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NOTICE INVITING TENDER

(Document No PS:MSX:NIT)

TENDER NO.: BHEL/NR/SCT/PANKI/POWER CYCLE PIPING/1172

NAME OF WORK: ERECTION, TESTING, COMMISSIONING, TRIAL OPERATION AND HANDING OVER OF POWER CYCLE PIPING, ALL ASSOCIATED PIPING & EQUIPMENT , INSULATION AND FINAL PAINTING INCLUDING SUPPLY OF PAINTS FOR 1 X 660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR,UP.

Bharat Heavy Electricals Limited

Ref: BHEL/NR/SCT/PANKI/POWER CYCLE PIPING/1172 Date: 16/10/2019

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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/POWER CYCLE PIPING/1172**	
ii	**Broad Scope of job**	**ERECTION, TESTING, COMMISSIONING, TRIAL OPERATION AND HANDING OVER OF POWER CYCLE PIPING, ALL ASSOCIATED PIPING & EQUIPMENT , INSULATION AND FINAL PAINTING INCLUDING SUPPLY OF PAINTS FOR 1 X 660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR,UP.**	
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 : 28/10/2019 , Time :15:00 HRS*** ***Place : on https://bhel.abcprocure.com***	*Applicable*
vi	**OPENING OF TENDER**	***At due date / time*** ***Date : 28/10/2019 , 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 30,32,000/-.***	***Applicable (for all bidders including MSEs)***
viii	**COST OF TENDER**	***Rs 2000/-.***	***Applicable (for all bidders including MSEs)***
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:* ***R M CHANDRA*** *Designation: Dy. MANAGER* *Deptt: SCT* *Address: BHEL-PSNR, PLOT NO. 25, SECTOR – 16A, NOIDA - 201301* *Phone: (Landline) 0120 - 2416440* *Email : rmchandra@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 vii 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).

.**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 &	HO – Ahmedabad

			Support	
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

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

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

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)

Sl. No.	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
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) = $\mathbf{T_T}$
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 $R_{BHEL} \geq 80$, 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**".

27.0 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.

28.0 **Micro and Small Enterprises (MSE) –Not Applicable**

29.0 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.

30.0 **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.

31.0 Order of Precedence

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

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

for BHARAT HEAVY ELECTRICALS LTD

(SCT)

Enclosure:-

(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) Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFYING REQUIREMENTS

JOB	ERECTION, TESTING, COMMISSIONING, TRIAL OPERATION AND HANDING OVER OF POWER CYCLE PIPING, ALL ASSOCIATED PIPING & EQUIPMENT , INSULATION AND FINAL PAINTING INCLUDING SUPPLY OF PAINTS FOR 1 X 660 MW PANKI THERMAL POWER PROJECT, PANKI, KANPUR,UP.
TENDER NO	BHEL/NR/SCT/PANKI/POWER CYCLE PIPING/1172

SL. NO.	NAME AND DESCRIPTION OF PRE-QUALIFICATION CRITERIA	BIDDER'S CLAIM IN RESPECT OF FULFILLING THE PQR CRITERIA
A	Submission of Integrity Pact duly signed	**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' **Power Cycle Piping** of one unit of ≥400 MW.	**Applicable**
D **D-1**	**FINANCIAL:** **TURNOVER**: Bidders must have achieved an average annual financial turnover (Audited) of **Rs. 609.60 Lakhs** or more over last three Financial Years (FY) i.e. (2016-2017, 2017-2018, 2018-2019). Bidder shall submit the Audited Balance Sheet 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. If financial statements are not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by Chartered Accountant.	**Applicable**
D-2	**NET WORTH:** Net worth (only in case of companies) of the bidder should be positive. Note: Net worth shall be calculated based on the latest Audited Accounts, as furnished for 'D-1' above. 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. Note: 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.	
E	**Approval of Customer**	**Applicable**
F	**Consortium Criteria**	Not Applicable

Explanatory Notes for QR 'C' :

1. For Sl no 'C',

   (a) "**Executed**" means "**STEAM BLOWING COMPLETION**"

   The bidder should have achieved the above criteria, even if the contract has not been completed or closed.

   (b) Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass.

   (c) For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5 TPH where ever rating of HRSG/BOILER is mentioned in MW.

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 the start of work.

3. For evaluation of PQR, the credentials of the bidder alone, and not that of the Group Company shall be considered.

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
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	

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 OPERATION AND HANDING OVER OF POWER CYCLE PIPING, ALL ASSOCIATED PIPING & EQUIPMENT, INSULATION AND FINAL PAINTING INCLUDING SUPPLY OF PAINTS

FOR

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 Erection, Testing, Commissioning, Trial operation and Handing over of **Power Cycle Piping, all associated piping & equipment, it's Insulation and Final Painting including supply of paints.**

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

1. Receipt of materials from site store/yard, stacking, storage, preservation, erection and commissioning of the system.
2. Their preservation and, safe keeping, watch and ward
3. Checking, Dressing, Chipping, Leveling of foundations (if any)
4. Pre-assembly, Erection, Alignment.
5. Welding, Heat Treatment, Radiography, UT and Non-Destructive Tests, as per approved documents / FQP.
6. Hydraulic Tests, Acid cleaning, Steam Blowing, and other pre commissioning tests,
7. Insulation, Touch up and finish painting include supply of paints, etc.
8. Assistance during chemical cleaning , alkali boil out, acid cleaning and passivation, PG test as per scope given in the tender
9. 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.
10. Unit Trial 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.**

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 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 Installation of piping valves shall be protected with wooden blanking plates securely fastened with wire of by plastic insert plugs.

2.4.5 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.

2.4.6 Fabrication and installation, setting and commissioning of pipe supports, guides, anchors and spring supports as required.

2.4.7 Execute painting and Labeling of all equipment, piping (including small bore piping), and structures like platform, pipe rack.

2.4.8 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.

2.4.9 Obtain clearances and approvals from all applicable statutory / Government agencies e.g. IBR, Electrical Inspectorate, Labour Inspectorate etc.

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

2.4.11 Testing of welds/flanged joints.

2.4.12 Erection, testing and commissioning of CBD, IBD and other tanks.

2.4.13 Preparation of As-Built Drawings.

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

2.4.15 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.

2.4.16 Temporary lines for Steam blowing of Power Cycle piping 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.

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

2.4.18 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.

2.4.19 The number of joints indicated in the welding schedules is approximate only and liable for variation, as per site conditions and also design consideration of manufacturing unit.

2.4.20 The welding process, weld joint and material specification may change to suit site requirement.

2.4.21 The list is furnished only for estimation purpose.

2.4.22 Consumables are within the scope of contractor for both temporary and main piping except those which are in BHEL scope. Please refer to SCC Rev-02- Clause 4.1.1 for further details.

2.4.23 The contractor shall weld the joints of site routing piping as per site requirement, no extra payment shall be made for such additional joints.

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 **PG wise break up of System is tentative as indicated under Annexure-A.1, A.2, and A.3.**

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 Power Cycle Piping and all associated piping system shall be indicated in Annexure-A. Accordingly, approximate weight to be erected shall be 5,227 MT.

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 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 can be inferred from the relevant drawings and any further clarifications can be obtained / decided by BHEL and that is 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 equipments constituting terminal points, whether the terminal equipments 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.

2.10 The contractor shall submit a copy of license to undertake construction / repair of Boilers & Piping issued by Boiler inspectorate before commencement of Pressure Parts / Piping Erection.

2.11 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.

2.12 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.

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

2.14 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.

2.15 **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.

2.16 **SITE ORGANISATION**

2.16.1 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.

2.16.2 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.

2.16.3 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.

2.16.4 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.

2.16.5 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.

2.17 ERECTION SCHEDULE

2.17.1 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.

2.17.2 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.

2.18 DEWATERING

2.18.1 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.

2.18.2 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 2.18.2

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.

2.19 **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.

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

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

2.22 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.

2.23 **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.

2.24 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.

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

3.16.4 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	12/ 14/ 18 MT	4
3.	Trailer with Pulling Unit	20/40 MT	2
4.	Electric Winch	3/5/10 MT	APR
5.	Drilling Machines		APR
6.	Grinding Machines		APR
7.	Welding Sets, TIG welding machine with accessories and ovens for welding electrodes baking and holding.		APR
8.	Welding Machine for T23 with accessories		APR
9.	Oxy- acetylene Gas Cutting Set		APR
10.	Plasma Cutting Machine		APR
11.	Hoisting & Pulling Devices/ Pulleys etc		APR
12.	Hydraulic Jacks	10/20/50/100 MT	APR
13.	Welding sets with accessories and ovens for welding electrodes backing and holding		APR
14.	Heat Treatment and Stress Relieving sets		APR
15.	Hydraulic Pipe Bending machine (Manual and Motorised) of various sizes		1 No each/ APR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
16.	**Radiography arrangement including source**		
	Iridium 192		2 source/ APR
	Cobalt 60		APR
17.	Pipe Chamfering Machine/ Tube Cutting		APR
18.	Pipe Cutting & bevelling Machines		APR
19.	Chain Pulley blocks of various & suitable capacities		APR
20.	Three phase DB with complete set up for drawl and distribution of construction power		APR
21.	Electrical cables for drawl and distribution of construction power, heating machines		APR
22.	Sleepers of suitable sizes		APR
23.	Concrete block for pre-assembly bed		APR
24.	Various sizes of clamps/ fixtures for assembling		APR
25.	Dewatering pumps		APR
26.	Recordable UT test Equipment suitable to meet the requirements (KRAUTKRAMMER MODEL USN 50 or EQUIVALENT)		APR
27.	Ultrasonic Hardness Testing Machine [Ultrasonic contact impedance (UCI)]		APR
28.	Annealing cables have to be arranged by the contractor within the quoted rates.		APR

S.NO.	EQUIPMENT	CAPACITY	QTY. IN NOs
29.	Hardness testing equipment (Equotip or Microdur make)		APR
30.	Digital Temperature Indicator.		APR
31.	Magnetic particle testing equipment DRY & WET Type		APR
32.	DPT Kit		APR
33.	Temperature recorder for 0-1000C 6/12 points with thermos couples/ rods and compensating cable		APR
34.	Spectrometer for metal testing		APR
35.	Elcometer for paint thickness checking		APR
36.	Hand Operated Megger 500/1000V		APR
37.	Tong Tester 10,20 or 50 Amp +/-3% accuracy		APR
38.	Digital Analogue Multi meter		APR
39.	Scaffolding Pipes		Min. 4000 Nos/ APR
40.	Master Level		APR
41.	Pressure Gauges of multiple ranges	0-800 Kg/cm2	APR
42.	Hydro test Pump	250 Kg/cm2	APR

Note: APR- As per requirement (Contractor shall have to deploy the T&P whenever required at site as decided by BHEL ENGINEER)

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.

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:**

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 / equipments to carry out the work.
VIII. Compensating cable & Heating Elements (Annealing cables)

4.7 **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) 36/40 MT crane- @ Rs 5000/- per day
b) 12/ 14/ 18 MT hydra crane - @ Rs 3000/- per day

c) 20 MT Trailer - @ Rs 2000/- per day
d) 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.

4.8 In addition to the deduction mentioned in clause 4.5 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.

4.9 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.

4.10 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.

4.11 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 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	**CRAWLER CRANE**	250/ 270 MT	1 No.	On sharing basis as per requirement
2	**CRAWLER CRANE**	135 MT	1 No.	On sharing basis as per requirement
3	**EOT Cranes at TG Hall without operator**		1 No.	On sharing basis
4	**DG SET**	250kVA/500kVA	1No.	For P91/ P92 joints
5	**INDUCTION HEATING MACHINE**		APR	
6	**HT PUMP**	(600-800 Kg/cm2)	1 No.	On sharing basis
7	**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 will be provided as per requirement and availability at the sole discretion of the BHEL Engineer.

4. **EOT Crane –** Allotment will be made only on need basis. 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.

   Providing manpower assistance required for free movement of trailing cable of EOT Crane is **included in the scope of contractor**.

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

5. All the consumables to carry out the work for the T91/P91/T23/P11/CS Piping/ P22/ SS Piping welding materials/ consumables, 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.

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

7. 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.

8. 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.

9. 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.

10. The Contractor shall be responsible for the safe and proper use of the above equipments 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.

11. 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.

12. 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.

13. 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.

14. 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.

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

16. 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.

17. Any loss / damage to any or part of the above equipments 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.

Cranes provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor. Cranes will be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose. 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 **22 (Twenty Two) 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	
Hydro Test/ Drainable	6th month	
Readiness for Boiler Light up	11th month	
Readiness for Steam Blowing	13th month	M1
Readiness for Synchronization (Coal)	14th month	M2
Readiness for Full load	15th month	
Readiness for Trial Operation	18th month	
Readiness for Completion of facilities	22nd 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 operation, attending punch points, handing over of the Power Cycle Piping & 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 operational acceptance of facilities/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 Unit rates (Applicable for item no. 1 to 6 of Rate Schedule)

SL NO	**Contract (Main Package) Identification ----->**	**PIPING & VALVES**			**INSULATION**
	Rate schedule Identification ------->	**1)P-91 2)AS 3)CS (HP) 4)CS (LP) 5)SS 6)OTHERS**	**Hangers & Supports and Tanks**	**Temporary Piping 1)Steam Blowing 2)Chemical Cleaning**	**1)Fixing Components 2) Mineral Wool 3)Sealing Compound 4)Aluminium sheeting 5)Ancillary Material**
1.1	ON PRE-ASSEMBLY WHEREVER APPLICABLE (IF NOT APPLICABLE, THIS PORTION SHALL BE CLUBBED WITH PLACEMENT IN POSITION)	20	15	-	--
1.2	PLACEMENT IN POSITION	20	25	-	50
1.3	ALIGNMENT	10	15	-	15
1.4	WELDING/BOLTING/FIXING/ GROUTING	15	20	-	20
1.5	COLD SETTING OF HANGERS	-	10	-	-

SL NO	Contract (Main Package) Identification ---->	PIPING & VALVES			INSULATION
	Rate schedule Identification ------->	**1)P-91 2)AS 3)CS (HP) 4)CS (LP) 5)SS 6)OTHERS**	**Hangers & Supports and Tanks**	**Temporary Piping 1)Steam Blowing 2)Chemical Cleaning**	**1)Fixing Components 2) Mineral Wool 3)Sealing Compound 4)Aluminium sheeting 5)Ancillary Material**
1.6	COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT (if not applicable, then this portion to be paid along with welding)	5	-	-	--
1.7	INSTALLATION OF TEMPORARY PIPING	-	-	60	-
1.8	DISMANTLING OF TEMPORARY PIPING, EDGE PREPARATION AND RETURN TO BHEL STORES	-	-	25	-
1.9	HANGERS & SUPPORTS ETC WHEREVER NECESSARY	10	-	-	--
1.10	HYDRAULIC TEST OR PNEUMATIC TEST	3	-	-	-
1.11	FLOATING OF LINES, FINAL ADJUSTMENT OF SUPPORTS FOR COLD AND HOT VALUES (if not applicable, this portion to be clubbed along with hydraulic test/pneumatic test)	2	-	-	
	TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)	**85**	**85**	**85**	**85**

(II) Stage/Milestone Payments (15%)

SL NO	Contract (Main Package) Identification ---->	PIPING & VALVES			INSULATION
	Rate schedule Identification ------->	1)P-91 2)AS 3)CS (HP) 4)CS (LP) 5)SS 6)OTHERS	Hangers & Supports and Tanks	Temporary Piping 1)Steam Blowing 2)Chemical Cleaning	1)Fixing Components 2) Mineral Wool 3)Sealing Compound 4)Aluminium sheeting 5)Ancillary Material
2.1	Boiler Light Up	1	1	-	1
2.2	ABO/Chemical Cleaning	1	1	-	1
2.3	Steam Blowing	1	1	-	1
2.4	SVF	1	1	-	1
2.5	Rolling and Synchronisation	-	1	-	-
2.6	Coal Firing	-	1	-	1
2.7	Full Load	1	1	-	1
2.8	Trial Operation of Unit	2	2	-	2
2.9	Completion of all drains and vents to respective locations and placement of instrument sensors after steam blowing	2	-	-	-
2.10	Painting	2	2	-	-
2.11	Area cleaning, temporary structures cutting/removal and return of scrap	1	1	5	3
2.12	Punch List points/pending points liquidation	1	1	-	1
2.13	Material Reconciliation	1	1	10	2
2.14	Completion of Contractual Obligation	1	1	-	1
	TOTAL FOR PRO RATA PAYMENTS (TOTAL 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 BOILER & AUX, SCR AND AUXILARIES AT 1X660 MW PANKI TPS

AA. SUMMARY OF WEIGHTS

S.No.	Description	WEIGHT	UOM	CATEGORY
1.	P91 and valves	1,109	MT	**P91**
2.	Other piping including P11/12/22, CS, etc and valves (excluding P91 & SS)	2,410	MT	**O, CS/GI**
3.	SS and valves	11	MT	**SS**
4.	H&S, Tanks, etc	791	MT	**H**
5.	Insulation	561	MT	**I**
6.	Temporary Piping	345	MT	**TEMP**
	TOTAL WEIGHT	**5,227**	**MT**	

Notes:

1. Weight mentioned in the Annexures-A.1, A.2 & A.3 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.

ANNEXURE- A.1

Weight Schedule for Power Cycle Piping, Auxiliary Piping & Aux

SL NO	PGMA	PGMA DESCRIPTION	EST Weight (Kg)	Category
(A) OTHER PIPING (P11, P12, P22, CS, etc) & VALVES				
1	80303	MS HEADER TO AUX PRDS	4,000.00	O
2	80320	CRH FROM TURBINE TO REHEATER	2,16,000.00	O
3	80321	HPBP VALVE TO CRH PIPING	11,000.00	O
4	80322	CRH PIPING TO DEAERATING HEATER	12,900.00	O
5	80323	STEAM TO BFP DRIVE TURBINE	7,000.00	O
6	80324	CRH HEADER TO AUX.PRDS	1,400.00	O
7	80329	EXTRACTION STEAM TO BFP DRIVE TURBINE	12,900.00	O
8	80331	EXTRACTION STEAM TO LP HEATER-2	8,200.00	O
9	80332	EXTRACTION STEAM TO LP HEATER-3	6,700.00	O
10	80334	EXTRACTION STEAM TO LP HEATER-5	10,400.00	O
11	80335	EXTRACTION STEAM TO DEAERATING HEATER	15,100.00	O
12	80336	EXTRACTION STEAM TO HP HEATER NO.1	5,000.00	O
13	80337	EXTRACTION STEAM TO HP HEATER-2	5,100.00	O
14	80338	EXTRACTION STEAM TO HP HEATER-3	5,600.00	O
15	80339	AUX STEAM TO BFD TURBINE	3,200.00	O
16	80340	AUX STEAM HEADER	4,300.00	O
17	80341	AUX STEAM HEADER INTERCONN BETWEEN UNITS	16,000.00	O
18	80342	AUX STEAM TO SCAPH	13,000.00	O
19	80343	AUX STEAM TO AH SOOT BLOWERS	4,000.00	O

20	80344	AUX STEAM TO FO SYSTEM TP	11,000.00	O
21	80345	AUX STEAM TO DEAERATING HEATER	7,500.00	O
22	80349	AUX STEAM TO GLAND SEALS - TG SCOPE	800.00	O
23	80351	AUX STEAM TO UNLISTED USERS - SG SCOPE	19,000.00	O
24	80355	STEAM TRACING PIPING	10,000.00	O
25	80363	EXHAUST STEAM FROM PRIME MOVERS-TG SCOPE	31,000.00	O
26	80370	HP DRAIN FLASH TANK VENT TO ATMOSPHERE	47,000.00	O
27	80371	DRAIN FLASH TANK VENT TO CONDENSER	7,200.00	O
28	80373	AUX STEAM HEADER SV EXHAUST	8,100.00	O
29	80375	UNLISTED SV EXHAUSTS - TG SCOPE	5,700.00	O
30	80379	HPH SV EXHAUST TO FLASH TANK	5,000.00	O
31	80381	HP HEATER VENTS - TG SCOPE	3,900.00	O
32	80382	LP HEATER VENTS	1,900.00	O
33	80385	VENT FROM UNLISTED PPG/EQPT TO COND	6,900.00	O
34	80388	CONDENSER AIR EVACUATION PIPING	2,900.00	O
35	80395	AUX STEAM TO FUEL OIL ATOMISING	200.00	O
36	80399	STEAM BLOWING PIPING-TEMPORARY	1,40,000.00	TEMP
37	80400	CONDENSATE SUCTION	10,700.00	O
38	80401	CD FROM PUMP TO LPH1/DC INLET TEE&RECIR	52,200.00	O
39	80402	CD FROM LPH1/DC INLET TEE TO TG TP	26,900.00	O
40	80403	CD FROM TG TP TO DEAERATING HEATER	14,600.00	O
41	80407	CONDENSATE FOR SEALING OF VACUUM	2,400.00	O

42	80408	CONDENSATE DUMP FROM HEADER	7,500.00	O
43	80418	ERECTION MATERIALS FOR INSTRUMENTS	400.00	O
44	80419	DEAERATOR SAFETY VALVE EXHAUST TO ATM	5,300.00	O
45	80420	BOILER FEED PUMP SUCTION	20,000.00	O
46	80421	BOILER FEED PUMP RECIRCULATION	45,000.00	O
47	80423	BOILER FEED PUMP TO HPH INCLUDING BYPASS	1,90,000.00	O
48	80424	BFD BETWEEN HTRS & GROUP PROTECTION VLV	1,75,000.00	O
49	80425	BFD FROM FINAL HPH TO SG TP	65,000.00	O
50	80430	SPRAY WATER TO HPBP	8,000.00	O
51	80431	SPRAY WATER TO AUX PRDS	1,600.00	O
52	80433	SPRAY WATER FROM BFP INTERSTAGE	18,500.00	O
53	80434	UNLISTED SPRAY WATER - SG SCOPE	4,300.00	O
54	80439	TURBINE FLASH TANK DRAIN TO CONDENSER	300.00	O
55	80442	GLAND STEAM COOLER DRAINS	400.00	O
56	80545	LP CONDENSATE PIPING WITHIN TG HALL FOR SCB	15,000.00	O
57	80443	LP HEATER-1 TO CONDENSER	8,400.00	O
58	80444	LP HEATER-2/3/4/5 DRAINS&DRIP PUMP INCL	12,000.00	O
59	80446	DEAERATING HEATER OVER FLOW AND DRAIN	5,000.00	O
60	80447	HP HEATER DRAINS	38,700.00	O
61	80448	DRAIN FROM UNLISTED EQPT/VESSEL-TG SCOPE	8,100.00	O
62	80449	TG CYCLE PIPING DRAINS & VENTS	21,000.00	O
63	80451	BOILER INTEGRAL PIPING DRAINS	17,000.00	O

64	80452	HP PIPING DRAINS - SG SCOPE	27,000.00	O
65	80453	LP PIPING DRAINS - SG SCOPE	32,000.00	O
66	80454	SCAPH DRAINS	2,000.00	O
67	80455	DRAIN FROM UNLISTED EQPT/VESSEL-SG SCOPE	13,000.00	O
68	80457	MANIFOLDS FOR HP FLASH BOX & CONDENSER	3,100.00	O
69	80459	HP FLASH TANK DRAIN TO CONDENSER	3,500.00	O
70	80460	SG AUX COOLING WATER UNIT SYSTEM	40,000.00	O
71	80463	TG AUX COOLING WATER	1,60,000.00	O
72	80471	BOILER WATER WASH TO & FROM UNIT	15,000.00	O
73	80473	DEMINERALISED WATER SYSTEM	2,000.00	O
74	80477	SERVICE WATER PIPING	16,000.00	O
75	80478	DRINKING WATER PIPING	14,000.00	CS/GI
76	80480	FIRE WATER-OTHER AREAS	25,000.00	O
77	80493	HP FLASH TANK VENT TO CONDENSER	2,400.00	O
78	80494	LP FLASH TANK VENT TO CONDENSER	4,100.00	O
79	80495	LP FLASH TANK DRAIN TO COND	2,800.00	O
80	80601	LOW PRESSURE DOSING PIPING	900.00	O
81	80604	ACID CLEANING PIPING-TEMPORARY	1,85,000.00	TEMP
82	80610	SERVICE AIR-COMP SUCT & DIS TO RECEIVER	8,000.00	O
83	80612	SERVICE AIR FOR INDIVIDUAL UNITS	17,000.00	O
84	80614	INST AIR COMP SUC & DIS TO RECEIVER	10,000.00	O
85	80616	INSTRUMENT AIR FOR INDIVIDUAL UNIT	20,000.00	O

86	80650	FUEL OIL SUPPLY AND RETURN PIPING	17,000.00	O
87	80650	FUEL OIL SUPPLY AND RETURN PIPING	2,00,000.00	O
88	80673	LUBE OIL PIPING SYSTEM	6,500.00	O
89	80901	SUB DELIVERY VALVES FOR LIGHT UP	8,500.00	O
90	81411	DIRECT GAUGES FOR STEAM LINES	1,000.00	O
91	81412	DIRECT GAUGES FOR NON-STEAM LINES	750.00	O
92	81414	LOCAL CONTROL EQPT FOR NON-STEAM LINES	150.00	O
93	22-xxx	Valves	1,000.00	O
94	xx-xxx	CONTROL VALVES & FLOW ELEMENTS - PEM SUPPLY	29,300.00	O
95	xx-xxx	AUXILIARY PRDS SYSTEM	2,150.00	O
96	xx-xxx	AIR TRAPS, AIR RELEASE VALVES, BALL VALVES, STEAM TRAPS, BUTTERFLY VALVES (STEAM SERVICE)	20,125.00	O
		Total weight in Kg for Other Piping & Valves	23,32,475.00	
Total Weight in MT for Other Piping & Valves			**2,332.48**	
(B) HANGERS & SUPPORTS, TANKS, VESSELS, ETC				
97	80921	H&S FOR LIGHT UP STEAM LINE	35,000.00	H
98	80926	H&S FOR TEMPORARY PIPING ACID AND ALKALI	15,000.00	TEMP
99	80927	H&S FOR TEMPORARY PIPING - STEAM BLOWING	5,000.00	TEMP
100	80928	H&S FOR BOILER LIGHT UP - TG	64,000.00	H
101	80930	H&S FOR SYNCHRONISATION - TG	66,470.00	H
102	80933	H & S FOR LP PIPING	15,450.00	H
103	80935	VLH AND CLH for MS PPG UPTO MSV -HERP	3,100.00	H
104	80936	VLH AND CLH for SG PPG -HERP	6,000.00	H

105	80937	VLH AND CLH Critical PPG -HERP	41,000.00	H
106	80940	AUX STRUCTURE FOR CRITICAL PIPING-SG	1,50,000.00	H
107	80941	VLH AND CLH for BFD PPG -HERP	11,000.00	H
108	80942	VLH AND CLH for TG PPG -HERP	12,000.00	H
109	80830	H&S FOR CRITICAL PIPING - STEAM LINES	2,32,058.50	H
110	80920	H&S FOR HYDRO TEST	17,850.00	H
111	81036	CW STORAGE TANK 16-25 CUM	5,500.00	H
112	81060	SPECIAL TANKS AND VESSELS	47,000.00	H
113	81041	IMPURE CONDENSATE TANK	4,000.00	H
114	81100	CONDENSATE PUMP	6,000.00	H
115	81110	COOLING WATER PUMP	500.00	H
116	xx-xxx	ME BELLOWS - PEM SUPPLY	38,000.00	H
		Total weight in Kg for Hangers & Supports, etc	7,74,928.50	
Total Weight in MT for Hangers & Supports, etc			**774.93**	
(C) INSULATION				
117	81318	FIX COM FOR MISCELLANEOUS PPG INSULATION	6,000.00	I
118	81325	MINERAL WOOL MATTRESS	55,000.00	I
119	81341	SEALING COMPOUND FOR INSL	350.00	I
120	81350	ALUMINIUM CLADDING FOR INSULATION	21,000.00	I
121	xx-xxx	LRB Mattress - PEM Supply	3,80,000.00	I
122	xx-xxx	ALUMINIUM SHEET - PEM Supply	70,000.00	I
123	xx-xxx	Anciliary material - PEM Supply	25,000.00	I

		Total weight in Kg for Insulation	5,57,350.00	I
Total Weight in MT for Insulation			**557.35**	
(D) P91 PIPING & VALVES				
124	80300	MS FROM SUPERHEATER TO BOILER STOP VALVE	1,40,000.00	P91
125	80301	MS FROM BOILER STOP VALVE TO ESV	4,77,000.00	P91
126	80303	MS HEADER TO AUX PRDS	4,000.00	P91
127	80304	MS HEADER TO HPBP VALVE	46,000.00	P91
128	80307	HP & LP BYPASS WARM UP	1,000.00	P91
129	80310	HRH FROM REHEATER TO INTERCEPTOR VALVE	3,52,000.00	P91
130	80452	HP PIPING DRAINS - SG SCOPE	5,000.00	P91
131	80312	LPBP VALVE UPSTREAM & DOWNSTREAM	76,000.00	P91
132	22-xxx	Valves	4,000.00	P91
		Total weight in Kg for P91 Piping & Valves	11,05,000.00	
Total Weight in MT for P91 Piping & Valves			**1,105.00**	
(E) SS PIPING & VALVES				
133	80412	CONDENSATE TRANSFER	3,000.00	SS
134	80473	DEMINERALISED WATER SYSTEM	2,000.00	SS
135	22-xxx	Valves	1,000.00	SS
		Total weight in Kg for SS Piping & Valves	5,000.00	
Total Weight in MT for SS Piping & Valves			**5.00**	
		TOTAL WEIGHT OF POWER CYCLE & AUX IN MT	**4,774.75**	

ANNEXURE- A.2

Weight Schedule for Auxiliary Boiler Piping and Aux

Sl. No.	PGMA	WBS Description	Estimated Wt (Kg)	Category
(A) HANGERS & SUPPORTS, DEAERATOR, TANKS, VESSELS, PUMPS ETC				
1	80920	H AND S FOR HYDRO TEST	2,300.00	H
2	80921	H AND S FOR LIGHT UP STEAM LINE	3,100.00	H
3	80922	H AND S FOR LIGHT UP - NON STEAM LINES	1,200.00	H
4	80936	VLH AND CLH for SG PPG -HERP	1,000.00	H
5	80992	WELDING ELECTRODES-1	-	H
6	81005	INTERMITTENT BLOW DOWN EXPANDER-D1500 MM	2,400.00	H
7	81026	TRAY TYPE DEAERATOR BELOW 100 cuM/HR	23,000.00	H
8	81034	PLATFORM & STAIRS FOR FEED TANK & DEARTR	2,800.00	H
		Total weight in Kg for Hangers & Supports	35,800.00	
		Total weight in MT	**35.80**	
(B) INSULATION				
9	81318	FIX COM FOR MISCELLANEOUS PPG INSULATION	550.00	I
10	81325	MINERAL WOOL MATTRESS	1,800.00	I
11	81341	SEALING COMPOUND FOR INSL	30.00	I
12	81350	ALUMINIUM CLADDING FOR INSULATION	1,300.00	I
		Total weight in Kg for Insulation	3,680.00	
		Total Weight in MT	**3.68**	
(C) OTHER PIPING (P11, P12, P22, CS, etc) & VALVES				
13	80300	MS FROM SUPERHEATER TO BOILER STOP VALVE	2,000.00	O
14	80345	AUX STEAM TO DEAERATING HEATER	3,500.00	O
15	80366	IBD TANK VENT TO ATMOSPHERE	850.00	O
16	80417	BOILER FEED DISCHARGE PIPING	750.00	O
17	80420	BOILER FEED PUMP SUCTION	700.00	O
18	80421	BOILER FEED PUMP RECIRCULATION	250.00	O
19	80446	DEAERATING HEATER OVER FLOW AND DRAIN	550.00	O
20	80450	CBD AND EMERGENCY DRUM DRAIN	350.00	O
21	80451	BOILER INTEGRAL PIPING DRAINS	400.00	O
22	80453	LP PIPING DRAINS - SG SCOPE	250.00	O
23	80460	SG AUX COOLING WATER UNIT SYSTEM	830.00	O
24	80612	SERVICE AIR FOR INDIVIDUAL UNITS	350.00	O
25	80616	INSTRUMENT AIR FOR INDIVIDUAL UNIT	470.00	O
26	80650	FUEL OIL SUPPLY AND RETURN PIPING	2,100.00	O

27	80901	SUB DELIVERY VALVES FOR LIGHT UP	800.00	O
		Total weight in Kg for Other Piping	14,150.00	
		Total Weight in MT	**14.15**	
		(D) SS PIPING & VALVES		
28	80473	DEMINERALISED WATER SYSTEM	675.00	SS
29	80600	HIGH PRESSURE DOSING PIPING	150.00	SS
30	80601	LOW PRESSURE DOSING PIPING	95.00	SS
		Total weight in Kg for SS Piping	920.00	
		Total Weight in MT	**0.92**	
GROSS WEIGHT AUXILIARY BOILER & AUX (IN MT)			**54.55**	

ANNEXURE- A.3

Weight Schedule for Valves

Sl no.	PGMA No	Description	Unit Weight (kg)	Category
(A) OTHER PIPING (P11, P12, P22, CS, etc) & VALVES				
1	80277	6-C150-FV-FL-WCB,4-C150-FV-FL-WCB,1-C800-SV-SC-HO-A105,1-1/2-C800-SV-SC-HO-A105,2-C800-SV-SC-HO-A105,1-1/2-C800-SV-SW-HO-A105-SST,2-C800-SV-SW-HO-A105-SST,2-C800-CV-SC-A105,1-C800-GV-SW-HO-A105,1-1/2-C800-GV-SW-HO-A105,2-C800-GV-SW-HO-A105,2-C800-GV-SW-MO-A105,2-C800-GV-SC-MO-A105,3-C150-GV-FL-HO-WCB,4-C150-GV-FL-HO-WCB,6-C150-GV-FL-HO-WCB,10-C300-FV-FL-WCB,12-C300-FV-FL-WCB,20-C150-FV-FL-WCB,16-C150-FV-FL-WCB,2-C800-GV-SC-HO-A105,3-C300-SV-FL-HO-WCB,4-C300-SV-FL-HO-WCB,6-C300-SV-FL-HO-WCB,8-C300-SV-FL-HO-WCB,2-C800-SV-SW-MO-A105,2-C800-GV-SW-HW-A105,14-C150-GV-FL-GO-WCB,8-C150-GV-FL-HO-WCB,10-C150-GV-FL-HO-WCB,6-C150-GV-FL-MO-WCB,10-C150-GV-FL-MO-WCB,4-C150-GV-FL-MO-WCB,12-C150-GV-FL-MO-WCB,10-C300-RV-FL-GO-WCB	25,676.63	O
2	80278	1910N,1914L,1912T/P1&P2,3/4"1994H-SW,1990M:SW,1905N-XLS,1905P-XLS	3,062.60	O
3	80279	3-C150-FV-FL-WCB,1-C800-SV-SC-HO-A105,1/2-C800-SV-SW-HO-A105-SST,3/4-C800-SV-SW-HO-A105-SST,1-C800-SV-SW-HO-A105-SST,1-C800-CV-SW-A105,1-1/2-C800-CV-SW-A105,1-C800-GV-SW-HO-A105,1-1/2-C800-GV-SW-HO-A105,1-C800-SV-SW-MO-A105,3-C300-RV-FL-MO-WCB,4-C300-RV-FL-MO-WCB,2-C800-SV-SW-MO-A105,1912R/P1&P2,2-C800-RV-SW-MO-A105,1-1/2-C800-GV-SW-MO-A105,1-C800-RV-SW-MO-A105,3-C150-GV-FL-HO-WCB,4-C150-GV-BW-HO-WCB-SG,3-C150-GV-BW-MO-WCB,6-C150-GV-FL-HO-WCB,6-C150-GV-BW-HO-WCB,6-C150-GV-FL-MO-WCB,4-C150-GV-BW-MO-WCB-SG	4,460.80	O
4	80290	3-C300-FV-BW-WCB,8-C300-FV-BW-WCB,1/2-C800-SV-SW-HO-A105-SST,1-C800-SV-SW-HO-A105-SST,1-1/2-C800-SV-SW-HO-A105-SST,2-C800-SV-SW-HO-A105-SST,1-C800-RV-SW-HO-A105,8-C300-GV-BW-HO-WCB,14-C300-FV-BW-WCB,4-C300-RV-BW-HO-WCB,8-C300-RV-BW-HO-WCB,1905Q/P1&P2,4-C300-GV-BW-HO-WCB,3-C300-GV-BW-HO-WCB,4-C150-GV-BW-HO-WCB,4-C150-GV-BW-MO-WCB,6-C150-GV-BW-HO-WCB,10-C300-GV-BW-MO-WCB-BP,14-C300-GV-BW-GO-WCB-BP,10-C300-FV-BW-WCB	4,661.30	O

5	80905	8-C150-FV-BW-WCB,4-C300-FV-BW-WCB,1-1/2-C800-SV-SW-HO-A105-SST,1-C800-RV-SW-HO-A105,1-1/2-C800-RV-SW-HO-A105,1-1/2-C800-CV-SW-A105,2-C800-CV-SW-A105,1/2-C800-GV-SW-HO-A105,1-C800-GV-SW-HO-A105,16-C150-GV-BW-GO-WCB,3-C300-RV-BW-HO-WCB,3-C300-SV-BW-HO-WCB,2-C800-GV-SW-HW-A105,2-C800-GV-SW-MO-A105,3-C300-GV-FL-HO-WCB,4-C300-GV-FL-HO-WCB,6-C150-GV-BW-HO-WCB,4-C300-GV-BW-HO-WCB,3-C300-GV-BW-HO-WCB,3-C150-GV-BW-HO-WCB,4-C150-GV-BW-HO-WCB,14-C150-GV-BW-GO-WCB,6-C150-GV-FL-HO-WCB,10-C150-GV-BW-HO-WCB,12-C150-GV-BW-HO-WCB,6-C300-GV-BW-HO-WCB,8-C300-GV-BW-HO-WCB,10-C300-GV-BW-HO-WCB,6-C300-GV-BW-MO-WCB,8-C300-GV-BW-MO-WCB-BP,12-C300-FV-BW-WCB	16,218.12	O
6	80913	750-C900SPL-HRHIV-BW-C12A,1-C1500-SV-SW-HO-F22,3-C3500SPL-GNV-BW-MO-C12A,22-C3000SPL-GV-BW-MO-C12A-PR,3-C3500SPL-GV-BW-MO-C12A,8-C2900SPL-GV-BW-MO-C12A-BP-PR,750-C600-CRHIV-BW-WCC,8-C150-FV-BW-WCB,3-C300-FV-BW-WCB,6-C300-FV-BW-WCB,8-C300-FV-BW-WCB,3-C150-FV-BW-WCB,1-C2500-SV-SW-HO-A105,1-1/2-C2500-SV-SW-HO-A105,2-C2500-SV-SW-HO-A105,1/2-C800-SV-SW-HO-A105-SST,1-C800-SV-SW-HO-A105-SST,1-1/2-C800-SV-SW-HO-A105-SST,2-C800-SV-SW-HO-A105-SST,1-C800-RV-SW-HO-A105,1-1/2-C800-RV-SW-HO-A105,2-C800-RV-SW-HO-A105,1-C800-CV-SW-A105,1-1/2-C800-CV-SW-A105,2-C800-CV-SW-A105,1-C800-GV-SW-HO-A105,8-C600-GV-BW-GO-WCC,8-C600SPL-GV-BW-GO-WCC-BP,10-C600SPL-GV-BW-GO-WCC-SG,10-C600SPL-GV-BW-MO-WCC,38-C600-GV-BW-GO-WCC-BP-PR,1-C800-SV-SW-MO-A105,24-C150-GV-BW-MO-WCB-SG,18-C300-GV-BW-MO-WCB,12-C300-FV-BW-WCB,16-C300-FV-BW-WCB,38-C300-FV-BW-WCB,4-C300-RV-BW-HO-WCB-SG,6-C300-RV-BW-HO-WCB-SG,4-C1500-GNV-BW-MO-WCC,2-C800-SV-SW-MO-A105,1905E:SPL,1905G:SPL,1910E,1912T/P1&P2,4-C1500-NRV-BW-WCC,20-C300-NRV-BW-WCB,18-C2750SPL-NRV-BW-WCC,8-C1500-NRV-BW-WCC,10-C1500-NRV-BW-WCC,14-C1500-NRV-BW-WCC,4-C1500-GV-BW-HO-WCC,14-C1500-GV-BW-MO-WCC -BP- PR,14-C1500-GV-BW-MO-WCC-PR,14-C1500-GV-BW-GO-WCC -BP- PR,14-C1500-GV-BW-GO-WCC-PR-SG,20-C2850SPL-GV-BW-MO-WCC-BP-PR,20-C2850-GV-BW-MO-WCC-BP-PR,20-C2850-GV-BW-MO-WCC-PR,16-C2000SPL-SLBV-BW-WCC-4.2-7.0,10-C2750SPL-GV-BW-GO-WCC-PR,8-C2500-GV-BW-GO-WCB-PR,14-C3500-GV-BW-MO-WCC-BP - PR,22-C2750SPL-GV-BW-MO-WCC-BP-PR,12-C600-GV-BW-GO-WCB-BP,4-C600-GV-BW-MO-WCC,10-C600-GV-BW-MO-WCC,1-1/2-C800-SV-SW-MO-A105,2-C800-RV-SW-MO-A105,1-1/2-C3000SPL-SV-SW-HO-A105,1-1/2-C3000SPL-SV-SW-	2,70,981.34	O

		MO-A105,1-1/2-C3000SPL-CV-SW-A105,6-C150-GV-BW-HO-WCB-SG,10-C300-GV-BW-HW-WCB,4-C300-GV-BW-HO-WCB,3-C300-GV-BW-HO-WCB,3-C150-GV-BW-HO-WCB,4-C150-GV-BW-HO-WCB-SG,3-C150-GV-BW-HO-WCB-SG,12-C300-GV-BW-MO-WCB,16-C300-GV-BW-GO-WCB,12-C300-GV-BW-GO-WCB-SG,3-C300-GV-BW-MO-WCB,6-C150-GV-BW-HO-WCB,8-C150-GV-BW-HO-WCB-SG,10-C150-GV-BW-HO-WCB-SG,12-C150-GV-BW-HO-WCB-SG,6-C300-GV-BW-HO-WCB,8-C300-GV-BW-HO-WCB,10-C300-GV-BW-HO-WCB,8-C300-GV-BW-HO-WCB-SG,8-C300-GV-BW-MO-WCB,12-C300-GV-BW-GO-WCB,10-C300-GV-BW-MO-WCB,16-C300-GV-BW-MO-WCB,18-C300-FV-BW-WCB,16-C300-RV-BW-MO-WCB,4-C300-GV-BW-MO-WCB-SG,14-C300-GV-BW-GO-WCB-SG,36-C150-GV-BW-MO-WCB-SG,14-C150-GV-BW-GO-WCB-SG,14-C300-GV-BW-GO-WCB,22-C300-GV-BW-GO-WCB,22-C300-GV-BW-GO-WCB-SG,20-C300-GV-BW-MO-WCB,18-C300-GV-BW-MO-WCB-BP,22-C300-GV-BW-MO-WCB,18-C300-GV-BW-GO-WCB,6-C300-RV-BW-MO-WCB,8-C300-RV-BW-MO-WCB-SG,12-C300-RV-BW-MO-WCB,10-C300-FV-BW-WCB,RJ.GASKET.BX160S316-460K,SEALING RING-GRAFOIL-3245,SEALING RING-RUB (750-C500/C900-RHIV),RJ.GASKET.RX44S304 F/5-1/8"-5M,1-1/2-C2500-SV-SW-HO-F22,2-C1500-CV-SW-F22,2-C1500-SV-SW-MO-F22,2-C1500-SV-SW-HO-F22,6-C2500-NRV-BW-WC9,12-C600-GV-BW-MO-WC9		
7	80914	1/2-C800-SV-SW-HO-F51,1-C2500-SV-SW-HO-A105,1/2-C800-SV-SW-HO-A105-SST,1-C800-SV-SW-HO-A105-SST,1-C3000SPL-SV-SW-HO-A105,1-C1500-SV-SW-HO-F22	3,150.00	O
8	80917	3-C300-FV-BW-WCB,6-C300-FV-BW-WCB,1-C1500-SV-SW-HO-A105,1/2-C800-GV-SW-HO-A105,1-C800-GV-SW-HO-A105,12-C300-FV-BW-WCB,2-C800-GV-SW-HO-A105,4-C300-RV-BW-HO-WCB,14-C1500-GV-BW-MO-WCC -STEAM BLOWING,3-C300-GV-BW-HO-WCB,6-C300-GV-BW-HO-WCB,8-C300-GV-BW-HO-WCB,10-C300-GV-BW-HO-WCB,12-C300-GV-BW-GO-WCB,10-C300-RV-BW-GO-WCB	19,837.80	O
9	80918	TUBE OD 16 X 2 - SA213TP316TI,QCNRV-20"-C150-WCB-WOA-RHS,QCNRV-10"-C600-WCB SPL-WOA-RHS,QCNRV-20"-C150-WCB-WA--LHS,QCNRV-24"-C150-WCB-WA--RHS-WO-CNT-WT(SPL,QCNRV-24"-C150-WCB-WA--RHS-WO-CNT-WT,QCNRV-36"-C150-WCB-WA-CWT-LHS,QCNRV-10"-C600-WCB-WA--LHS(SPL),QUICK EXHAUST VALVE-G1/2",JUNCTION BOX FOR QCNRV,1/2in BSP(M) X 16MM OD CONNECTOR,3- WIRE POSITION TRANSMITTER,SBD-34"C600,CRHNRV-34"-C600SPL-WC9-WA-LHS,QCNRV-14"-C600-WC9-WOA-LHS,QCNRV-14"-C600-WC9-WA--RHS	31,830.14	O

10	80919	18-C300-GV-BW-GO-C12A,1/2-C800-SV-SW-HO-A105-SST,1-C800-SV-SW-HO-A105-SST,1-1/2-C800-SV-SW-HO-A105-SST,2-C800-SV-SW-HO-A105-SST,1-1/2-C1500-SV-SW-HO-A105,1-C800-CV-SW-A105,1-C800-GV-SW-HO-A105,3-C300-SV-BW-HO-WCB,6-C300-SV-BW-HO-WCB,4-C300-RV-BW-MO-WCB,50/65-C1500-AD-BW-MO-A105,80/100-C1500-AD-BW-MO-A105,4-C300-GV-BW-MO-WCB,6-C150-GV-BW-HO-WCB,12-C150-GV-BW-HO-WCB,8-C300-GV-BW-HO-WCB,1990:FLG(DIN),50/65-C1500-AD-BW-MO-F22,25/40-C1500-AD(3S)-SW-MO-F22,1-C1500-SV-SW-HO-F22,1-1/2-C1500-SV-SW-HO-F22	3,803.30	O
11	80905	1/2-C800-SV-SW-HO-A105-SST,1-C800-SV-SW-HO-A105-SST,2-C800-SV-SW-HO-A105-SST	825.00	O
12	80277	1-C800-SV-SW-HO-A105-SST	1,040.40	O
13	80919	2-C1500-SV-SW-HO-F22,2-C3000SPL-SV-SW-HO-F22,40/50-C1500-AD(3S)-BW-MO-F22,16-C300-GV-BW-MO-WC9,16-C300-RV-BW-MO-WC9	3,249.00	O
		Total weight in Kg for Other Piping & Valves	3,88,796.43	
		Total Weight in MT for Other Piping & Valves	**388.80**	
		(B) P91 PIPING & VALVES		
14	80913	2-C1500-SV-SW-HO-F91,2-C1500-SV-SW-MO-F91,2-C3000SPL-SV-SW-HO-F91,1-C3000SPL-SV-SW-HO-F91,1-C1500-SV-SW-HO-F91,1-C1500-CV-SW-F91,1-C3000SPL-CV-SW-F91,2-C3000SPL-SV-SW-MO-F91	1,194.20	P91
15	80914	1-C3000SPL-SV-SW-HO-F91, 1-C1500-SV-SW-HO-F91	1,488.60	P91
16	80919	50/65-C1500-AD(3S)-BW-MO-F91,50/65-C1500-AD-BW-MO-F91,1/2-C1500-SV-SW-HO-F91,1-1/2-C1500-SV-SW-HO-F91,2-C1500-SV-SW-HO-F91,1-C2500-SV-SW-HO-F91,2-C3500SPL-SV-SW-HO-F91,50/65-C3500SPL-AD-BW-MO-F91,50/65-C2500-AD-BW-MO-F91	1,710.00	P91
		Total weight in Kg for P91 Piping & Valves	4,392.80	
		Total Weight in MT for P91 Piping & Valves	**4.39**	
		(C) SS PIPING & VALVES		
17	22100	ANGLE 50 x 50 x 6 -IS2062E250A,SS TUBE 25x3-1000MM,ISO.BALL VALVE DN25PN315	21.56	SS
18	22600	ANGLE 50 x 50 x 6 -IS2062E250A,SS WELD NIPPLE SKO 16,SS WELD NIPPLE SKO 30,SS WELD NIPPLE SKO 25	60.52	SS
19	80277	1-C800-SV-SW-HW-F316-SST,1-1/2-C800-SV-SW-HO-F316-SST,2-C800-SV-SW-HO-F316-SST,1-C800-CV-SW-F316-SST,1-C800-SV-SW-MO-F316,2-C800-SV-SW-MO-F316-DST	266.80	SS

20	80290	2-C800-CV-SW-F316-DST,1/2-C800-GV-SW-HO-F316,1-C800-GV-SW-HO-F316,2-C800-SV-SW-HO-F316-SST,1-C800-CV-SW-F316-SST,3-1500-PR-F316- M20_M20_M20,4-C300-GV-BW-HO-CF8,4-C300-RV-BW-HO-CF8M,4-C300-FV-BW-CF8M	433.85	SS
21	80905	1-C800-SV-SW-HW-F316-SST,3-1500-PR-F316- M20_M20_M20	11.05	SS
22	80913	2-C800-RV-SW-HO-F316,1-C800-SV-SW-HO-F316-DST,1-1/2-C800-SV-SW-HO-F316-DST,2-C800-SV-SW-HO-F316-DST,2-C800-CV-SW-F316-DST,1-C800-CV-SW-F316-SST,2-C800-SV-SW-HO-F316-DST,1-C800-SV-SW-MO-F316,4-C300-GV-BW-HO-CF8,3-C150-GV-BW-HO-CF8,3-C150-GV-BW-HO-CF8,3-C150-GV-BW-HO-CF8-SG,4-C150-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8,3-C300-GV-BW-HO-CF8,3-C150-GV-BW-MO-CF8,4-C150-GV-BW-MO-CF8,4-C150-GV-BW-MO-CF8,6-C150-GV-BW-HO-CF8,6-C150-GV-BW-HO-CF8,6-C150-GV-BW-HO-CF8,8-C150-GV-BW-HO-CF8,8-C150-GV-BW-HO-CF8,10-C150-GV-BW-HO-CF8,10-C150-GV-BW-HO-CF8,6-C300-GV-BW-HO-CF8,4-C150-GV-BW-HO-CF8-SG,3-C300-RV-BW-HO-CF8,4-C300-RV-BW-MO-CF8-SG,4-C300-FV-BW-CF8,4-C150-FV-BW-CF8,3-C150-FV-BW-CF8,6-C300-FV-BW-CF8,6-C300-FV-BW-CF8	3,769.02	SS
23	80914	1/2-C800-SV-SW-HO-F316-DST,1-C800-SV-SW-HW-F316-SST,1-C1500-SV-SW-HO-F316,1-C3000SPL-SV-SW-HO-F316,1-C3000SPL-SV-SW-HO-F316	278.00	SS
24	80918	1/2-BALL VALVE-SCR-HO-SS316,1in(M) BSPx 1/2in(M) BSP SS316 FITTING	9.10	SS
25	80919	3-1500-PR-F316- M20_M20_M20, 3-1500-PR-F316-M20_M20_M20	11.90	SS
		Total weight in Kg for SS Piping & Valves	4,861.80	
Total Weight in MT for SS Piping & Valves			**4.86**	
GROSS TOTAL WEIGHT VALVES (IN MT)			**398.05**	

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 structures equipment, including anchor/ foundation bolts, beneath base, base hollows etc as may be applicable, is excluded in the scope of contractor. Grouting will be carried out by BHEL civil agency.**

While grouting will be carried out by other agency, 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. All assistance required has to be provided by the contractor. 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 / Equipments 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 / labour 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 equipments / 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 equipments, 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 Labour 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 equipments and personnel. All piping shall be adequately supported and protected to prevent damage during handling and erection. The history cards for major equipments 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) Machine/ flame/ electric cutting, grinding, welding, radiography and stress relieving
b) Fitting, Fettling, Filing, Straightening, Chamfering, Chipping, Scrapping, Reaming as cleaning, checking, levelling, blue matching, aligning and assembly
c) Machining, Surface grinding, drilling, doweling, shaping
d) Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication
e) Insulation and painting

14.2 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.

14.3 **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.

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

14.5 Any fixtures, lifting arrangement for boiler columns, etc, 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. Any such materials, if supplied by manufacturing unit will be issued free of cost by BHEL.

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 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.

14.11 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.

14.12 Hanger rods are shown in the pressure parts arrangement drawing for the boiler. Any cutting/ welding of these hanger rods will be done by the contractor. The hanger for pressure parts will be tested for even distribution of load with the help of torque wrench.

14.13 The headers are provided with hand holes. The contractor, shall as per requirement, carry out removal and re-fixing of hand plates within finally accepted rates.

14.14 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.

14.15 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.

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

14.17 All attachments welding including those for insulation works coming on pressure parts/ non-pressure parts which the contractor has erected shall be done by IBR/ BHEL tested welders only.

14.18 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.

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

14.20 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.

14.21 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 equipments shall be dismounted, calibrated and re-erected by the contractor as per requirement.

14.22 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 BHEL 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.

14.23 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.

14.24 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.

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

14.26 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.

14.27 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.

14.28 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.

14.29 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.

14.30 Contractor shall ensure lowering of pipes in position with adequate precautions as to avoid any damage to either material or men. Only the anchoring points earmarked for the purpose of lowering the pipes are to be used.

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

14.32 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.

14.33 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.

14.34 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.

14.35 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.

14.36 Suspension for piping etc will be supplied in running lengths, which shall be cut to suitable sizes and adjusted as required.

14.37 The adjustment for all hangers & supports erected in both cold & hot conditions for maintaining the proper slopes towards the drain pots and application of cold pull in the piping wherever required is also included in the scope of contractor.

14.38 No temporary supports should be welded on the pressure parts and piping. In case of absolute necessity prior to approval should be taken from BHEL engineer. In such cases the contractor, if required, shall carry out heat treatment.

14.39 Spring suspensions / constant load hangers have to be pre-assembled and adjusted for the required loading and erected as per instructions, of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers, etc., have to be carried out as and when required at no extra cost to BHEL.

14.40 Contractor shall install piping in such a way that no excessive or destructive expansion forces exists. In either the cold 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 of joints, anchors, care must be taken to see that full design movement is available at all times from maximum to minimum temperature.

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

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

14.43 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.

14.44 Erection and welding of necessary instrumentation tapping points, thermocouples pads, thermos-wells, valves, battery of first root valves, condensing vessels, flow nozzles and control valves to be provided on, auxiliaries and pipe lines are covered within the scope of this specification. This will be the responsibility of the contractor and will be done as per instructions of BHEL Engineer. The welding of all above items will be contractor's responsibility even if the:

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

14.45 The contractor shall carry out the tightening of field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or turn of part method. The methods used tools and the equipment deployed shall be subject to approval of BHEL engineer. The competent technicians shall carry out the bolting work.

14.46 The contractor shall prepare as built piping drawing & submit to BHEL engineer for approval & verification of material used.

14.47 Erection of power cylinders, motorised valves, valve actuators etc. coming under various groups is covered under the scope of this specification. However C&I calibration / commissioning for pneumatic valves & power cylinders shall be arranged by BHEL through C&I agency at no cost to the contractor for this package. Contractor will however be

responsible for drawing the materials from the stores and handing over to the agency that is to commission these. Any damage / loss in their custody will be the contractors account. The alignment and any mechanical adjustments including link adjustment, opening & reconnection of links, replacement of valve / actuator or any mechanical part, air filter & regulator cleaning etc. required during calibration and operation, the same shall be carried by the contractor for this package. However, if re-calibration is required till handing over of the equipments the same shall be organised by the contractor for this package as detailed above with in the final accepted rates. The contractor will however be responsible for drawing the materials from the stores and handing over to the agency that is to commission these. Any damage / loss in their custody will be the contractors account.

14.48 The erection of all pneumatic power cylinders for the burner-tilt mechanism and SADC is covered within the scope of this specification. BHEL will get these power cylinders for the burner-tilt mechanism and SADC calibrated & commissioned. The contractor for this scope of work shall assist and coordinate for the same with the agency engaged by BHEL to calibrate such pneumatic actuators.

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

14.50 Welding of P91, T23, T91, T92 materials in Boiler is to be carried out as mentioned in **clause no 15.38** of TCC.

14.51 Scope of work for chemical cleaning for the boiler system has been covered under **clause no 15.40** of TCC.

14.52 During connection & floating of TG deck, etc., before and after pipe connections, adding tentative loads, readjusting of spring to the required level is covered in this scope of work.

14.53 Erection of all drains / vents / relief / escape / safety valve, piping to various tanks/ sewage / drain canal / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping to the equipments erected by the contractor is completely covered in the scope of work.

14.54 Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive within the quoted / accepted rate.

14.55 Pipes shall not be dropped to avoid impact or bump.

14.56 Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., shall be the responsibility of the contractor and the same shall be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, the Items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package.

14.57 All the valves will have to be checked, cleaned, lapped or overhauled in full or in parts before erection, after chemical cleaning and during commissioning. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.

14.58 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. Pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.

14.59 All the equipments / 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 equipments 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.

14.60 Erection of platform and supporting structures around the equipments / valves / filters etc., is covered in the scope of contract and shall be erected by the contractor as per accepted tonnage rate for "Hangers and Supports".

14.61 Additional platforms, Cross over, Canopies, Ladders, etc. for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be fabricated and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for "Hangers and Supports". The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement.

14.62 Bolts are to be tightened as per the instruction of BHEL Engineer. The bolted joints shall be jointly checked by BHEL / Customer and contractors personnel for the required tightness and retightened wherever necessary. The tightened bolts shall be identified by color paints. Facility for random checking with calibrated Torque Wrench shall also be provided by contractor.

14.63 Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.

14.64 All the drain lines should have sufficient slope towards drain. Slope of 1:500 shall be maintained towards drain point unless otherwise specified. Expansion loops shall be provided in all the vents and drains as per the drawings.

14.65 Wherever pipes / bends / equipments are supplied in pre-fabricated / assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.

14.66 All the oil & gas piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.

14.67 All piping will be supplied in running meter, contractor has to cut and edge prepare as per the standards / drawings and as per the instruction of BHEL Engineer within the quoted rate.

14.68 Wherever drawings indicate site routing and site fabrication, such pipes (in general equal to and less than 2" Dia) will be issued in running meters as straight length. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. In some cases attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor.

14.69 Certain extra lengths of portions / parts of various site fabricated components / parts / bellows / piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout. Certain small length of portions / components / bellows / piping casing etc., may have to be added to suit conditions and layouts. Preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work. No extra payment will be admitted for such works.

14.70 Certain adjustments in length may be necessary while erecting pipelines and the contractor should remove the extra lengths / add extra lengths / to suit the final layout after preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work.

14.71 Minor adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL

Engineer to suit the layout, with specified heat treatment procedure shall be carried out by the contractor within the quoted rate.

14.72 For any mismatch while matching the joints in tubes, the cutting, adjusting, re welding, addition of spool pieces shall be done by the contractor to match site conditions without any extra payment.

14.73 For pipes nominal size 2” and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site engineer’s advice.

14.74 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 equipments, the same shall be subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., by grinding / gouging and not by hammering. Any burrs left on the equipments / 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 sub-surface cracks in these ground areas.

14.75 The surface of the pipes to be joined shall be suitably prepared as per instructions of BHEL Engineers. Edge preparation shall be done by chamfering machine, whenever required and all welding surfaces must be cleaned thoroughly. All works due to the mistake of the contractor shall be repaired / redone at contractor’s cost. Instrumentation drains, stubs which are sent in loose from manufacturing units are to be welded at site as per BHEL Engineer’s instructions.

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

14.77 All the weld joints on equipments and piping shall be ground or filed after completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.

14.78 Wherever elbows of 45 deg or any other angle are required, the same shall be cut from 90 deg. elbow supplied and used as per the instructions of BHEL engineer. No extra cost shall be paid.

14.79 Flow nozzles, orifice, spray nozzles etc., shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.

14.80 Erection of Flow nozzles, flow orifices, flow switches, steam traps, filters, flow meters, flow indicators, other metering elements, spray nozzles, steam traps, flow orifices, flow indicators, control valves, aux. control valves, filters, suction strainers, CRH NRV and other NRVs, HPBP Valve and suction strainers of pumps, servomotors etc. forming part of the system (under this scope of work) irrespective of the suppliers is also to be carried out by the agency without any extra cost after chemical and / or steam blowing / oil flushing at site. This will include collecting from BHEL / Customer stores, transport to site, suitably cutting the erected piping, cleaning, erection, welding, radiography, NDE and stress relieving and commissioning.

14.81 The contractor has to fabricate stainless steel orifice plate within the quoted rate. No extra payment will be made for fabrication of above orifice plates. The required stainless steel plate will be supplied by BHEL.

14.82 Fixing, fitting, welding of thermowells, stubs, hoses, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification.

14.83 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.

14.84 Welding of all thermo wells, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads are in the scope of work.

14.85 The contractor shall also weld all thermo wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermowells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermo wells and flow elements with branch pipes be installed and welded.

14.86 Suspension for piping etc., will be supplied in running lengths and shall be cut to suitable sizes and adjusted as required. Hangers' components which are being supplied in loose shall be assembled at site and erected as part of the work.

14.87 For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold / hot values and locking etc.

14.88 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing and complete installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading, if involved will only be done by BHEL.

14.89 The hangers and supports for pipelines and pressure parts may be supplied in dismantled / knocked down condition. It is the responsibility of the contractor to assemble them as per approved drawings and install them in position as per site engineer instructions.

14.90 Wherever hangers and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work within quoted rate. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports.

14.91 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc. shall be carried out at site by contractor within the quoted rate.

14.92 For Hangers and Support the instruction given in the drawing & documents must be followed for handling, erection, setting of COLD/HOT values and logging etc.

14.93 Contractor has to fabricate and erect temporary spool pieces wherever required due to non- receipt of valves in time and after receipt of valves the spool pieces are to be replaced with regular valves at free of cost. For spool pieces materials will be supplied free of cost by BHEL.

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

14.95 Contractor shall arrange all equipments, alignment bolts, tools, consumables like welding electrodes in their scope and argon gas cylinders etc., for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are in contractor's scope. Only filler wires as stipulated by manufacturing units and identified in relevant shipping list will be supplied to the contractor free of cost. Any excess requirement shall be arranged by the contractor/BHEL at contractor's cost. Argon gas for stainless steel tubes purging during welding to be arranged by contractor within the

quoted rates. Welding electrodes for welding of Piping to be procured from Customer/BHEL approved vendors only.

14.96 It shall be the responsibility of the contractor to provide ladders on column for initial works till such time stairways are completed. For this the ladder should not be welded on the column and should be prefabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL.

14.97 The work on piping system (air, water, oil steam, gas etc.) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc. welded on the lines, fixing and adjustment of supports / hangers / shock absorbers and carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and / or as per approved drawings / documents..

14.98 After steam blowing during the restoration works, it is the responsibility of the contactor to ensure the removal of dummy/plugs and edge preparation for the thermowell stubs if required within the quoted rate.

14.99 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.

14.100 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.

14.101 **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 Pressure parts, equipment's 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 pressure parts, equipment, 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. **100% 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. Penetrameter 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 pressure parts, 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, RG and NDT given under clause 4.0 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**.

Consumables like welding filler wires for P91/P92 materials supplied by BHEL Manufacturing units shall be issued free of cost for welding. Electrodes/filler wires required for welding of T23/P11/CS Piping/ P22/ SS, 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)
c) Spot welding Machine for Fixing of Thermocouples
d) Calibrated Thermocouples
e) Calibrated temperature Recorder
f) Contact Type calibrated temperature Gauge.
g) Fillers for the **P91/P92 materials** welding will be supplied on the basis of theoretical consumption. Any extra quantity to be arranged by contractor. Also, Electrodes for P91/P92/T91/T92 will be supplied on the basis of theoretical consumption. Any extra quantity to be arranged by contractor.

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

o) Providing of LPI and MPI Facility as specified in the Welding process, including supply of all consumables.
p) 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 **Details of automatic resistance heating based equipment recommended for PWHT of T23**

Sl no.	Key component of the equipment	Description of the items that are essential
1.	Type of heating element	Flexible ceramic pads containing stranded heating elements of standard width and breadths to cover various diameters of pipes. The pads can be of 2.7/3.6kW power with 65V/80V.
2.	Power supply	Power source: 50/70KVA transformer power source with 3 phase input supply with 415/440V, 50Hz supply to provide a secondary output voltage of 65V/85V and 225 Amps per phase. 6 way thyristorised switching, energy regulators.
3.	Controller	Microprocessor based programmable cycle controller (0-1200°C) with easy setting of time and temperature for setting heating/ soaking and cooling rates.
4.	Temperature recorder	Calibrated Digital multi point recorder (12 channel-0 to 1200°C) cum printer with suitable connecting cable for real time recording temperature with time for the entire heating cycle.

5.	Power cables	Suitable plug in type copper cables, 2/3/4 way splitter cables to connect heating pads and power source. Suitable temperature compensating cables to connect thermocouples and power source and temperature recorder.
6.	Accessories	1. Capacitor discharge based thermocouple fixing unit 2. Calibrated thermocouples (type K) 3. Mineral wool/ ceramic wool insulation pads of min 25mm thick for insulation of the pipe. 4. Steel banding machine with 1"thick steel band for securing the heating pads with the pipe.

15.40 **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.

15.41 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.

15.42 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.

15.43 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.

15.44 Tentative Welding Schedule is enclosed as **Annexure-B.**

ERECTION / FIELD WELDING SCHEDULE

PROJECT : UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
1 X 660MW PANKI TPS EXTN.

CONTRACTOR : M/s. BHEL

CONTRACT NO:

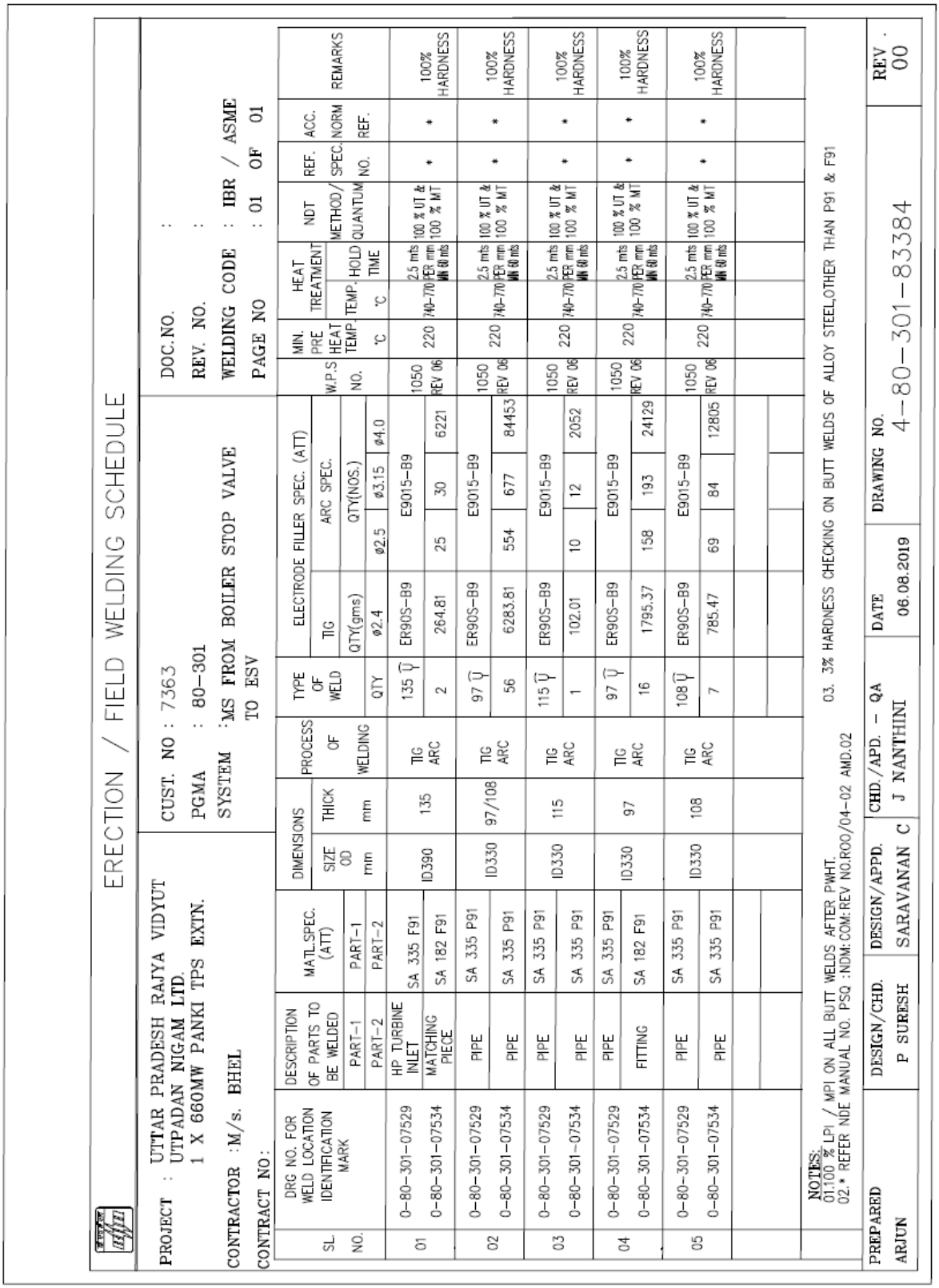
CUST. NO : 7363
PGMA : 80-300
SYSTEM : MS FROM SUPERHEATER TO BOILER STOP VALVE

DOC.NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 01 OF 01

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS		PROCESS OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPEC. (ATT)				W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT		NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
				SIZE OD mm	THICK mm			TIG QTY(gms)	ARC SPEC. QTY(NOS.)					TEMP. °C	HOLD TIME				
		PART-1	PART-1																
		PART-2	PART-2				QTY	ø2.4	ø2.5	ø3.15	ø4.0								
01	0-80-300-07533	SH OUTLET HEADER	SA 335 P91	508	120	TIG ARC	120 Ⓕ	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm ON BUTTS	100 % UT & 100 % MT	*	*	100% HARDNESS
		MATCHING PIECE	SA 182 F91				2	224.42	19	23	2593								
02	0-80-300-07533	PIPE	SA 335 P91	ID330	97	TIG ARC	97 Ⓕ	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm ON BUTTS	100 % UT & 100 % MT	*	*	100% HARDNESS
		FITTING	SA 182 F91				2	224.42	19	23	3016								
03	0-80-300-07533	PIPE	SA 335 P91	88.9	23	TIG ARC	23 Ⓕ	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm ON BUTTS	100 % UT & 100 % MT	*	*	100% HARDNESS
		FITTING/VALVE	SA 182 F91				12	286.17	66	132	92								
04	0-80-300-07533	PIPE	SA 335 P91	ID330	97/108	TIG ARC	97 Ⓕ	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm ON BUTTS	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA 335 P91				22	2468.64	217	266	33178								
05	0-80-300-07533	PIPE	SA 335 P91	88.9	23	TIG ARC	23 Ⓕ	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm ON BUTTS	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA 335 P91				4	95.39	22	44	30								
06	0-80-300-07533	PIPE	SA 335 P91	ID330	97	TIG ARC	97 Ⓕ	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm ON BUTTS	100 % UT & 100 % MT	*	*	100% HARDNESS
		VALVE	SA 182 F91				4	448.84	39	48	6032								

NOTES:
01.100 % LPI / MPI ON ALL BUTT WELDS AFTER PWHT.
02.* REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO.ROO/04-02 AMD.02
03. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOY STEEL,OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APD. – QA	DATE	DRAWING NO.	REV.
ARJUN	P SURESH	SARAVANAN C	J NANTHINI	06.08.2019	4-80-300-83380	00



ERECTION / FIELD WELDING SCHEDULE

PROJECT : UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD. 1 X 660MW PANKI TPS EXTN.
CONTRACTOR : M/s. BHEL
CONTRACT NO :

CUST. NO : 7363
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SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED		MATL.SPEC. (ATT)		DIMENSIONS		PROCESS OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPEC. (ATT)					W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT		NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
		PART-1	PART-2	PART-1	PART-2	SIZE OD mm	THICK mm		QTY	TIG QTY(gms)	ARC SPEC. QTY(NOS.) ø2.5	ø3.15	ø4.0				TEMP. °C	HOLD TIME				
01	0-80-301-07529	HP TURBINE INLET		SA 335 F91		ID390	135	TIG ARC	135	ER90S-B9	E9015-B9				1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
	0-80-301-07534	MATCHING PIECE		SA 182 F91					2	264.81	25	30	6221									
02	0-80-301-07529	PIPE		SA 335 P91		ID330	97/108	TIG ARC	97	ER90S-B9	E9015-B9				1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
	0-80-301-07534	PIPE		SA 335 P91					56	6283.81	554	677	84453									
03	0-80-301-07529	PIPE		SA 335 P91		ID330	115	TIG ARC	115	ER90S-B9	E9015-B9				1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
	0-80-301-07534	PIPE		SA 335 P91					1	102.01	10	12	2052									
04	0-80-301-07529	PIPE		SA 335 P91		ID330	97	TIG ARC	97	ER90S-B9	E9015-B9				1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
	0-80-301-07534	FITTING		SA 182 F91					16	1795.37	158	193	24129									
05	0-80-301-07529	PIPE		SA 335 P91		ID330	108	TIG ARC	108	ER90S-B9	E9015-B9				1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
	0-80-301-07534	PIPE		SA 335 P91					7	785.47	69	84	12805									

NOTES:
01.100 % LPI / MPI ON ALL BUTT WELDS AFTER PWHT.
02.* REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO.R00/04-02 AMD.02
03. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOY STEEL,OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APD. - QA	DATE	DRAWING NO.	REV.
ARJUN	P SURESH	SARAVANAN C	J NANTHINI	06.08.2019	4-80-301-83384	00

ERECTION / FIELD WELDING SCHEDULE

PROJECT : UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
1 X 660MW PANKI TPS EXTN.

CONTRACTOR : M/s. BHEL

CONTRACT NO:

CUST. NO : 7363
PGMA : 80–304
SYSTEM : MAIN STEAM HEADER TO HIGH PRESSURE BYPASS VALVE INLET PIPING

DOC. NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 01 OF 01

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS SIZE OD mm	DIMENSIONS THICK mm	PROCESS OF WELDING	TYPE OF WELD QTY	ELECTRODE FILLER SPEC. (ATT) TIG QTY(gms)	ELECTRODE FILLER SPEC. (ATT) ARC SPEC. QTY(NOS.) ø2.5	ELECTRODE FILLER SPEC. (ATT) ARC SPEC. QTY(NOS.) ø3.2	ELECTRODE FILLER SPEC. (ATT) ARC SPEC. QTY(NOS.) ø4.0	W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT TEMP. °C	HEAT TREATMENT HOLD TIME	NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
		PART–1	PART–1																
		PART–2	PART–2																
01	1–80–304–22746	PIPE	SA 335 P91	ID200	54/69	TIG & ARC	54	ER 90S–B9	E9015 B9			1050 REV 06	220	740–770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MPI	*	*	100% HARDNESS
		PIPE/FITTING	SA 335 P91 SA 234 WP91				24	1643.13	158	184	9213								
02	1–80–304–22746	PIPE	SA 335 P91	ID200	69	TIG & ARC	69	ER 90S–B9	E9015 B9			1050 REV 06	220	740–770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MPI	*	*	100% HARDNESS
		PIPE	SA 335 P91 SA 234 WP91				6	410.78	39	46	3478								

NOTES:
01. LPI / MPI ,UT WHEREVER APPLICABLE SHALL BE CARRIED AFTER PWHT. 03. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOYSTEEL,OTHER THAN P91 & F91
02. * REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO:R00/04–02 AMD.02

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APPD. – QA	DATE	DRAWING NO.	REV.
ARJUN	P.SURESH	SARAVANAN C	J NANTHINI	06.08.19	4–80–304–83317	00

ERECTION / FIELD WELDING SCHEDULE

PROJECT: UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD. 1 X 660MW PANKI TPS EXTN.
CONTRACTOR : M/s. BHEL
CONTRACT NO :

CUST. NO:7363
PGMA :80-310
SYSTEM :HRH FROM REHEATER TO Y-PIECE & HRH FROM Y-PIECE TO IP TURBINE.

DOC.NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 01 OF 01

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS		PROCESS OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPEC. (ATT)				W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT		NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
				SIZE OD	THICK			TIG	ARC SPEC.					TEMP. °C	HOLD TIME				
		PART-1	PART-1	mm	mm		QTY	QTY(gms)	QTY(NOS.)										
		PART-2	PART-2						ø2.5	ø3.2	ø4.0								
01	0-80-310-07535 0-80-310-07536	RHO HEADER	SA 335 P91	812.8	87.5	TIG & ARC	87.5	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		REDUCER	SA 182 F91				2	426.31	37	46	4562								
02	0-80-310-07535 0-80-310-07536	PIPE	SA 335 P91	ID630	37/ 40	TIG & ARC	37	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA 335 P91				74	15772.72	1383	1709	42816								
03	0-80-310-07535 0-80-310-07536	PIPE	SA 335 P91	ID630	37/ 40	TIG & ARC	37	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		RHO ISOLATOR	ASTM A217 C12A				4	852.63	74	92	2314								
04	0-80-310-07535 0-80-310-07536	PIPE	SA 335 P91	ID630	37	TIG & ARC	37	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		FITTING	SA 234 WP91				17	3623.68	317	392	9836								
05	0-80-310-07535 0-80-310-07536	REDUCER	SA 182 F91	812.8	87.5	TIG & ARC	87.5	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		IP TURBINE	SA 335 P92				2	426.31	37	46	4562								
06	0-80-310-07535 0-80-310-07536	PIPE	SA 335 P91	ID630	40	TIG & ARC	40	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA 335 P91				5	1064.9	93	115	3234								

NOTES:
01.100 % LPI / MPI ON ALL BUTT WELDS AFTER PWHT.
02.* REFER NDE MANUAL NO. PSQ :NDM: COM: REV NO.ROD/04-02 AMD.02
03. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOY STEEL,OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APPD. - QA	DATE	DRAWING NO.	REV.
ARJUN	P SURESH	C SARAVANAN	J NANTHINI	06.08.19	4-80-310-83401	00

ERECTION / FIELD WELDING SCHEDULE

PROJECT: UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD. 1 X 660MW PANKI TPS EXTN.
CONTRACTOR : M/s. BHEL
CONTRACT NO :

CUST. NO:7363
PGMA :80-312
SYSTEM :LPBP VALVE UPSTREAM AND DOWNSTREAM

DOC.NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 01 OF 01

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS SIZE OD mm	DIMENSIONS THICK mm	PROCESS OF WELDING	TYPE OF WELD QTY	ELECTRODE FILLER SPEC. (ATT) TIG QTY(gms)	ELECTRODE FILLER SPEC. (ATT) ARC SPEC. QTY(NOS.) ø2.5	ELECTRODE FILLER SPEC. (ATT) ARC SPEC. QTY(NOS.) ø3.2	ELECTRODE FILLER SPEC. (ATT) ARC SPEC. QTY(NOS.) ø4.0	W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT TEMP. °C	HEAT TREATMENT HOLD TIME	NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
		PART-1	PART-1																
		PART-2	PART-2																
01	0-80-312-07531	PIPE	SA 335 P91	ID610	35/44	TIG & ARC	35	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA 335 P91				22	4540.52	387	508	11398								
02	0-80-312-07531	PIPE	SA 335 P91	1118	28	TIG & ARC	28	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA691-2 1/4 CR CL22				2	827.78	3	984	459								
03	0-80-312-07531	PIPE	SA691-2 1/4 CR CL22	1118	28	TIG & ARC	28	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE CAP	SA 182 F91				2	827.78	3	984	459								
04	0-80-312-07531	PIPE	SA 335 P91	ID610	35	TIG & ARC	35	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		FITTING	SA 182 F91				6	1238.55	105	138	3108								
05	0-80-312-07531	PIPE	SA 335 P91	ID610	44	TIG & ARC	44	ER90S-B9	E9015-B9			1050 REV 06	220	740-770	2.5 mts PER mm MIN 60 mts	100 % UT & 100 % MT	*	*	100% HARDNESS
		PIPE	SA 335 P91				8	1651.28	140	184	5755								

NOTES:
01.100 % LPI / MPI ON ALL BUTT WELDS AFTER PWHT.
02.* REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO.R00/04-02 AMD.02
03. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOY STEEL,OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APPD. - QA	DATE	DRAWING NO.	REV.
ARJUN	P SURESH	C SARAVANAN	J NANTHINI	06.08.19	4-80-312-83325	00

ERECTION / FIELD WELDING SCHEDULE

PROJECT : UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
1 X 660MW PANKI TPS EXTN.

CONTRACTOR : M/s. BHEL

CONTRACT NO:

CUST. NO : 7363
PGMA : 80-320
SYSTEM : COLD REHEAT PIPING FROM TURBINE OUTLET TO REHEATER INLET HEADER

DOC.NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 01 OF 02

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS		PROCESS OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPEC. (ATT)				W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT		NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
				SIZE OD mm	THICK mm			TIG	ARC SPEC.					TEMP. °C	HOLD TIME				
								QTY(gms)	QTY(NOS.)										
		PART-1	PART-1				QTY	ø2.4	ø2.5	ø3.15	ø4.0								
		PART-2	PART-2																
01	1-80-320-22755	HP TURBINE OUTLET	G-17CrMo9-10	914	47	TIG ARC	47 W	ER 90S-B3	E 9018 B3			MSW 74/97 REV 00	300 TO 350	690±10	120 min	RT 100%	*	*	100% HARDNESS
		MATCHING PIECE	SA 182 F22				1	328.99	1	0	0								
02	1-80-320-22755	PIPE	SA 335 P22	965	37/40	TIG ARC	37 W	ER 90S-B3	E 9018 B3			1014 REV 03	150	680-720	2.5mts PER mm (Min. 60mts)	RT 100%	*	*	3% HARDNESS
		PIPE/FITTING	SA 335 P22				4	1419.28	5	1654	1425								
03	0-80-320-07532	PIPE	SA 106 GRC	762	30	TIG ARC	30 W	ER 70S-A1	E 7018 -1			1004 REV 04	100	610±15	2.5mts PER mm (Min. 30mts)	RT 100%	*	*	NIL
		PIPE/FITTING	SA 106 GRC				44	12611.52	48	14471	7744								
04	1-80-320-22755	CRH-NRV	SA 335 P22	965	37	TIG ARC	37 W	ER 80S-B2	E 8018-B2			1012 REV 04	150	680-720	2.5mts PER mm (Min. 60mts)	RT 100%	*	*	3% HARDNESS
		REDUCER	SA 335 P11				1	354.57	2	413	356								
05	0-80-320-07532	RH INLET HEADER	SA 105	508	32	TIG ARC	32 W	ER 70S-A1	E 7018 A1			1004 REV 04	100	610±15	2.5mts PER mm (Min. 30mts)	RT 100%	*	*	
		REDUCER	SA 106 GRC				2	371.6	15	184	303								
06	1-80-320-22755	PIPE	SA 335 P22	323.9	14.27	TIG ARC	14.27 W	ER 90S-B3	E 9018 B3			1014 REV 03	150	680-720	2.5mts PER mm (Min. 60mts)	RT 100%	*	*	3% HARDNESS
		FLAT END CLOSURE/STUB	WELDMENT				2	251.98	26	132	0								

NOTES:
01.100 % LPI / MPI ON ALL BUTT WELDS AFTER PWHT.
02.* REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO.R00/04-02 AMD.02
03. PREHEAT MAINTENANCE AS PER RELEVANT WPS.
04. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOY STEEL,OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APD. - QA	DATE	DRAWING NO.	REV.
ARJUN	P.SURESH	SARAVANAN C	J NANTHINI	20.08.19	4-80-320-83499	00

ERECTION / FIELD WELDING SCHEDULE

PROJECT : UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
1 X 660MW PANKI TPS EXTN.

CONTRACTOR : M/s. BHEL

CONTRACT NO :

CUST. NO : 7363
PGMA : 80-320
SYSTEM : COLD REHEAT PIPING FROM TURBINE OUTLET TO REHEATER INLET HEADER

DOC.NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 02 OF 02

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS	PROCESS OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPEC. (ATT)				W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT		NDT METHOD/ QUANTUM NOTE 1	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
							TIG	ARC SPEC.					TEMP. °C	HOLD TIME				
				SIZE OD mm / THICK mm		QTY	QTY(gms)	QTY(NOS.) ø2.5	ø3.15	ø4.0								
		PART-1	PART-1															
		PART-2	PART-2															
07	1-80-320-22755	PIPE	SA 106 GRC	965 / 37	TIG ARC	37 W	ER 70S-A1	E 7018 -1			1033 REV 03	150	650-670	2.5mts PER mm (Min. 30mts)	RT 100%	*	*	3% HARDNESS
		PIPE	SA 335P11			1	354.57	2	413	356								
08	1-80-320-22755 0-80-320-07532	PIPE	SA 106 GRC	965 / 37	TIG ARC	37 W	ER 70S-A1	E 7018 -1			1004 REV 04	100	610±15	2.5mts PER mm (Min. 30mts)	RT 100%	*	*	NIL
		PIPE	SA 106 GRC			10	3547.7	11	4136	3564								

NOTES:
01. 100 % LPI / MPI ON ALL BUTT WELDS AFTER PWHT.
02.* REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO.ROO/04-02 AMD.02
03. PREHEAT MAINTENANCE AS PER RELEVANT WPS.
04. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOY STEEL OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APD. – QA	DATE	DRAWING NO.	REV.
ARJUN	P.SURESH	SARAVANAN C	J NANTHINI	20.08.19	4-80-320-83499	00

ERECTION / FIELD WELDING SCHEDULE

PROJECT : UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
1 X 660MW PANKI TPS EXTN.

CONTRACTOR : M/s. BHEL

CONTRACT NO:

CUST. NO : 7363
PGMA : 80-321
SYSTEM : MAIN STEAM HEADER TO HIGH PRESSURE BYPASS VALVE INLET PIPING

DOC.NO. :
REV. NO. :
WELDING CODE : IBR / ASME
PAGE NO : 01 OF 01

SL. NO.	DRG NO. FOR WELD LOCATION IDENTIFICATION MARK	DESCRIPTION OF PARTS TO BE WELDED	MATL.SPEC. (ATT)	DIMENSIONS		PROCESS OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPEC. (ATT)				W.P.S NO.	MIN. PRE HEAT TEMP. °C	HEAT TREATMENT		NDT METHOD/ QUANTUM	REF. SPEC. NO.	ACC. NORM REF.	REMARKS
				SIZE OD mm	THICK mm			TIG QTY(gms)	ARC SPEC. QTY(NOS.)					TEMP. °C	HOLD TIME				
		PART-1	PART-1				QTY	ø2.4	ø2.5	ø3.2	ø4.0								
		PART-2	PART-2																
01	1-80-321-22747	PIPE	SA 335 P22	508	20	TIG & ARC	20 W	ER 90S-B3		E9018 B3		1014 REV 03	150	680-720	2.5mts PER mm (Min. 60min)	100 % RT	*	*	3% HARDNESS
		PIPE/FITTING	SA 335 P22				6	1181.9	33	594	224								
02	1-80-321-22747	PIPE	SA 335 P22	508	20	TIG & ARC	20 W	ER 80S-B2		E8018-B2		1012 REV 04	150	680-720	2.5mts PER mm (Min. 60min)	100 % RT	*	*	3% HARDNESS
		PIPE/FITTING	SA 335 P11				2	393.3	11	198	74								
03	1-80-321-22747	PIPE	SA 335 P11	508	20	TIG & ARC	20 W	ER 70S-A1		E7018-1		1033 REV 03	150	650-670	2.5mts PER mm (Min. 60min)	100 % RT	*	*	3% HARDNESS
		PIPE/FITTING	SA 106 GrC				2	393.3	11	198	74								
04	1-80-321-22747	PIPE	SA 106 GrC	508	20.62	TIG & ARC	20.62 W	ER 70S-A1		E7018-1		1005 REV 05	100	620-650	2.5mts PER mm (Min. 60min)	100 % RT	*	*	
		PIPE/FITTING	SA 106 GrC				6	1181.9	33	594	224								

NOTES:
01. LPI / MPI ,UT WHEREVER APPLICABLE SHALL BE CARRIED AFTER PWHT.
02. * REFER NDE MANUAL NO. PSQ :NDM:COM:REV NO.R00/04-02 AMD.02
03. PREHEAT MAINTANANCE AS PER RELEVANT WPS.
04. 3% HARDNESS CHECKING ON BUTT WELDS OF ALLOYSTEEL,OTHER THAN P91 & F91

PREPARED	DESIGN/CHD.	DESIGN/APPD.	CHD./APPD. - QA	DATE	DRAWING NO.	REV.
ARJUN	P SURESH	SARAVANAN C	J NANTHINI	06.08.19	4-80-321-83351	00

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

16.2 All pressure parts 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 / boiler 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 Hydraulic testing pumps for HP lines (Above 400Kg/cm2) shall be provided by BHEL free of hire charges. The testing pumps will be issued to the contractor in working conditions. Installation, electrical connection, erection, testing and dismantling and returning to BHEL stores, etc, shall be carried out by the contractor as part of this work without any extra charges. In case any servicing of the test pump is to be done during the course of the test, the contractor shall provide the necessary labour for the same and spares will be arranged by BHEL.

16.10 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.

16.11 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.

16.12 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.

16.13 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.

16.14 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.

16.15 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.

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

16.17 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.

16.18 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.

16.19 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.

16.20 Temporary blinds / lugs / caps of piping and associated equipments like tanks, pumps etc. required for oil flushing / alkali cleaning / acid cleaning of piping & other equipments during erection & pre-commissioning shall be erected by contractor within the quoted rate.

16.21 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 equipments and the same shall be carried out by contractor as per requirement. The finally accepted price / rates shall also include all such work.

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

16.23 During steam blowing operations the required manpower for fixing the target plates shall be arranged by the contractor as per the instructions of BHEL Engineer within the quoted rates. The manpower for the above operation may be required round the clock if necessary. The contractor shall carry out the above operation as per the instructions of BHEL Engineer within the quoted rates.

16.24 Main Steam Line & Hot Reheat Line Strainers bodies are erected first by other agency and the lines will be erected by piping contractor. After Hydraulic Test, the strainer elements are to be fixed, by other agency. During trial operation, if required, the strainers are to be removed for inspection of debris & cleaning. During all these operation piping contractor shall extend all assistance by providing necessary man power, T & P within the quoted rate.

16.25 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.

16.26 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.

16.27 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.

16.28 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.

16.29 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 Removal 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.

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 equipments as required and specified as per painting schedules for the components of Piping & Other equipments 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. 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 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.

18.16 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.

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

18.18 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.

18.19 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.

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

18.21 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL/ Customer.

18.22 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.

18.23 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.

18.24 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.

PRESERVATION / TOUCH UP PAINTING

18.25 Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipments 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.

18.26 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.

18.27 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.

18.28 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.

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

18.30 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 All the chemicals required for carrying out these activities will be supplied by BHEL free of cost.

19.3 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.

19.4 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.

19.5 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.

19.6 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.

19.7 All items / materials (Including Chemicals) required for conducting hydraulic test, pre-Boiler system detergent flushing / chemical cleaning, steam blowing etc., will be supplied by BHEL. However fabrication, servicing, erection, dismantling and returning of the same to stores are the responsibility of the contractor who is erecting the equipment / piping. The contractor may note that no separate payment shall be released for any temporary works that are to be carried out for conducting pre-commissioning and commissioning tests. Bidders are advised to include expenses on temporary works along with the rates being quoted by them. Broadly the work on temporary systems will be as under erection etc. of all temporary piping including valves, tanks, effluent pumps, electrical control panel and cabling along with insulation and supports for steam blowing.

Chemical cleaning and effluent disposal are to be carried out as part of work. Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities. All the pumps, motors and electrical control panels/ switch gear, valves and actuators will be furnished to the contractor after due servicing.

The above is only a broad breakup of the temporary works. The engineer at site will make final break up. His decision will be final and binding on the contractor. Dismantling of the temporary equipment and piping will be done by the contractor. Contractor will also responsible to return these materials to the stores.

19.8 Commissioning of the boiler will involve trial run of all the equipment erected. Boiler has to be lighted up for refractory drying, alkali boil out, acid cleaning, passivation, preservation, steam blowing and floating of safety valves. Flushing of all the lines by air, oil or steam as the case may be, trial run of the boiler, servicing of valves and any other works incidental to commissioning are to be carried out. During this period though the BHEL's customer's staff will also be associated in the work, the contractor's responsibility will be to arrange for the complete requirement of supervision, men, consumables, T&P and IMTE's till such time the commissioned units are taken over by the BHEL's customer.

19.9 It shall be the responsibility of the contractor to preserve the boiler as per BHEL's requirement. Required chemicals, DM Water and other required items etc required for this purpose will be supplied by BHEL.

19.10 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.

19.11 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.

19.12 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.

19.13 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.

19.14 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.

19.15 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.

19.16 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.

19.17 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.

19.18 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial 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 unserviced. 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.

19.19 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

19.20 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.

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

19.22 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.

19.23 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.

19.24 Contractor shall layout all necessary temporary piping, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test, oil flushing, steam blow off or for any other tests as the case may be and will be carried out above activities under the scope of work as per instructions of BHEL. After the test is over, all the temporary piping, etc., will be removed and returned to BHEL store. All these form part

of the scope of work. No separate payment shall be made towards erection and dismantling of these temporary works. Chemical cleaning of feed lines, CEP outlet lines, and Drip lines will be carried out by a separate agency. Cleaning of all other lines is in scope of this contract. However the contractor executing this work has to render all assistance to the separate agency including removal of valves, putting loops and restoring back after cleaning.

19.25 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.

19.26 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.

19.27 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 equipments, 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.

19.28 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.

19.29 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 equipments 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.

19.30 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.

19.31 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.

19.32 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.

19.33 The instruction of the motor manufacturer regarding storage of the motors and re-conservation must be strictly followed without any deviation.

19.34 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.

19.35 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.

19.36 After synchronization, the commissioning activities and trial operations will continue till handing over of the unit. Contractor shall provide the manpower for three months from trial 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 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.

19.37 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.

19.38 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.

19.39 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.

19.40 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.

19.41 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.

19.42 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 "A" IN INR (IN FIGURES AND WORDS)
1.0	TOTAL PRICE FOR THE TOTAL WORK OF " ERECTION, TESTING, COMMISSIONING, TRIAL OPERATION AND HANDING OVER OF POWER CYCLE PIPING, ALL ASSOCIATED PIPING & EQUIPMENT, IT'S INSULATION AND FINAL PAINTING INCLUDING SUPPLY OF PAINTS" AS PER TENDER SPECIFICATIONS AT 1X660MW PANKI TPS, PANKI, KANPUR.	
Notes:		
1.	The rates of individual item for the entire scope of work as define in BOQ Chapter X shall be arrived as per Calculation defined in Annexure-C.	
2.	The derived item rate will remain firm throughout the contract period	

Annexure-C

Calculation ratio for different items based upon the total value as per rate schedule

Sl. No	DESCRIPTION OF WORK	Qty. (in MT)	FACTOR (F)	Rate per MT (INR) [(F)*(A)/1,00,000]	Amount (INR)= Rate per MT x Qty
1.	Erection, testing, commissioning, trial operation and handing over of **P91 Piping and valves etc** as per tender specifications **(As per Annexure- A)**	1,109	28.3954		
2.	Erection, testing, commissioning, trial operation and handing over of **Other Piping including P11/12/22, CS, etc and valves (excluding P91 & SS) etc** as per tender specifications **(As per Annexure- A)**	2,410	21.0218		
3.	Erection, testing, commissioning, trial operation and handing over of **SS Pipes and valves** as per tender specifications **(As per Annexure- A)**	11	39.9270		
4.	Complete scope of work as per tender specification **for H&S, Tanks, etc** as per specifications. **(As per Annexure- A)**	791	12.1006		

Sl. No	DESCRIPTION OF WORK	Qty. (in MT)	FACTOR (F)	Rate per MT (INR) [(F)*(A)/1,00,000]	Amount (INR)= Rate per MT x Qty
5.	Erection, testing, commissioning, trial operation and handing over of **Insulation etc** as per tender specifications **(As per Annexure- A)**	561	8.1519		
6.	Erection, testing, commissioning, trial operation and handing over of **Temporary Piping etc** as per tender specifications **(As per Annexure- A)**	345	9.4579		
	TOTAL AMOUNT "A" (INR)				

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.

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 rate schedules are approximate only and liable for variation on either side depending upon site / design requirement. The tentative contract value (CV) of entire scope of work shall be calculated as per finally quoted / accepted rates & the Quantities indicated in Rate Schedule.

v. Contractor's total quoted price as per **RATE SCHEDULE (ANNEXURE-C)** will be taken as tentative only. The contractor undertakes to execute actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually executed at site and payments will also be regulated for the same Taxes (GST) shall be payable extra as per relevant clauses in Technical Conditions of Contract.