damaged material shall be to the account of contractor.

17.8 Aluminum sheet cladding will be fabricated to the sizes and shapes specified in drawings. Beading, Swaging, Beveling of sheets, crowning the sheets, if necessary, will be carried out by him. Two coats of anti-corrosive black bituminous paint are to be applied on inner surfaces of the cladding. Bitumen sealing compound on the joints if necessary is included in the scope of this work. **Contractor may note that he will also supply anti-corrosive**

black bituminous paint & bituminous sealing compound required for above works at his cost. However, if any material is received from BHEL manufacturing unit, the same shall be issued free of cost to the contractor.

17.9 Aluminum sheet metal cladding over insulation will consists of plain/ ribbed/ corrugated sheets. The sheets will be supplied in standard sizes. Cutting them to required size, grooving, fabricating bends, boxes etc for proper covering is contractor's responsibility. Any cutting/ bending/ welding of fabricated skin casing sheets if required will also covered within the scope of this contract.

17.10 A log book shall be maintained by the contractor to obtain clearance for application of insulation. If the contractor does the work on his own accord without prior permission the area may have to be redone at his cost.

17.11 Contractor is liable for the exact accounting of the material issued to him and he shall make any unaccountable losses good. Allowed Wastage for the material issued are as below:

1. Wool/ LRB mattresses and cladding sheets 2%

17.12 The entire surplus, unused materials etc supplied by BHEL shall be returned to BHEL after the work is over. Materials like gunny bags and packing materials, empty containers may be returned at periodical intervals.

17.13 The contractor shall leave certain gaps and openings while doing the work as per instructions of BHEL engineer to facilitate inspection during commissioning and to fix gauges, fittings and instruments. The gaps will have to be finished as per the drawings at a later date by the contractor at his cost.

17.14 If during erection and commissioning any of the parts are to be insulated temporarily fixed and then replaced by permanent ones at a later date or if any of the parts are to be removed for modification, rectification, adjustment and then refitted or if some parts are to be opened for inspection, checking and for measurement of metal surface temperature the same may necessitate removal and re-application of insulation and sheet metal cladding, which shall be done by the contractor and the erection rate quoted shall be inclusive of such contingencies.

17.15 Removable type insulation shall be provided for valves, fittings, expansion joints, etc as per the drawing or as directed by BHEL Engineer.

17.16 All temporary pipelines required during testing, pre-commissioning and commissioning should be insulated as directed by BHEL at no extra cost to BHEL. However, required insulation material shall be issued by BHEL free of cost.

17.17 Insulation of expansion joints, dampers, etc shall be carried out after NDT/gas tightness test.

17.18 Day to day cleaning of insulation debris and scraps to be ensured by the contractor. Excessive wastage will attract cost recovery.

17.19 Though for Haridwar scope of equipment and piping, the application of insulation is not in the scope of this contract, but the transportation of the HWR scope insulation and arrangement of scaffolding for the insulation of equipment and integral piping is in the scope of this contract.

18.0 **PAINTING INCLUDING FINISH PAINTING & STENCILING**
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

18.1 The scope of work shall also include supply and application of final painting including stenciling of all the erected equipment as required and specified as per painting schedules for the components of Piping & Other equipment etc.

18.2 Required paints, thinner other consumable such as wire brush, brush etc. shall have to be arranged by the contractor at their own cost. The required manpower, other required consumables, T & P etc shall be provided by the contractor within the quoted rate. The arrangement of primer/paint will be in contractor's scope.

18.3 All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.

18.4 In the case of steel fabricated items, raw steel after fabrication has to be cleaned and subsequent painting to be carried out.

18.5 All exposed metal parts of the equipment, structure, auxiliaries, piping, and other items (covered within the scope of this contract) after installations are to be painted after thoroughly cleaning the dust, rust, scales, grease, oil and other foreign materials by wire brushing, scrapping and any other method approved by BHEL Engineer. Mostly the equipment / components installed are with one coat each of primer paint and synthetic enamel / heat resistant paint. However, due to aging, the same may have got deteriorated for peeled off. The surfaces are to be thoroughly cleaned of all dirt, rust, scales, grease, oils and other foreign materials by wire brushing, scrapping, any other method as per requirement of BHEL. The same will be inspected and approved by the engineer before painting.

18.6 After applying the primer paints all structure/ equipment/ items, shall be finish painted with two coats of alloyed resin machinery enamel paints as specified by BHEL engineer. In case proper finish is not obtained in two coats, the contractor shall apply additional coat(s) till proper finish is achieved. Before applying the subsequent coats the thickness of each coat shall be measured and recorded with BHEL / Customer. After completion of painting all bright spots shall be cleaned to the satisfaction of Engineer.

18.7 Certain equipment like control panels, valves etc. shall require spray painting. The contractor shall make arrangements of the required equipment for spray painting. Spray painting at the job site shall be permitted only at times and locations approved by Engineer.

18.8 Contractor at no extra cost to BHEL shall supply all paints, primers, tools and other consumables including scaffolding materials required for finish painting. Paint is to be BHEL/Customer approved make only and painting should be as per colour scheme and quality approved / specified by Engineer. Valid Test Certificate for the paint so supplied shall be made available before use of the same on work. No paint whose shelf life has expired should be used for painting.

18.9 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.
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.
(**Painting procedure to be followed also for touch-up painting on damaged areas**).

18.10 The contractor may be required to fill up dents / marks by applying putty before final painting of equipment. All materials and arrangements have to be made within quoted lump sum price/rates.

18.11 The contractor shall provide legends with direction of flow on equipment and piping in size specified by Engineer. Letter writing shall be done in Hindi / English or in both languages.

18.12 The painters have to undergo test on a mock plate of size 1m*1m and only qualified painters will be allowed to work.

18.13 The contractor shall ensure availability of

- Ford Cup-4 to measure consistency of paint,
- Automatic magnetic gauge/Elcometer to measure the dry film thickness and
- SSPC Visual standards to assess degree of cleanliness of surfaces to be painted.

18.14 All paints should be stored in well-ventilated store. The painters and other personnel deployed should use proper protective equipment to avoid inhalation of fumes.

18.15 The Turbines, Generator and all auxiliaries of this contract scope, are also to be painted as per the paint schedules.

18.16 Each coat (Primer, intermediate, finish) shall have a minimum thickness of dry film thickness (DFT) in microns and the DFT of finish paint shall not be less than the specified.

Elcometer for measuring the thickness of paint applied is to be arranged by the contractor.

18.17 Finish coat paint, No of coat and DFT shall be as indicated in the painting specification enclosed in this tender / relevant BHEL document/ customer's specifications. The painting specification which is forming part of this tender as in TCC shall be used as guidelines to be followed.

18.18 The actual colour to be applied shall be approved by the customer before starting of actual painting work.

18.19 Primer & finish paint shall be of reputed paint supplier approved by BHEL / Customer. Contractor has to procure paints from the BHEL / Customer approved agencies only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities. The batch certificates of paints to be submitted to BHEL Engineer before using the same.

18.20 No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.

18.21 Before commencement of final painting, contractor has to obtain written clearance from BHEL / Customer for effective completion of surface preparation.

18.22 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL/ Customer. **The instrument for checking the thickness of coats (DFT measurement, Elcometer) to be procured by the contractor and should be calibrated after periodical intervals.**

18.23 Wherever applicable, supply and application of primer / final painting of all the insulation items erected under the scope of this tender. The painting shall be as required and specified in the painting schedule.

18.24 Painting of inner side of sheet metal covering over the insulation walls with two coats of anti-corrosive paint (IS-158) to be applied to the entire satisfaction of BHEL Engineer and application of bituminous sealing compound on cladding/ sheet metal joints shall also be carried out by the contractor. Retainer type 'A' must be coated with Aluminium paint. For

which the required amount of paint, thinner and other accessories for painting, cleaning the surfaces etc., shall be arranged by the contractor within the quoted rate.

18.25 The contractor shall effectively protect the finished work from action of weather and from damage of defacement and shall cover the finished parts, then and there, for their protection.

18.26 **CONDENSER PAINTING**

a) The condenser main tube plates will be dispatched to site from the works with surface protection only on water box side. The same shall be removed adopting one of the suitable methods indicated elsewhere in this specification. The contractor shall do the surface protection of these tube plates after the completion of the tube insertion and expansion activities. The surface shall be first painted with at least two or more coats of approved quality chemical resistant epoxy zinc chromate primer after thoroughly cleaning all such parts of al dirt, rust scales greases, oils and other foreign materials by adopting suitable methods as approved by BHEL. Afterwards the above parts shall be finished with two or more coats of approved quality high build black coal tar coating. Before the painting is taken up, the contractor shall plug all the holes with suitable tapered plastic / wooden plugs to avoid any damage to the tube ends. The plastic / wooden plugs and paints required for the above operations shall have to be arranged by the contractor at his cost. **The above paints are also to be applied on water chamber / box.** The thickness is to be confirmed by suitable measurement. **The inside of water box has to be painted with High build Black Coal Tar epoxide paint of thickness DFT= 0.25mm or as per painting procedure.**

b) The condenser steam space shall be surface protected with at least two coats of suitable steam washable paint. Before the painting is taken up, the contractor shall clean the surfaces to be coated by adopting suitable methods. The contractor at no extra cost shall procure paint to BHEL

PRESERVATION / TOUCH UP PAINTING

18.27 Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipment under this tender specification right from pre- assembly stage to till the equipment is cleared for final painting. The primer paint shall be matching shop primer.

18.28 Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of same primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.

18.29 Mostly the equipment / items/ components will be supplied with one coat of primer paint and one coat of finish paint. However during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour.

18.30 Required paints, thinner other consumable such as wire brush, brush etc. shall have to be arranged by the contractor at their own cost. The required manpower, other required consumables, T & P etc. shall be provided by the contractor within the quoted rate. The arrangement of primer/paint will be in contractor's scope.

18.31 Painting of portions of Employer's structures wherever connection/welding is carried out by contractor for supporting structures.

18.32 All rectification including painting of Employer's structure which are damaged by contractor during his work.

19.0 TESTING , PRE-COMMISSIONING & COMMISSIONING AND POST COMMISSIONING
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

19.1 Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation. Specific omission of any test which is required for the successfully commissioning all the equipment's covered under scope does not absolve the contractor of its responsibilities of performing of that test.

19.2 Trial run of FEED PUMPS, CEP, and various rotating machineries / pumps.

19.3 Trial run and commissioning of motors/ drives for various auxiliaries. This includes testing of motors including CT testing, actuators etc, with supply of test kits.

19.4 Hydraulic test of pipelines, closed systems, tanks and vessels. Any calibrated pressure gauges required for the hydrotests are to be arranged by the contractor at his cost.

19.5 Flushing of all pipelines by air/oil/water/steam as the case may be.

19.6 Servicing of all valves and fittings.

19.7 Manual/ mechanical cleaning of Oil Tanks, Deaerator, FST, Suction strainers /filter elements of CEP, BFP, Booster pump and other various equipments and tanks erected by the contractor. This may have to be repeated several times during the commissioning process.

19.8 BARRING GEAR.

19.9 ROLLING AND SYNCHRONISATION.

19.10 FULL LOAD OPERATION.

19.11 TRIAL/INITIAL OPERATION

19.12 These would also include hydraulic test of condenser and water flushing of piping, oil flushing of oil system etc. as instructed by BHEL.

All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests / activities may not have been listed in these specifications.

Specialized test equipment which are supplied by Manufacturer's as special T&P for Erection and Commissioning shall be provided by BHEL / its client free of hire charges. However contractor has to take proper care of the equipment issued to him.

Any other T&P, MME, Precision equipment, Testing kit other than that provided by BHEL/client has to be arranged by contractor, as and when required with no extra cost to BHEL, and ensuring uninterrupted flow of work.

19.13 The contractor shall carry out the air-tightness test on assembled generator to the satisfaction of BHEL Engineer. The necessary arrangement for testing with dry-clean air shall be made by the contractor at his cost. Compressed air for testing can be taken by the contractor from the existing system.

19.14 **Helium Leakage Test-** The contractor shall carry out the Helium Leakage Test on assembled generator to the satisfaction of BHEL Engineer. The necessary arrangement/ test kit for carrying out the Helium Leakage test shall be made available by the contractor at his cost.

19.15 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall repairs all joints (shop welded or site welded) failed during testing.

19.16 While the Detergent cleaning operation including the required looping in piping , draining and disposal will be carried out by another agency , the Contractor will have to ensure the readiness and availability of CEP ,associated systems and the piping which is erected under this scope and is to be cleaned . Any work required on the permanent system will have to be carried out by the Contractor. Cleaning of strainers and any support required for detergent flushing of the systems/equipment which come under this contract has to be done by the contractor.

19.17 All temporary piping along with their supports for steam blowing in the systems erected by the Contractor, and the required loops for chemical cleaning of the piping erected by the contractor will have to be erected within the quoted rates.

19.18 For completing the chemical cleaning/oil flushing contractor may have to do some temporary piping /welding will be in the scope of work.

19.19 The Contractor will also be responsible for their installation wherever required. He will dismantle the total system and return the same to BHEL / their customer store as

directed. No separate payment will be released for erection & dismantling of the required equipment & piping.

19.20 Thermal shocks will be required during oil flushing operations. The contractor is required to make all arrangements for the same. This would include fabrication of heating tank with nozzles and requisite piping with supports. Complete erection with pumps, tanks, electrical fittings including and other accessories is to be carried out. All material and equipment will be provided on returnable basis by BHEL.

19.21 The scope of pre-commissioning activities cover installation of all necessary temporary piping, supports, valves, blanking, pumps, tanks etc. and other accessories with access platforms valves, pressure gauges, electric cables, switches, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test, steam blowing or for any other tests as the case may be and will carry out above activities under this scope of work as per instructions of BHEL. The scope also covers the offsite disposal of effluents.

19.22 All arrangement required for steam blowing including removal, reinstallation and welding of CRH NRV and installation of steam blowing arrangements, temporary piping including steam blow off piping is included in the scope of work.

19.23 It shall be the responsibility of the contractor to preserve the cleaned surface as per BHEL's requirement.

19.24 The pre-commissioning activities will start prior to oil flushing of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, Chemicals etc.

19.25 All these works need specialized gangs including electricians, instrument technicians, and fitters, in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required.

19.26 Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

19.27 All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests/ activities may not have been listed in these specifications.

19.28 Specialized test equipment, if any, shall be provided by BHEL/ Customer free of hire charges. However, contractor has to take proper care of the equipment issued by him.

19.29 All the tests may have to be repeated till all the equipment satisfy the requirement /obligation of BHEL at various stages. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.

19.30 Scope of pre-commissioning activities cover installation of all necessary equipment including temporary piping, supports, valves, blanking, pumps, tanks, etc and other accessories with access platforms valves, pressure gauges, electrical cables, switches, cutting of some existing valve, placing of rubber wedges in the valves, etc, required for hydro test, or for any other tests as the case may be and will carry out above activities under this scope of work as per instruction of BHEL Engineer.

19.31 It shall be the responsibility of the contractor to provide various category of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. Contractor will provide necessary consumables, Certified T&P's, IMTE's etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

19.32 It shall be specifically noted that the above employees of the contractor may have to work round the clock along with BHEL Engineers and hence overtime payment by the contractor to his employees may be involved. The contractors finally accepted rates should be inclusive of all these factors also.

19.33 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.

19.34 During commissioning, opening / closing of valves, changing of gaskets, realignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. The finally accepted price / rates shall also include all such work.

19.35 Contractor shall make all necessary arrangements including making of temporary closures on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost.

19.36 The water boxes of the condenser will be tested hydraulically to 1.5 or 1.3 times (OR as per UPRVUNL/NTPC requirement) the design pressure after its assembly at site. The arrangement of all the blanking for carrying out the hydraulic test shall be the responsibility of the contractor at no additional cost. However only the main blanking flanges with fasteners for CW inlet and CW outlet of the condenser shall be provided by BHEL free of cost. Fabrication of blanks will be carried out by the contractor.

19.37 The water-fill test of the steam space shall be carried out by filling the water upto 300 mm above the final joint of the exhaust hood with the turbine or as required above the top row of tubes to facilitate leak detection. It should be done so that all the field welding joints are covered in the test. Hydraulic testing shall be carried out on the condenser water boxes. Dummy plates shall be provided by BHEL.

19.38 The contractor shall fill the condenser upto the specified level as many times as called for by the Engineer for checking of the turbine at no additional cost

19.39 Valves will have to be checked, cleaned or overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.

19.40 In case any defect is noticed during tests, trial runs and commissioning such as loose components, undue noise or vibration, strain on connected equipment etc., the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and realignment are necessary, the contractor at his cost shall do the same as per Engineer's instructions including repair, rectification and replacement work. The parts to be replaced shall be provided by BHEL.

19.41 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.

19.42 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial/initial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-

serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.
Cleaning and servicing of all the filters / strainers, toppings of oils coming in the system shall be done by the contractor within the accepted price.

19.43 At the time of each inspection, the contractor shall take note of the decisions / changes proposed by the Engineer and incorporate the same at no additional cost. The contractor shall carry out any other test as desired by BHEL Engineer/ Manufacturer on erected equipment covered under scope of this contract during testing and commissioning to demonstrate the physical completion of any part or parts of the work performed by the contractor

19.44 Scope of pre-commissioning, commissioning and post commissioning activities cover installation of all necessary temporary piping, supports, valves, blanking, pumps, tanks etc. and other accessories with access platforms valves, pressure gauges, electric cables, switches, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test, or for any other tests as the case may be and will carry out above activities under this scope of work as per instructions of BHEL. Any temporary fasteners, gaskets etc, if required to be provided for commissioning of the system, are under the scope of this contract within the quoted rates.

19.45 The contractor shall make all necessary arrangements including making of temporary closures on piping/ equipment for carrying out the hydro-static testing on piping equipment covered as per the scope at no additional cost. The contractor shall carryout the required test on the pipelines such as Hydraulic Test (as per IBR requirement/ instruction of BHEL), of piping systems as per the scope, Ultrasonic Test for weld defects and finding thickness, Dye penetrant test, Magnetic particles test for Weld defects and materials defects etc. All facilities (manpower, materials, equipment, consumables etc.) including proper approaches wherever required shall be provided by the contractor for satisfactory conduction of above tests. Special equipment such as magnetic particle tester, ultrasonic test kit and engineers required for these tests shall be arranged by the contractor along with qualified technician within finally accepted rates.
All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests/ activities may not have been listed in these specifications.

19.46 All the above tests should be repeated till all the erected piping satisfy the requirement/obligation of BHEL and Boiler Inspectorate, if required at various stages. All the repair for site welded joints arising out of the failures during testing shall be done by the contractor as part of the work within finally accepted rates.

19.47 Commissioning of electrically operated actuators for valves, dampers, gates, etc. are under the scope of this contractor. Pneumatic actuator will be commissioned by other agencies of BHEL. All the required support will in the scope of this contract.

19.48 Valves will have to be checked, cleaned or overhauled in full or in part before erection, alkali flushing, steam blowing and during commissioning as may be necessary.

19.49 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/ ventilation draining points with valves as per BHEL Engineer's instruction, for performing hydro test of piping and other equipment, is within the scope of this specification. Gaskets, valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided free of cost by BHEL. Contractor shall cut out steel blanks from steel provided. After completion of Hydraulic Test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/ scars of cutting weld filled, ground as per BHEL Engineer's instruction at no extra cost. NDT & SR if required may have to be carried out.

19.50 Hydro test of piping has to be repeated several times in consonance with technical/statutory requirements during stage of erection pre commissioning/ commissioning. Hydro test will have to be done to the satisfaction of Boiler Inspector/ Customer/ BHEL Engineer after attending repairs, Hydro test shall be repeated before Boiler Inspector/customer/ BHEL engineer to their satisfaction.

19.51 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. During Hydraulic Test, the pipes being tested shall be isolated from the equipment to which they are connected.

In certain places blanking has to be resorted prior to Hydraulic test and spool pieces have to be erected in place of control valves, orifices and other fittings and these spool pieces have to be subsequently replaced with the regular valves/ fittings by the contractor at no extra cost.

19.52 During this period though the BHEL's/ client's staff will also be associated in the work, the contractor's responsibility will be to arrange for the complete requirement of supervision, consumables, labour, T&P and IMTEs required till such time the commissioned units are taken over by the BHEL's customer.

19.53 It is possible that due to any reason the final supporting may not be completed before conducting Hydraulic Test. The contractor may have to strengthen or install any additional supports as per instruction of BHEL. This work is a part of the work and no additional payment shall be made on this account.

19.54 During commissioning changing of gaskets , tightening of bolts, realigning of rotating and other equipment, attending to leakage and minor adjustments of erected equipment may arise. The quoted rate of contractor shall be inclusive of all such works.

19.55 The instruction of the motor manufacturer regarding storage of the motors and re-conservation must be strictly followed without any deviation.

19.56 Contractor to provide necessary commissioning assistance from pre-commissioning state onwards and up to continuous operation of the unit & handing over to customer. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programs made to achieve the schedule agreed with customer.

19.57 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part commissioning assistance for a period of six months after synchronization or till handing over of sets to customer, whichever is earlier.

19.58 After synchronization, the commissioning activities and trial/initial operations will continue till handing over of the unit. Contractor shall provide the manpower for three months from trial/initial operation or submission of final bill with material reconciliation whichever is later. It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers as per the work requirement along with supervisors including necessary consumable tools etc., during this period. The rate quoted shall indicate all these contingencies also. The various categories of workers required for pre-commissioning, commissioning and post-commissioning activities are as follows:

a) Pipe fitters
b) Millwright Fitters
c) HP& structural welders
d) Riggers
e) Unskilled workers
f) Supervisors
g) Electricians
h) Laggers

i) Sheet metal fabricator/fitter
j) Any other category of workers as may be required.

Further in addition to the above, contractor has to arrange the following minimum manpower exclusively for assisting BHEL commissioning engineers during stabilization and trial/initial operation period. This manpower will be directly controlled by BHEL commissioning engineers.

1. One supervisor per shift for three shifts.
2. Two fitters per shift for three shifts.
3. Two helpers per shift for three shifts.

It shall be specifically noted that the above employees of the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL commissioning Engineers and hence, overtime, may be involved. The contractor‘s quoted rate shall be inclusive of all these factors also.

19.59 During commissioning any improvement or rectification due to design requirement is involved and if the contractor is asked to carry out the job, they shall be paid at man-day rates as per GCC clause no. 2.15. For this purpose, daily labour report indicating therein nature of work carried out, consumables used, etc. shall be maintained by contractor, and got signed by BHEL Engineer every day. It is not obligatory on the part of BHEL to get the works done by the contractor. They can employ any other agency if they so desire at that time.

19.60 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.

19.61 The contractor has to provide required man power assistance during pre-commissioning and commissioning checks of motor operated valves, actuators, control valves etc. without any extra charges.

19.62 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.

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

UNPRICED RATE SCHEDULE

ITEM NO.	DESCRIPTION OF WORK	TOTAL VALUE IN INR (IN FIGURES AND WORDS)
1.0	LUMPSUM PRICE FOR THE TOTAL WORK OF " ERECTION, TESTING, COMMISSIONING, TRIAL/INITIAL OPERATION AND HANDING OVER OF STEAM TURBINE, GENERATOR, INTEGRAL PIPING AND OTHER AUXILIARIES OF THE SYSTEM INCLUDING BOIs, PUMPS, INSULATION etc. AND FINAL PAINTING OF THE UNIT INCLUDING SUPPLY OF PAINTS" AS PER TENDER SPECIFICATIONS AT 1X660MW PANKI TPS, PANKI, KANPUR.	
Notes:		
a.	The derived item rate will remain firm throughout the contract period	

Notes:

i. Bidder's quoted price above shall be complete in all respect for the full scope defined in specification and in accordance with all terms & conditions of tender.

ii. Contractor shall fully understand description and specifications of items mentioned in BOQ (Chapter – X : Annexures).

iii. Conditional price bids with any deviation / clarification etc. are liable to be rejected. No cutting / erasing / over writing shall be done.

iv. Quantities mentioned in BOQ (Chapter – X : Annexures) are approximate only and liable for variation on either side depending upon site / design requirement.

v. The contractor while quoting the above rates, categorically confirms having understood the fullest implications of price escalation provisions contained in tender. Accordingly taking into consideration all aspects thereof quoted above rates. Further contractor confirms that he will not come with any other claim/compensation on account of any increase whatsoever during the entire period of execution including extended period if any.

vi. Taxes (GST) shall be payable extra as per relevant clauses in Technical Conditions of Contract.