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

S. No.	E- TENDER SPECIFICATION NUMBER
01	BHE/PW/PUR/BWT6-LP PIPING/2230

FOR

Handling at site stores / storage yard, transporting to site, inspection, preassembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer for**, LP piping and its associated items, CW & ACW water system, Fire protection system**, Valves, Fittings, Hangers & Supports and Insulation of 1x660MW, Unit-6, Bhusawal TPS, Bhusawal**.**

VOLUME I – TECHNICAL BID

THIS TENDER SPECIFICATION CONSISTS OF:

Notice Inviting Tender	
Volume-IA	**Technical Conditions of Contract**
Volume-IB	**Special conditions of Contract**
Volume-IC	**General conditions of Contract**
Volume-ID	**Forms & Procedures**
Volume-IE	**Technical Specifications and Drawings**
Volume II	**Price Bid**

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

CONTENTS		
Volume No	Description	Hosted in website bhel.com (Briefly) and detailed in BHEL e-Procurement Portal as files titled
NIL	Tender Specification Issue Details	(Part of **Vol-IA-2230**)
NIL	Notice Inviting Tender	(Part of **Vol-IA-2230**)
I-A	Technical Conditions of Contract	Vol-I-A-2230
I-B	Special Conditions of Contract	Vol-I-BCD-2230
I-C	General Conditions of Contract	(Part of Vol-I-BCD-2230)
I-D	Forms & Procedures	(Part of Vol-I-BCD-2230)
I-E	Technical Specifications and Drawings	Vol-IE-2230
II	Price Bid Specification as specified in E-Procurement Portal	Volume-II-2230

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

S. No.	E- TENDER SPECIFICATION NUMBER
01	BHE/PW/PUR/BWT6-LP PIPING/2230

FOR

Handling at site stores / storage yard, transporting to site, inspection, preassembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer for**, LP piping and its associated items, CW & ACW water system, Fire protection system**, Valves, Fittings, Hangers & Supports and Insulation of 1x660MW, Unit-6, Bhusawal TPS, Bhusawal**.**

EARNEST MONEY DEPOSIT: Refer Notice Inviting Tender

LAST DATE FOR TENDER SUBMISSION: Refer Notice Inviting Tender

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

M/s. ……

……..

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

AGM (Purchase)

Place: Nagpur
Date:

2230

NOTICE INVITING TENDER

Bharat Heavy Electricals Limited

E-Tender Spec No: BHE/PW/PUR/BWT6-LP PIPING/2230 Date: 10/01/2020

NOTICE INVITING E-TENDER (NIT)

NOTE: BIDDER MAY DOWNLOAD/ UPLOAD THE TENDER/ OFFER FROM/ON BHEL E-PROCUREMENT PORTAL → https://bhel.abcprocure.com

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To,

Dear Sir/Madam,

Sub : NOTICE INVITING E-TENDER

Offers are invited in two part bid system from reputed & experienced bidders (meeting PRE QUALIFICATION CRITERIA as mentioned in Annexure-I) through **E-procurement portal→https://bhel.abcprocure.com only** for the subject job by the undersigned on behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender documents. Following points relevant to the tender may please be noted and complied with:

Note: ***The bidder should respond by submitting their offer online only in our e-Procurement platform at* https://bhel.abcprocure.com. *No Hard copy bid/ bids through email/ fax shall be accepted***.

1.0 Salient Features of NIT

S No.	ISSUE	DESCRIPTION	
i	**E-TENDER NUMBER**	**BHE/PW/PUR/BWT6-LP PIPING/2230**	
ii	**Broad Scope of job**	Handling at site stores / storage yard, transporting to site, inspection, preassembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer for**, LP piping and its associated items, CW & ACW water system, Fire protection system**, Valves, Fittings, Hangers & Supports and Insulation of 1x660MW, Unit-6, Bhusawal TPS, Bhusawal**.**	
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-IE	*Technical Specifications and Drawings*	*Applicable*
F	Volume-II	*Price Bid as specified in E-Procurement Portal*	*Applicable*
iv	**Issue of Tender Documents**	**From https://bhel.abcprocure.com** *(Tender documents will be available for downloading from BHEL e-Procurement website till due date of submission)* Brief information of the tender shall also be available at Central Public Procurement portal	*Applicable*

S No.	ISSUE	DESCRIPTION	
		(https://eprocure.gov.in) *and* **BHEL website (www.bhel.com).**	
v	**DUE DATE & TIME OF OFFER SUBMISSION**	***Date: 31/01/2020, Time: 15.00 Hrs*** ***Place: on E-Tender Portal https://bhel.abcprocure.com*** • ***Offer to be submitted online only through e-procurement Portal***	*Applicable*
vi	**OPENING OF TENDER (Techno-Commercial Bid)**	***Date: 31/01/2020, Time: 16.00 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 extended to the next working day.* *(2) T**his tender being an e-tender, it shall be opened online only through the E-Procurement Portal. Participating bidders may witness the Opening online only.***	*Applicable*
vii	**EMD AMOUNT**	***Rs. 27,00,000/- (Rupees Twenty-Seven Lakhs only)*** ***[To be submitted in the form and manner as mentioned below]*** ***Important Note: Bidders kindly to take note that EMD (Earnest Money Deposit) shall be furnished by MSE bidders as well, as per the amount and procedure indicated in the NIT/GCC.***	*Applicable*
viii	**COST OF TENDER**	~~*Rs 2000/-.*~~ ~~***[To be submitted in the form and manner as mentioned below]***~~	~~*Applicable*~~
ix	**LAST DATE FOR SEEKING CLARIFICATION**	*Three days before the due date of offer submission. Along with soft version also, addressing to undersigned & to others as per contact address given below.*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**	**20/01/2020; 11.00 Hrs** at BHEL PSWR HQ Nagpur	*Applicable*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	**Shri Arun Chandra Verma, IPS (Retd.)** **and** **Shri Virendra Bahadur Singh, IPS (Retd.)** (Please refer Annexure-04 "Important Information" of NIT for more details)	*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 Corrigendum), Central Public Procurement portal (https://eprocure.gov.in) & on e-tender portal **https://bhel.abcprocure.com and not in the newspapers**. Bidders to keep themselves updated with all such information.	

2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender

together with subsequent correspondences shall be submitted by them, duly **digitally** signed on each page, as part of offer. **Rates/Price including discounts/rebates, if any, mentioned anywhere/in any form in the techno-commercial offer other than the Price Bid, shall not be entertained**.

~~3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Power Sector Regional HQ at Nagpur issuing the Tender. along with techno-commercial offer. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office as stated above against sl no iv of 1, on any working day. Copy of Cash receipt or the proof of Demand Draft duly **digitally** signed is to be uploaded with the Techno Commercial offer **on e-tender portal https://bhel.abcprocure.com**. However Original Demand Draft shall be sent to the officer inviting tender within a reasonable time failing which the offer is liable to be rejected. Sale of tender Documents shall not take place on National Holidays, holidays declared by Central or State Governments and BHEL PS HQ at _____, Sundays and second/ last Saturdays.~~

4.0 Unless specifically stated otherwise, bidder shall deposit EMD as per the provisions in General Conditions of Contract Clause no. 1.9.1. In case of remittance of EMD through **Demand Draft/Pay Order**, same shall be in favour of **Bharat Heavy Electricals Ltd**, payable at Nagpur. In case of remittance of EMD through **Bank Guarantee** (for the balance EMD amount in excess of Rs 2 Lakhs) OR through **FDR**, refer General Conditions of Contract Clause no. 1.9.1(iv). Proforma of Bank Guarantee for Earnest Money shall be as provided in Vol-ID "FORMS & PROCEDURES". For other details and for 'One Time EMD' please refer General Conditions of Contract.

In case of remittance of EMD through Electronic Fund Transfer, Bank account details of BHEL PSWR to be used is as below: -

NAME OF THE COMPANY	BHARAT HEAVY ELECTRICALS LTD
ADDRESS OF THE COMPANY	SHREE MOHINI COMPLEX 345, KINGSWAY,NAGPUR
NAME OF BANK	STATE BANK OF INDIA
NAME OF BANK BRANCH AND BRANCH CODE	SBI,KINGSWAYBRANCH,BRANCH CODE-00432
CITY	NAGPUR
ACCOUNT NUMBER	31380025872
ACCOUNT TYPE	CURRENT A/C
IFSC CODE OF THE BANK BRANCH	SBIN0000432
MICR CODE OF THE BANK BRANCH	440002002

Above bank account, details can be used for remittance of Security Deposit as well by the successful tenderer.

Procedure for Earnest Money Deposit					
Description/ Mode of Submission	**EFT**	**Cash**	**DD/Pay Order**	**FDR (Refer GCC clause no 1.9.1(iv) for FDR)**	**Bank Guarantee (Refer GCC clause no 1.9.1(iv) for Acceptable Portion of EMD in the Form of BG)**
Proof of EMD along with the offer	Receipt of Amount Transferred	Receipt of cash	Scan Copy has to be uploaded	Scan Copy has to be uploaded	Scan Copy of BG has to be uploaded.

Procedure for Earnest Money Deposit					
Submission of EMD to BHEL PSWR, Nagpur	into BHEL Account	deposit at BHEL office	Original DD/ Pay order to be sent through Registered Post	The Original FDR to be sent through Courier/Post to BHEL PSWR Nagpur.	The Original Bank Guarantee/any extensions /amendments shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Purchase Department, BHEL PSWR, Nagpur.

~~Copy of One Time EMD Certificate or~~ The proof of Demand Draft/ Payorder/FDR or BG or receipt of Electronic Fund Transfer duly **digitally** signed is to be uploaded with the Techno Commercial offer on **'e-tender portal'→ https://bhel.abcprocure.com**. **In case of Demand Draft/ Payorder/FDR/BG, Original Demand Draft/ Payorder/FDR/BG shall be sent to the officer inviting tender within a reasonable time failing which the offer is liable to be rejected.**

5.0 **Procedure for Submission of Tenders**:

Procedure for Submission of Tender is available in the "Bidder Manual for BHEL Bidders" at E-tender portal https://bhel.abcprocure.com . Terms and conditions mentioned therein shall form integral part of the NIT and bidders shall abide by the same.

a) Hardware and Software requirements for participating in e-tender:

- Please refer the website for the minimum system requirements and setting document for Bidders under the link: https://bhel.abcprocure.com

b) **Digital Signature**

- To know the procedure for obtaining Digital Signature Certificate (DSC), suppliers who are not having the DSC are advised to visit our website www.bhel.com → Tender Notifications → Sample Checklist.

c) M/s E-Procurement Technologies Limited Helpdesk Contacts:

During normal business hours, helpline maintained by the service provider e-Procurement Technologies Limited is available for clarifying any doubts of supplier/s. The helpline numbers are provided in the e-procurement website.

- Mr. Swapnil Hamilton, Support Executive, Ph: +91 7940270549, e-mail ID: swapnil.h@eptl.in
- Mr. Hardik Oza, Support Executive, Ph: +91 7940270560, e-mail ID: hardik.oza@eptl.in
- Mr. Ankur Bhatt, Support Executive, Ph: +91 7940270590, e-mail ID: ankur.bhatt@eptl.in
- Mr. Prashant, Asst. Manager – Implementation & Support, Ph: +91 7940270545, e-mail ID: prashant@eptl.in

Note

i. **Offers/tenders submitted in the E-tender portal shall only be considered for further evaluation. Offers sent by FAX / E-mail / any mode other than E-tender would not be entertained.**

The Tenderers must submit their Tenders, as detailed below:

- PART-I consisting of 'PART-I A (Techno Commercial Bid)' & 'PART-I B (EMD/~~COST of TENDER~~)'
- PART-II (Price Bid)

The contents of the offer/tender are as given below. **(All Documents to be digitally signed and uploaded in E-tender Portal)**

SN	Description	Remarks
	Part-I A	
i.	Covering letter/Offer forwarding letter of Tenderer (in the techno commercial compliance sheet provided)	
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format. **Note:** a. In case of any deviation, the same should be submitted separately, indicating respective clauses of tender against which deviation is taken by bidder. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	
iii.	Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that a credential certificates issued by clients shall distinctly bear the name of organization, contact phone no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/ Errata etc. pertinent to this NIT.	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	If applicable
vi.	Duly filled-in annexures, formats etc. as required under this Tender Specification/NIT	
vii.	Notice inviting Tender (NIT)	
viii.	Volume – I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume – I B : Special Conditions of Contract (SCC)	
x.	Volume – I C : General Conditions of Contract (GCC)	
xi.	Volume – I D : Forms & Procedures	
xii.	Volume - IE: Technical Specifications and Drawings	
~~xiii.~~	~~Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item~~	
xiv.	Any other details preferred by bidder with proper indexing.	

	PART-I B	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in this Tender **OR** ~~Documentary evidence for 'One Time EMD' with the Power Sector Region of BHEL floating the Tender~~ ~~2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)~~	

	Note: Refer Clause No-~~3~~ and 4 of NIT for further details	

	PART-II	
ii	Volume II – PRICE BID (Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures)	

- **SPECIAL NOTE: All documents/ annexures to be submitted should be uploaded in respective places in the E-Tender portal as per the list mentioned given in this NIT. BHEL shall not be responsible for in-complete documents.**

6.0 Void

7.0 Deviation with respect to tender clauses and additional clauses/suggestions in Techno-commercial bid / Price bid shall NOT be considered by BHEL. Bidders are requested to positively comply with the same.

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

9.0 Assessment of Capacity of Bidders:

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 I))

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 TabIe-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 from BHEL.

The "FIRST TIMER" tag shall remain till completion of all the contracts against which vendor 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.

10.0 Since the job shall be executed at site, bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation, applicable wage structure, wage rules, etc before quoting for this tender. They may also consult this office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions.

11.0 For any clarification on the tender document, the bidder may seek the same in writing or through e-mail or **through E-tender 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.

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

13.0 In the event of any conflict between requirement of any clause of this specification/ documents/drawings/data sheets etc or requirements of different codes/standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification

(whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error/missing pages/ other clerical errors in the tender documents, noticed must be pointed out before pre-bid meeting/submission of offer; else BHEL's interpretation shall prevail.

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

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

16.0 The Bidder has to satisfy the Pre-Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the Pre-Qualification Criteria specified in this NIT as per Annexure-I (as applicable), past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right not to consider offers of parties under HOLD.

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

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

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

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

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

21.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents. For the tenders requiring services of Original supplier of equipment/services, offer is preferred from the OEM/Principal. However, if the OEM/Principal insists on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/supplier in the same tender. Moreover, either the agent could bid on behalf of manufacturer / supplier or manufacturer / supplier could bid directly but not both. In case bids are received from both manufacturer / supplier and the agent, bid from agent shall be ignored.

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

~~23.0 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre-Qualifying Requirement (PQR) criteria, and in such a case the following shall be complied with:~~

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

23.2 ~~'Standalone' bidder cannot become a '~~**~~Prime Bidder' or a 'Consortium bidder' or 'Technical Tie up bidder' in a consortium (or Technical Tie up) bidding~~**~~. Prime bidder shall neither be a consortium partner to other prime bidder nor take any other consortium partners. However, consortium partner may enter into consortium agreement with other prime bidders. In case of non-compliance, consortium bids of such Prime bidders will be rejected.~~

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

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

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

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

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

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

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

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

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

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

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

23.14 ~~The consortium partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. In case there are two consortium partners, then each partner shall submit SD equivalent to 0.5% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. The~~

~~100% SD value to be submitted by the consortium partner/(s) shall be remitted before start of work. All the terms & conditions of the SD clause in Vol-IC GCC shall be applicable for this SD except clauses no 1.10.1, 1.10.4 & 1.10.6 of Vol-IC GCC. For "**modes of deposit**" of this SD, clause no 1.10.3 of Vol-IC GCC shall be applicable.~~

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

24.0 The bidder shall submit/upload documents in support of possession of 'Qualifying Requirements' duly self-certified and stamped by the authorized signatory **(through Digital Signature**), as per the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.

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

26.0 Order of Precedence

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

a. Amendments/Clarifications/Corrigenda/Errata etc issued in respect of the tender documents by BHEL
b. Notice Inviting Tender (NIT)
c. Price Bid-Volume-II
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

It may please be noted that guidelines/rules in respect of suspension of business dealings', 'Vendor evaluation format', 'Quality, Safety & HSE guidelines', etc may undergo change from time to time and the latest one shall be followed.

For BHARAT HEAVY ELECTRICALS LTD

(Addl. General Manager - Purchase)

Enclosure

01. Annexure-1: Pre Qualifying criteria.
02. Annexure-2: Check List.
03. Annexure-3: Integrity Pact
04. Annexure-4: Important Information.
~~05. Annexure-5: MSE Annex.~~
06. Annexure-6: Declaration for Reverse Auction.
07. Annexure-7: Declaration for not being under Bankruptcy Code Proceedings.

ANNEXURE - 1

PRE QUALIFYING CRITERIA

E-Tender Specification Number: BHE/PW/PUR/BWT6-LP PIPING/2230	
JOB	Handling at site stores / storage yard, transporting to site, inspection, preassembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer for**, LP piping and its associated items, CW & ACW water system, Fire protection system**, Valves, Fittings, Hangers & Supports and Insulation of 1x660MW, Unit-6, Bhusawal TPS, Bhusawal**.**

S No	PRE QUALIFICATION CRITERIA	~~Bidders claim in respect of fulfilling the PQR Criteria~~ Applicability	
A	Submission of Integrity Pact duly signed (if applicable) (Note: To be submitted by Prime Bidder ~~& Consortium /Technical Tie up partner jointly in case Consortium bidding is permitted,~~ otherwise by the sole bidder)	**APPLICABLE**	
B	**Technical Criteria:** **B.1: Not Applicable** **B.2:** Bidder shall essentially meet all the Qualifying Requirements **(i.e. B.2.1 or B.2.2 or B.2.3)** as under, in last seven years from latest date of bid submission: **B.2.1** Bidder should have Executed atleast 5148 MT Piping Work necessarily including atleast 829 MT quantity of minimum 1944 mm Diameter pipe in a power / industrial / infrastructure project. **OR** **B.2.2** Bidder should have Executed Boiler (Consisting of Power Cycle Piping/ Pressure Parts)/ Power Cycle Piping of one unit of ≥30 MW Thermal Power Plant. **OR** **B.2.3** Bidder should have Executed STG work of one unit of ≥190 MW.	**APPLICABLE**	
C-1	**Financial TURNOVER** Bidders must have achieved an average annual financial turnover (audited) of **Rs. 510.00 Lakhs** or more over last three Financial Years (FY) i.e. 2016-17, 2017-18 & 2018-19.	**APPLICABLE**	
C-2	**NETWORTH** (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive.	**APPLICABLE**	

S No	PRE QUALIFICATION CRITERIA	~~Bidders claim in respect of fulfilling the PQR Criteria~~ Applicability	
C-3	**PROFIT** Bidder must have earned profit in any one of the three Financial Years as applicable in the last three Financial Years as furnished for 'C-1' above.	**APPLICABLE**	
C-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. (***Refer Annexure-7 of NIT for format***).	**APPLICABLE**	
D	**Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)** The "Assessment of Capacity of Bidders" for this Tender shall be carried out by considering the identified similar package.	**APPLICABLE**	**BY BHEL**
E	**Approval of Customer (if applicable)** **Note:** Names of bidders (including consortium/Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval	**APPLICABLE**	**BY BHEL**
F	Price Bid Opening **Note:** Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E		**BY BHEL**
G	Consortium tie-ups	**NOT APPLICABLE**	

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

Explanatory Notes for PQR B.1 (Technical)

1. For the criteria (B.1), actual executed value shall be considered.

2. Value of work is to be updated with indices for "All India Avg. Consumer Price index for industrial workers" and "Monthly Whole Sale Price Index for All Commodities" with base month as per last month of work execution and indexed up to three (3) months prior to the month of latest due date of bid submission as per following formula-

$$P = R + \left\{0.425 \times R \times \frac{(X_N - X_0)}{X_0}\right\} + \left\{0.425 \times R \times \frac{(Y_N - Y_0)}{Y_0}\right\}$$

Where
P = Updated value of work

R = Value of executed work

X_N = All India Avg. Consumer Price index for industrial workers for three months prior to the month of latest due date of bid submission (e.g. If latest bid submission date is 02-Mar-17, then bid submission month shall be reckoned as March'17 and index for Dec'16 shall be considered).

S No	PRE QUALIFICATION CRITERIA	~~Bidders claim in respect of fulfilling the PQR Criteria~~ Applicability

X_0 = All India Avg. Consumer Price index for industrial workers for last month of work execution.

Y_N = Monthly Whole Sale Price Index for All Commodities for the month, three months prior to the month of latest due date of bid submission (e.g. If latest bid submission date is 02-Mar-17, then bid submission month shall be reckoned as March'17 and index for Dec'16 shall be considered).

Y_0 =Monthly Whole Sale Price Index for All Commodities for last month of work execution.

Explanatory Notes for PQR B.2 (Technical):

3. Unless otherwise specified, for the purpose of "**B.2 Technical Criteria**", the word **'EXECUTED'** means achievement of milestones as defined below –
   a) "ACHIEVEMENT OF PHYSICAL QUANTITIES" as per PQRs.
   b) "READINESS FOR COAL FILLING" in respect of Mill Bunker**.**
   ~~c) "CHARGING" in respect of Power Transformers / Bus Ducts / "HT/LT Switchgears" / "HT / LT Cabling".~~
   ~~d) For C&I works: "SYNCHRONISATION" in case of power project and "WORK COMPLETION of the value as defined in PQR" in case of industry.~~
   e) "BOILER LIGHT UP" in respect of Boiler / CFBC / ESP.
   f) "GAS IN" in respect of HRSG.
   g) "STEAM BLOWING COMPLETION" in respect of Power Cycle Piping.
   h) "HYDRAULIC TEST" of the system in respect of Pressure parts / LP Piping / CW Piping.
   i) "FULL LOAD OPERATION OF THE UNIT" in respect of Insulation work.
   j) "SYNCHRONISATION" in respect of STG / GTG.
   k) "SPINNING" in respect of HTG.
   l) "COMPLETION AND HANDING OVER FOR MECHANICAL ERECTION" in respect of STG Deck and Machine/Equipment foundation.
4. Boiler means HRSG or WHRB or any other types of Steam Generator.
5. Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass.
6. 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. Similarly, wherever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating of the same in terms of MW shall be considered for evaluation.
7. Scope for Capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine.
8. In case the tendered scope is not a Pulverized Fuel Boiler, experience of Oil/Gas Fired Boilers can also be considered.
9. In case of lower rated units in Cogen, Combined Cycle of Industrial projects (especially Refinery projects), the packaging philosophy should be a composite package consisting of GTGs/STGs/Boilers etc. for tendering purpose with a PQR of a 500 MW Boiler with consortium provision for STG.

Explanatory Notes for PQR -C (Financial):

10. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above.

S No	PRE QUALIFICATION CRITERIA	~~Bidders claim in respect of fulfilling the PQR Criteria~~ **Applicability**

11. In case audited financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years.
12. 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.
13. C-2: -NETWORTH: Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital* + Reserves.
    (*: Share Capital OR Partnership Capital OR Proprietor Capital as the case may be)
14. C-3: Bidder must have earned profit in any one of the three financial years as applicable in the last three financial years as furnished for 'C-1' above.
    Note: PROFIT shall be PBT earned during any one year of last three financial years as in 'C-1' above.

Common Explanatory Notes:

1. For evaluation of PQR, the credentials of the Bidder alone, and not that of the Group Company shall be considered.
2. Completion date for achievement of the technical criteria specified in the Common QR 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. "**Executed**" means the bidder should have achieved the criteria specified in the Common QR even if the Contract has not been completed or closed.
4. In case the Experience/PO/WO certificate enclosed by bidders do not have separate break up of prices for the E&C portion for Electrical and C&I works (i.e. the certificates enclosed are for composite order for supply and erection of Electrical and C&I and other works if any), then value of Erection & Commissioning for the Electrical and C&I portion shall be considered as 15% of the price for supply & erection of Electrical and C&I.
5. ~~Following shall be complied with in case of **consortium**:~~
   a. ~~The Prime Bidder and Consortium Partner(s) are required to enter in to a consortium agreement with a validity period of "**six months"** initially. Thereafter, the Prime Bidder and Consortium Partner(s) shall certify to BHEL regarding existence and validity of their consortium agreement on **six monthly** basis.~~
   b. ~~Prime Bidder and Consortium partners shall be approved by Customer for being considered for the tender (applicable if customer approval is required).~~
   c. ~~Number of partners including prime Bidder shall be NOT more than **3 (Three).**~~
   d. ~~Prime Bidder alone shall necessarily comply with "**B1 Technical Criteria**" except for mechanical package where B1 criteria is not applicable.~~
   e. ~~Prime Bidder and Consortium Partner shall together comply with the '**Pre-Qualification Requirements**' specified for the respective category of technical requirement as per "B2 technical criteria".~~
   f. ~~Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified.~~
   g. ~~All other conditions shall be read in conjunction with clause no 23.0 of NIT.~~
   h. ~~Prime Bidder shall be the Bidder who has a major share of work.~~
   i. ~~Prime Bidder shall be responsible for the overall execution of the Contract.~~
   j. ~~Performance shall be evaluated for Prime Bidder and the Consortium partner for their respective scope of work.~~

S No	PRE QUALIFICATION CRITERIA	~~Bidders claim in respect of fulfilling the PQR Criteria~~ Applicability
	~~k. In case the Consortium partner backs out, another consortium partner meeting the QRs, has to be engaged by Prime Bidder and if not, the respective work will be withdrawn and executed on risk and cost basis of the prime bidder.~~ ~~l. In case Prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.~~ ~~m. After successful execution of one work with a consortium partner under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a **'standalone'** bidder for works similar to that for which consortium partner was engaged, for subsequent tenders.~~ n. ~~The Consortium partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the Prime Bidder for the total contract value~~.	

BIDDER SHALL SUBMIT CREDENTIALS (DETAILED WORK ORDER, BOQ, ONGOING/COMPLETION CERTIFICATE, TDS CERTIFICATES AND FINANCIAL DOCUMENTS ETC) BASED ON WHICH BIDDER IS CLAIMING TO SATISFY THE PQ CRITERIAs.

Note:

1. **Credentials submitted by the bidder against "PRE QUALIFYING CRITERIAS" shall be verified for its authenticity. In case, any credential (s) is/are found unauthentic, offer of the bidder is liable to the rejection. BHEL reserves the right to initiate any further action as per its internal guidelines.**

2. **No consortium bid is allowed for this Tender. However, for the purpose of qualification, after successful execution of one work with a consortium partner under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'standalone' bidder for works similar to that for which consortium partner was engaged, for subsequent tenders.**

ANNEXURE - 2

CHECK LIST

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

1	Name and Address of the Tenderer		
2	Details about type of the Firm/Company		
3.a	Details of Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
3.b	Details of alternate Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
4	EMD DETAILS	DD No: Date : Bank : Amount: Please tick (√) whichever applicable:- ~~ONE TIME EMD /~~ ONLY FOR THIS TENDER	
5	Validity of Offer	TO BE VALID FOR SIX MONTHS FROM DUE DATE	
		APPLICABILITY (BY BHEL)	ENCLOSED BY BIDDER
6	Whether the format for compliance with **PRE QUALIFICATION CRITERIA** (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable/~~Not Applicable~~	YES / NO
7	Audited profit and Loss Account for the last three years	Applicable/~~Not Applicable~~	YES/NO
8	Copy of PAN Card	Applicable/~~Not Applicable~~	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc. are read understood and signed	Applicable/~~Not Applicable~~	YES/NO
10	Integrity Pact	Applicable/~~Not Applicable~~	YES/NO
11	Declaration by Authorized Signatory	Applicable/~~Not Applicable~~	YES/NO
12	No Deviation Certificate	Applicable/~~Not Applicable~~	YES/NO
13	Declaration for Reverse Auction by Bidder	Applicable/~~Not Applicable~~	YES/NO

14	Declaration confirming knowledge about Site Conditions	Applicable/~~Not Applicable~~	YES/NO
15	Declaration for relation in BHEL	Applicable/~~Not Applicable~~	YES/NO
16	Non-Disclosure Certificate	Applicable/~~Not Applicable~~	YES/NO
17	Bank Account Details for E-Payment	Applicable/~~Not Applicable~~	YES/NO
18	Capacity Evaluation of Bidder for current Tender	Applicable/~~Not Applicable~~	YES/NO
19	Tie Ups/Consortium Agreement are submitted as per format	~~Applicable~~/Not Applicable	YES/ NO
20	Power of Attorney for Submission of Tender/Signing Contract Agreement ~~Power of Attorney of Consortium Partner.~~	Applicable/~~Not Applicable~~	YES/NO
21	Analysis of Unit rates	Applicable/~~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

INTEGRITY PACT

Between

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

And

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

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____. The Principal values full compliance with all relevant laws of the land, rules and regulations and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

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

Section 1 - Commitments of the Principal

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

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for 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)/ Contractors(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant 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 Bidders (s)/ Contractor(s) shall disclose the name and address of agents and representative in India and India Bidder(s)/Contractor(s) to disclose their foreign principals or associates. The Bidders (s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

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

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

If the Bidder(s)/Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per separate "Guidelines on 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 to Earnest Money Deposit/ Bid Security.

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

Section 5 – Previous Transgression

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

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

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

6.1 The 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/ Sub-contractors

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

Section – 8 Independent External Monitor(s)

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

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

8.3 The Bidder(s)/ Contractors(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s)/ Sib-contractor(s) with confidentiality 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 meeting could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 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 organization.

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 bidder 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 reminder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

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

For & On Behalf of the Principal

(Office Seal)

For & On Behalf of the Bidder/ Contractor

(Office Seal).

Place ----------

Date----------

Witness: _____

(Name & Address) _____

_____

Witness: _____

(Name & Address) _____

_____

ANNEXURE-4

IMPORTANT INFORMATION

E -Tender for this work is invited by BHEL PSWR NAGPUR and offer shall be submitted through BHEL e-procurement portal only. All correspondences regarding this tender shall be through E-procurement portal.

Postal Address:
AGM /Purchase BHEL PSWR,
SRIMOHINI COMPLEX, 345 KINGSWAY, NAGPUR 440001, INDIA

Following are the concerned BHEL officials to whom bidders can contact in case of any difficulty:

AGM Purchase, Email: prchiwarkar@bhel.in. Ph: +91 – 712 – 3048 - 633
Dy Manager Purchase, Email: nktiwari@bhel.in, Ph: +91 – 712 – 3048 – 713
Sr Engineer Purchase, Email: svm@bhel.in, Ph: +91 – 712 – 3048 – 715
Asst. Engineer Purchase, Email: baijnath@bhel.in , Ph: +91 – 712 – 3048 - 652

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

2. **Refer Chapter XII of Volume IB Special Conditions of Contract regarding Suspension of Business Dealings: The abridged version of extant 'Guidelines for suspension of business dealings with suppliers/ contractors' has now been uploaded on www.bhel.com on "supplier registration page" at the following link:** http://www.bhel.com/vender_registration/pdf/Suspension_guidelines_adbridged.pdf

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

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

3.1. 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.

3.2. Commitment by Bidder/ Supplier/ Contractor:

3.2.1. 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.

3.2.2. 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.

3.2.3. 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 price 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 extant guidelines of the company available on www.bhel.com and/or under applicable legal provisions".

4. **"Pradhan Mantri Kaushal Vikas Yojna:** 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".

5. **All Statutory Requirements as applicable for this project shall be complied with.**

6. **BHEL Fraud Prevention Policy: "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."**

7. **Following clause shall form part of the HSE documents issued under Chapter IX of Volume IB 'Special Conditions of Contract'**

"In case of any financial deduction made by Customer for lapses of safety other than what is provided elsewhere in the contract, the same shall be charged on back-to-back basis on the defaulting contractor without prejudice to any other right spelt anywhere in the tender /contract"

8. **Please take note of following Revised Tender Clauses:**
   - Notice Inviting Tender: Sl No 4 and corresponding Changes in GCC Clause No 1.9 regarding EMD
   - General conditions of Contract: Clause 1.10, 2.13, 1.15.11, Clause No. 2.7.2, Clause No. 2.7.3, Clause No 2.7.10 (New), Clause No 2.28.5 (New), Clause No 2.21.

9. Following Notes are added to Form F- 15 of Volume I D 'Forms & procedures'

i. It is only indicative and shall be as per the online format issued by BHEL time to time.

ii. No request will be entertained after specified date of the current month w.r.t the changes requested in the scores of immediate previous month.

10. **"Performance Guarantee for Workmanship":** Clause no 2.24 of General Conditions of contract is amended as below:

2.24 **PERFORMANCE GUARANTEE FOR WORKMANSHIP**

2.24.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of 12 **months commencing from the date of Completion of contract as certified by BHEL Engineer**, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the Guarantee money.

2.24.2 Release of guarantee money: As per Cl no. 2.42.2 of General Conditions of contract.

11. **Delay in 1st submission of SDBG/ PBBG**: SDBG/ PBG is to be furnished by the vendor before start of work. No payment will be released till SDBG/PBG is submitted by the vendor.

However if requested by the vendor, cash recovery equivalent to SDBG/ PBG value to be made from the running bills submitted by the vendor. In such case, recovery of interest calculated @SBI PLR +2% on amount equivalent to SDBG/ PBG value to be made for the gap period (difference between date of start of work and date of submission of BG/ cash recovery).

12. **Compensation in case of Death/ Permanent Incapacitation of Person:** BHEL shall recover the amount of compensation paid to victim (s) by BHEL towards loss of life/ permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employee as detailed below:

a) Victim: Any person who suffers permanent disablement of dies in an accident as defined below.

b) 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 thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, 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.

c) Compensation in respect of each of the victims:

(i) In the event of death or **permanent disability** resulting from **Loss of both limbs**: Rs 10,00,000/- (**Rs Ten Lakh**)

(ii) In the event of **other permanent disability**: Rs 7,00,000/- (**Rs Seven Lakh**)

d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to Section 2(I) of the Employee's Compensation Act, 1923.

13. The clause 2.7.9.1 below is added under the heading "Rights of BHEL" of General Conditions of Contract Volume-IC GCC.

2.7.9.1 Provision of Penalty in case of slippage of Intermediate Milestones:

i) Two major Intermediate Milestones are mentioned as M1 & M2 in Chapter VI: Time Schedule of Vol IA Technical Conditions of Contract.
ii) In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to Form 14.
iii) 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.
iv) 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.
v) 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.
vi) Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.
vii) Final deduction towards LD (if applicable as per clause 2.7.9 above), 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.
viii) 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.

14. Acceptance of Bank Guarantee (BG)
Revision in Acceptance of Bank Guarantee (BG) Clause no. 1.10.3 (iii) of Vol I C GCC:

Clause No. 1.10.3 (iii) of Vol IC GCC is revised as below: -
"Bank Guarantee issued by:
a. Any of the BHEL consortium bank listed below:

State Bank of India
ABN Amro Bank N.V.
Bank of Baroda
Canara Bank
Citi Bank N.A.
Corporation Bank
Deutsche Bank

HDFC Bank Ltd.
The Hongkond and Shanghai Banking Corporation Ltd
ICICI Bank Ltd.
IDBI Ltd.
Punjab National Bank
Standard Chartered Bank
State Bank of Travancore
State Bank of Hyderabad
Syndicate Bank

b. Any public sector Bank (other than consortium banks) with a clause in the text of Bank Guarantee that "**It is enforceable at Nagpur, Maharashtra**".

c. Any private sector banks, with a clause in the text of Bank Guarantee that "**It is enforceable by being presented at any branch of the bank**".

Note: "Bank Guarantees issued by Co-operative Banks are not acceptable".

15. Broad Terms & Conditions of Reverse Auction

In continuation to Clause 19.0 of NIT (Notice Inviting Tender) following are the broad terms and conditions of Reverse Auction for which Declaration Proforma by bidder has been given in Annexure VI of NIT:

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.

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).

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.**

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).

As a reminder to the bidders, system will flash following message (in RED color) during the course of 'online sealed bid':

"Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL"

Note:- In case the tender is an e-tender and bids are submitted on e-procurement portal of BHEL → https://bhel.abcprocure.com, the term 'envelope sealed bid' to be read as "price bid in e-procurement portal".

16. **MSE Vendors:** MSE bidders kindly to take note that EMD (Earnest Money Deposit) shall be furnished by MSE bidders as well, as per the amount and procedure indicated in the NIT/GCC.

~~**Micro & Small Enterprises (MSE) is exempted from Payment of Tender Fees (as in Sl No 1 viii of NIT) and Earnest Money deposit (EMD) (as in Sl No 1 vii of NIT), if Applicable.**~~

~~To avail this benefit, participating MSEs should be registered with District Industries Centers or Khadi and Village Industries Commission or Khadi and Village Industries Board or Coir Board or National Small Industries Corporation or Directorate of Handicrafts and Handloom or Udyog Aadhaar Memorandum or any other body specified by Ministry of Micro Small and Medium Enterprises.~~

~~MSE bidders can avail the above benefit only if they submit along with the offer, copies of either Udyog Aadhaar Memorandum or EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with copy of a CA certificate (format enclosed at **Annexure- 5** where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (part 1 in case of two part bid). Non submission of said documents will lead to consideration of their bid at par with other bidders in terms of EMD. No benefit shall be applicable for this enquiry, if any deficiency in the above required documents is not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal.~~

17. PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA) CLAUSE:

"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."

18. Integrity Pact:

(a) IP is a tool to ensure that activities and transactions between the company and its Bidder/Contractors are handled in a fair, transparent and corruption free manner.

Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Address	Phone & 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

(b) 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 bidding. In other words, entering into this pact would be a preliminary qualification.

(c) 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 any of the IEM(s). All correspondence with the IEMs 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 provided below:

Details of contact person (s):

Name: (1) P R Chiwarkar/ AGM (Purchase) (2) Shivkesh Meena/ Sr Engineer (Purchase)
Dept.: Purchase Department
Address: Shreemohini Complex, 345 Kingsway, Nagpur-440001
Phone: (LL/ Mobile) (1) 0712-3048633 (2)0712-3048715
Email: prchiwarkar@bhel.in (2) svm@bhel.in
Fax: 0712-3048699

ANNEXURE-5

MSE ANNEX

Certificate by Chartered Accountant on letter head

This is to Certify that M/s _____, (hereinafter referred to as 'company') having its registered office at _____ is registered under MSMED Act 2006, (Entrepreneur Memorandum No (Part-II) _____ dtd:_____,
Category: _____ (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year _____as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (Le. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :

Rs _____ Lakhs

2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:

Rs _____ Lakhs

The above investment of Rs _____ Lakhs is within permissible limit of Rs _____ Lakhs for _____ Micro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

OR

The company has been graduated from its original category (Micro/ Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is..... (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:
(Signature)

Name –

Membership number –

Seal of Chartered Accountant

ANNEXURE-6

Declaration for Reverse Auction

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub: Declaration for Participation in Reverse Auction (RA)
Ref: NIT/Tender Specification No: **BHE/PW/PUR/BWT6-LP PIPING/2230**

We declare that we will participate in Reverse Auction (RA) if BHEL decides for that instead of opening the sealed envelope/ E-Procurement Portal Price Bid, submitted by us. We have read all the guidelines of reverse auction available in tender enquiry as well as on www.bhel.com portal. We also declare that during reverse auction:

- We will submit online sealed bid less than or equal to of our envelope sealed/ E-Procurement Portal price bid already submitted to BHEL along with the offer.

We also declare to submit the "Process Compliance Form" (to the designated service provider) as well as "Online Sealed Bid" in the Reverse Auction, in case BHEL decides to go for that.

Yours Faithfully,

(Signature, Date & Seal of Authorized Representative of the Bidder)

Date:

ANNEXURE-7

UNDERTAKING

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub: Declaration for not being under Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR

Ref: NIT/Tender Specification No: **BHE/PW/PUR/BWT6-LP PIPING/2230**

We, _____ declare that we are not under Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR, which will render us ineligible for participation in this tender.

Yours Faithfully,

(Signature, Date & Seal of Authorized Representative of the Bidder)

Date:

2230

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

CONTENTS

1. Project Information

The brief information of project is given below:

1.0	**Project Title**	
1.1	Project Name	1x660MW Bhusawal Thermal Power Station, Unit-6
1.2	Rating/Plant Capacity	1x660MW
1.3	Owner	Maharashtra State Power Generation Co. Ltd. (MAHAGENCO)
2.0	**Location and approaches**	
2.1	Plant Site Location	At-Deepnagar, Bhusawal, District-Jalgaon, Maharashtra State
2.2	Location Co-ordinate	75°51'10''East/21°02'30''North
2.3	Nearest Town/City	Bhusawal– 8Kms, Jalgaon- 30Kms, Dhule-115Kms
2.4	State Capitol	Mumbai
2.5	Nearest Railway Station	Bhusawal Junction– 8Kms
2.6	Nearest Airport	Aurangabad–170Kms, Mumbai–461Kms
2.7	Nearest Seaport	Mumbai–461Kms
2.8	Nearest Road Access	NH-6 (Mumbai-Nagpur Highway)
3.0	**Meteorological conditions**	
3.1	Site Elevation	210M above MSL
3.2	Ambient Temperature	
a	Mean of Daily Maximum Temperature	48.25°C (During May)
b	Mean of Daily Minimum Temperature	18°C (During January)
c	Wet Bulb Temperature	27°C (Maximum)
3.3	Annual Rainfall	112mm average annually
3.4	Wind Speed	0 to 39 Km/Hr
3.5	Wind Direction	East North East to West South West
3.6	Seismic Zone	Zone III as per IS:1893
4.0	**Plant Input Sources**	
4.1	Source of Coal	Machaakata Coal blocks in Orissa
4.2	Source of Water	Ozerkheda Reservoir 18Km from Site
4.3	Plant Land Area	108.94 Hectors near existing TPS
4.4	Ash Disposal Area	Ash Bund is at Velhala 12Kms from site

The Bidder shall visit site and get acquainted himself with the conditions prevailing at site before submission of the bid. The information given here in under are for general guidance and shall not be contractually binding on BHEL/ Owner. All relevant site data/information as may be necessary shall have to be obtained/ collected by the Bidder

2.0 SCOPE OF WORK

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

2.1 The scope of work for the package as follows:

Handling at site stores / storage yard, transporting to site, inspection, preassembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer for, **LP piping and its associated items, CW & ACW water system, Fire protection system,** Valves, Fittings, Hangers & Supports and Insulation of 1x660MW, Unit-6, Bhusawal TPS, Bhusawal.

2.2 The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipments at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, grinding, radiography, LPI/ MPI/ UT testing wherever needed, heat treatment, carrying out air tightness test by soap solution / kerosene, hydraulic test, steam / air blowing, light up, chemical cleaning, passivation, steam blowing and safety valve floating including inter connection of all the termination points, erection and dismantling of all temporary piping, valves, pumps, tanks etc., required for the above operations, all pre-commissioning tests, commissioning and trial runs of; LP piping and its associated items /systems, CW & ACW water system, Fire protection system, Valves, Fittings, Hangers and Supports, Insulation and Supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating of 1x660MW, Unit-6 Bhusawal Project.

- The scope of works also include Erection, testing and Commissioning of Pipings, Fire protection systems including pipes, valves, flanges, fittings, fasteners etc. as required, making the system complete in all respects.

- 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 and other testing of piping installations, above and below ground.

- Installation of all valves and other miscellaneous in line / on line items is also included. Open ends of piping valves shall be protected with wooden blanking plates securely fastened with wire or by plastic insert plugs.
- 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.
- Fabrication and installation, setting and commissioning of pipe supports, guides, anchors and spring supports as required.
- Obtain clearances and approvals from all applicable statutory / Government agencies e.g. IBR, etc.
- Installation of any necessary blind or additional valves to isolate lines to facilitate phased commissioning and start-up.
- Testing of welds / flanged joints.
- 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.
- Preparation of As-Built Drawings.
- Completion of punch points and assistance for handing over of unit to customer. Execution of all Mechanical jobs identified during OWNER Technical audits, check list of pre-commissioning and commissioning. Erection of additional supports required to restrain pipe movement avoiding interference with nearby structural / piping.
- Unit trial operation of equipment, systems of Unit as a whole, resolving any deficiencies observed and handing over of Unit.
- Assistance during PG testing of main equipment along with all auxiliaries, Supply of Manpower during PG Test for installing of Temp and Pressure gauge Sensors, Mounting of thermo-wells etc.

2.3 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.

2.4 The PGMA wise breakup of LP piping and its associated items /systems, CW & ACW water system, Fire protection system, Valves, Fittings, Hangers and Supports, Insulation etc. are indicated in the relevant chapters of this tender specification, but the contractor is required to erect actual tonnage which may be necessary to complete the work in all respects as detailed in the tender specifications, for which payments shall be released on finally settled rates. The weights and dimensions of material shown are approximate and are liable to vary. No increase in quoted / accepted rates / prices shall be allowed due to change in weights and dimensions of the equipment / materials.

2.5 The weights given in the Chapter-IX "ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK (BOQ)"are approximate and these are subject to change as per site conditions.

2.6 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.

2.7 It shall be specially noted that, the contractor may have to work round the clock (24x7) to achieve the completion schedules / plans / targets during the entire course of erection, testing and commissioning works, which may involve payment of considerable overtime. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including labours, engineers / supervisors, T&Ps etc.

2.8 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, welding, 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.

2.9 All terminal connections for equipment & piping covered in this specification. Installation of fittings, thermowells/thermo couples etc. required for successful completion of Performance Guarantee Test. All assistance of issue of materials, return after PG test, assistance during PG test is in the scope of vendor. System Isolation, flushing of root valves etc. during PG test is in the scope of vendor.

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

2.11 Necessary permits, certificates and licenses from statutory authority (as applicable). Contractor shall be responsible for all necessary liasioning work with Statutory Authority towards the certification of installation / works. All incidental expenses shall be borne by Contractor. BHEL/ BHEL's Customer shall be providing technical assistance, drawing & document for submission to Statutory Authority. Contractor shall provide all logistics services in this regard. All registration/statutory inspection fees required under statutory laws/permits/approvals and/or licenses during construction phase may have to be paid by contractor, same shall be reimbursed to Contractor by BHEL/BHEL customer. All other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor‟s Welders/Electricians qualification tests etc. (Refer clause 2.8.6 of GCC).

2.12 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.

2.13 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, synchronization etc., are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

2.14 The storage yard is located inside the Main Plant Boundary at a distance of approximately 1-2 KM from the location of Boiler area. All other materials have to be transported from storage yard to construction area by the contractor at his own cost.

2.15 During the course of erection, testing and commissioning, certain rework / modification / rectification / repairs / fabrication etc will be necessary on account of feedback/revision from various relevant sources, and also on account of design discrepancies/ alterations, manufacturing defects, site operations/ maintenance requirements. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repairs etc promptly and expeditiously. Daily

log sheets indicating the details of work carried out, man-hours etc shall be maintained by the contractor and got signed by BHEL engineer every day. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.

2.16 The scope of work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management and green belt management. The contractor should ensure successful and timely completion of the work. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.

2.17 Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The erection manuals for piping and structures etc., which are available with BHEL site office are to be referred for compliance and guidance before taking up the work. Any failure to comply with the above might lead to rework and the cost for the same shall be borne by the contractor only. BHEL engineer, depending upon the availability of materials, fronts etc., will decide the sequence of erection and methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs or for any reason whatsoever.

2.18 **Broad scope of system covered under scope of work;** Piping and associated all types of fittings, Hanger & supports, expansion bellows, etc., Flow measuring devices / sensors like nozzles, orifice plates, dosing system etc., Air and moisture traps, Air release valves, Safety relief valves, Butterfly valves, Expansion joints, Valves – with Manual, Electrical and Pneumatic operated actuators.

2.19 **The area of work covers, but not limited to the systems;** Auxiliary cooling water system, Service water system, Instrument Air System, Main circulating water piping (mostly underground), Aux. cooling water piping, ECW piping, Raw water piping, Intake water piping (mostly underground), Plant water piping, Drinking water piping, Demineralized water piping, Water based fire protection system, Hydrant & spray system, Medium velocity water spray system, High velocity water spray system, Inert gas system, Foam based fire protection system etc, associated pipings, tanks drains & vents, etc.

Any other piping system required to make the Low Pressure (LP) piping systems complete in all respect in the area of Boiler & aux system; TG & aux systems, Condensate system; Service water system, Raw water system; Pre water treatment; DM water system; Cooling water system; DM/ Emergency DM water cooling system; Fire protection and detection system; Miscellaneous piping system etc

The material range from MS, GI, CS, SS, PVC etc., the connection are welded, flanged or threaded as per system and drawings. The valves are operated -manual, electrical or pneumatic or hydraulic. The valves may be supplied either mounted with or without actuator. If supplied separately, the actuator is to be assembled to the valve at site during erection.

The erection/commissioning of LP piping system, CW & ACW system and fire protection system has to be completed in all respects by the contractor. It may also be required to erect Valves/control valves/Bellows/ steam-traps, orifice, flow nozzles, fittings, Hanger & Supports etc. of PEM/Piping Centre/Trichy/Bhopal/PESD etc scope supply for completion of the system, with no extra cost to BHEL.

Note:

a. The 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.
b. 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.
c. The welding process, weld joint and material specification may change to suit site requirement.
d. The list is furnished only for estimation purpose. The contractor is not entitled for any additional payment even if there is any increase in quantum of welding.
e. The contractor shall weld the joints of site routing piping as per site requirement, no extra payment shall be made for such additional joints.
f. Access shall be provided by the contractor for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained

2.20 Supply and application of final paining, wrapping and coating.

- The scope includes the supply and application of final paining for the systems/items/components covered in the entire scope of work including supply of primer, paints and associated consumables.

- The scope includes; Supply and application of Coating & Wrapping as underground protection to the buried pipes is covered under this scope work.

In case any shop painted structure/component is required to be repainted due to the reasons attributable to the contractor such as Mis-handling, damage during erection process, other reasons incidental to the work etc, such touch-up painting/re-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.

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner.
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Fire fighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labour colony (as per availability)		Yes	
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	**Electricity For construction purposes**			
a	Single point source (of Voltage 415 V**,** A.C.,3 Phase , 50 Hz)	Yes		FREE (however any taxes, duties, levy etc. as charged by customer, shall be paid by contractor.) At a distance of 1000 M from site (Distance is only tentative, it may vary up-to an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	

Sl.No	Description PART I	Scope / to be taken care by BHEL	 Bidder	*Remarks*
3.2.2	**Electricity for the office, stores, canteen etc of the bidder**			
a	Single point source	Yes		FREE (however any taxes, duties, levy etc. as charged by customer, shall be paid by contractor.) At a distance of 1000 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	**Electricity for living accommodation of the bidder's staff, engineers, supervisors etc**		YES	
a	Single point source		**Yes**	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	**WATER SUPPLY**			
3.3.1	**For construction purposes:**			
a	Making the water available at single point	**Yes**		FREE (however any taxes, duties, levy etc. as charged by customer, shall be paid by contractor.) At a distance of 1000 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	**Water supply for bidder's office, stores, canteen etc.**			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	Making the water available at single point	Yes		FREE (however any taxes, duties, levy etc. as charged by customer, shall be paid by contractor.) At a distance of 1000 M from site (Distance is only estimated, it may vary upto an extent depending on site condition)
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	**Water supply for Living Purpose**			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	**LIGHTING**			
a.	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Telephone, fax, internet, wi-fi, e-mail services etc		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		**Yes**	

Sl.No	Description PART I	Scope / to be taken care by BHEL	 Bidder	*Remarks*
a	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc		Yes	
b	Installation of above system and operation & maintenance of the same		Yes	
c	Supply of the all the consumables for the above system during the contract period		Yes	
3.7.0	**Demobilization of all the above facilities**		**YES**	
3.8.1	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	
3.8.2	**Other**			
a	Adequate water less urinal for both male & female and toilet facilities		Yes	

Sl. No	Description PART II	Scope / to be taken care by BHEL	 Bidder	Remarks
3.9	**ERECTION FACILITIES**			
3.9.1	**Engineering works for construction:**	Yes		
a	Providing the erection drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes	Yes	In consultation with BHEL
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
d	Shipping lists etc for reference and planning the activities	Yes		In consultation with BHEL

Sl. No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.9	**ERECTION FACILITIES**			
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on SL No. e		Yes	In consultation with BHEL
h	Daily erection / work plan based on SL No. g		Yes	In consultation with BHEL
i	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	
k	Arranging the materials required for preassembly		Yes	

3.10 ELECTRICITY:

3.10.1 The construction power (415V) will be provided at a single point for construction purpose only at free of any charges and the further distribution is to be arranged by the bidder at his cost. Construction power shall be provided from the nearest Substation / tapping point at a distance of approx.1000 M from site. The distance is only estimated, it may vary upto an extent depending on site condition.

3.10.2 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.

3.10.3 Provision of distribution of electrical power from the given single central common point to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.

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

3.10.5 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.

3.10.6 Although the Electricity is free for construction, the same shall be used sparingly. Taxes, duties, levy etc. as charged by MSPGCL, shall be paid by contractor, if any. Details of Electricity units consumed shall be submitted to BHEL office every month for records.

3.10.7 The MSPGCL tariff and tax may vary from time to time. The required Energy meter for measuring the consumption shall be provided and installed by the contractor. Any dispute regarding consumption, the BHEL engineer's decision shall be final & binding to the contractor. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc.

3.10.8 The required energy meter for measuring power consumption shall be arranged by the contractor and taken care by the contractor.

3.10.9 Contractor has to make his own arrangements for his electricity requirement for his labour colony at his cost.

3.10.10 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

3.11 CONSTRUCTION WATER

3.11.1 The construction water will be provided at a single point for construction purpose only, at free of any charges. The further distribution is to be arranged by the bidder at his cost. Construction water shall be provided at a distance of 1000 M from site. Distance is only estimated, it may vary upto an extent depending on site condition.

3.11.2 The required water meter for measuring the consumption shall be provided and installed by the contractor. All materials required for further distribution of water like pipes, pumps and accessories, tanks etc shall be arranged by the contractor at their cost. BHEL is not responsible for any loss or damage to the contractor's equipment due to any reason. Any dispute regarding water consumption and distribution, the BHEL engineer decision will be final and binding.

3.11.3 Although the construction water is free, the same shall be used sparingly. Taxes, duties, levy etc. as charged by MSPGCL, shall be paid by contractor, if any. Any duty, deposit involved in getting the Water shall be borne by the bidder

3.11.4 In case of non-availability of water, the contractor shall make his own arrangements of water suitable for construction purpose to have uninterrupted work. No separate payment shall be made, for any contingency water arrangement made by contractor, due to delay / failure for

providing water supply. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

3.12 POTABLE/DRINKING WATER

3.12.1 The potable/drinking water will be provided at a single point at free of any charges. The further distribution is to be arranged by the bidder at his cost. potable/drinking water shall be provided at a distance of 1000 M from site. Distance is only estimated, it may vary upto an extent depending on site condition.

3.12.2 All materials required for further distribution of water like pipes, pumps and accessories, tanks etc shall be arranged by the contractor at their cost. BHEL is not responsible for any loss or damage to the contractor's equipment due to any reason. Any dispute regarding water consumption and distribution, the BHEL engineer decision will be final and binding.

3.12.3 Although the potable/drinking water is free, the same shall be used sparingly. Taxes, duties, levy etc. as charged by MSPGCL, shall be paid by contractor, if any. Any duty, deposit involved in getting the Water shall be borne by the bidder

3.12.4 In case of non-availability of water, the contractor shall make his own arrangements of water suitable for drinking purpose to have uninterrupted work. No separate payment shall be made, for any contingency water arrangement made by contractor, due to delay / failure for providing water supply. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

3.13 ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM (SCMS):

3.13.1 The bidder will have to supply and install 02 Nos. of PCs, 01 printer and accessories along with one operator per PC with power backup, for the online material management system, reporting of daily progress, billing and other similar activities pertaining to contractor's scope of work. PCs & printers are to be installed at places as per instruction of BHEL Engineer.

Computers shall have minimum configuration multimedia PC work station Core i3/i5,1 GHZ or above, 320 GB HDD, 4 GB RAM, 100 MBPS LAN card of DELL/HP/ASUS or equivalent make with window 10 O/S with required accessories like mouse, keyboard, UPS and required software like MS Office 2010 Professional, AutoCAD 2011, ADOBE PDF CREATOR (version 8.0) with one laser jet printer compatible for A4 and A3 size printing (ink/ cartridge for which to be supplied as and when required, (the consumption may be assumed as 1 cartridge per month).

3.13.2 These computers/ printers & accessories shall remain contractor's property/ ownership for all legal/technical purposes. However, contractor will be allowed to take out the same after completion of the site works as per instruction of BHEL Engineer.

3.14 CONSUMABLES:

3.14.1 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.

3.14.2 All the required electrodes (in his scope) as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding, suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables. BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / brand etc.

3.14.3 Only TIG welding wires for CS, AS & SS welding will be supplied by BHEL free of cost for Piping systems, as provided by manufacturing units. All other electrodes including stainless steel electrodes required for shall be arranged by the contractor at his cost. However BHEL will provide imported electrodes as provided by manufacturing units. The bidder shall use the Customer approved quality welding electrodes only. The utilization of the TIG welding wires issued by BHEL shall be duly accounted for exercising maximum care and ensuring economical usage for minimum wastage. If during erection, it is found that the consumption of filler wire is more than the actual requirement due to improper usage, the cost for the additional quantity so consumed shall be recovered from the contractor.

3.14.4 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.

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

Note: List of approved vendors attached in: Chapter-XXII Approved welding electrode supplier

3.15 MATERIAL SUPPLY:

BHEL will supply the materials / equipments indicated in the weight schedule from their respective manufacturing units which are to be executed / incorporated in the permanent system. In addition the material such as lube oil, grease required for commissioning the erected equipments and chemicals required for chemical cleaning of equipments will be supplied free of cost by BHEL.

3.16 LIGHTING FACILITY:

Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre assembly yard and contractor's material storage area etc. at his cost.

3.17 GASES:

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

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

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

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

3.18 ELECTRODES SUPPLY AND STORAGE

3.18.1 The bidder shall use the BHEL / Customer approved quality welding electrodes only.

3.18.2 It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.

3.18.3 Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate.

3.18.4 Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.

3.18.5 All low hydrogen electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C - 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost.

3.18.6 In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bills

at market value plus departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.

3.18.7 BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

3.19 OTHER FACILITIES

3.19.1 Adequate water less urinals (male & female both) shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas of works like boiler, ESP, FGD, Critical Piping etc, with proper disposal arrangement.

3.19.2 Vendors have to comply requirements of HSE & Statutory requirement in line with BHEL HSE plan, MSPGCL Safety requirement, Maharashtra/Central statutory requirement.

3.19.3 Vendors have to arrange labour rest sheds, drinking water facility, toilets, canteen facility as per local labour act/BOCW act. Maintaining hygiene and disposal of debris, scraps, canteen items and area cleaning is included in vendor's scope.

3.19.4 Agency has to arrange trained scaffolding experts with accreditation from statutory agencies with proper experience and they will issue fitness certificates for safe use. Such kind of qualified scaffolding experts will vary as per job requirement. At the same time, training has to be given by these experts at regular intervals for their own workers for increasing no. of experts.

3.19.5 Agencies HSE officers should have sufficient experience as per rule 209 of Bocw act central rule 1998. Agencies HSE officers will be part of BHEL HSE Team and they will be responsible for giving training on HSE issues in addition to normal field works and other normal site requirements.

3.19.6 Preparation of method statement, HIRA, Job Safety analysis, permit to work, Lifting plans, and all supporting documents as required for starting & continuation of work/job is in vendor's scope.

3.19.7 The bidders shall engage ambulance with driver at site within the quoted rate and also tie up with nearby healthcare centre/ hospitals for the treatment of labours.

3.19.8 First aid facilities shall be maintained by contractor at no. of working places as required as per instruction of BHEL Engineer. The basic medical facility will also be maintained by BHEL at site and the cost of the same will be proportionately recovered from BHEL subagencies/vendors working at site on monthly basis.

3.19.9 Vendor has to arrange land within his quoted rate for making labour colony. Vendors labour colony has to be maintained with proper hygiene, drinking water, bathroom water, lighting arrangement, sewerage system. These facilities are to be regularly maintained including drains, surrounding, upkeepment of labour colony. BHEL/NTPC & local statutory authorities will visit labour colony from time to time and all healthy conditions are to be maintained by vendor.

3.19.10 Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.

3.20 DEWATERING:

Contractor shall ensure at all times that the 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. All equipments/materials required for dewatering such as pumps, pipes and accessories shall be arranged by the contractor. No separate claim in this regard shall be admitted by BHEL.

3.21 SITE ORGANISATION

3.21.1 The contractor shall provide adequate staffing in the following areas in addition to the staffing requirements of execution as instructed/informed by BHEL:

i. Overall planning, monitoring & control.
ii. Quality control and quality assurance.
iii. Materials management.
iv. Safety, fire & security.
v. Industrial relations and fulfilment of labour laws and other statutory obligations.

3.21.2 The 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 construction manager having sufficient authority to take decisions at site.

The contractor should also submit to BHEL for approval a list of construction equipment, erection tools, tackle etc prior to commencement of site activities. These tools & tackles shall not be removed from site without written permission of BHEL.

4.1 The following minimum major Tools & Plants (T&P) shall be arranged by the Contractor for execution of work as per Technical Conditions of Contract of this tender within the quoted rate.

4.1.1 List of major Tools & Plants (T&P)

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	REMARKS
1.	Crawler Crane	75/80 MT	01 Nos.	Till completion of CW Piping erection.
2.	Tyre mounted mobile crane	12/14 MT	02 Nos	
3.	Tyre mounted mobile crane	18/20 MT	02 Nos	
4.	Trailer with prime mover	20/30MT	As required	As per site requirement
5.	Ultrasonic hardness testing machine (Ultrasonic contact impedance (UCI)) - 1 no	As required	As required	GE or Kraut Kramer or Microdur make or reputed branded ultrasonic hardness testing machine.
6.	Air compressor (electric/ diesel operated)	120 CFM	01 nos.	
7.	Tube expander	As required	As required	As required
8.	TIG welding set, Submerged ARC WELDING M/C, DC arc welding machine, Oxy Acetelyne Gas cutting Machine, Welding rectifiers (electrical), Welding generator (diesel operated)	As required	As required	
9.	Recordable UT test Equipment suitable to meet the requirements (KRAUTKRAMMER MODEL USN50 or EQUIVALENT)	Type USN 50 or equivalent/ up graded type	As required	As per requirement
10.	Electric operated winch machine	2/3/5/10/15 ton capacity	As Required	
11.	Filling pumps	As Required	As Required	For hydro/other tests of various systems
12.	Hydraulic test / pressurizing pump Upto 400 kg per cm2 along with accessories	As Required	As Required	
13.	Portable hardness testing equipment (Equotip or Microdur make)	As required	As per requirement	
14.	PORTABLE MAGNETIC STRUCTURE SCOPE Capacity/Specification.	As required	01 No	

4.1.1 List of major Tools & Plants (T&P)				
SN	**DESCRIPTION**	**CAPACITY (MINIMUM)**	**MINIMUM QUANTITY**	**REMARKS**
15.	PMI (Positive Material Identification)	As required	01 no.	
16.	3-phase distribution board with complete set up for drawl of construction power	As required	As required	
17.	Power cable for drawl of construction power	As required	As required	
18.	Pipe chamfering machine, Tube Cutting, Pipe cutting & beveling machines etc	As required	As required	
19.	Electro-hydraulic pipe bending machine	Up to 2" nb and 12 mm thick pipes	As required	
20.	Equipment for carrying out preheating, post-heating, radiography, and other NDT test like LPI/MPI etc along with consumables.	As required	As required	
21.	Hydraulic pipe bending machine (manual)	For bending of pipes up to 50 mm nb size	As required	
22.	Chain pulley blocks of various & Suitable capacities	As required	As Required	
23.	Baking oven, holding oven with thermostat &temperature gauge and portable oven for welding electrodes	As required	As Required	
24.	Hand winch	0.5/1.0 ton capacity	As required	
25.	Scaffolding materials with clamps suitable for working at various heights	As required	As required	
26.	Profile making m/c for aluminium sheet cladding work	As required	As required	
27.	Nibbling m/c, Shearing m/c	As required	As required	
28.	Portable grinding m/c, Portable drilling m/c	As required	As required	
29.	Hoisting and pulley devices/pulleys	Assorted capacities	As required	
30.	Fire retardant tarpaulins	As required	As required	to protect the machined components / assembled parts drawn from BHEL before and after erection
31.	Alcometer for paint thickness checking	As required	As required	
32.	Concrete Blocks for making bed of steel structure for checking	As required	As required	

4.1.1 List of major Tools & Plants (T&P)				
SN	**DESCRIPTION**	**CAPACITY (MINIMUM)**	**MINIMUM QUANTITY**	**REMARKS**
	dimensional accuracy, configuration and minor rectification.			
33.	Wooden sleeper for material storage at site.	As required	As required	
34.	Equipment for carrying out preheating, post-heating, radiography, and other NDT test like LPI/MPI etc along with consumables.	As required	As required	
35.	Fire extinguisher	As required	As required	
36.	Hydraulic Jacks	10/20/50/100 MT	As required	
37.	Dewatering pumps with all accessories (Electrical & Diesel engine operated)	As required	As required	
38.	Various sizes of clamps/ fixtures for assembling	As required	As required	

4.1.2 List of suggestive safety Equipments/PPEs to be included in List of minimum T&P:		
SN	**DESCRIPTION**	**Capacity & Qty (Minimum)**
1.	Safety Net (Conforming IS 11057:1984) Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12mm diameter polypropylene rope (tested as per IS: 5175).Two metres length shall be provided at all four corners.	As required
2.	Fall Arrester 'Rope grab fall arrester' & anchorage line. Anchorage Line: 14mm- 16 mm diameter, three strand twisted Polyamide rope. Rope Grab fall arrester: Openable & Guided type Fall Arrestor (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope. Material: Nickel Chrome plated Steel Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN), material: Steel	As required As required As required
3.	**Horizontal life line** Stainless Steel Wire rope of 8mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end).	As required

4.1.2 List of suggestive safety Equipments/PPEs to be included in List of minimum T&P:

SN	DESCRIPTION	Capacity & Qty (Minimum)
4.	**Ladders on column** The minimum design live load on metallic ladder shall be a single concentrated load of 100 kilo grams. All rungs shall have a minimum diameter of 1.90 centimeters, and minimum clear length of rungs shall be 40.6 centimeters. The distance between rungs shall not exceed 30.5 centimeters. Each ladder shall have maximum height of 9.0metre. The ladder shall have proper fastenings for attaching it to a column using positive means such as bolt, weld or other type of fasteners.	Cumulative length of ladders is 1200 metres

4.2 MEASURING AND MONITORING DEVICES (MMD):

As per requirement to be finalized at site, shall meet the requirements as per field quality plan and other erection, testing related activities.

NOTE:

1. All above T&Ps are to be deployed by contractor as and when required as per instruction of BHEL engineer. If works gets delayed due to non-availability of above T&Ps, BHEL reserves the right to deploy the same and recover the charges thereof from the contractor as per prevailing market rate/hiring rate/BHEL internal hiring rates + Applicable overhead rates.

2. All the T&Ps required for this scope of work, except the Tools & Plants provided by BHEL are to be arranged by the contractor with in the quoted rates.

3. **Hydras are not permitted for material handling. Contractor shall deploy and use pick & carry crane of TRX or equivalent type only for the above purpose.**

4. This above list of T&Ps is only indicative and neither exhaustive nor limiting. Quantities indicated above are only the minimum required. Contractor shall deploy all necessary T&P to meet the schedules & as prescribed by BHEL engineer and required for completion of work.

5. Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work.

6. Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor‘s account.

7. Contractor has to submit the Calibration certificates of all the precision Equipement to BHEL. BHEL may ask for recalibration of the MMEs /precision equipments for ensuring quality of work. Contractor must reascertain/ recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration/ deployment.

8. Any T&Ps, Cranes, Slings, D-shackles and other lifting tackles, Trailers required for shifting of material from store to site shall be arranged by contractor over and above T&Ps/ crane provided by BHEL.

9. T&P and the mobilization shown in the above mentioned list is suggestive requirement considering parallel working in Main plant structural area. Mobilization schedule as mutually agreed at site for major T&Ps, have to be adhered to. Numbers / time of requirement will be reviewed time to time at site and contractor will provide required T&P / equipments to ensure completion of entire work within schedule / target date of completion without any additional financial implication to BHEL. Vendor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipments. Also on completion of the respective activity, demobilization of T&P in total or in part can be done with the due approval of engineer in charge. Retaining of the T&Ps during the contract period will be mutually agreed in line with construction requirement.

10. In the event of need of change of type of any of major T&Ps, approval shall be taken from BHEL Engineer in-charge prior to mobilization. The decision of Number of T&P required due to replacing the enlisted T&P as per above table, shall be taken after analyzing the production capacity and suitability of both the T&Ps.

11. The contractor shall submit the valid test certificate/calibration certificates for all the T&Ps before put into actual use at site. The certificates shall be renewed time to time as instructed by BHEL Engineer.

12. Crane operators deployed by the contractor shall have valid license for operation of cranes.

13. 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 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.

14. Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer.

15. Apart from above mentioned T&P, any additional item required for proper execution of scope of work, contractor has to arrange such T&P within quoted rate as instructed by BHEL Engineer. Deployment schedule of such T&Ps shall be maintained as per the instruction of BHEL Engineer.

16. T&P's mentioned above shall be specifically deploy as per the respective works. However, as per work requirement and availability of T&Ps the inter use in Material Handling and Mechanical works may be permitted as per the instruction of the BHEL Engineer.

17. Any of the T&Ps deployed by the contractor, will be released from site during contract period / extended period only after completion of work for which the particular T&Ps was

envisaged. The written permission shall be taken by contractor from BHEL Construction Manager for releasing the T&Ps.

18. In the eventuality of contractor not deploying cranes / abnormal down time of cranes in his scope during the period specified above, and BHEL arranges for the same [either BHEL's own cranes / hired cranes], prevailing BHEL Corporate Crane hire charges (may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed in "**Chapter XXI- BHEL T&P Hire Charges**". (Please note that these charges are as valid up to May 31, 2021 and may get revised further).

19. The loading, unloading and transportation of contractors T&Ps shall be in the scope of contractor. All necessary items such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor at his own cost.

20. The contractor has to furnish a list of Tools and plants including cranes / tractors / trailers / trucks etc. which he proposes to be deployed for this work.

21. The contractor shall arrange crane operator, diesel, petrol and other consumables required for the tools and plants, equipments etc. Preventive and routine maintenance of T & P are also to be arranged by the contractor at his cost without any delay. Required number of experienced mechanics and helpers for routine maintenance of the above cranes shall be arranged by the contractor within his quoted rate.

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

SL NO	DESCRIPTION & CAPACITY OF T&P	QUANTITY	REMARKS
1	**Cranes**	As decided by BHEL	All cranes (except Contractor scope) required for mentioned work will be arranged by BHEL as per requirement.

5.2 All the T&Ps mentioned in clause 5.1 above shall be given to contractor on sharable basis and the allotment is made by BHEL on need basis.

5.3 Contractor shall transport from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores all T&Ps mentioned in Sr no 5.1 for his use.

5.4 These cranes are owned or hired by BHEL. Operator for BHEL owned crane will be arranged by BHEL. Operators for BHEL's hired crane will be provided by the hiring agency.

5.5 Contractor shall make necessary arrangements like laying of special sleeper beds and steel plates for assembly and dismantling of heavy attachment, boom, jib etc for movement and operation of the crane. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work.
Backfilling & consolidation of the ground, if required (Area required for movement of crane), for placing crane for operation shall be done by the contractor, at his cost. Positioning of the crane is to be decided in consultation with BHEL.

5.6 Contractor shall provide the fuel and consumables for BHEL provided cranes (hired/owned) for his use. Lubricants for crane (hired/owned) shall be provided by the BHEL.

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

5.8 All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections for the BHEL issued T&Ps shall have to be arranged by the contractor at his cost.

5.9 The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to him. Necessary grout materials are to be arranged by the contractor at his cost.

5.10 The day-to-day and routine maintenance including replacement of spares for the BHEL T&Ps will be carried out by the contractor at his own cost. However, BHEL shall supply spare parts free of charges for normal wear and tear only.

5.11 Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor.

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

5.13 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 and Mobilization:

6.1 INITIAL MOBILIZATION

After receipt of fax/Email LOI, Contractor shall discuss with Project Manager / Construction Manager regarding initial mobilization. Contractor shall reach site, make his site establishment and be ready to commence the erection work within 15 days from the date of issue of Letter of Intent or as per the directions of Construction Manager/ Project Manager of BHEL. Such resources shall be progressively augmented to match the schedule of milestones and commissioning.

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

The activities for erection, testing etc. shall be started as per directions of Construction Manager of BHEL. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.1) as per requirement to commence the work of erection, testing etc. of LP piping, CW&ACW piping, Fire protection system etc progressively augment the resources to match schedule of the project.

6.2.1 The entire scope of work as detailed in the Tender Specification shall be completed within **28 (Twenty eight months)** months from the date of "Start of Contract period" at site.

6.2.2 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

6.2.3 The contractor shall have to mobilize his resources earlier than the start of contract period for preparatory work like taking over & chipping of foundations, start of preassembly, Material transportation for yard etc. The contractor shall complete all the works in the scope of this contract within the contract period. Pending points identified by the customer/BHEL during the execution of the contract are to be liquidated during the contract period itself.

6.3 COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

Erection/placement on its designated foundation / location, of the first major permanent equipment / component / column covered in the scope of these specifications, (whichever is earlier as decided by BHEL) shall be recognized as "Start of contract period". Smaller items like packer plates, shims, anchors, inserts etc. will not be considered as start of contract period. The date of Start of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy, the decision of BHEL engineer is final.
Based on the availability of civil foundations from BHEL and materials from manufacturing units, contractor may have to advance the start of erection after getting clearance from construction manager, or the start of erection may get delayed due to site condition.

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

SL No.	Milestones	Months
1	Start of erection work	(Expected Jan-20)
2	Boiler Hydro Test- drainable	31-May-2021
3	System readiness: Fire protection system for BLU	31-Jul-2021
4	System readiness: ACW system	30-Oct-2021
5	Boiler Light Up (BLU)	30-Nov-2021
6	Steam Blowing Completion	19-Feb-2022
7	System readiness: Complete readiness of Fire protection system	28-Feb-2022
8	System readiness: CW system	28-Feb-2022
9	Oil Synchronization	31-Mar-2022
10	Coal Firing and Full load operation	30-Apr-2022
11	Completion of Trial Run	31-May-2022
12	Completion of all facilities and scope of work	31-May-2022

6.4 CONTRACT PERIOD

The contract period for completion of entire work under scope of this packages shall be 28 **(Twenty Eight) months** from the "START OF CONTRACT PERIOD" as specified earlier for completion of the entire work.

6.5 PROVISION OF PENALTY IN CASE OF SLIPPAGE OF INTERMEDIATE MILESTONES:

In case of slippage of Two Major Intermediate Milestones, mentioned as M1 & M2 hereunder, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to F-14.

Milestones	Activities	To be completed by
M1	System readiness: Fire protection system for BLU	31-Jul-2021
M2	System readiness: CW system	28-Feb-2022

Note 1: Refer clause no 13.0 of 'Annexure-4 Important Information' of the NIT regarding modalities against provision of penalty in case of slippage of Intermediate Milestones.

Note 2:

1. In order to meet above schedule in general, and any other intermediate targets set, to meet customer/project schedule, contractor shall arrange & augment all necessary resources from time to time as per the instructions of BHEL.
2. In case the activities in the schedule are to be advanced, the related structural activities in the scope of the contractor are to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.
3. The contractor shall submit area-wise L3 schedule within 7 days in consultation with BHEL. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Bidder shall submit L3 schedule in MS Projects to meet the agreed project schedule covering various mile stone activities and their split up details such as mobilization, procurement of materials, fabrication & erection activities. This schedule shall also clearly indicate the interface facilities / inputs applicable in each package

7.0 Terms of Payment:

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

7.1 Progressive Payment against monthly running bills will be made up-to 85 % of the value of the erected Pro-rata as per SL no 7.1.1 to 7.1.11 of the following table.

Table: 7.1

Sl No.	Sub Packages ------->	LP piping			Insulation	Fire protection System
	Rate schedule Identifier --->	**1A- CS Piping (other than CW Piping), 1B - SS Piping**	**1D - CS Piping (CW Piping)**	**1C - Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items**	**2A- Insulation-Wool Matress, 2B- Insulation-Iron parts, 2C- Insulation-Al cladding sheets**	**3A- CS Piping (other than CW Piping), 3B - SS Piping, 3C - Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items**
I	**Pro rata payments (85%)**					
7.1.1	On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position)	15%	15%	15%	--	10%
7.1.2	Placement in position	20%	20%	25%	50%	15%
7.1.3	Alignment	15%	15%	20%	15%	10%
7.1.4	Welding/bolting/fixing	15%	15%	20%	20%	15%
7.1.5	Wrapping & coating except joint area (if not applicable, this portion to be clubbed with previous activity)	3%	5%	-	-	3%
7.1.6	Completion of non-destructive examination & stress relieving/ heat treatment (if not applicable, this portion to be clubbed with previous activity)	5%	5%	--	--	10%
7.1.7	Hangers & supports etc wherever necessary as per drg	5%	3%	--	--	5%
7.1.8	Hydraulic test/pneumatic test ((if not applicable, this portion to be clubbed with previous activity))	3%	3%	--	--	5%
7.1.9	Wrapping & coating in joint area (if not applicable, this portion to be clubbed with previous activity)	2%	2%	--	--	2%
7.1.10	Floating of lines, final adjustment of supports for cold and hot values ((if not applicable, this portion to be clubbed with previous activity)	2%	2%	5%	--	-

Sl No.	Sub Packages ------->	LP piping			Insulation	Fire protection System
7.1.11	Completion of TAC approval for Water Based Fire Protection System including Fire water Pump House –2% Hydrant Based Spray system completion - 2% Medium & Heavy velocity water Spray System - 2% Inert Gas Extinguishing System -2% Foam Based Protection system -2%	--	--	--	--	10%
	TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)	**85%**	**85%**	**85%**	**85%**	**85%**

7.2 Further 15 % payment on pro-rata basis common to all PGs of Boiler shall be released on achievement of the following stage / milestones events (as per Cl no 7.2.1 to 7.2. of the following table) for the tonnage erected.

Table 7.2

Sl No.	Sub Packages ------->	LP piping			Insulation	Fire protection System
	Rate schedule Identifier --->	**1A- CS Piping (other than CW Piping), 1B - SS Piping**	**1D - CS Piping (CW Piping)**	**1C - Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items**	**2A- Insulation-Wool Matress, 2B- Insulation-Iron parts, 2C- Insulation-Al cladding sheets**	**3A- CS Piping (other than CW Piping), 3B - SS Piping, 3C - Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items**
II	**STAGE/MILESTONE PAYMENTS (15%)**					
7.2.1	boiler hydraulic test (drainable)	2%	--	2%	--	--
7.2.2	boiler hydraulic test (non drainable)	--	--	--	--	--
7.2.3	boiler light up	1%	1%	1%	1%	1%
7.2.4	abo/chemical claening	--	--	--	--	--
7.2.5	steam blowing	--	1%	--	1%	1%
7.2.6	safety valve floating	--	--	--	--	--
7.2.7	Rolling and synchronization	1%	1%	1%	1%	1%
7.2.8	readiness for coal feeding	--	--	--	--	--
7.2.9	coal firing	1%	1%	1%	1%	1%
7.2.10	full load	1%	1%	1%	1%	1%

7.2.11	trial operation of unit	1%	2%	1%	2%	2%
7.2.12	Completion of all drains and vents to respective locations and placement of instrument sensors after steam blowing	1%	--	--	--	--
7.2.13	Painting	1%	2%	2%	2%	2%
7.2.14	Area cleaning, temporary structures cutting/removal and return of scrap	1%	1%	1%	1%	1%
7.2.15	Punch List points/pending points liquidation	2%	2%	2%	2%	2%
7.2.16	Submission of 'As Built Drawings'	1%	1%	1%	1%	1%
7.2.17	Material Reconciliation	1%	1%	1%	1%	1%
7.2.18	Completion of Contractual Obligation	1%	1%	1%	1%	1%
	TOTAL FOR STAGE/MILESTONE PAYMENTS (15%)	**15%**	**15%**	**15%**	**15%**	**15%**
	TOTAL I + II	**100%**	**100%**	**100%**	**100%**	**100%**

8.0 TAXES, DUTIES, LEVIES (Rev 13 dated 05/11/2018)

1. All taxes excluding GST, GST Cess **& BOCW** Cess **but including, Royalties, fees, license, deposits, commission, any State or Central Levy and other charges whatsoever, if any, shall be borne by you and shall not be payable extra.**

2. Any increase of the taxes excluding GST, GST Cess & BOCW **Cess**, at any stage during execution including extension of the contract shall have to be borne by the contractor. Quoted/ accepted rates/ price shall be inclusive of all such requirements. Please note that since GST on output will be paid by BHEL separately as enumerated below, your quoted rates/ price should be after considering the Input Credit under GST law at your end.

3. **GST :**
   The successful bidder shall furnish proof of GST registration .GST along with Cess (as applicable) legally leviable & payable by the successful bidder as per GST Law, shall be paid by BHEL. Hence Bidder shall not include GST along with Cess (as applicable) in their quoted price.

4. GST charged in the Tax Invoice/Debit note by the contractor shall be released separately to the contractor only after contractor files the outward supply details in GSTR-1 on GSTN portal and input tax credit of such invoice is matched with corresponding details of outward supply of the contractor and has paid the GST at the time of filing the monthly return

5. Bidder shall note that the GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred there under) wherein the 'Bill To' details will as below :-
   BHEL GSTN – As per **Annexure -1**
   NAME -- Bharat Heavy Electricals Limited
   ADDRESS – Site address

6. Bidder to immediately intimate on the day of removal of Goods (in case of any supply of goods) to BHEL along with all relevant details and a scanned copy of Tax Invoice to below email ids to enable BHEL to meet its GST related compliances :-
   Email id ---- to be intimated later on.

   In case of delay in submission of the abovementioned documents on the date of dispatch, BHEL may incur penalty /interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from the successful bidder, if such delay is not attributable to BHEL.

7. In case of raising any Supplementary Tax Invoice (Debit / Credit Note) Bidder shall issue the same containing all the details as referred to in Section 34 read with Rule 53.

8. Bidder shall note that in case GST credit is delayed/ denied to BHEL due to delayed / non receipt of goods and /or tax invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from the vendor along with interest levied / leviable on BHEL, as the case may be.

9. Bidder shall upload the Invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Bidder shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law , GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the bidder along with interest levied / leviable on BHEL.

10. Way Bill: Successful Bidder to arrange for way bill / e-waybill for any transfer of goods for the execution of the contract.

The Bidder has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit/ Way Bill, if required, shall be arranged by the contractor and BHEL will not supply any Road Permit/ Way Bill for this purpose.

11. **New taxes and duties**:-Any New taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period including extension, if the same is not attributable to you, shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.
Benefits and/or abolition of all existing taxes must be passed on to BHEL against new Taxes, if any, proposed to be introduced at a later date.

    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 must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of the price bids. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

12. For transportation work, bidder shall declare in his quotation whether he is registered under GST, if yes, whether he intends to claim GST on forward charge basis. In absence of this declaration, BHEL will proceed further with the assumption that bidder intends not to claim GST on forward charge basis. However, in case of GST registered transporter, the amount to the extent of goods and service tax will be retained till BHEL avails the credit of GST. Further, transporter shall issue tax invoice which inter alia includes gross weight of the consignment, name of the consigner and the consignee, registration number of vehicle in which the goods are transported, details of goods transported, details of place of origin and destination, GSTIN of the person liable for paying tax whether as consigner, consignee or goods transport agency, and also containing other information as mentioned under rule 46.

13. **TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills unless exemption certificate from the appropriate authority/ authorities is furnished.**

14. **TDS under GST shall be deducted at prevailing rates on applicable value from the running bills.**

15. Refer Annexure – 2 for BOCW Act & Cess Act.

ANNEXURE-1

State wise GSTIN no.s of BHEL

Sl. No	Projects under state	GSTIN
1	Andhra Pradesh	37AAACB4146P7Z8
2	Bihar	10AAACB4146P1ZU
3	Chhattisgarh	22AAACB4146P1ZP
4	Gujarat	24AAACB4146P1ZL
5	Jharkhand	20AAACB4146P5ZP
6	Madhya Pradesh	23AAACB4146P1ZN
7	Maharashtra	27AAACB4146P1ZF
8	Orissa	21AAACB4146P1ZR
9	Telangana	36AAACB4146P1ZG

ANNEXURE-2
BOCW Act & Cess Act

Bidder may please note that the sub-contractor/bidder of BHEL engaging building or construction worker in connection with building or other construction work, are required to follow the procedures enumerated below:

1. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.

2. It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities.

3. It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work.

4. It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may , by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.

5. It shall be sole responsibility of the contractor as employer to get registered every Building Worker, who is between the age of 18 to 60 years of age and who has been engaged in any building or other construction work for not less than ninety days during the preceding twelve months as Beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996.

6. It shall be sole responsibility of the contractor as employer to maintain all the registers, records, notices and submit returns under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.

7. It shall be sole responsibility of the contractor as employer to provide notice of poisoning or occupation notifiable diseases, to report of accident and dangerous occurrences to the concerned authorities under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the rules made thereunder and to make payment of all statutory payments & compensation under the Employees' Compensation Act, 1923.

8. It shall be the responsibility of the sub-contractor as employer to make payment/deposit of applicable cess amount on the extent of work involving building or construction workers engaged by the sub-contractor within a period of one month from the receipt of payment. It shall also be responsibility of the Contractor to furnish BHEL on monthly basis, Receipts/ Challans towards Deposit of the Cess

under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder along with following statistics :

(i) Number of Building Workers employed during preceding one month.
(ii) Number of Building workers registered as Beneficiary during preceding one month.
(iii) Disbursement of Wages made to the Building Workers for preceding wage month.
(iv) Remittance of Contribution of Beneficiaries made during the preceding month

9. BHEL shall reimburse the contractor the Cess amount deposited for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.

10. It shall be responsibility of the Building Worker engaged by the Contractor and registered as a beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board , within the fifteen days from such deduction.

11. Bidders may please note that though the quoted price is exclusive of BOCW (which will be reimbursed by BHEL as per sub-clause 9 above) , however, If at any point of time during the contract period, non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder is observed, BHEL reserves the right to deduct the applicable cess (1%) on the contract value and penalty (if any, imposed by Cess Authorities) from the payables on account of non-compliance.

12. The contractor shall declare to undertake any liability or claim arising out of employment of building workers and shall indemnify BHEL from all consequences / liabilities / penalties in case of non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.

BILL OF QUANTITY

Summary of Weight of BOQ under the scope:-

Sl No.	Area	Rate Schedule identifier	Approx. Weight (MT)
1	CS Piping (other than CW Piping)	1A, 3A,	5346.27
2	CS Piping (CW Piping)	1D	2774.00
3	SS Piping	1B, 3B	37.21
4	Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items	1C, 3C	351.88
5	Insulation-Wool Matress	2A	25.00
	Insulation-Iron parts	2B	3.05
	Insulation-Al cladding sheets	2C	8.00
		Total (MT)	**8545.41**

Detailed (PGMA wise) weight of BOQ applicable for this package

Unit (For reference)	PGMA	Description	Design Wt Kgs	System/Sub system	Rate schedule identifier
LP Piping					
CS Piping					
PC-WO7288	80-463	TG AUX COOLING WATER	0.000	CS Piping	1A
PC-WO7288	80-468	MAIN CIRCULATION WATER PIPING	96,000.000	CS Piping (CW Piping)	1D
PC-WO7288	80-477	SERVICE WATER PIPING	0.000	CS Piping	1A
PC-WO7288	80-478	DRINKING WATER PIPING	0.000	CS Piping	1A

PC-WO7288	80-610	SERVICE AIR-COMP SUCT AND DIS TO RECEI	0.000	CS Piping	1A
PC-WO7288	80-614	INST AIR COMP SUC AND DIS TO RECEIVER	0.000	CS Piping	1A
PC-WO7372	80-463	TG AUX COOLING WATER	2,48,000.000	CS Piping	1A
PC-WO7372	80-468	MAIN CIRCULATION WATER PIPING	26,78,000.000	CS Piping (CW Piping) (Mostly underground)	1D
PC-WO7372	80-477	SERVICE WATER PIPING	37,43,000.000	CS Piping	1A
PC-WO7372	80-478	DRINKING WATER PIPING	38,000.000	CS Piping	1A
PC-WO7372	80-610	SERVICE AIR-COMP SUCT AND DIS TO RECEI	39,000.000	CS Piping	1A
PC-WO7372	80-614	INST AIR COMP SUC AND DIS TO RECEIVER	23,000.000	CS Piping	1A
Trichy	Valves	LP piping valves	50,000.000	CS Piping	1A
PEM	Valves & traps	PEM - Valves,Traps, bellows, orifices, dosing system & other items	50,000.000	CS Piping	1A
	Misc	Misc items and equipments	1,000.000	CS Piping	1A
		Subtoal	**6966000.00**		
SS Piping					
PC-WO7288	80-412	CONDENSATE TRANSFER	0.000	SS Piping	1B
PC-WO7288	80-473	DEMINERALISED WATER SYSTEM	0.000	SS Piping	1B
PC-WO7372	80-473	DEMINERALISED WATER SYSTEM	36,000.000	SS Piping	1B
		Subtoal	**36000.00**		
Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items					
PC-WO7288	80-928	H AND S FOR BOILER LIGHT UP - TG	100.000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	1C
PC-WO7288	80-930	H AND S FOR SYNCHRONISATION - TG	100.000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	1C
PC-WO7288	80-933	H AND S FOR LP PIPING	10,000.000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	1C
PC-WO7372	80-933	H AND S FOR LP PIPING	2,04,000.000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	1C

-		Load hangers	2,500.000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	1C
		Platforms, galleries and handrails	5,000.000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	1C
		Subtoal	**221700.00**		
Butterfly valves - dia 700mm & below (Bhopal Supply)					
BPL	Butter fly Valves	DIA. 700-E-1600 X 1100 X 400, Qty-2	2620	CS Piping	1A
BPL	Butter fly Valves	DIA. 700-M-1600 X 1100 X 400, Qty-9	11790	CS Piping	1A
BPL	Butter fly Valves	DIA. 600-M-1500 X 1100 X 400, Qty-3	2475	CS Piping	1A
BPL	Butter fly Valves	DIA. 500-E-1300 X 800 X 350, Qty-3	2085	CS Piping	1A
BPL	Butter fly Valves	DIA. 500-M-1300 X 800 X 350, Qty-2	1290	CS Piping	1A
BPL	Butter fly Valves	DIA. 450-E-1300 X 800 X 350, Qty-10	4700	CS Piping	1A
BPL	Butter fly Valves	DIA. 450-M-1300 X 800 X 350, Qty-14	6230	CS Piping	1A
		Subtoal	**31190.00**		
		Total - LP piping	**7254890**		
Insulation					
Wool Matress (Mineral Wool)					
-	Wool	MINERAL WOOL MATTRESS	25000.00	Insulation	2A
		Subtoal	**25000.00**		
Iron Parts					
-	Iron parts	FIX COM FOR PPG INSULATION	3,000.000	Insulation	2B
-	Iron parts	SEALING COMPOUND FOR INSL	50.000	Insulation	2B
		Subtoal	**3050.00**		
Al Cladding					

-	Al cladding	ALUMINIUM CLADDING FOR INSULATION	8,000.000	Insulation	2C
		Subtoal	**8000.00**		
		Total - Insulation	**36050**		
Fire Protection System					
PESD	WBFPS	WBFPS			
PESD	WBFPS	Fire water PH tonnage			
PESD	WBFPS	CS Piping	50100	CS Piping	3A
PESD	WBFPS	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	13700	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	3C
PESD	WBFPS	Hydrant Spray System			
PESD	WBFPS	CS Piping	500100	CS Piping	3A
PESD	WBFPS	CS Piping (Buried and Wrapping)	165800	CS Piping (Buried and Wrapping)	3A
PESD	WBFPS	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	35000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	3C
PESD	WBFPS	Medium Velocity			
PESD	WBFPS	CS Piping	269200	CS Piping	3A
PESD	WBFPS	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	42000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	3C
PESD	WBFPS	High Velocity			
PESD	WBFPS	CS Piping	142790	CS Piping	3A
PESD	WBFPS	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	22000	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	3C
PESD	Inert gas System	Inert Gas System			
PESD	Inert gas System	CS Piping	18000	CS Piping	3A
PESD	Inert gas System	SS Piping	1210	SS Piping	3B
PESD	Inert gas	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	18300	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	3C

	System				
PESD	Foam System	Foam System			
PESD	Foam System	CS Piping	8280	CS Piping	3A
PESD	Foam System	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	4180	Hanger&Supports,tanks, vessels,panel, instru,Eqpt,Str & misc items	3C
		Total - Fire protection system	**1290660**		
		Final Total	**8581600**		

Details of Fire protection system;

PROJECT ::	**1 x 660 MW BHUSAWAL THERMAL POWER PROJECT**							**Date: 31.10.19**
CUSTOMER ::	**MAHAGENCO**							
DOC NO. / TITLE ::	**PEMC-07299 / FIRE PROTECTION SYSTEM : ERECTION BOQ FOR WATER BASED FIRE PROTECTION SYSTEM**							**REVISION NO:: 01**
Sl.No	**SYSTEM DESCRIPTION**					**SUMMARY OF ERECTION WORKS TO BE CARRIED OUT AT SITE**	**Area**	**Rate Schedule identifier**
I	**FIRE WATER PUMP HOUSE EQUIPMENT**	**Unit**	**Qty**	**Mass/ Mtr or Unit Weight in Kgs**	**Total Mass (T) (Tonnes)**			

10	Control Panel for Booster Pumps	Sets	1	1,000	1.0	- Installation of Panel as per approved FWPH - Power supplies to panel from nearest feeder - Hooking up of the panel with FDA system	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
11	Batter & battery Charger for diesel engine of Booster Pump.	Sets	2	500.0	1.0		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
12	Hydro-pneumatic Tank of Cap. 18 Cu. Mtrs.	Nos.	1	10,000	10.0	' -Installing the tank on foundation and alligning it - Grouting & bolt fixation. - Installing all accessories and instrumentation. - Dry Weight indicated	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

13	Air Compressors Cap. 25M3 at 12.5 Kg/cm2 (Main and Stand-by)	Nos.	2	400.0	0.8	-Shifting the air compressor to desired location. -Installing the tank on foundation and alligning it - Grouting & bolt fixation. - Installing all accessories and instrumentation. - Dry Weight indicated	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
14	Relay based panel for Fire fighting system	No.	1	300.0	0.3	- Shifting the panel to desired location. -Install the panel on foundation if its floor mounted or attach the panel to wall through anchors, is its wall mounted. - Grouting & bolt fixation, if floor mouted, and anchor fasteners fixation on wall, if wall mounted. - Connecting the cables as per approved datasheet.	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
15	Diesel Engine cum battery charger panel	Nos	2	300.0	0.6		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
18	Pressure Relief Valve	Nos.	2			As per Standard Practices	CS Piping	3A
19	Gate Valve - Isolation						CS Piping	3A

i	C.I. Gate Valve - 600 NB	Nos.	2	1,250	2.50	As per Standard Practices	CS Piping	3A
ii	C.I. Gate Valve - 300 NB	Nos.	5	300	1.50	As per Standard Practices	CS Piping	3A
iii	C.I. Gate Valve - 250 NB	Nos.	10	201	2.01	As per Standard Practices	CS Piping	3A
iv	C.I. Gate Valve - 200 NB	Nos.	2	127	0.25	As per Standard Practices	CS Piping	3A
v	C.I. Gate Valve - 80 NB	Nos.	6	28	0.17	As per Standard Practices	CS Piping	3A
vi	C.I. Gate Valve - 150 NB	Nos.	-	78	-.00	As per Standard Practices	CS Piping	3A
vii	C.I. Gate Valve - 100 NB	Nos.	2	44	0.09	As per Standard Practices	CS Piping	3A
viii	C.I. Gate Valve - 50 NB	Nos.	2	16	0.03	As per Standard Practices	CS Piping	3A
ix	C.I. Gate Valve - 25 NB	Nos.	2	10	0.02	As per Standard Practices	CS Piping	3A
20	Cast steel Non-return Valves - Swing Check type					As per Standard Practices	CS Piping	3A
i	C.I. Non-return Valve - 80 NB	Nos.	4	30	0.12	As per Standard Practices	CS Piping	3A
ii	C.I. Non-return Valve - 25 NB	Nos.	2	10	0.02	As per Standard Practices	CS Piping	3A
	C.I. Non-return Valve - 250 NB	Nos.	5	200	1.00		CS Piping	3A
21	2500 NB Basket Stainer in M.S. Contruction	Nos.	2	150	0.30	As per Standard Practices	CS Piping	3A
22	Piping - ERW, MS Black as per IS:1239 Part I/IS:3589						CS Piping	3A

i	M.S. Pipe - 600 NB	Mtrs.	120	140.8	15.6	- Installation of insert plate above the pedestals, invlolving grouting and bolting. - Placement of pipe above the Insert plate. - Fixing Pipes through U-Clamps or any other fxing methods, on pedestals. - Welding of Pipes as per Welding procedure specification. - Carrying out hydrotest for Pipes	CS Piping	3A
ii	M.S. Pipe - 300 NB	Mtrs.	36	50.0	1.8	- Same as above	CS Piping	3A
iii	M.S. Pipe - 250 NB	Mtrs.	60	41.1	2.5	- Same as above	CS Piping	3A
iv	M.S. Pipe - 400 NB	Mtrs.	40	78.5	3.1	- Same as above	CS Piping	3A
v	M.S. Pipe - 150 NB	Mtrs.	120	21.3	2.6	- Same as above	CS Piping	3A
vi	M.S. Pipe - 100 NB	Mtrs.	45	14.5	0.7	- Same as above	CS Piping	3A
vii	M.S. Pipe - 80 NB	Mtrs.	65	9.9	0.6	- Same as above	CS Piping	3A
viii	M.S. Pipe - 50 NB	Mtrs.	30	4.5	0.1	- Same as above	CS Piping	3A
ix	M.S. Pipe - 25 NB	Mtrs.	40	2.9	0.1	- Same as above	CS Piping	3A
23	Pipe Fittings & Flanges ,Primer and Paint with other accesorries to complete the system.	LOT	1	15,000.0	15.0	Covered in SL.No V and VI	CS Piping	3A
24	Paint Material					ThePaint material shall be in the scope of bidder		
	FIRE WATER PUMP HOUSE				63.8			

	TONNAGE OF MTRL.							
II	**Hydrant & Spray System Pipes**	**Unit**	**Qty**	**Mass/ Mtr**	**Total Mass (T) (Tonnes)**			
1	**UG Pipes:: Pipes upto 150 NB IS:1239 Part-I and above 150 NB IS:3589**							
i	250 NB	Mtrs	650	41.4	26.9	- Cleaning of trenches and compacting the soil to desired depth and width, if pipe not laid in trenches. - Bedding of trenches are done sunsequent to excavating works. - Wrapping and coating of Pipe strictly as per submitted procedures. - Fixing Pipes through U-Clamps or any other fxing methods, once pipes are laid on insert plates. - Welding of Pipes as per Welding procedure specification. - Carrying out hydrotest for Pipes	CS PIPING (BURIED & WRAPPING)	3A
ii	200 NB	Mtrs	2500	33.1	82.8		CS PIPING (BURIED & WRAPPING)	3A
iii	150 NB	Mtrs	2200	21.3	46.9		CS PIPING (BURIED & WRAPPING)	3A
iv	100 NB	Mtrs	500	14.5	7.3		CS PIPING (BURIED & WRAPPING)	3A
v	80 NB	Mtrs	200	9.9	2.0		CS PIPING (BURIED & WRAPPING)	3A
2	**AG Pipes:: Pipes upto 150 NB IS:1239 Part-I and above 150 NB IS:3589**							
i	250 NB	Mtrs	5500	41.4	227.7	- Installation of insert plate above the pedestals, invlolving	CS Piping	3A

ii	200 NB	Mtrs	3500	33.1	115.9	grouting and bolting. - Placement of pipe above the Insert plate. - Fixing Pipes through U-Clamps or any other fxing methods, on pedestals. - Welding of Pipes as per Welding procedure specification. - Carrying out hydrotest for Pipes	CS Piping	3A
iii	150 NB	Mtrs	3500	21.3	74.6		CS Piping	3A
iv	100 NB	Mtrs	500	14.5	7.3		CS Piping	3A
v	80 NB	Mtrs	500	9.9	5.0		CS Piping	3A
3	**Water Monitor- 2500 - 2700 lpm**	Nos	38	75	2.9	- In standard practice, center line of water monitor inlet pipe line is mantained at height of 1.2 Mt from the FGL/FFL/FPL. - Accordingly, a 100 NB MS (Standpost) pipe tapoff from the main pipe is vertically drawn of desired length, by welding it to main Pipe. - An elbow is selected to suit 100 NB pipe tap-off and welded with the pipe. Elbow is welded such that, the downstream end of elbow is pointing towards the building. - Water Monitor as per approved datasheet is flanged joint to the pipe.	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

4	**Single headed 63 mm dia hydrant landing valve (conforming to IS : 5290 : 1983) with MS matching flanges**							
i	External	Nos	100	20	2.0	- In standard practice, center line of hydrant valves inlet pipe line is mantained at height of 1.2 Mt from the FGL/FFL/FPL. - Accordingly, a 80 NB MS (Standpost) pipe tapoff from the main pipe is vertically drawn of desired length, by welding it to main Pipe. - An elbow is selected to suit 80 NB pipe tap-off and welded with the pipe. Elbow is welded such that, the downstream end of elbow is pointing towards the building. - Fix the hydrant on the stand post using gaskets, bolts & nuts, with its outlet pointing towards the building wall.	CS Piping	3A

ii	Internal	Nos	60	20	1.2	- In standard practice, center line of hydrant valves inlet pipe line is mantained at height of 1.2 Mt from Stair landing or Floor Landing. - Further as per approved FEH layout, an 80 NB horizontal tapoff of desired length and from desired height of Wet riser, is drawn by welding it to Wet riser. - Fix the hydrant on hydrant valve using gaskets, bolts & nuts, with its outlet pointing away from the building wall. - A clearance of 100 mm is left between the building wall and hydrant landing inlet flange.	CS Piping	3A
5	**63 mm Branch pipe Nozzle as per IS : 903 (Internal)**							
i	External	Nos.	39	10	0.4	Kindly refer to Central Hose station Drawing for Mounting details.	CS Piping	3A

ii	Internal	Nos.	60	10	0.6	This comes mounted in the Hose box. Kindly refer Hose Box Mouting Details.	CS Piping	3A
6	**2 Nos of RRL Hose (Type - A) with couplings as per IS:636**						CS Piping	3A
i	15 Mtrs Hose Pipe	Nos.	78	15	1.2	Kindly refer to Central Hose station Drawing for Mounting details.	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	7.5 Mtrs Hose Pipe	Nos.	120	8	1.0	This comes mounted in the Hose box. Kindly refer Hose Box Mouting Details.	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
7	**Hose boxes**							
i	Hose boxes (External)	Nos.	Not Applicable				CS Piping	3A
ii	Hose boxes (Internal)	Nos.	60	5	0.3	7.5 M hose pipe (2 Nos) shall be rolled into one hose box (internal). These internal hose boxes are located in the buildings (at staircase landings).	CS Piping	3A
8	**Gate Valve - Isolation**							

i	200 NB and above	Nos	35	80	2.8	As per standard Practice.	CS Piping	3A
ii	150 NB and below	Nos	75	60	4.5	As per standard Practice.	CS Piping	3A
9	**Air release valve**	Nos	30	1	0.030	As per standard Practice.	CS Piping	3A
10	**Hume Pipes For Road crossings & rail Crossing (IS:458)**							
i	NP3 Type - 300 mm dia	Metres	1300			**The Hume pipes shall be in the scope of BHEL**		
ii	NP3 Type - 400 mm dia	Metres	270					
iii	NP4 Type - 300 mm dia	Metres	160					
iv	NP4 Type - 400 mm dia	Metres	120					
v	NP3 Type - 800 mm dia	Metres	30					
11	**Miscelleneous items for erection of piping**							
i	Insert plates	Lot	1	15,000	15.0	0.09 M2 area per Plate	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	U -Clamp	Lot	1	10,000	10.0		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
iii	Anchor fasteners	Lot	1	5,000	5.0	Approximately 2000 Nos of Anchors Fasteners will be used.	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
12	**Wrapping & Coating**	Sq. M	8,800			The Wrapping and coating material shall be procured by Bidder.		

13	**Pipe Fittings, Flanges, Studnuts & gaskets (Exact details of fitting will be furnsihed after completion of area layouts)**	Lot	1	60000	60.0		CS Piping	3A
	HYDRANT & SPRAY SYSTEM TONNAGE OF MTRL.				702.9			
III	**MEDIUM VELOCITY WATER SPRAY SYSTEM (For Conveyors, Cable Galleries, Transfer Points, Fuel Tanks, Crusher House, Wagon Tippler etc.)**	**Unit**	**Qty**	**Mass/ Mtr**	**Total Mass (T) (Tonnes)**			
1	**MS ERW Galvanized to IS:1239,Part-1, Galvanized as per IS: 4736 upto 150 NB**							
i	150 NB	Mtrs.	1334	21	28		CS Piping	3A
ii	100 NB	Mtrs.	4315	15	63		CS Piping	3A
iii	80 NB	Mtrs.	433	10	4		CS Piping	3A
iv	65 NB	Mtrs.	1333	8	11		CS Piping	3A
v	50 NB	Mtrs.	5872	6	36		CS Piping	3A
vi	40 NB	Mtrs.	6294	4	28		CS Piping	3A
vii	25 NB	Mtrs.	5000	3	15		CS Piping	3A

	200 NB	Mtrs.	100	33	3		CS Piping	3A
2	**Cast iron Rising spindle Type Gate Valve**							
i	150 NB	Nos.	26	76	2		CS Piping	3A
ii	100 NB	Nos.	120	44	5		CS Piping	3A
iii	80 NB	Nos.	2	27	0		CS Piping	3A
3	**Cast iron wafer Butterfly Valve**							
i	150 NB	Nos.	13	13	0.17		CS Piping	3A
ii	100 NB	Nos.	60	9	0.54		CS Piping	3A
iii	80 NB	Nos.	1	5	0.01		CS Piping	3A
4	**Cast iron Deluge Valve (wet pilot) complete with necessary trim, water gong**							
i	150 NB	Nos.	13	151	1.96		CS Piping	3A
ii	100 NB	Nos.	60	97	5.82		CS Piping	3A
iii	80 NB	Nos.	1	70	0.07		CS Piping	3A
5	**M.S Y- Type Strainer**							
i	150 NB	Nos.	13	40	0.52		CS Piping	3A
ii	100 NB	Nos.	60	25	1.50		CS Piping	3A
iii	80 NB	Nos.	1	20	0.02		CS Piping	3A
6	Spray Nozzle - Stainless Steel	No	6000	0.125	0.75		CS Piping	3A
7	Q.B Detector - 79 °	No	282	0.25	0.07		CS Piping	3A
8	Pressure Switch	No	90	0.25	0.02		CS Piping	3A

9	Solenoid Valve	No	74	25	1.85		CS Piping	3A
10	Local Control panel for Deluge Valve	No	74	10	0.74		CS Piping	3A
11	Limit Swicth	No	148	0.25	0.04		CS Piping	3A
13	**SS orifice plate**							
i	150 NB	No	13	2	0.03		CS Piping	3A
ii	100 NB	No	60	1.5	0.09		CS Piping	3A
iii	80 NB	No	1	1	0.00		CS Piping	3A
14	Structural Steel	Lot	1	40000	40.00		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
15	Pipe Fittings	Lot	1	45000	45.00		CS Piping	3A
16	Flanges, nut blot & gasket	Lot	1	15000	15.00		CS Piping	3A
17	Pipe clamps	Lot	1	2000	2.00		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
19	Pressure gauge	No	128	0.25	0.03		CS Piping	3A
21	**Paints and Primer**	Lot	1			The Paints and Primer shall be in the bidders scope		
	MVWS D/s OF DV - TONNAGE OF MTRL.				311.2			
IV	**HIGH VELOCITY WATER SPRAY SYSTEM (ST, SAT, UAT & UT TRANSFORMERS, BOILER BURNER, LUBE OIL CONSOLE, BFP LUBE OIL,**	**Unit**	**Qty**	**Mass/ Mtr**	**Total Mass (T) (Tonnes)**			

	TURBINE LUBE OIL)							
1	**ERW G.I. Pipe as Per IS:1239 Heavy Class**							
i	150 NB	Mtrs.	1300	21	28	Welded Joint	CS Piping	3A
ii	100 NB	Mtrs.	1300	15	19	Welded Joint	CS Piping	3A
iii	80 NB	Mtrs.	400	10	4	Welded Joint	CS Piping	3A
iv	65 NB	Mtrs.	600	8	5	Welded Joint	CS Piping	3A
v	50 NB	Mtrs.	2000	6	12	Screwed Joint/Weld Joint	CS Piping	3A
vi	40 NB	Mtrs.	900	4	4	Screwed Joint/Weld Joint	CS Piping	3A
vii	32 NB	Mtrs.	200	3	1	Screwed Joint/Weld Joint	CS Piping	3A
viii	25 NB	Mtrs.	800	3	2	Screwed Joint/Weld Joint	CS Piping	3A
2	**ERW, MS black pipe as Per IS:1239 Heavy Class**							
i	80 NB	Mtrs.	300	10	3	Welded Joint	CS Piping	3A
ii	65 NB	Mtrs.	450	8	4	Screwed Joint/Weld Joint	CS Piping	3A
iii	50 NB	Mtrs.	1200	6	7	Screwed Joint/Weld Joint	CS Piping	3A
iv	40 NB	Mtrs.	0	4	0	Screwed Joint/Weld Joint	CS Piping	3A

v	25 NB	Mtrs.	4500	3	14	Screwed Joint/Weld Joint	CS Piping	3A
3	**Cast iron Rising spindle Type Gate Valve**							
i	150 NB	Nos.	8	76	0.61		CS Piping	3A
ii	100 NB	Nos.	32	44	1.41		CS Piping	3A
iii	80 NB	No	8	27	0.22		CS Piping	3A
4	**Cast iron wafer Butterfly Valve**							
i	150 NB	Nos.	4	13	0.05		CS Piping	3A
ii	100 NB	Nos.	16	9	0.14		CS Piping	3A
iii	80 NB	No	4	5	0.02		CS Piping	3A
5	**Cast iron Deluge Valve (wet pilot) complete with necessary trim, water gong**							
i	150 NB	Nos.	4	151	0.60		CS Piping	3A
ii	100 NB	Nos.	16	97	1.55		CS Piping	3A
iii	80 NB	No	4	70	0.28		CS Piping	3A
6	**M.S Y- Type Strainer**							
i	150 NB	No	4	40	0.16		CS Piping	3A
ii	100 NB	No	16	25	0.40		CS Piping	3A
iii	80 NB	No	4	20	0.08		CS Piping	3A
7	Spray Nozzle - Stainless Steel	No	1500	0.125	0.19		CS Piping	3A
8	Q.B Detector - 79 °	No	1200				CS Piping	3A
9	Pressure Switch	No	48				CS Piping	3A

10	Solenoid Valve	No	24				CS Piping	3A
11	Local Control panel for Deluge Valve	No	24				CS Piping	3A
12	Limit Swicth	No	48				CS Piping	3A
14	**SS orifice plate**							
i	150 NB	No	4	2	0.01		CS Piping	3A
ii	100 NB	No	16	2	0.02		CS Piping	3A
iii	80 NB	No	4	2	0.01		CS Piping	3A
15	Structural Steel	Lot	1	20000	20.00	24	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
16	Pipe Fittings	Lot	1	25000	25.00	30	CS Piping	3A
17	Flanges, nut blot & gasket	Lot	1	10000	10.00	12	CS Piping	3A
18	Pipe clamps	Lot	1	2000	2.00	2.4	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
20	Pressure gauge	No	21				CS Piping	3A
	HVWS D/s OF DV - TONNAGE OF MTRL.				164.8			
WELDING DETAILS								
V	**WELD DETAILS FOR FITTINGS (Field Piping)**	**Units**	**Qty.**		**Total Weld Joints Nos.**			
1	90 ELBOW							
i	3" SCH STD - 5.4mm Thk.	No	180		**360**	Butt Weld		
ii	4" SCH STD - 6.02 mm Thk.	No	150		**300**	Butt Weld		
iii	6" SCH STD - 7.11 mm Thk.	No	165		**330**	Butt Weld		
iv	8" SCH 20 - 6.35 mm Thk.	No	85		**170**	Butt Weld		

v	10" SCH 20 - 6.35 mm Thk.	No	450		**900**	Butt Weld		
vi	16" SCH 20 - 8 mm Thk.	No	10		**20**	Butt Weld		
2	EQUAL TEE							
i	3" SCH STD - 5.4mm Thk.	No	10		**30**	Butt Weld		
ii	4" SCH STD - 6.02 mm Thk.	No	15		**45**	Butt Weld		
iii	6" SCH STD - 7.11 mm Thk.	No	55		**165**	Butt Weld		
iv	8" SCH 20 - 6.35 mm Thk.	No	10		**30**	Butt Weld		
v	10" SCH 20 - 6.35 mm Thk.	No	35		**105**	Butt Weld		
3	REDUCERS							
i	4"x3" SCH STD x STD - 6.02 x 5.49 mm thk.	No	16		**16**	Butt Weld		
ii	6"x3" SCH STD x STD - 7.11 x 5.49 mm thk.	No	30		**30**	Butt Weld		
iii	6"x4" SCH STD x STD - 7.11 x 6.02 mm thk.	No	28		**28**	Butt Weld		
iv	8"x6" SCH 20 x STD - 6.35 x 7.11 mm thk.	No	20		**20**	Butt Weld		
v	10"x6" SCH 20 x STD - 6.35 x 7.11 mm thk.	No	24		**24**	Butt Weld		
vi	10"x8"SCH 20 x 20 - 6.35 x 6.35 mm thk.	No	16		**16**	Butt Weld		
VI	**WELD DETAILS FOR FLANGES (Field Piping)**	**Units**	**Qty.**		**Total Weld Joints Nos.**			

1	FLNG SLIPON IS2062 3" CL150 B16.5 FF - 150mm thk.	No	90		**90**	Fillet Weld		
2	FLNG SLIPON IS2062 4" CL150 B16.5 FF - 150mm thk.	No	56		**56**	Fillet Weld		
3	FLNG SLIPON IS2062 6" CL150 B16.5 FF - 150mm thk.	No	35		**26**	Fillet Weld		
4	FLNG SLIPON IS2062 8" CL150 B16.5 FF - 150mm thk.	No	22		**22**	Fillet Weld		
5	FLNG SLIPON IS2062 10" CL150 B16.5 FF - 150mm thk.	No	68		**68**	Fillet Weld		
6	FLNG SLIPON IS2062 16" CL150 B16.5 FF - 150mm thk.	No	2		**2**	Fillet Weld		
7	FLNG BLIND IS2062 16" CL150 B16.5 FF - 150mm thk.	No	2		**2**	Fillet Weld		
VII	**WELD DETAILS FOR PIPES (FIELD PIPING)**	**Units**	**Qty.**		**Total Weld Joints Nos.**			
1	200 NB and above (UG Piping)	m	3500		**570**	Butt Weld		
2	150 NB and below (UG Piping)	m	2800		**530**	Butt Weld		

3	200 NB and above (AG Piping)	m	9700		**2000**	Butt Weld		
4	150 NB and below (AG Piping)	No	8300		**1700**	Butt Weld		
VIII	**WELD DETAILS FOR FWPH**	**Units**	**Qty.**		**Total Weld Joints Nos.**			
1	M.S. Pipe - 600 NB	m	85		**16**	Butt Weld		
2	M.S. Pipe - 300 NB	m	50		**10**	Butt Weld		
3	M.S. Pipe - 250 NB	m	50		**10**	Butt Weld		
4	M.S. Pipe - 450 NB	m	50		**10**	Butt Weld		
5	M.S. Pipe - 150 NB	m	75		**15**	Butt Weld		
6	M.S. Pipe - 100 NB	m	20		**4**	Butt Weld		
7	M.S. Pipe - 80 NB	m	20		**4**	Butt Weld		
8	M.S. Pipe - 50 NB	m	15		**3**	Butt Weld		
9	M.S. Pipe - 25 NB	m	40		**8**	Butt Weld		
IX	**WELD DETAILS FOR WATER MONITOR**	**Units**	**Qty.**		**Total Weld Joints Nos.**			
1	Water Monitor	No	38		**38**	Fillet Weld		
X	**WELD DETAILS FOR GATE VALVES (FIELD PIPING)**	**Units**	**Qty.**		**Total Weld Joints Nos.**			
1	200 NB and above	No	48		**96**	Fillet Weld		
2	150 NB and above	No	56		**112**	Fillet Weld		

3	Air relase valve	No	20		**40**	Fillet Weld		
XI	**WELD DETAILS FOR MVWS SYSTEM**	**Units**	**Qty.**		**Total Weld Joints Nos.**			
1	**MS ERW Galvanized to IS:1239,Part-1, Galvanized as per IS: 4736 upto 150 NB**							
i	150 NB	m	40		**80**	Fillet Weld		
ii	100 NB	m	7000		**1400**	Fillet Weld		
iii	80 NB	m	450		**90**	Fillet Weld		
iv	65 NB	m	1700		**340**	Fillet Weld		
v	50 NB	m	14450		**2890**	Fillet Weld		
vi	40 NB	m	12500		**2500**	Fillet Weld		
vii	25 NB	m	9650		**1930**	Fillet Weld		
2	**M.S Y- Type Strainer**							
i	150 NB	No	35		**35**	Fillet Weld		
ii	100 NB	No	215		**215**	Fillet Weld		
iii	80 NB	No	2		**2**	Fillet Weld		
3	**SS orifice plate**							
i	150 NB	No	15		**15**	Fillet Weld		
ii	100 NB	No	180		**180**	Fillet Weld		
iii	80 NB	No	5		**5**	Fillet Weld		
XII	**WELD DETAILS FOR HVWS SYSTEM**	**Units**	**Qty.**		**Total Weld Joints Nos.**			

1	**ERW G.I. Pipe as Per IS:1239 Heavy Class**							
i	150 NB	m	400		**80**	Fillet Weld		
ii	100 NB	m	1650		**330**	Fillet Weld		
iii	80 NB	m	450		**90**	Fillet Weld		
iv	65 NB	m	675		**135**	Fillet Weld		
v	50 NB	m	2750		**550**	Fillet Weld		
vi	40 NB	m	1675		**335**	Fillet Weld		
vii	32 NB	m	750		**150**	Fillet Weld		
viii	25 NB	m	1000		**200**	Fillet Weld		
2	**ERW, MS black pipe as Per IS:1239 Heavy Class**		0					
i	80 NB	m	325		**65**	Fillet Weld		
ii	65 NB	m	850		**170**	Fillet Weld		
iii	50 NB	m	750		**150**	Fillet Weld		
iv	40 NB	m	475		**95**	Fillet Weld		
v	25 NB	m	8700		**1740**	Fillet Weld		
3	**M.S Y- Type Strainer**		0					
i	150 NB	m	30		**6**	Fillet Weld		
ii	100 NB	m	180		**36**	Fillet Weld		
XIII	**PAINTING**							
1	**Fire water Piping Above Ground Piping - MS ERW pipes - Always charged with water**							
i	Surface Prepartion by Wire brush, air blow etc.	Sq. m	10000					

ii	One Coat Red oxide Primer of 30 -35 micron DFT and 3 coats of Synthetic enamel paint of 25 micron each layer.	Sq. m	10000					
2	**G.I pipes - Normally empty but periodically charged with water**							
i	Surface Prepartion by Wire brush, air blow etc.	Sq. m	6000					
ii	One Coat Red oxide Primer of 30 -35 micron DFT and 3 coats of chlorinated rubber paint of 25 micron each layer	Sq. m	6000					
3	**Weld joints on G.I pipes**							
i	Surface Prepartion by Wire brush, air blow etc.	Sq. m	1000					
ii	One Coat Red oxide Primer of 30 -35 micron DFT and 3 coats of Zinc Silicate paint of 25 micron each layer	Sq. m	1000					
4	**Water Based FPS equipment such as hydrants, monitors,**							

	hose boxes etc.							
i	Surface Prepartion by Wire brush, air blow etc.	Sq. m	1000					
ii	One Coat Zinc Filled Epoxy of 30 -35 micron DFT and 3 coats of Aliphatic Polyurethene paint of 25 micron each layer - (shade RAL3000)(P.O Red)	Sq. m	1000					
XIV	**TESTS TO BE CONDUCTED**	**Units**	**Qty.**					
1	Hydro Test of all the lines (Charged with water) - 1.5 times of the design pressure	LOT	For 100 % Piping					
2	Radiography - 10 % of the welded joints	LOT	10 % of Butt welded Joints					
3	Holiday test - Underground piping	LOT	For 100 % Piping					
4	Flushing of all the line (Open to atmosphere)	LOT	For 100 % Piping					
5	Die Penetration test for all longitudinal & cross weldings	LOT	100 % of Fillet welded Joints					

6	Dry Film Thickness test for paint	LOT	For 100 % Piping.					
7	TAC approval - for the total system after erection	LOT	For complete System					
NOTES:								
1	Supervision of Tests to be conducted, inspection & TAC approval on the system will be in Power sector Scope of work.							
2	This document is meant for preliminary planning purpose only.							
3	The Wrapping and coating material , Paint & Primer and Hume pipes shall be procured by Region only. Same shall not be supplied by PE&SD.							
4	Construction of buildings/sheds for housing the FPS equipment is not included in this BOQ.							
5	Civil works of Fire water Pump house, booster Pump house, Foam Pump house, are not included in this Estimates.							
6	All civil works related to above ground piping including valve chambers foundations etc. is not included in this BOQ.							
7	All civil works related to interfacing works such as road crossing of pipes/trenches etc is not included in this BOQ.							
8	All civil works related to site establishment for FPS works is not included in this BOQ.							
9	Per unit mass has been taken from IS 1239/3589 standards.							
10	Any other civil works reqired for FPS is not included in this BOQ.							

DOC NO. / TITLE	**PEMC-07299 / FIRE PROTECTION SYSTEM : ERECTION BOQ FOR INERT GAS SYSTEM**							**REVISION NO. :: 00**	
Sl. No	**Detailed Description**	**Unit**	**Quantity**	**Location**	**Weight of Each unit**	**Total Weight (T)**	**SUMMARY OF ERECTION WORKS TO BE CARRIED**	**SubArea**	**Rate Schedule identifier**

					(Kgs)		OUT AT SITE		
1	Inert Gas Cylinder	Nos.	160	Cylinder room located at EL 0.0 m of Control room bldg.	80	12.8	-Receipt of cylinders at site - Safe storage at site - Erection of Cylinders in designated locations - E&C of IGES system & connection to FDA system	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
2	Discharge Hose	Nos.	160	Cylinder room located at EL 0.0 m of Control room bldg.	-	-	Part of cylinder room	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
3	Check Valve	Nos.	160		-	-			
4	Contact Pressure Gauge Unit	Nos.	135		-	-			
5	Release Unit with Solenoid, CPG & Actuator	Nos.	12		-	-			
6	Leak / Bleeder unit	Nos.	3		-	-			
7	Non Return Valve	Nos.	5		-	-			

8	Hi-flex hoses	Nos.	185		-	-			
9	Ball Valve with dual action pneumatic actuator	Nos.	6		-	-			
10	Pressure Relief device	Nos.	1		-	-			
11	Pressure Gauge	Nos.	1		-	-			
12	Discharge Nozzle	Nos.	130		-	-			
15	Pressure Regulator	Nos.	1		-	-			
16	Solenoid valve	Nos.	5		-	-			
17	Restrictor	Nos.	5		-	-			
18	T-Piece for Pilot Line	Nos.	135		-	-			
19	Cros for Pilot Line	Nos.	20		50	1			
20	Pipes	Mtrs.	1500		12	18	-Receipt of C.I pipes at site - Safe storage at site -Laying of pipes from cylinder room to control	CS piping	3A
i	150 NB	m	150	Control Room, Conference room & CER					
ii	100 NB	m	350						
iii	80 NB	m	320						
iv	50 NB	m	110						
v	40 NB	m	45						
vi	25 NB	m	110						
vii	20 NB	m	10						
21	Fittings	Lot	1						

22	Pipe Supports	Lot	1				room & further distribution - E&C of IGES system & connection to FDA system		
23	Cylinder Manifolds	Nos.	5						
24	6 way DV manifold	Nos.	1						
25	Pilot Line Manifold	No.	1						
26	Structural Steel for Cyl. Mounting Frame Bracket	kg	5500	Cylinder room located at EL 0.0 m of Control room bldg.		4.5		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
27	Gas Release Panel	Nos.	1				-Receipt of devices at site - Safe storage at site - Fixing of devices at designated locations as per approved drawings	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
28	Ni-Cad batteries	Nos.	1	Inert Gas Release panel					
29	Pressure Operated Switch	Nos.	10	Each Zone of IGES					
30	Pressure Relief Vent	Nos.	35	Each Zone of IGES					

31	Gas Discharge EPB & Inhibitor unit	Nos.	10	Each Zone of IGES			- Laying of cable from panel to devices and back to panel - E&C of IGES system		
32	Warning sign	Nos.	15	-	-	-			
33	Junction box	Nos.	10	-	-	-			
36	Misc. for painting, primers, other finishes etc.	Lot	1	-	-	-			
DOC NO. / TITLE	**PEMC-07299 / FIRE PROTECTION SYSTEM : ERECTION BOQ FOR FOAM SYSTEM**							**REVISION NO. :: 00**	
Sl. No	**Detailed Description**	**Unit**	**Quantity**	**Location**	**Weight of Each unit (Kgs)**	**Total Weight (T)**	**SUMMARY OF ERECTION WORKS TO BE CARRIED OUT AT SITE**	**Remarks**	**Rate Schedule identifier**
1	Foam tanks and all its accessories 6000 ltr. Capacity (1 Working + 1 standby)	Nos.	2	Foam Pump House	1000	2.00	- Receipt of Foam system material at site - Proper storage of the material - Transport	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

2	Foam Pumps with motor : 6 cum/hr @ 70 m head - Motor driven (Working)	Nos.	1	Foam Pump House	300	0.30	ation of Material from store to site -Erection of equipment in Foam PH such as pumps, Foam conc. Tanks, diesel engine etc. -Erection of field equipment & instrumentation such as S.S piping, Foam monitors, foam proportioners etc. - Erection of foam piping on fuel oil tanks -Provision of power	H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
3	Foam Pumps with engine and battery and battery charger 6 cum/hr @ 70 m head - Engine driven (standby)	Nos.	1	Foam Pump House	350	0.35		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
4	63mm Foam Hydrant valves	Nos.	6	Dyke Area	35	0.21		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
5	Ratio controller	Nos.	3	Foam Pump House	40	0.12		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
6	Foam concentrate Bypass valve	Nos.	3	Foam Pump House	55	0.17		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

7	Foam proportioners						supplies - Interfacing of system with FDA - Commissioing of the system		
i	100 NB	Nos.	2	Dyke Area	15	0.03		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	80 NB	Nos.	1	Dyke Area	12	0.01		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
8	Foam Chamber								
i	100 NB	Nos.	1	Dyke Area	25	0.03		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	65 NB	Nos.	1	Dyke Area	20	0.02		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
9	Deluge valve with accessories								
i	100 NB	Nos.	2	Dyke Area	45	0.09		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	80 NB	Nos.	1	Dyke Area	35	0.04		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
10	Gate valves								
i	150 NB	Nos.	1	Dyke Area	76	0.08		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	100 NB	Nos.	2	Dyke Area	44	0.09		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
iii	80 NB	Nos.	4	Dyke Area	27	0.11		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
iv	65 NB	Nos.	4	Dyke Area	25	0.10		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

v	50 NB	Nos.	4	Dyke Area	18	0.07		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
vi	40 NB	Nos.	3	Dyke Area	16	0.05		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
11	Solenoid operated valves	Nos.	3		10	0.03		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
12	Butterfly valves							H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
i	100 NB	Nos.	1	Dyke Area	42	0.04		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	80 NB	Nos.	2	Dyke Area	25	0.05		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
13	Y-Strainers							H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
i	100 NB	Nos.	1	FOAM PUMP HOUSE	42	0.04		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
ii	80 NB	Nos.	2	FOAM PUMP HOUSE	25	0.05		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
14	NRV(Foam concentration line ,SS)								
i	50 NB	Mtrs.	2	FOAM PUMP HOUSE	20	0.04		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

ii	40 NB	Mtrs.	3	FOAM PUMP HOUSE	18	0.05		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C
15	Foam concentrate SS pipe								
i	80 NB	Mtrs.	50	FOAM PUMP HOUSE	12	0.60		SS Piping	3B
ii	65 NB	Mtrs.	40	FOAM PUMP HOUSE	9	0.36		SS Piping	3B
iii	50 NB	Mtrs.	25	FOAM PUMP HOUSE	6	0.15		SS Piping	3B
iv	40 NB	Mtrs.	20	FOAM PUMP HOUSE	5	0.10		SS Piping	3B
16	Foam Solution GI pipe (Downstream of DV)								
i	100 NB	Mtrs.	320	Dyke Area	16	5.12		CS Piping	3A
ii	80 NB	Mtrs.	20	Dyke Area	12	0.24		CS Piping	3A
iii	65 NB	Mtrs.	80	Dyke Area	10	0.80		CS Piping	3A
17	MS ERW Pipe for							CS Piping	3A

	DV Upstream								
i	150 NB	Mtrs.	35	Dyke Area	28	0.98		CS Piping	3A
ii	100 NB	Mtrs.	30	Dyke Area	16	0.48		CS Piping	3A
iii	80 NB	Mtrs.	55	Dyke Area	12	0.66		CS Piping	3A
18	Deluge valve local control panel	Nos.	3	Dyke Area	8	0.02		H&S,tanks,vessels,panel,instru,Eqpt,Str,misc items	3C

Note to weight schedule:

1. The weights mentioned above are approximate and liable to vary as per design consideration. There will be change in PG, weight, description etc. However payments will be made for the tonnage actually erected at the quoted rate. Quantity Variation will be dealt as per clause 2.14 of General Conditions of Contract (Volume I BCD).
2. **Besides PG / PGMA indicated in the weight schedule, there is likely hood of addition product groups integral to LP piping system, CW/ACW piping system Fire protection system etc. and its aux. The quoted rate shall be applicable for such product groups also. There may be variation or addition of PGMAs, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted / accepted rate in the respective category at the discretion of BHEL.**
3. Rate Schedule Identified for PGMAs are based on envisaged material specification. Payment shall be made on the basis of material specification of actual material received and erected at site. BHEL's decision in this regard shall be final.
4. The temporary piping for pre-commissioning & commissioning activities will be issued as and where conditions in cut pieces. The scope includes cutting and edge preparation and erection as per the site condition & dismantling after the process is over and return to store with identification mark as instructed by the BHEL Engineer. The quoted rate shall be inclusive of all this.

5. The erection & dismantling of temporary piping, pumps, tanks, dummy plates & other miscellaneous equipment etc. for pre-commissioning and commissioning activities like hydraulic test, chemical cleaning, steam blowing etc. are covered in this contract and shall be carried out as a part of work. The quoted rate shall be inclusive of all this.

6. Payment for additional CONTROL VALVES / STEAM TRAPS/ FLOW NOZZLES / ORIFICES & OTHER VALVES AND FITTINGS (except temporary system valves) will be made as per the quoted / accepted tonnage rate of respective piping category in which these material is installed. i.e. LP Piping & SS piping.
7. Imported electrodes / TIG welding wires released by Manufacturing units will be supplied by BHEL. All other electrodes / TIG welding wires are to be supplied by contractor under his scope.
8. Also refer Erection welding schedule in Vol IE.

10.1 General:

Site Visit by the Bidder

10.1 **The bidder shall, prior to submitting his tender for the work, visit and examine the site of works and its surroundings at his own expense, and obtain and ascertain for himself on his own responsibility all information that may be necessary for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.**

10.2 The bidder shall satisfy themselves about the following factors:

i) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.

ii) Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.

iii) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.

iv) Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.

v) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.

vi) The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.

vii) The type of equipment and facilities needed, for and in the performance of the work:

viii) The extent of lead and lift required for the work in complete form over the entire duration of the contract, and

ix) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

10.3 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.

10.4 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 approach platforms or scaffolding works or as bed for pre-assembly works. Contractor shall arrange himself all such materials. The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel (angles, channels, beams, plates etc) for such usage as normal scope of work without any cost implication on BHEL.

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.

10.5 All the works such as cleaning, levelling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rate. Major machining work, if any, which is only to be carried out in workshops, will be arranged by BHEL.

10.6 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawls at the rate prescribed by manufacturing units.

10.7 No member of the already erected structures, platform, ladders, pipes, grills, other component and auxiliaries should be cut without specific approval of BHEL engineer. In case it is necessary to cut, the contractor shall rectify / repair in a manner acceptable to BHEL / customer without any additional cost.

10.8 No temporary supports shall be welded on the Pipes/Tubes. Welding of temporary supports, cleats, etc. on the erected structures shall be avoided. In case of absolute necessity contractor shall take prior approval from BHEL Engineer. Further, any cutting or alternation of member of the structure of platform or other equipment shall not be done without specific prior approval of BHEL Engineer.

10.9 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies / personnel on ISO 9001 Standards latest version.

10.10 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like piping, Turbine, Generator erection, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments coming under this scope. Sometimes, more than one agencies may have to work in same location. Sometimes it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

10.11 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

10.12 For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

10.13 All necessary certificates and licenses, permits & clearances to carry out this work from the respective IBR authorities/statutory/ local authorities/ Electrical Inspectorate are to be arranged by the Contractor at his cost in time to ensure smooth progress of work and render all assistance, service required in this regard.

10.14 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken inside.

10.15 Upon completion of daily work , the contractor shall remove from the vicinity of work all scrap packing materials, rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer.

10.16 During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

10.17 On completion of work, 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 expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

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

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

10.20 Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. All the work shall be carried out as per instructions of BHEL engineer. Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the Contractor. No claims for extra payment from the Contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

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

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

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

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

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

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

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

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

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

10.30 Hangers & suspensions, supports etc for pipings and other systems etc will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required within the quoted cost.

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

10.32 Layout of field routed, fine fittings, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. As such, layout of small bore piping in boiler and oil system shall be done as per the site requirement. Necessary sketch for routing these lines shall be prepared and got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines when after completion, to suit the site conditions. The contractor should absorb this cost in his quoted rate.

10.33 Erection and welding of necessary instrumentation tapping points, thermowell, thermocouple pad, metal temp pad and clamps, root valve, battery of first root valves condensing vessel, flow metering & measurement devices, and control valves etc for regular measurements and performance testing to be provided on boiler, piping & other areas in the scope are covered within the scope of this specification. The installation of all the above items will be Contractor's responsibility even if:

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

b) Items are supplied by an agency other than BHEL.

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

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

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

10.36 Actuators/drives of valves, dampers, gates, powered vanes etc may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work. Assistance for calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting to actuators coming under various groups shall be provided by contractor within the quoted rates.

10.37 All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make

all arrangements in this regard and complete the work as instructed. BHEL will provide the motorized insulation testers.

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

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

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

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

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

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

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

10.45 Gases like argon, oxygen, acetylene etc that are required for erection related activities shall be arranged by the Contractor at his cost. The supply should accompany test certificate for the batch indicating individual element 'ppm' level and overall purity level.

10.46 **It shall be the responsibility of the contractor to preserve the Pipings as per BHEL's requirement.**

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

10.48 The consumables (welding electrodes, special T&Ps etc), commissioning spares and erection material spares released in PG-MA XX-991, XX-992, XX-993, XX-988, XX-997 and other similar items are not billable. However, certain spare items when actually erected as a part of permanent equipment shall be paid as per agreed payment terms as applicable. The decision of BHEL Engineer in this regards shall be final and binding on contractor.

10.49 It is not the intent to specify herein all details of all material. Any item related to 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.

10.50 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

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

10.52 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.

10.53 Contractor shall retain all T&P / Testing instrument / Material handling equipment's etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge. The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.

10.54 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.

10.55 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

10.56 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer in- Charge.

10.57 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.

10.58 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors.

10.59 Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

10.60 Contractor at his cost shall lay all necessary temporary piping including cutting and edge preparation, 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 thermo well 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.

10.61 **SITE INSPECTION**

10.61.1 The owner / employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

10.61.2 BHEL / Customer will have full authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by customer / BHEL.

10.61.3 Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work

10.62 **UTILITY POINTS**

10.62.1 Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N2) etc., shall be indicated in the P & I diagram. Contractor to locate the utility points as advised by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with 'BILL OF MATERIAL' to BHEL for approval.

10.62.2 The utility points shall be located at convenient point to handle and to be terminated with brass / bronze valve with suitable connection for hose pipe.

10.62.3 AS BUILT DRAWING:

After successful completion, testing and commissioning of installation work, Purchaser's drawings / documents shall be updated in line with the actual work carried out and as built drawings / documents shall be submitted by the contractor as agreed for the project. Contractor shall be supplied with one extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copy with red ink all the changes / deviations / alterations etc., Carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

10.63 **DOCUMENTATION**

10.63.1 Contractor shall be supplied with two extra copies of the layout & isometrics drawings. Contractor to incorporate in one of the copy with Red ink all the changes / deviations / alterations etc. carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

10.63.2 After successful completion, testing and commissioning of installation work, as built drawings / documents if any, in line with the actual work carried out as per site routing drawing shall be submitted by the contractor as agreed for the project.

10.63.3 Other documents as specified in Technical Conditions of Contract.

10.64 **PLATFORMS, CROSSOVERS & CANOPIES**

Platforms, ladders, crossovers and canopies shall also be provided at places where it has not been shown in drawings but if felt necessary by BHEL site engineer.

Contractor has to fabricate and install canopies for all outdoor pumps and motors, actuators, lub oil units, control valves and at places as instructed by BHEL Engineer etc. Raw materials required for fabrication of platforms, ladders, crossovers and canopies shall be provided by BHEL free of cost. The work is to be carried our as per the instruction of BHEL and shall be paid as per accepted tonnage rate for "Schedule of Rates and Quantities identifier – 1C for Hanger and Supports". No separate payment for fabrication is envisaged.

10.65 **Inspection, cleaning of piping and subsequent restoration, rectification, normalization.**

During erection, pre-commissioning, commissioning, operation, Stabilisation period trial Run – Inspection and cleaning of LP Pipings and allied areas are to be carried out.
For this vendor has to arrange manpower, T&P, other resources for inspection , cleaning of ash /oil shoots and other foreign materials from Pipes & surrounding areas. For this, required scaffoldings and other resources/consumables are to be arranged by vendors for inspection, cleaning, followed by restoration/rectification/normalization. Vendor has to repeat this type of activity no. of times till handing over Unit to customer without any cost implication on BHEL treating this types of jobs as normal cope of vendor's work.

10.66 **Statutory approval**

Necessary approval for drawings, documents, load testing, certification and license of erected items by bidders has to be arranged for getting statutory fitness certificates, load test certificates, drawings/documents from Statutory agency/Third party inspectors without any extra commercial implication on BHEL treating as normal scope of work.

Contractor has to arrange sufficient manpower (fitters, electricians with supporting helpers) and T&P /other resources with sufficient testing instruments, IMTE/MMD for erection and commissioning of these systems without any extra commercial implication on BHEL treating as normal scope of work.

Weight/loads required for load test of hoists shall be provided by BHEL free of cost.

10.67 **TARIFF ADIVSORY COMMITTEE APPROVAL FOR FIRE PROTECTION SYSTEM**

BHEL Will make arrangement of TAC approved agency for accreditation of work. The contractor has to facilitate TAC for getting approval. As per TAC any modification or any rerouting of the lines, re erection of equipment should be done and same should be carried by contractor with in quoted rates. There is no extra payment will be paid.
However contractor is responsible for availing the TAC approval for Fire protection system. Also responsible for getting any necessary approval from statutory and regulatory body of TAC if any needed. All the reports from concerned statutory departments obtaining is the responsible by contractor. All these activities should be carried with in the quoted rates.

10.68 **Support for Handing Over of T&P, spares to BHEL/Customer, diversion to other BHEL Sites/Units**

Vendor shall assist in handing over of Special T&Ps for Erection/commissioning which were issued to them free of charge for returning to BHEL /Customer store.

10.69 **Dewatering**

Dewatering of Low Lying areas like pits, trenches and other low lying areas (as per scope applicability) till handing over to customer is in bidders scope for which vendor has to arrange and maintain adequate no. of Diesel & electrical pumps of suitable capacities, operators, necessary manpower with sufficient quantity of suction & discharges hoses, pipes, Clamps, cables, Electrical panels/starters, diesel, consumables without any extra commercial implication on BHEL treating as normal scope of work. Dewatering pumps will be required to run to ensure job progress is not hampered & if required pumps are to be run on round the clock basis on working days & holidays, Sundays.

10.70 **Housekeeping/Area Cleaning**

The contractor has to do area cleaning on every date on daily basis. Noncompliance of the above cleaning shall call for penal recovery of Rs.2000.00 on each instance and at the same time, cleaning of the area shall be done by BHEL at the risk and cost of the contractor. No excuses on this above account shall be entertained by BHEL on whatsoever account.
Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity. in the various work fronts.

All relevant provisions/responsibilities of contractors as mentioned in any of the chapter of this specification (same or different chapter) shall also be applicable, mutatis-mutandis, to any other chapter of this specification.

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

11.1 Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume - I BCD. Plan and review will be done as per the formats.

11.2 The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.

11.3 It is the responsibility of the contractor to provide all relevant information on a regular basis regarding progress of work, labour availability, equipment deployment, testing, etc.

11.4 Contractor is required to draw mutually agreed monthly work programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.

11.5 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.

11.6 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.

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

11.8 The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard.

11.9 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

11.10 The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details :-

a) Progress photographs in colour.

b) Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.

c) Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan.

d) Category - wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas cutters, electricians, crane operators and helpers. Data shall be split up under the work areas like Boiler (pressure parts, structures), Auxiliary boiler, Rotating machines, Electro static precipitator, Bunker structure etc.

e) Consumables report giving consumption of all types of gases and electrodes during the previous month.

f) Availability report of cranes.

g) Safety implementation report in the format.

h) Pending material and any other inputs required from BHEL for activities planned during the subsequent month.

12 FOUNDATIONS AND GROUTING

12.1 Building foundations and other necessary civil works for supporting structures, equipments etc will be provided by BHEL / Customer. The checking of dimensional accuracy, axes, elevation, levels, orientation etc, with reference to bench marks of foundations and anchor bolt pits have to be checked and logged by the Contractor as per drawing. The permanent benchmark / reference marks will have to be transferred to new locations with sufficient care to maintain the accuracy and protected / preserved with adequate care (to enable rechecking at later dates) as per BHEL instruction.

12.2 Minor adjustment of foundation level, dressing and chipping of foundation surfaces, enlarging the pockets and blue-matching (wherever required) for of all equipments as per BHEL Engineers instructions, should be done by the Contractor as part of the work. Contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations upto 30 mm for achieving proper levels will be within the scope of work/specification.

12.3 It shall be contractor's responsibility to check the various equipment foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.

12.4 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments / equipments based on the foundations including shear lug provisions / openings.

12.5 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment. Packer plates should not only be blue matched with foundation but also inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineer's instructions.

12.6 All temporary foundations and anchor points required for installing erection Equipments and winches, foundations for pumps, tanks etc are in the scope of Contractor. All building materials like cement, steel including re-enforcement bars, grits cements etc for such temporary foundations shall have to be arranged by the

Contractor within the quoted rates. All such foundations shall be demolished and normal ground conditions restored after the usage.

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

12.8 BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting / chiseling / grinding and de-burr the same. Machining of the packers, wherever necessary, shall be arranged by contractor within quoted rates.

12.9 Complete grouting of structures and equipments, including anchor/ foundation bolts, pockets, beneath base, base hollows etc, as may be applicable, is included in the scope of Contractor. Arranging all labour, building materials including cement, sand, chips, fine aggregates, ordinary portland as well as quick setting – free flow - non-shrink grout mix (e.g. conbextra gp1/gp2, Shrinkkomp or its equivalent), form work, shuttering, and any other requirements is in the Contractor's scope. Contractor shall obtain approval of BHEL for cement (Ordinary Portland as-well-as quick setting – free flow- non-shrink grout mix) prior to use. Cleaning of foundation surfaces, pocket holes and anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods are within the scope of this specification/ work.

12.10 After the grouting has finally set and cured, alignment of equipments involved shall be checked again to verify for any disturbance or any other reason. If required, de-coupling of equipments 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.

12.11 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification as advised by the Engineer or BHEL after preparing the foundation surface for grouting. The contractor has to arrange, a representative from the supplier of special cement for witnessing the grouting and other works at their cost including any miscellaneous expenditure for this activity. The certificates of the grout shall be submitted to BHEL. If necessary test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards.

12.12 **PROCEDURE FOR GROUTING:** Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per the supplier's recommendation / IS standard. Copy of those recommendations is to be submitted to BHEL for records.

12.13 CIVIL WORKS

12.13.1 The major civil works like excavation, compaction, sand filling & etc. for the buried piping identified in this contract are excluded from the scope of this work. However the widening of the trench at the weld joint area for giving free working space on each side of the pipe is included in the scope of this work. This type of incidental works are to be carried out by the contractor within quoted rates. The required coordination with civil and other agencies shall be extended by the contractor to ensure smooth execution of works.

12.13.2 CIVIL WORKS FOR ABOVE GROUND & BURIED PIPING is excluded from contractor's scope. The Civil works (Excavation, back filling, compaction, concreting, sand filling, pipe trenches, pipe pedestal, Hume pipe etc.) for buried piping & above ground piping will be under the scope of the BHEL.

12.13.3 Box cutting and excavation of earth up to the required depth and width, concreting etc., are not covered in the scope of works of this tender and shall be carried out by others on phased manner as per the site requirement and decided by BHEL site in-charge. As and when the clearance for erection of piping is given, contractor shall carry out erection work promptly without any delay and release for further civil in a phased manner as instructed be site in-charge.

12.13.4 Necessary excavation for buried pipe and backfilling with earth is excluded from the scope of bidder and shall be done by BHEL. BHEL will release excavated clear front to bidder for erection of buried pipe. Dewatering with all necessary arrangement required like pumps after handing over of excavated front is under the scope of bidder. Foxholes (cutting of earth below pipe joint) for welding will be in bidder's scope. No separate payment shall be made on account of fox holes, dewatering, as detailed above and the erection and commission rate as per price schedule of River/Canal Water piping shall be inclusive of the same. Concrete bedding / encasing is excluded from scope of work.

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 at a distance of approximately 1-2 KM from the location of Boiler area.**

13.3 Transportation of all items including ODC items from BHEL Store/Yard to Erection site shall be in the contractors scope.

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 The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.

13.7 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. However, in specific cases **"as a special case to expedite the job"** the consignment received at BHEL stores can directly be diverted to the work site, as decided by BHEL, following issuance procedure of BHEL. Such direct issues shall be as per the Challan/dispatch document/LR received with the consignment. In such cases, contractor shall do unloading of materials from trucks/lorry at their own cost.

13.8 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.

13.9 All materials issued by BHEL shall be stacked neatly, preserved, stored in the contractor's shed / work area above ground level by use of concrete or wooden sleepers. No materials shall remain on ground at any time. All concrete or wooden sleepers required for stacking the materials shall be arranged by contractor at his own cost within the quoted rates. 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.

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

13.11 The contractor shall take care of material issued by BHEL and shall protect the same from damage and weathering. The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered. Contractor has to arrange required fire proof tarpaulins to protect the machined components / assembled parts drawn from BHEL store before and after erection as required at their cost.

13.12 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.

13.13 The contractor shall in no case be entitled for any compensation on account of any delay in supply or non-supply thereof for all or any such materials. However in case of non-availability of any specific materials which delays the completion of work, such cases shall be recorded separately in monthly planning format (F 14) and shall be considered for time extension of contract.

13.14 The contractor shall solely be responsible for the safety & security of material after it is handed over and issued to contractor by the BHEL. BHEL reserves the right to recover from the contractor any loss arising out of damage/ theft or any other causes or during verification/stacking or at any time under the custody of the contractor.

13.15 Contractor shall also carryout in complete association with BHEL, the material management functions and execution like day-to-day update of materials, issued to contractor, accounting for surplus/scrap material returned etc. These functions shall also be carried out through computerized system utilizing suitable software.

Contractor shall engage experienced software personnel to associate on dedicated basis for efficient discharge of the same in time.

13.16 Open land for storage purposes shall be provided by BHEL on free of cost/as available basis. Temporary barbed wire fencing, as required, of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc wherever required off the land provided to him and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel's to safeguard all such materials in his custody. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. In case, loss of any materials for whatsoever reasons attributable to the contractor, then cost of such materials shall be recovered from the running bill payment with applicable overheads.

13.17 All surplus materials shall be returned to BHEL store. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be returned to the stores on weighment basis in consultation with BHEL Engineer and a receipt obtained for material accounting purposes. Scrap materials shall be sorted section-wise and returned separately at a place directed by BHEL Engineer within the project area. Return of such materials will not be entitled for any handling and incidental charges.

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

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

14.1 The contractor will have to follow the instructions provided in the technical manuals, drawings, and specifications provided by BHEL, to the contractor from time to time. In case of ambiguity or deviation the decision/clarification of BHEL engineer will have to be followed.

14.2 In case of any class of work for which there is no such specifications as laid down in the contract such as blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.

14.3 Contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawls at the rate prescribed by manufacturing units.

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

14.5 The temporary structures/ items welded to permanent members/pipes are to be cut and removed without any damage. Any damage so to permanent members/ pipes to be made good by the contractor at his cost.

14.6 In the case of structural members/ plates / ducts / pipes in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints at no extra cost. The contractor will have to carry out suitable minor alteration / adjustments at site, without any extra payment.

14.7 All welded joints shall be subjected to acceptance by BHEL Engineer.

14.8 Work such as minor rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc. are covered in the scope of work.

14.9 All piping items including pipes, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope. No separate payment will be made for the edge preparation of pipes, Standard fittings such as bends, Tees etc.

14.10 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. For 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.

14.11 In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.

14.12 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 instruction of BHEL Engineer. No extra cost shall be paid.

14.13 Erection of flow switches, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting from BHEL/Customer stores, transportation to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.

14.14 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.

14.15 Welding of all thermowells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads for permanent system as well as for performance guarantee test is in the scope of work.

14.16 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.

14.17 Wherever hanger and support materials are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the system on temporary supports to ensure the progress of work. 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. This work shall be carried out by contractor within quoted rate.

14.18 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 is within the quoted / accepted rate.

14.19 All the equipments /material to be taken inside the plant building shall be cleaned thoroughly before taking them inside for erection. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints and other components as per instruction of BHEL Engineer during erection within the quoted rate.

14.20 Contractor shall cut / open works if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value. During commissioning, opening of valves, changing of gaskets, attending to leakages, minor modification, and rectification works may arise. The contractor has to carry out these works at his cost by providing

required manpower with T & Ps in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning, the same has to be rectified by the contractor at his cost.

14.21 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up and preservative painting required to be done on any equipment or part during the course of erection will have to be done by the contractor. The Contractor shall arrange all paints, primer and consumables, T&P and facilities.

14.22 Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be removed / attended as per BHEL engineer.

14.23 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. All test to be carried out as per FQP (Field Quality Plan) will be in bidders scope. FQP shall be provided by BHEL during execution time.

14.24 Brief list of System / sub-system to be erected by the contractor & approximate weight of individual PGMA's and erection welding schedule number of welding joints mentioned in this Tender Specification are meant for giving general idea to the tenderer only about magnitude of the work involved. This should not be taken for billing or any other claims. All weights for such purposes will have to be taken from design documents only (shipping list). This section also gives general idea about various components to be erected with expected accuracy level. However the contractor shall get the correct details from the engineer to avoid mistakes and rework.

14.25 Preparation of preassembly bed is very much essential for preassembly of Pipes, structures, hanger and support etc. on consolidated ground and to avoid sagging and shrinking the temporary supports are to be provided. The preassembled component should have minimum three supports to avoid sagging.

14.26 Erection shall be done as per approved drawings and instruction of BHEL engineer. Log sheets are to be maintained in line with log sheets which are available with BHEL. The tolerance shall be as indicated in BHEL's erection drawings

14.27 The tightening procedures for HSFG bolts are to be obtained from BHEL at site before taking up the work. Normally it is done by turn of nut method. Torque wrenches also can be used. The bolted joints will be checked jointly by BHEL/Customer engineers for required tightness and retightening is to be done as per requirement. The tightened bolts will be marked with colour paints. Facility for random checking by torque wrench will have to be done. The required calibrated torque wrench shall be in the scope of the contractor.

14.28 Some platform materials, suspension materials etc. will be supplied in running meters. The contractor has to fabricate these materials wherever they are supplied in running meters to the required size / shape, to be welded and erect them within the quoted rates.

14.29 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 all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include;

a) Machine / flame / electric cutting, grinding, welding, radiography and stress relieving.

b) Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, 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.

14.30 Certain adjustments in length of steel /pipe/tube members may be necessary while erecting Piping items and the contractor should remove the extra lengths to suit the final layout after preparing edges afresh and adopting specified heat treatment procedures at no extra cost, wherever indicated. Depending upon the type of deviation BHEL will consider the reimbursement at man hour rates. If the drawing provides for erection allowance, then it becomes part of the work and no compensation is payable. The prepared edges in pipes shall be applied with wieldable primer as preservation and supply of the primer is in contractor scope.

14.31 Certain piping items are dispatched to site in loose condition and these are to be assembled at site before erection.

14.32 All the valves, lifting equipments, power cylinders, hanger& supports etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre-commissioning. The bearings of dampers shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract.

14.33 In case of any class of work for which there is no such specifications as laid down in the contract such us blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.

14.34 The contractor shall fabricate pipes, special bends including threading and welding wherever necessary as instructed by BHEL engineer and carry out the acid cleaning of fabricated piping. etc. The raw materials for fabrication shall be provided by BHEL free of cost.

14.35 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain a reliable and complete pipe 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 major machining or threading is involved will only be done by BHEL).

14.36 Normally valves will have prepared edges for welding. But if it becomes necessary the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like "T" pieces, weld neck flanges, reducers etc., shall be suitably matched with pipes for welding. Edge preparation becomes the part of erection work. No extra payment shall be made for this.

14.37 All valves will have to be checked, cleaned, lapped or overhauled in full or in part before erection, after chemical cleaning and during commissioning as may be necessary. Any special tools required for lapping only will be arranged by BHEL. After the hydro test/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, over hauling, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.

14.38 Adjustments like removal of ovalities in pipes and opening or closing the fabricated bends of all piping including high pressure piping to suit the layout shall be considered part of work and the contractor is required to carry out such work free of cost, as per instructions of BHEL, which shall include specific heat treatment procedures etc.

14.39 Pipes are sent in standard length and shall be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends up to NB 65 mm nominal bore will have to be fabricated at site adopting specified heat treatment procedures wherever required at no extra cost. Only cold cutting methods are to be employed for cutting of pipes and tubes irrespective of the size and material. Gas Cutting, if any, will be allowed only in CS LP piping as per instruction of BHEL Engineer.

14.40 The enclosed welding schedule in "Chapter- XXIV Erection Welding Schedule" is tentative and for reference only. The applicable welding schedules, procedure will be issued during erection of work at site.

14.41 All attachment welding including those for insulation and refractory work coming on the pipes shall have to be done by the contractor. The hooks are suitable for stud welding machines. Contractor's quoted rate shall include all these contingencies.

14.42 It is the responsibility of the contractor to do the alignment, checking, etc., if necessary, repeatedly to satisfy BHEL Engineer / customer Engineers with all the necessary tools and tackles manpower, etc., without any extra cost. The alignment will be complete only when jointly certified so, by the BHEL Engineer & customer. Also the contractor should ensure that the alignment is not disturbed afterwards.

14.43 The Contractor shall install additional platforms of permanent nature for approaching different equipments as per the site requirement and also to meet O&M requirement, which may not be indicated in drawings, shall be fabricated, assembled and erected by the contractor. 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. Works of major nature are not covered under this clause. Payment only for erected weight as certified by BHEL engineer shall be made at the rate applicable for Hangers & Supports. No payment is envisaged for fabrication of structures.

14.44 Certain extra lengths of various tubes/pipes and fabricated component etc are provided as erection allowance and the same have to be cut/adjusted to suit the site conditions and layouts or certain small lengths may have to be added for adjustments to suit the site conditions. For any mismatch while matching the joints in tubes/pipes, the cutting,

adjusting, re welding, addition spool pieces, specified heat treatment procedures should be done by the contractor to match site conditions without any ex0tra payment.

14.45 Any cutting / welding and required heat treatment and necessary NDT of hanger rods will be done by the contractor. The hangers of pipes shall be tested for even distribution of load with the help of torque wrench.

14.46 For all the site routed piping as built drawings are to be submitted by the contractor immediately after erection. Contractor shall complete all welding joints as per site routing of pipes. It is to be noted that piping for fine fittings, small bore pipes and other system shall be supplied mostly in running meters which will be erected and all joints are to be welded as per the drawings/site routing within the quoted rates by the bidder.

14.47 Before lifting the heavy components like CW Piping, ACW piping, equipments etc. soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the crane / winch. The end caps provided at shop for various stubs are to be removed during final fit up only.

1. The temporary supports to be removed prior to hydraulic test. While erecting the temporary supports, care should be taken so that they do not affect the erection of permanent supports. Tack welding of suspension rods with bearing plates to be done after final adjustment. Details for welding of bearing plates can be referred in the drawings/check list.
2. Equal loading of the hangers is to be ensured. Sequence of welding to be followed while welding higher size joints.
3. Erection of various components is taken up from top to bottom. Planning has to be done every month in consultation with the engineer. Pre assembly of pipes, tubes, hanger and supports can be done on the ground before erection, if feasible. The alignment is to be achieved. Details to be checked with engineer.
4. Pipes welding or flange joint with Pump case / volute shall be in the scope of work and it is to be done as per instruction of BHEL.
5. The required accuracy level to be ensured before welding as per drawing. Necessary radiography/NDT along with heat treatment to be done.
6. In certain cases motor alignment shall be taken only after completion of system pipe work supports. When mounted, the pump should accommodate movement in the pipe without imposing excessive loads on the casing and branches. Sufficient clearance should be available beneath the motor to facilitate removal during maintenance.
7. Before taking up the erection of pipes, tubes, pre erection checks to be carried out like width and length, damages, permanent bows if any, sponge test and completion of ground inspection as deemed. Ensure the removal of the transportation supports in each pipes prior to erection.
8. 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.
9. While erecting the safety valves, check for the set pressure and type. The lever arrangement, blow down ring approach for floating should be ensured. Drip pan drains

with proper slope to be given to safe location. Check the drain/overflow/exhaust pipe arrangement for expansion and proper guides to be given. Ensure anchor points for the above pipes.

10. Other tapping points meant for monitoring the level should be erected and protocol is to be made.
11. TIG welding must be used for sampling lines instead of arc welding.
12. All the drain lines should have sufficient slope towards drain. Provide expansion loops in all the vents and drains as per the drawings. Provide pre compression springs where required to take care of the load. All the motor operated valve stems should be vertical preferably. All the valve packing with asbestos base to be lubricated once in 6 months till handing over. Necessary gland packing will be supplied by BHEL.
13. Prior to erection of any pipes and tubes etc. inspection to be done for any foreign materials and damages and they are to be removed/ attended as per BHEL engineer.

14.48 All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary 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.

14.49 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.

14.50 Statutory Approval: It shall be the responsibility of the Contractor to obtain the all necessary approvals/permits from the inspection/regulatory authorities etc. on behalf of the Employer, as may be required for erection, testing and commissioning etc. As called for under the statutes, regulations and the safety codes, all such documentation submission and taking necessary approval shall be the responsibility of contractors. Necessary approval is required from statutory authorities for the entire work.

14.51 All the bearings, Gearboxes etc., of the equipment and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing/gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for regressing/ lubricating them with recommended lubricants and assembling back.

14.52 In some cases, structural material, pipes, ducts, suspension for pipes/ducts will be supplied in running lengths which shall be cut to size and adjusted as required. All joints connecting ducts, expansion pieces shall be seal welded on inside and as well outside. Also it may sometime become necessary to remove any of the erected members to facilitate erection of bigger / pre-assembled equipment. In such as the removal and re-erection of such members as per instruction of the BHEL Engineer, will have to be carried out by the contractor without any extra payment.

14.53 **Other structures, galleries and platforms:** All the hand rails and toe guards shall be provided as per drawings and site requirement. hand rails supplied in running lengths shall be suitably cut, edge prepared and welded. Also, hand rails/ guards may have to be provided

from the safety point of view in certain places though not indicated in the erection drawings. The weld joints of hand rails shall be ground smooth to flush finish.

14.54 Electroforged floor grills will be supplied for this project. These may have to be cut to suit requirement. Cutting shall be done only by mechanical cutters and not by gas cutting. Cold galvanizing compound is to be applied on the cut surface/edge. Cold galvanizing paint supply is in Contractor scope. (To be modified)

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

14.56 Correction of ovalities/ distortion of pipes and tubes, hangers ~~etc ducts, expansion bellows etc~~ occurred during transportation/ handling are to be carried before erection as part of work.

14.57 Certain structural items like beams, channels, angles platform etc will be supplied in running lengths which shall be cut to required suitable sizes and adjusted/trimmed as part of work.

14.58 Mechanical erection works associated with the valves, power cylinders, valve actuators etc., coming under various groups shall be done by contractor within the finally accepted rates. The Erection, testing and commissioning of all electrically operated valves, actuators and dampers is covered within the scope of this specification.

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

14.60 hydro test of other equipment as per BHEL engineer's instructions is included in the scope of work.

14.61 Certain equipment after initial runs and commissioning of the equipment have to be re-aligned/hot-aligned as per the instructions of BHEL engineer. Cleaning, free of extraneous steel, scaffolding materials electrodes, all foreign materials etc., before trial run of equipment, and at various stages of pre-commissioning activities as per BHEL engineer's instruction, is within the scope of work.

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

14.63 After initial trial of equipment, control and power cabling for motors and other equipment / instrumentation shall have to be disconnected for checking alignment and re-setting / re-alignment / hot alignment. Contractor shall have to arrange for disconnecting control and power cabling as per BHEL engineer's instructions and clearance and reconnect the control and power cabling after realignment. Quote tonnage rate shall be inclusive of the above.

14.64 **Contractor shall arrange changing of preservative oil in the gearboxes, journal and other bearing assemblies of equipment when in storage areas or after erection of equipment as the case may be as per the instructions of BHEL engineer. Necessary lubricants / oil will be supplied by BHEL and the same will be drawn by contractor from BHEL / customer's stores and transporting to site. No additional payment will be made for such works even though supply of lube oil might have been made under regular dispatch-able unit (DU) number against product group main assembly (PGMA) and appearing in the shipping list. Prior to the commissioning of the equipment, oil should be drained and collected in drums provided by BHEL and returned to BHEL / customer's stores.**

14.65 The pipes, tubes and equipments shall be checked for clearances and other vital tolerances. Necessary assistance for balancing of equipment during trial run, if required, shall be provided by the contractor free of cost.

14.66 Whenever required the contractor shall arrange for pre-qualification of process task Performers.

14.67 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.

14.68 Instrument tapping for all systems and associated equipment's to be welded/fitted by the contractor with in the quoted price.

14.69 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.

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

14.71 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 the details of C&I agency. The contractor shall coordinate with the C&I agency for removal, calibration and re-installation of the instruments. Though C&I agency will remove and reinstall the instruments after calibration, the contractor for this package will maintain the list of all the instruments removed & reinstalled. Instruments prior to removal and after reinstallation shall be considered in custody of the contractor for this package.

14.72 The contractor shall completely erect and test all the piping systems, covered in the specification including sampling lines up to and including sampling, hangers & supports, valves and accessories in accordance with the drawings furnished. This includes all necessary bolting, welding, pre-heating, stress relieving, testing, cleaning and final painting, wrapping and coating. 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 shown on the drawings. All piping shall be erected true to the lines and elevation as indicated in the drawings.

14.73 The 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.

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

14.75 Wherever piping erected by the contractor is connected to pipings/equipment/valves/Butterfly valves/RE joints etc., erected by the other agencies, the joint at the connecting point shall be the responsibility of the contractor under these specifications.

14.76 Normally the 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 the work.

14.77 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 over hauled in full or in part before erection and during commissioning.

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

14.79 Suspension for piping, etc., will be supplied in running lengths, which shall be cut to suitable sizes and adjusted as required. The adjustment of 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 the contractor. Spring suspensions / constant load hangers have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Any adjustments, removal of temporary arrests / locks etc., have to be carried out as and when required.

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

14.81 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.

14.82 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 of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rates.

14.83 The contractor shall carry out the tightening of the field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or the turn of part method. The methods used the tools and the equipment deployed shall be

subject to the approval of Engineer. The competent technicians shall carry out the bolting work.

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

14.85 Plate Type Heat exchangers will be supplied for cooling of Auxiliary Cooling water lines. Vendor scope covers erection of these PHEs as per the instruction of BHEL engineers.

14.86 All lifting tackles including wire-ropes slings, shackles, used by the contractor, shall be got approved by BHEL Engineer. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damages to equipment and personnel. Calibration/fitness testing certificates from recognized agency are to be submitted to BHEL site office for equipment/instrument/appliances to be used, as per requirement of BHEL/ISO system. Expenditure on such works forms a part of the scope of work.

14.87 The contractor shall erect scaffoldings/Temporary platforms supports etc required during erection before the permanent supports are erected. These should be of adequate capacity and shall never be overloaded. These should be replaced when not found suitable during erection work. All structure materials required for the above shall be arranged by the contractor at his own cost. No such material shall be supplied by BHEL in any case. Welding of temporary supports, cleats etc on the columns shall be avoided. In case of absolute necessity, contractor shall take prior approval from BHEL Engineer. Further, any cutting or alteration of member of the structure or platform or other equipment shall not be done without specific prior approval of BHEL Engineer.

14.88 The piping components are sent in parts for convenient transportation / layout requirements. They are to be cleaned, pre-assembled in stage by stage, welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.

14.89 The work on piping systems (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 other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and / or as per approved drawings / documents.

14.90 Pre Assembly joints to be marked in isometrics drawings in consultation with BHEL Engineers and submit to BHEL before starting work. Contractor to maintain Line History sheet (LHS) of all Pipe lines as per BHEL Format and submit before HT to BHEL/Customer for getting HT Clearance.

14.91 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.

14.92 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.

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

14.94 The scope of work includes marking of labelling & flow direction on the piping over insulation/other parts at the one place or number of places as instructed by BHEL Engineer. All consumable required for this work shall be in the scope of contractor.

14.95 Normally weld neck valves will have prepared edges for welding. But if it becomes necessary the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like tees, weld neck flanges, reducers, elbows, flanges, inserts etc., shall be suitably edge prepared and matched with pipes for welding. No extra cost shall be paid for this.

14.96 In case of any class of work for which there is no such specifications as laid down in the contract such us blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.

14.97 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 structure.

14.98 The Contractor shall carry out the reaming and honing of coupling holes with his own reamers, honing machine and honing accessories etc at his own cost.

14.99 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.

14.100 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, as per the instruction of BHEL Engineer.

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

14.102 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.

14.103 Fittings like bends, tees, elbow, mitre bends, reducers, flanges, thruster blocks, etc., will be supplied as loose items and edge preparation if required shall be carried out by the contractor.

14.104 Certain adjustments in length may be necessary while erecting pipelines. Removing / adding extra lengths / to suit the final layout, preparing edges afresh and adopting specified heat treatment procedure are in the scope of work.

14.105 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 BHEL Engineer‘s advice.

14.106 Piping below size 2||, valves, flanges, fittings etc. shall be supplied as commercially available. Hence fit-ups, edge preparation including welding of stubs, shall be included in the contractor‘s scope.

14.107 Contractor should fabricate bends of </=2|| diameter size at site from running meters of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer‘s instructions.

14.108 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.

14.109 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.

14.110 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.

14.111 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.,

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

14.113 Erection of Flow nozzles, flow switches, steam traps, filters, flow meters, other metering elements, spray nozzles, steam traps, flow orifices, flow indicators, control valves, aux. control valves, NRVs, suction strainers, servomotors, pumps 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 and stress relieving and commissioning.

14.114 Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismount such instruments and re-erect whenever required prior to

commissioning. Sometime this may have to be handed over to store or instrumentation contractor.

14.115 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.

14.116 Fixing, fitting, welding of thermo wells, 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 for the erected equipments / pipe lines is the scope of this specification.

14.117 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. Thermo wells 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.

14.118 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.

14.119 The hangers and supports for pipelines 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.

14.120 Contractor has to fabricate and erect temporary spool pieces wherever required due to non receipt of valves/fittings 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.

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

14.122 Welding, non-destructive testing and heat-treatment as prescribed in BHEL Welding / Heat treatment manual is to be carried out by the contractor. The contractor shall conduct nondestructive tests like radiography, ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipments etc. as per BHEL Engineer‘s instructions within the quoted rate.

14.123 Contractor shall arrange all equipments, alignment bolts, tools, Consumables like welding electrodes in their scope (all types except those supplied by BHEL), 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 / Nitrogen gas for stainless steel tubes purging during welding to be arranged by contractor within the quoted rates.

14.124 The Matching Pieces / Nozzles / Reducers (including the reducers to be connected with equipment are forming part of the systems and are also in the scope of work including issue, transportation, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.

14.125 Cutting and removal of dummies for all the shop welded stubs (irrespective of the equipments supplier for the above) for all the terminal points and preparation of edge where the piping is to be terminated is also in the scope of the contractor without any extra payment.

14.126 For skid mounted equipment, the checking and re-alignment required at site is in the scope of work.

14.127 All the shafts of rotating equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment.

14.128 The actuators / motors of valves may be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.

14.129 All dimensions / elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer‘s advice.

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

14.131 Contractor has to arrange required fire retardant covering material at their cost to protect the machined components, assembled parts and insulation materials drawn from BHEL before and after erection.

14.132 Prior to erection of any components, inspection to be done for any foreign materials and damages and they are to be removed / attended as per instructions of BHEL engineer.

14.133 The temporary structures / items welded to permanent members / pipes are to be cut and removed without any damage. In case of any damage, the same has to be made good by the contractor at his cost.

14.134 Erection of all the items/piping systems, supplied by BHEL’s Manufacturing units or Vendor as integral part of the systems covered under this scope of work, shall be done by the contractor as per the accepted tonnage rate.

14.135 **GALVANISED STEEL PIPING**

- Galvanized pipe shall be joined by screwing in to socket and screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before joining. The exposed threaded portion on either side of the socket joint shall be applied with Zinc Silicate Paste. All these consumables are in the scope of contractor and shall carry out within the quoted rate.

- GI pipe with flanged joints shall have screwed flanges. Flanged joints faces shall be painted with red lead and bolting up evenly on all sides with compressed asbestos gaskets in between two flanges.

- Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be attached by screwing the pipe through the flange and pipe and flange shall be refaced accurately. Required Teflon tapes are to be arranged by the contractor at his cost.

- Required threading should be done by the contractor at site as specified in the drawing. The pipes shall be cut only by Hacksaw / Machining. Required Teflon tapes are to be arranged by the contractor within the quoted rate.

- ALL THE SCREWED JOINTS ARE TO BE SEAL WELDED IF REQUIRED BY CUSTOMER, SUITABLE ELECTRODES FOR FULL SEAL WELDING ARE TO BE ARRANGED BY THE CONTRACTOR AT HIS COST.

14.136 PVC WELDING: For PVC welding required solvent cement and cleaning agent / consumables will be supplied by BHEL. Necessary storage and application procedure to be followed as per supplier recommendation. Contractor shall take adequate care in handling, usage of these consumables to avoid wastage.

14.137 **BURIED PIPING**

- The pipe in general shall be laid with the top of the pipe minimum 2.0 / 1.5 metre below

  finished general ground level or as specified in the drawing. Anti-corrosive treatment for all buried pipes as specified in the drawings including supply & application of anti-corrosive treatment, required consumables are in the scope of contractor and shall carry out as per drawing within the quoted rate.

- Buried GI pipes shall not have flanged joints. All the joints shall be screwed with socket.

  Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before joining. Threaded portion on either side of the socket joint shall be applied with Zinc Silicate Paste. All these consumables are in the scope of contractor and shall carry out within the quoted rate.

- Free access is to be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained. This type of incidental works are to be carried out by the contractor within quoted rates.

- Prior to lowering and laying pipe in any trench, the contractor shall ensure for the backfill and compact the bottom of the trench or excavation in accordance with IS 5822 / as per drawing to provide an acceptable bed for placing the pipe.

- Dewatering of excavated area for pipe laying, welding, wrapping coating etc is in the scope of the contractor.

- Preparation of pipe surface as per customer consultant's specification by sand / shot /grit blasting for wrapping and coating is included in the scope of this tender. All fittings like elbows, tees, reducers, flanges, inserts etc., valves flow nozzles, etc shall be matched with pipes for welding which may required re-edge preparation, grinding etc., if found necessary.

- Contractor shall arrange all the equipments, alignment bolts, tools, consumables like welding electrodes (all type), TIG wires (Other than the supplied TIG wires from BHEL if any) 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.

14.138 All the rubber – lined pipes are flange joined and the flanges are also rubber lined. No welding is allowed on these pipes. If any damages occurred / notices in the above pipe lines during erection / transportation / commissioning of rubber lined pipes, the same has to be rectified by the contractor at his cost.

Also refer clause 1.16.0 of Technical conditions of Contract – coating and wrapping (Chapter- XVIII of this booklet)

14.139 Brief list of equipments / sub-assemblies to be erected by the contractor & approximate weight and size of individual heavy components are given under the (Bill of quantity) and is meant for giving general idea to the tender only about magnitude of the work involved. The components are sent in parts for convenient transportation. They are to be cleaned, assembled in stage by stage, fastened / welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.

14.140 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

14.141 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 all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include equipment for checking, cleaning, servicing and site fabrication.

I. Scaffolding and rigging operations

II. Flame / electric cutting, grinding, welding, radiography and stress relieving & wrap inspection by HOLIDOY equipment.

III. Fitting, fettling, filing, straightening, chamfering chipping, Scrapping, reaming, cleaning, checking, leveling, blue matching, Aligning and assembly.

IV. Surface grinding, drilling, doweling, shaping.

V. Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication

14.142 The temporary structures/ items welded to permanent members/pipes are to be cut and removed without any damage. Any damage so to permanent members/ pipes to be made good by the contractor at his cost.

14.143 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.

14.144 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 restack 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.

14.145 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.

14.146 Fine fittings, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines when after completion, to suit the site conditions. The contractor should absorb this cost in his quoted rate.

14.147 It shall be the responsibility of the contractor to provide ladders for all pipe trenches for erection purpose. Rollers to be provided for the pipe to be welded for easy work. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL.

14.148 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. For pipes below 2" diameter, shall be sponge cleaned with air flushing.

14.149 All piping items including pipes, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.

14.150 No separate payment will be made for the edge preparation of pipes, Standard fittings such as bends, Tees etc.,

14.151 Contractors 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 is within the quoted / accepted rate.

14.152 Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from, all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity.

14.153 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.

14.154 Upon completion of daily work, the contractor shall remove from the vicinity of work all scrap packing materials, rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer.

14.155 All fittings like elbows, tees, reducers, weld neck flanges, inserts etc., shall be matched with pipes for welding which may require re-edge preparation, grinding etc., No extra cost shall be paid for this.

14.156 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 NDT, heat treatment procedure shall be carried out by the contractor within the quoted rate.

14.157 Contractor shall remove the bridge, stopper etc., by gouging/ grinding 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.

14.158 All erectable gaskets, fasteners and other hardware shall be supplied by BHEL free of cost if any.

14.159 The piping, valves etc will be provided by BHEL free of cost. However dismantling of the piping, valve etc, its cleaning and edge preparation, for its reuse, if required, will have to be done by the contractor without any extra claim.

14.160 All pipes including Canal water / Raw water piping (underground and over ground) shall be supplied by BHEL in fabricated condition in tentatively 6 mtr to 12 mtr length. Fittings like tees, reducers, elbows, manholes, mitre bends, flanges etc shall be supplied by BHEL in fabricated condition. Cutting of tees, elbows / reducers to suit the pipe fitting / erection as required, is to be done without any extra claim.

14.161 The contractor may have to carry out fabrication of mitre bends, tees, reducer of sizes NB 250 and above for LP piping systems. Pipes will be supplied in running meters by BHEL free cost. Required number of mitre bends, tees is to be fabricated by the LP piping erection contractor. Payment shall be made as per applicable item of price schedule.

14.162 Erection & welding, of all valves, misc fittings required to complete the system but not specifically mentioned in relevant chapter of tender is covered in the scope of contract and payment will be made as per applicable piping item of mechanical price schedule. All such materials will be supplied by BHEL. The erection activity of valve also includes cleaning, servicing and final painting of valves. All counter flanges, bolts, nuts, washer, gaskets etc shall be supplied by BHEL loose (free issue).

14.163 Any other connected material supply which is not covered in BOM but required to complete the system shall be erected by the vendor and payment in this case shall be made as per applicable item rate.

14.164 Bidders to exercise utmost care while doing execution and commissioning work for this package so that no damage is caused to the existing plant at site. Any such damage will be back charged to bidder.

14.165 Protection of pipeline against floatation during the contract period shall be the responsibility of the contractors. Should any section of the pipe line float due to their negligence etc. the entire cost of laying it again to the correct line and level shall be to the contractor's account.

WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

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.)

15.1 Welding, non-destructive testing and heat-treatment as prescribed in BHEL Welding / Heat treatment manual is to be carried out by the contractor

15.2 The piping, equipments shall be erected in conformity with the provisions of drawing and documents 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.

15.3 Welding of, Piping, high tensile structural steel shall be done by certified HP/LP welders who possess valid certificate and who are approved by BHEL Engineer..

15.4 All welders including tack welders, structural and HP/LP welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder without assigning any reason if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification and performance 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.

15.5 The welder Identification code as approved by the BHEL Engineer shall be stamped by the welder on each joint done by them. The contractor will be responsible for the periodic renewal, retesting of the welders as demanded by BHEL.

15.6 BHEL Engineer is entitled to stop any Welder from the work if his performance is unsatisfactory for any technical reasons or there is a high percentage of rejection of joints welded by him, which in opinion of the BHEL Engineer will adversely affect the quality of the welding though the Welders has earlier passed the tests prescribed by BHEL Engineers. The welders having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.

15.7 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 quality engineer.

15.8 The contractor shall carry out the root run welding of all LP piping, valves by TIG welding method only, as applicable. 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.

15.9 All expenses for testing of contractor's welders including destructive and Non- destructive tests conducted by BHEL at site or at laboratory shall have to be borne by the contractor only.

Limited quantity of tube and pipe material required for making test pieces will be supplied by BHEL free of cost.

15.10 Only BHEL approved electrodes and filler wire shall be used. 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. Separate ovens shall be used for baking and holding.

15.11 All butt / fillet welds shall be subject to Non –Destructive testing as per the Drawing/Procedures/Welding Schedules/Documents 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.

15.12 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 otherwise of the welds shall be final.

15.13 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. Prepared edges to be preserved / applied with wieldable primer.

15.14 The welded surface irrespective of place of welding shall be cleaned of slag and painted with anticorrosive primer paint / red oxide paint immediately once radiography, stress reliving and other NDE works are over as applicable. Necessary consumables and scaffolding etc. including paints shall be provided by contractor at his own cost. Daily welding reports in the format suggested by BHEL should be submitted by next morning without fail.

15.15 Pre-heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, wherever necessary, are parts 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.

15.16 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor shall 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.

15.17 The contractor shall also be equipped for carrying out other NDT like LPI /MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required, will be arranged by contractor within the quoted rate.

15.18 Oxy-acetylene flame heating or exo-thermic chemical heating for stress relieving is not permitted. Heating shall be by means of Electric Induction coil or Electric resistance coil. Potentiometric type recorders shall only be used for temperature recording purposes

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

15.20 The 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.

15.21 Contractor at his cost shall arrange necessary safe guards required for radiography. 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.

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

15.23 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.

15.24 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. Lead intensifying screens for front and back of the film shall be used as per the ASME specification and as per the instructions of BHEL Engineer

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

15.26 All arrangements for carrying out radiography work including dark room, air conditioner and other accessories & facilities shall be provided by contractor within the space allotted for office at his cost. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. 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. All radiography films shall be developed in the dark room at site.

15.28 In case of radiography of less than 100%, the joints identified by BHEL at random shall be radiographed.

15.29 Contractor shall note that 100% radiography will be done at the initial stages on all the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radio graphed shall not be less than the requirement of BHEL welding schedule / welding Manual booklet applicable as per IBR/ Customer's requirements. The percentage radiography shown in the respective drawings shall be final and binding on the contractors. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL.

15.30 BHEL Engineer reserves the right to alter the quantum of radiography of joints. The decision of the BHEL Engineer in this regard is fixed and final and binding on the contractor. Any defects as pointed out by BHEL Engineer shall have to be rectified by the contractor at his cost. All X-Ray films of joints radiographed at site in connection with work shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.

15.31 Radiography on LP piping joints and other NDT test as called for in the FQP including LPI, MPI, UT and HT will have to be carried out within the quoted rates.

15.32 All the Radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL. They are to be reconciled with the work done, joints radio graphed and submitted to BHEL / customer.

15.33 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.

15.34 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.

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

15.36 The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radio graphed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor. 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-radio graphed at contractor's cost.

15.37 Radiography, heat treatment and other NDE processes may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make

all necessary arrangements including labour, operators/ supervisors/ engineer as required for timely and satisfactory execution of radiography work as per directions of BHEL.

15.38 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.

15.39 All welded joints shall be subjected to acceptance by BHEL Engineer.

15.40 The technical particulars, specifications and other general details of work shall be in accordance with BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.

15.41 The field joints are to be radiographed and preheating and post weld heat treatment to be done as per BHEL procedure and manuals.

15.42 Penetrometor as per ASME/ISO shall be used for all exposures.

15.43 The contractor shall also be equipped for carrying out other NDT like liquid penetrant inspection, magnetic particle inspection, etc. as and when required in the interest of work within the quoted rates.

15.44 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.

15.45 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.

15.46 The welding process, weld joint details, joint configuration and material specification may change to suit the design requirements. The contractors quoted rates shall be inclusive of each contingency. All welds involved in the erection of temporary pipe lines for hydraulic test, chemical cleaning, steam blowing etc. to be carried out within the quoted rates. The number of joints to be welded as mentioned in the welding schedule consists of butt welds. All other welds viz. attachment welds on pressure parts/non-pressure parts, fillet welds in non-pressure parts welding in the boiler and Rotating Machines has to be carried out by the bidder within quoted rates.

15.47 For uniform heating and better closed loop control, pre heating, post heating, controlled rate of heating & cooling and post weld heat treatment cycles for tube specifications should be carried out with suitable heating machine.

15.48 MPI must be done on joints, those are undergone ultrasonic testing.

15.49 Bidders to note that the applicable WPS numbers are mentioned in the respective Erection / Field Welding Schedule.

15.50 Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions. Where the electric resistance heating method is adopted Contractor shall make all arrangement including heating equipment with automatic recording devices,

all heating elements, thermocouples and attachment units, graph sheets, thermal chalks, & insulating materials like mineral wool, asbestos cloth/pad, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

15.51 **List of Penalties on Violations on Quality Provisions**

Sr no	Violation	Penalty in Rs
1	Mother oven not working	500 per day & ban on its use
2	Slackness in control over baking of welding electrodes(Doc.)	200 per incident
3	Holding oven not working/plugged in	500 per incident/day & ban its use
4	Portable oven not working/Plugged in	100 per incident & welder to be sent home
5	Use of cold electrodes(Except E6013)	100 per incident & welder to be sent home
6	Unauthorized welder on job	500 per incident & welder to be sent home
7	Delay in NDT Agency deployment w.r.t jointly agreed Ere. Prog	500 per incident & welder to be sent home
8	Failure to monitor Welder's Performance (RT, SR, Penalty Joint etc.)	5000 per week
9	Improper acts w.r.t maintain SR Charts	10000 per incident
10	Site Welding/QLY Engineer not deployed w.r.t mutually agreed Ere. Plan	500 per day
11	Delay in (RT, SR, UT) report submission & customer acceptance Log sheets esp. for Billed qty. from dt. of Billing (Vendor)	10,000 per week
12	Lack of safe approach Scaffolds/Platform for inspection & non-availability of calibrated MMDs –	1000 per incident.

15.52 **Guidelines for welding, NDE and heat treatment**

1. Receipt inspection of welding electrodes / filler wires
2. All electrodes / filler wires received at site stores shall be segregated for type and size of electrode.
3. Ensure that electrode packets received are free from physical damage.
4. Where electrodes are damaged, the same shall be removed from use.
5. Only electrodes identified in the "Rationalized List of Electrodes" are to be accepted.
6. Where filler metals are supplied by manufacturing unit, inspect for damages, if any.
7. Ensure availability of relevant test certificates. Refer tables of chemical compositions and mechanical properties for acceptance.
8. Endorse acceptance / rejection on the test certificate.

15.53 **Storage & identification of welding electrodes / filler wires**

1. Scope

1.1 This procedure is applicable for storage of welding electrodes / filler wires used at sites.

2. Procedure:

2.1 Only materials accepted (based on receipt inspection) shall be taken into account for storage.

2.2 Storage Facility:

2.2.1 The storage facility shall be identified.

2.2.2 Access shall be restricted to authorized personnel.

2.2.3 The storage area shall be clean and dry.

2.2.4 Steel racks may be used for storage.

2.2.5 Avoid storing wood inside the storage room.

2.2.6 Maintain the temperature of the storage facility above the ambient temperature.

2.2.7 This can be achieved by the use of appropriate heating arrangement .

2.3 The electrodes / filler wire shall be segregated and identified for

1. Type of electrode e.g. E7018.
2. Size of electrode e.g. Dia 3.15 mm.

2.4 Colour coding for filler wires:

2.4.1 On receipt of GTAW filler wires, codify the filter wires as per table I below . Both ends shall be coloured.

Table - 1

Specification	**Brand Name***	**Colour Code**
RT 1/ 2 Mo (ER80s-D2)	TGSM	Green
RT 1 Cr 1 / 2 Mo (ER80S-B2)	TGS 1CM	Silver grey/White
RT 2 1/ 4 Cr 1 Mo (ER90S-B3)	TGS 2CM	Brown / Red
RT 347 (ER 347	TGS – 347	Blue

(* or other approved equivalents)

2.4.2 Where another set of colour code is followed, maintain a record of coding used

2.4.3 Where the filter wire is cut, apply the appropriate colour code at both ends of the piece.

2.4.4 For other filler wires, a suitable colour distinct from table 1 shall be applied

15.54 **Baking and holding of welding electrodes**

1. Purpose:
   1.1 This section details activities regarding baking and holding of welding electrodes used at sites.

2. Procedure:
   2.1 While handling, avoid contact of oil, grease with electrodes. Do not use oily or wet gloves.
   2.2 It is recommended that not more than two days requirements are baked.
   2.3 GTAW Filler Wires:
      2.3.1 These wires do not require any baking
   2.4 Covered Electrodes:
      2.4.1 Baking and holding
      2.4.2 Identify baking oven and holding oven.
      2.4.3 They shall have a temperature control facility upto 3500C for baking oven and 200 Deg. C for holding oven.
      2.4.4 A calibrated thermometer shall be provided for monitoring temperature
      2.4.5 On opening a packet of electrodes, segregate and place them in the baking oven. Avoid mix up.
      2.4.6 After loading, raise the baking oven temperature to the desired range as per Table below.
      2.4.7 Note the time when the temperature reaches the desired range. Maintain this temperature for the duration required as per Table below.
      2.4.8 On completion of baking, transfer the electrodes to holding oven, maintain a minimum temperature of 1000C till issue.
      2.4.9 The electrode shall not be subjected to more than two cycles of baking. Maintain a register containing following details:
         a. Brand name (e.g. Supratherme)
         b. Size (e.g Dia 4.0 mm)
         c. Quantity (e.g. 110 pieces)
         d. Time at required temperature ie. Above 2500C
         e. Time of Transfer to holding oven. Activities a, b, c to be recorded before loading into the oven.

Baking and Holding Parameters

AWS Classification (*)	Baking		Holding Temperature ^{0}C (@)
	Temperature ^{0}C	Time (Hours)	
E7018	250 – 300	2	100 min
E7018-1	250 – 300	2	100 min
E7018-A1	250 – 300	2	100 min
E8018-B2	250 – 300	2	100 min
E9018-B3	250 – 300	2	100 min
E8018-B2L	250 – 300	2	100 min
E9018-B3L	250 – 300	2	100 min
E309 & E347	250 - 300	1	100 min

Note : (*) For other electodes, supplier's recommendations shall be followed.

(@) Maintain the temperature in the oven till issue.

15.55 **Structures**

a) Only material which has been identified against mill sheet or test certificates shall be used for construction. All plates above 40mm thickness shall be 100% ultrasonically tested.

b) Visual inspection of all welds shall be performed in accordance with AWS D.1.1.

c) NDT requirements of structural steel welds (other than Coal Bunkers) shall be as under:-

i. 100% RT/UT on butt-welds of plate thickness > 32 mm.

ii. For plates of 25mm < thickness < 32mm - 10% RT/UT and 100% MPI

iii. For plates of thickness < 25mm - 10% MPI/LPI.

iv. All fillet welds of built up plate girders shall be inspected 100% by MPI.

15.56 **NDT and PWHT of, Piping shall be guided by the site erection welding schedule and field quality plans.**

15.57 **Non-destructive examination of welds shall be carried out in accordance with the relevant design/manufacturing codes. However, as a minimum, the following requirements shall be met. Further, statutory requirement, wherever applicable, shall also be complied with.**

a) Temperature > 400 Deg, C or pressure exceeding 71 bar.

i. 100% RT/UT on butt welds and full penetration branch welds.

ii. 100% MPE.

b) Temperature > 175 Deg, C upto 400 Deg. C or pressure exceeding 17 bar and upto 71 bar.

i. 100% RT/UT on butt welds and full penetration branch welds for pipe dia more than 100 NB.

ii. 10% RT/UT on butt welds and full penetration branch for pipe dia upto 100NB.

iii. 100% MPE.

c) For all other pipes not covered above, shall be subjected 100% MPE/ DPT in case of under ground pipes and 10% MPE/DPT in case of piping above the ground. Further, 10% of butt welds of underground piping shall be subjected to RT.

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.)

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

Hydraulic testing

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

16.2 All Low Pressure Piping 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, 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 / equipmetnts 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 Statutory authorities 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, 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

16.8 Contractor has to arrange required filling 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, as required, shall be arranged by the contractor. Installation, electrical connection, erection, testing and dismantling, etc, shall be carried out by the contractor without any extra charges.

16.10 Contractor shall arrange and 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 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.

16.12 For conducting Hydro test / steam blowing of piping systems internals of valves and 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.

16.13 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.

16.14 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. Seal welding of thermo-wells and blanks of Temperature Element are to be removed by grinding only after steam blowing.

16.15 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.

16.16 The contractor shall see that the water shall not be allowed to accumulate in open trenches where work is in incomplete stage, precautionary works such as blank flanging the open ends of the pipe line and filling the pipe line with water etc. shall be taken as directed by the engineer. Such works shall be to the contractor's account and no separate payment will be made for the same

16.17 The contractor shall carryout the required test on the pipelines such as Hydraulic Test of various piping systems, 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.

16.18 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.

16.19 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.

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

16.21 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.

16.22 The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.

16.23 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.

Testing, pre–commissioning & commissioning and post commissioning

16.24 The Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation. These would include Air leak test, kerosene test, hydraulic test, land flow test, clean air flow test, Gas Distribution Test, chemical cleaning of piping, water washing, oil flushing of oil system etc. as instructed by BHEL using contractors own consumables, labour and scaffoldings etc. Air leak test on LP piping preliminary to hydraulic test by compressed air shall also be carried out to check and rectify the various leakage and defects etc. All the chemicals required for carrying out these activities will be supplied by BHEL free of cost.

16.25 Testing, & commissioning will involve, though not limited to these, various testing e.g., leak test, trial runs of equipments; checking/setting various clearances/ parameters, ensuring operation of various equipments free of undue restrictions, coal firing, trial operation and loading etc are some of these activities. All the activities for commissioning of the set, as informed by BHEL from time to time shall be completed.

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

16.27 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL to their client and also the relevant statutory authority at various stages of work.

16.28 The 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, chemical cleaning, steam blowing or any other tests as the case may be and will carry out above activities under this scope of work as per instructions of BHEL. The scope also covers the offsite disposal of effluents of the tests under the scope of this contract as per instruction of BHEL Engineer.

16.29 All items / material required for conducting hydraulic test, alkali boil out, acid cleaning/EDTA cleaning steam blowing etc., will be supplied by BHEL. However, servicing, dismantling and returning of the same to BHEL stores is the responsibility of the contractor who is erecting the equipment / piping. Broadly the work on temporary systems will be as under:

16.30 Commissioning will involve trial run of all the equipment erected. Flushing of all the lines by air, water, oil or steam as the case may be, servicing of valves and any other works incidental to commissioning are to be carried out. Contractor shall supply manpower round the clock.

16.31 It shall be the responsibility of the contractor to provide various categories 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. The contractor will provide necessary consumables, T&Ps, IMTEs 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.

16.32 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.

16.33 During commissioning, opening / closing of valves, changing of old/damaged gaskets & packings, tightening of bolts, re-alignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. Replacement materials will be given by BHEL. The finally accepted price /rates shall be inclusive of all such work.

16.34 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 re-alignment 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.

16.35 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.

16.36 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 un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.

16.37 Replacing, cleaning and servicing of all the filters / strainers, toppings of oils in the system shall be done by the contractor within the accepted price. All oils and greases to be filled in the main equipments as first fill and subsequent topping up's will be furnished by BHEL.

16.38 At the time of each inspection, the contractor shall take note of the decisions / changes proposed by the BHEL 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.

16.39 The valves, dampers, actuators etc. will have to be checked cleaned and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.

16.40 The hydraulic testing of the equipment and piping, covered under this scope of work has to be carried out by the contractor as per instructions of BHEL Engineer. The contractor shall provide all facilities required for hydraulic testing. Before hydraulic test, all the hangers are to be locked by locking pin / plate or temporary support. After completion of Hydraulic test, these are to be removed and all hangers are to be readjusted if required, to the desired value within quoted value.

16.41 Transportation of oil drums from customer/ BHEL's stores, filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly transport of chemicals for various pre-commissioning activities /

processes mentioned in the above clauses and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.

16.42 Contractor shall lay the temporary pipelines with fittings, accessories and erection / commission pumps, tanks, valves, fittings, hangers and supports and other installations within the quoted rates as instructed by BHEL, Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing / water washing / oil flushing etc. of piping and other equipments are in the scope of work. Necessary, materials for this will be provided by BHEL.

No payment will be made for the equipments brought by the Contractor such as pumps etc and foundations made by the Contractor for temporary systems. Overhauling / cleaning / servicing of valves, pumps, fittings in temporary system and acid cleaning tanks etc prior to the above operations / activities will also be carried out by the contractor at his cost. All the chemicals will be supplied by BHEL free of cost.

16.43 Chemical cleaning (Acid cleaning of piping / EDTA cleaning / alkali flushing) will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves, and installation of temporary tanks for chemical and for mixing. Necessary temporary access platforms to mixing tank are to be made by the contractor. The dissolving tank, neutralizing tank etc. required for acid pickling will have to be fabricated by the contractor within the quoted rate. Required materials will be provided by BHEL free of cost. Chemicals for chemical cleaning will be provided by BHEL and handling of chemicals & other consumables and other connected activities has to be carried out by the contractor at their cost. All other consumable would have to be provided by the contractor.

16.44 Laying of insulation of this temporary piping, tanks are to be carried out by the contractor within quoted rate, and required insulation materials will be provided by BHEL. The welding joints in the temporary pipe lines shall be welded by tested welders only. Required NDT tests are to be carried out for the above joints as part of work as per customer / BHEL requirement.

16.45 Steam blowing lines for Oil 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 have to be arranged by the contractor as a part of the work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.

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

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

16.48 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. The parts to be replaced shall be provided by BHEL free of cost. Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract. If the 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.

16.49 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.

16.50 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 required manpower, consumables, tools and plants till such time the commissioned unit is taken over by BHEL's client.

16.51 Contractor has to remove the all temporary supports, structures from inside of pipes and grind the all points after cutting and proper clean the duct and make it free from weldments and burrs.

16.52 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.

16.53 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.

16.54 **Commissioning of the system will involve trial runs and continuous operation of all erected equipments till completion of various milestones such as boiler light up, safety valve floating, synchronization, full load, trial run, PG test and handing over of unit.**

Contractor shall provide required workers along with supervisors with all the requisite tools round the clock and material for all these works, which shall form part of the work to be done.

16.55 After floating of safety valves, the commissioning activities and trial operations will continue up to 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 skilled, semi-skilled & un-skilled in sufficient numbers as per the work requirement along with supervisors including necessary Tools & plants, consumable 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) structural welders
c) Riggers
d) Unskilled workers
e) Supervisors
f) Electricians
g) Laggers
h) Any other category of workers as may be required.

Further in addition to the above, contractor has to arrange the following minimum manpower within the quoted rate exclusively for assisting BHEL commissioning engineers during stabilization and trial operation period. This manpower will be directly controlled by BHEL commissioning engineers.

1. One Engineer in charge for three shifts.
2. One supervisors per shift for three shifts
3. One fitters per shift for three shifts
4. Four helpers per shift for three shifts

16.56 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. 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.

16.57 It shall be specifically noted that the 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.

16.58 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.

16.59 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.

16.60 Contractor shall lay / install necessary blanking arrangement in pipes. This may involve fabrication & erection, welding & after satisfactory completion of test removal of same by cutting & grinding. Temporary installation itself has to be tested, tried, and subject to non-destructive examinations as per the instructions of BHEL as part of work.

No payment will be made for temporary installations made for testing of systems & similarly no payment will be made for electrical installations made for any temporary system.
All materials, equipment's necessary for installation of temporary system as above will be supplied by BHEL as free returnable issue in random sizes / lengths. However, servicing, fabrication, erection, dismantling of the same after completion of the process, and handing over back to BHEL stores will be the responsibility of the Contractor.
In accounting of temporary materials following wastage allowances are provided:

1. Structural items : 5%

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

- ✓ Similarly, during the course of erection, if certain portion of equipments erected by the Contractor has to be undone for enabling other Contractors / agencies of BHEL / customer to carry out their work, Contractor shall carry out such jobs expeditiously and promptly and make good the job after completion of work by other Contractors / agencies of BHEL / customer as per BHEL engineer's / agencies of BHEL / customers instructions. Claims, if any, in this regard shall be governed as relevant clauses of 'General Conditions of Contract

16.61 Contractor shall provide assistance in conducting of performance guarantee test (PG test) of the equipments under the scope of work. Contractor shall install all necessary tapping points; instruments etc and provide necessary assistance within the quoted rates. In case PG test is getting delayed beyond the contract period (normal plus extension if any) due to reasons not attributable to the Contractor, PG test issue will be mutually discussed and decided. However installation of necessary tapping points, impulse pipes, approaches etc are to be completed by the Contractor.

16.62 The contractor shall carry out all required tests, pre-commissioning and commissioning activities required for the successful and reliable operation of LP piping, CW/ACW System, fire protection system etc. as instructed by BHEL using their own consumables, labour and scaffoldings etc.

16.63 The 'Initial Operation'/trial operation of the complete facility as an integral unit shall be conducted for continuous 28 days. During the period of trial operation of

28 days, all systems in the scope shall operate continuously at full load at designated fuel for a period not less than 72 hours .The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.

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

16.65 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.

16.66 All the shafts of the equipment shall have to be properly aligned to that of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid over-heating of bearings or other conditions, which may tend to shorten the life of the equipment. All bearings, shafts and other rotating parts shall be thoroughly cleaned and lubricated as per recommendations of BHEL engineer.

16.67 Lubricating oil units of the rotating machines are to be cleaned thoroughly before pouring of final lubricating oil. Topping up of lubricants during running of the set till handing over to be done by the vendor. Required lubricants both for first filling and topping up are to be supplied by BHEL free of cost. The empty containers of the lubricating oils should be returned to BHEL stores/place indicated by BHEL from time to time.

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

16.69 It shall be the responsibility of contractor to attend all punch points post commissioning and resolve the deficiency as may be necessary for handing over the unit to BHEL's Client.

17 PAINTING

Supply and application of final paining:

- The scope includes the supply and application of final paining for the systems/items/components covered in the entire scope of work including supply of primer, paints and associated consumables.
- In case any shop painted structure/component is required to be repainted due to the reasons attributable to the contractor such as Mis-handling, damage during erection process, other reasons incidental to the work etc, such touch-up painting/re-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 .

BHEL/Customer Specification for Shop & Field Painting with regard to surface preparation and final painting with colour codes / scheme for surface preparation and finish paints coating including primer coating for shop and field painting will be given at site at the time of painting work.

Contractor shall carry out surface preparation and final painting works as per BHEL/Customer specification and instruction of BHEL engineer at site.

17.1 Scope of Contractor/BHEL regarding Supply of Paint & Paint application

S No	DESCRIPTION	BIDDER	BHEL	REMARKS
a)	Surface preparation	Yes	-	
b)	Preservation painting	Yes	-	Wherever applicable
c)	Touch up painting	Yes	-	Wherever applicable
d	Intermediate Coat application	Yes	-	Wherever applicable
e)	Finish Painting	Yes	-	
f)	Painting of Insulation cladding sheet	Yes	-	Wherever applicable
g)	Painting of welded surface	Yes	-	Wherever applicable
h)	Supply of Thinner	Yes	-	
i)	Supply of Primer	Yes	-	
j)	Supply of Paint (intermediate/Finish) including bituminous paint	Yes	-	
k)	Supply of Preservative/anticorrosive paint/protective paint	Yes	-	
l)	Supply of scaffoldings, platforms, structures & ropes etc	Yes	-	
m)	Supply of tools e.g wire brush, paint brush, Spray M/c, cleaning agents etc	Yes	-	

n)	Supply of Other Consumables	Yes	-	

17.2
Paints and painting work carried at site shall confirm to the following codes and standards:

IS:5 – Colour for ready mixed paints and enamels

IS : 101 Part 1 to 9 – Methods of sampling and test for paints, varnishes and related products

IS : 1477 Part I&II – Code of practice for painting of ferrous metals in building

IS : 2932 – Specifications for enamel, synthetic and exterior,
a) Under Coating
b) Finishing

IS: 9407 – Colour code for identification of pipelines used in thermal power plants.

Contractor shall satisfy himself, availability of all information in the specifications for proper selection of the paints and ensure their applications as per Codes.

17.3 Primer Painting:

a) After surface preparation, two coats of epoxy resin based zinc primer shall be applied. Dry film thickness of each coat shall be as per the recommendations of primer/paint manufacturer. Primer shall be applied by either spraying or bushing ensuring a continuous film without "holidays". Primer coat shall be immediately applied without any time lag after the surface preparation.

b) Any equipment shall be carefully examined and where ever the primer coat is damaged shall be recoated with primer. However over the field welds, bolts and nuts etc. two primer coats as per a) shall be applied.

17.4 Finish Painting

a) After the primer coat has dried out, the surface shall be cleaned of dust without scratching or in any way damaging the primer coat. Over this, dry surface finish painting shall be carried out.

b) Finish painting shall be carried out in two coats. Dry film thickness of each coat shall be as per the recommendation of the primer/paint manufacturer. Minimum thickness including primer and paint coating shall be as per specification.

c) Paint shall be applied either by brushing or spraying. It shall be ensured that brush marks are a minimum and the requirements of workmanship are as specified in IS: 1477 (for site painting works on systems, structures and components).

d) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of ready mixed type in original sealed containers as packed by the paint manufacturer. Addition of thinners shall not be permitted.

e) No painting shall be done in frost/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is 5o C or below.

f) Work of painting of condenser surfaces in various areas and at various stages of work are specified elsewhere in these specifications.

17.5
The Components which are supplied painted by BHEL manufacturing units as per their standard applicable painting schemes. Contractor shall carry out primer and finish painting coats and DFT requirement with colour codes & specifications as per requirement of BHEL/customer at site.

All exposed metal parts of the equipment including piping, structures, railings etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by BHEL engineer for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints.

17.6
Touch-up painting on damaged areas –

a) For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.
Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush within maximum seven (7) days of application of touch up primer.

17.7
Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of BHEL/Customer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.

(a.) Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.
(b.) Painting procedure to be followed for touch-up painting on damaged areas.

17.8
The scope of work includes painting (including supply) of colour bands, lettering, marking and signs for direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/Customer engineer at site for the equipments / components covered in these specifications.

17.9

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

17.10
Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents.

17.11
During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, contractor shall repair the same free of cost.

17.12
Specified drying time shall be permitted from one to another coat.

17.13
This work requires working at higher altitudes from ground level to as high as 50 mtr and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

17.14
Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by Contractor, BHEL shall have the right to recover the cost of such damages from the Contractor.

17.15
Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the Contractor without any extra charges.

17.16
In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush painting. However, areas/equipments inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the Contractor. Laying of air hose pipe and any other line required shall be done by Contractor at his cost

17.17
Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

17.18
Acceptance of Final Painting for required thickness shall be as per the thickness measured by Alcometer by NPCIL/BHEL Engineer. Contractor shall have to carry out painting till the required thickness is achieved.

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

17.20 Prior to application of refractory bituminous painting on the pressure parts and other area is under Contractor scope.

17.25 Painting two coats of bituminous paint on Insulation cladding sheet inner surface.

17.26 **PRESERVATIVE PAINTING**

17.26.1

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

17.26.2
The water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter apply two coats of primer paint followed by two/three coats of alloyed resin machinery enamel paints as approved by BHEL. Contractor shall submit manufacturer's batch test certificate / test certificate from BHEL approved laboratory for the primers and paints. Prior approval of BHEL for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing, number of coats may be applied and method of application shall be as recommended by the paint manufacturer.

17.26.3
All site weld joints falling in steam side shall be painted with two coats of steam washable paint.

17.26.4
All water side surfaces of water chambers including tube plate shall be thoroughly surface prepared and painted.

17.26.5
After the successful completion of hydraulic testing, the interior surfaces of the water boxes, main tube plates shall be painted with suitable anticorrosive paints as per special procedures laid down by BHEL.

17.26.6
Prior to hydraulic testing of water side of condenser, interior surfaces of water boxes shall be painted.

17.26.7
After completion of tubing and tube side hydro test, all water side surfaces of water chambers including tube plate shall be painted.

17.26.8
Preservation of all components/equipments during various stages of erection, commissioning till handing over is in the scope of work. All prescribed methods of surface cleaning prior to application of preservative paint shall be followed by the contractor.

17.26.9
Condenser internal components/parts/surfaces have to be surface protected with steam washable paint as per BHEL standards.

Refer PAINTING SCHEME: "Chapter-XXV- Painting Scheme"

18. COATING & WRAPPING -Under Ground Protection for Buried Piping EXTERNAL shall be done as follows.

1. The external surfaces of the buried pipes shall be thoroughly cleaned by sand/shot blasting method for free of rust, weld scales, burns etc., before start application of anti-corrosive coats. Slag Blasting may also be considered. Kerosene, solvent or other cleaning material should not be used for external cleaning of the pipes. The above work shall be carried out to the satisfactory of BHEL engineers or as instructed by BHEL engineers.

1.1. The entire length of pipe shall be cleaned and coated leaving the end about 230 mm for joints, which shall be coated manually after laying in the trench, welding and testing the pipe.

1.2. Coating & Wrapping of site joints shall be done after completion of weld and / or flanged connections and after completion & approval of Hydro testing. Materials required for coating, wrapping and consumables required for cleaning operations are to be arranged by the contractor within the quoted rate.

1.3. The materials used for coating and wrapping are

a. Coating Primer (Coal Tar Primer)
b. Coating Enamel (Coal Tar Enamel)
c. Wrapping Materials

1.4. All primer / Coating / Wrapping materials and method of application shall conform to IS 10221 & AWWA –C–203-93.

1.5. For all CW/ACW Pipe, LP Pipes, fire protection pipes, Underground Protection shall be provided for the Piping System as indicated in any one of the methods below:

i. Pipe surfaces shall be cleaned by sand / shot blasting before application. Slag blasting may also be considered. Tests to be carried out after application:

1. Bond / Adhesion test

2. Holiday test

ii. Coal Tar Primer, Coal Tar Enamel. Material and application of tapes shall confirm to IS1537 or equivalent. These tapes shall be applied hot over the cold tar primer in steps of 2mm thickness so as to cover the spiral edges of the first tape by the application of second tape. Total thickness of coating shall not be less than 4.0 mm.

iii. With anti-corrosive tape of 4mm thick conforming to IS-10221 and AWWA C203-93

T&Ps and instruments required for the above are to be arranged by the contractor within the quoted rates

1.6. Wherever Road/Rail crossings are envisaged, they will be provided with RCC encasement.

1.7. The top of the buried pipe shall be as per drawing.

1.8. Laying and alignment of CW piping and puddle flanges, supply and application of wrapping and coating materials, conducting HT of the piping, draining and dewatering of HT water at appropriate location as per instruction of BHEL engineer, is under contractor scope, within the quoted rates.

1.9. Also refer the painting schedule.

2. Protection of Internal Surface for buried pipe (For pipe dia 450NB and above)

a. Surface cleaning by wire brush, power tools cleaning
b. Application of one coat of epoxy resin based red oxide primer followed by adequate No. of finish coats of coal tar epoxy paint to achieve total dry film thickness of 200 microns

3. Protection of External Surface (Over ground Piping)

a. Surface cleaning by wire brush, power tools cleaning
b. Application of one coat of red lead primer followed by adequate No. of finish coats of synthetic enamel paint to achieve total dry film thickness of 200 microns.
c. Also refer the painting schedule.

19 APPLICATION OF INSULATION AND REFRACTORY

19.1 Handling at site stores / storage yard, Transportation to site of work, Application of refractory & Insulation materials and connected works for LP piping and equipments and binding and cladding with sheets etc., using their own tools plants, tackles, all consumables, supervisor and men as enumerated in the scope of contract at Boiler and other areas etc.

19.2 Application of wool insulation, sheet metal cladding, welding of hooks / supports to hold insulation and as wherever necessary for all the equipment covered in this contract are to be carried out as per instruction of BHEL Engineer at site.

19.3 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.

19.4 All insulations and refractory materials including iron components and other sheets casing materials, etc., required as per drawing will be supplied by BHEL and the same have to be erected / applied as per the drawings and specifications of BHEL by the contractor.

19.5 Clean the Surface to be Insulated from Rust, Dust, Grease, Loose scale, Oil, Moisture, etc.. Care shall be taken that flexible insulation is not unduly compressed. After insulating the equipment the gaps / joints shall be filled with loose wool/ moulded insulation as applicable

19.6 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 expeditiously, so as to avoid damage to the insulation from the weather. Retainer type 'A' must be coated with Aluminium paint. All required amount of paint, thinner and other accessories for painting, cleaning the surfaces etc., shall be supplied by the contractor within the quoted rate. However, if any supply of sealing compound by the BHEL Manufacturing Units, the same will be issued to contractor free of charges.

19.7 It is the responsibility of the contractor to ensure that the insulation, refractory and sheet metal covering issued to him for application are well protected against loss or damage from weather conditions tending to affect its quality. Closed / semi closed sheds or any other arrangements required for this shall be arranged by contractor at his cost. All the insulation, refractory and sheet metal covering etc., issued to the contractor shall be properly stored and handled before application due the same. 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 the contractor.

19.8 Contractor is liable for the exact accounting of the materials issued to him and any unaccountable losses shall be made good by him. The necessary accounting of the material issued will have to be furnished by the contractor periodically

19.9 The contractor shall provide the required quantity of wire, nails and other materials for centering works at their cost.

19.10 Prior to application of refractory, bituminous painting (including supply) on the piping parts, as instructed by BHEL Enginner shall be in the Contractor scope.

19.11 Wherever iron components are to be welded on piping, the contractor shall employ only approved welders. It shall also be the responsibility of the contractor to arrange for welding hooks, flats, plates, supports and other fixtures also. All consumables tools and plants etc., required for the work shall be arranged by the contractor at their cost.

19.12 Wool insulations will received at site as bonded, loose bonded and un bonded mattresses in standard sizes. These has to be dressed / cut to suit equipment / site work by the contractor. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipments/ systems covered under the scope of work.

19.13 Removal type of insulation to be provided for valves fittings, expansion joints etc., as per the drawings or as directed by BHEL Engineer.

19.14 All piping insulations shall be carried out in such a manner as to facilitate removal of bolts nuts and washers from the flanges.

19.15 Fabrication of covering sheets, Al cladding may be necessary like preparing the sheets to the sizes and shapes specified in drawings. Beading, swaging, beveling of sheets crowning of the sheets if necessary shall be carried out by contractor as specified in BHEL drawings or as instructed by BHEL engineer.

19.16 Fabrication, fixing or welding of hooks / supports to equipment of piping and other connected equipments to support wool insulation applying of primer paint to welded portion parts welding certain supports on parts other than pressure parts to hold refractory's (by engaging approved welders) as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.

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

19.18 Cladding sheets shall be suitably pressed along with diagonals to form diamond shape so as to improve the strength of the sheets, to avoid humpiness and to give aesthetic look.

19.19 Plates, bars, rods and other materials that are to be cut, and re-welded from the fabricated places to suit erection requirements for which no extra payment will be made to the contractor.

19.20 A log book shall be maintained by the contractor for the clearance of the area for application of refractory and insulation. If the contractor does the work on his own accord without prior permission the area should be redone at his cost.

19.21 The contractor shall draw only one week's requirement of material for their work from BHEL stores and keep them in their semi-closed shed near to the work area. The materials required for a particular space of work only shall be taken to the work spot. At the end of the day's work the leftover or unused materials shall be taken back to their semi-closed shed for keeping the materials safe. Necessary records shall have to be maintained by the contractor in respect of the above drawls / deposits, on daily basis as instructed by BHEL.

19.22 Wastages allowance for the materials issued are envisaged as follows:

a) Pourable and Castable refractory 2%
b) Insulation bricks & mortar 2%
c) Wool mattresses 2%
d) Cladding sheets 5%

19.23 Upon completion of daily work , the contractor shall remove from the vicinity of work all scrap packing materials rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer. Also, the contractor will demolish all the hutments, sheds, offices, constructed by him and shall clean the debris after the contract is over. In the event of his failure to do so, the same will be arranged / removed by BHEL Engineer and the expenses incurred with overhead will be recovered from the contractors.

19.24 Welding of hooks as per pitch, applying red oxide paint to the welded portion as directed as per drawings before application of mineral wool mattresses will have to be done by the contractor.

19.25 Applying different layers of mineral wool as directed and as per drawings and specifications for boiler and its auxiliaries, pipelines valves and other vessels and after fixing require holdings materials, suitably if necessary, fabrication of rings etc., and fixing as directed and as per drawings and specifications shall also form part of this work.

19.26 The scope includes; Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint shall be arranged by contractor. Cutting of the wool mattresses to the required shape and application of finishing cement of required thickness wherever required.

19.27 If necessary the hooks may have to be made from the rods, raw materials supplied in running lengths. The contractor may have to carry out this work also and use the same hooks. This shall be done within the quoted rates.

19.28 In case the contractor is required to dismantle and re-erect certain area as and when required for pre-commissioning / commissioning activities the rate as indicated in the rate schedule shall be paid by BHEL for erection. However, for dismantling no extra charge will be paid under any circumstances.

19.29 Wherever additional / clamps, frame works, etc., are required to be fabricated and installed even though not indicated in the drawings shall be fabricated and installed at their cost. Only steel materials shall be given by BHEL free of cost , consumables like electrodes, gases etc., are to arranged by the contractor at his cost.

19.30 Contractor has to arrange required fire retardant covering material at their cost to protect the insulation materials drawn from BHEL before and after erection.

19.31 The contractor shall provide any fixtures, concrete blocks / wooden sleepers, etc., which are required for temporary supporting of the insulation materials at site.

19.32 Delay in clearance of mechanical equipment and piping for insulations is unlikely to happen. However, if any delay occurs, the contractor shall not claim anything extra, like idle charges.

19.33 Application of insulation and removal of the same for temporary piping, tanks under scope of erection of this contract is also included in the scope of the work. However, BHEL will supply the insulation materials free of cost.

19.34 Dressing of insulation to suit site conditions, sheet cladding over insulations, form the part of this work.

19.35 The temporary structures / items welded to permanent members / pipes are to be cut and removed without any damage. Any damage so to permanent members / pipes to be made good by the contractor at his cost.

19.36 The contractor will have to follow the instructions provided in the technical manuals, drawings, and specifications provided by BHEL, to the contractor from time to time. In case of ambiguity or deviation the decision / clarification of BHEL Engineer will have to be followed.

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

19.38 The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, gratings etc) shall be of light weight construction. Contractor shall arrange steel pipes & clamps with accessories like base plate attachment, fixing pins, struts etc for scaffolding required for this work. However, BHEL's decision in this regard shall be final and binding. Contractor shall arrange the scaffolding materials in sufficient quantity.

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

19.39 All attachment welding, including welding of hooks / supports as per pitch both on equipment and piping shall be done as directed by Engineer. 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 scope of work.

19.40 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.

19.41 The number of layers / thickness of mineral wool / LRB mattresses for 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.

19.42 The contractor should ensure, proper finishing of surface of the insulation, sheeting and cementing.

19.43 The 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.

19.44 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 contractors responsibility. Any cutting / bending / welding of fabricated skin casing sheets if required will also covered within the scope of this contract.

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

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

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

19.48 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 and 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.

20 PRESERVATION & PROTECTION OF COMPONENTS

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

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

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

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

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

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

Weightages / Factors

Package: Handling at site stores / storage yard, transporting to site, inspection, preassembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer for, LP piping and its associated items, CW & ACW water system, Fire protection system, Valves, Fittings, Hangers & Supports and Insulation of 1x660MW, Unit-6, Bhusawal TPS, Bhusawal.

SN	Description	Rate schedule identifier	**Quantity**	**UOM**	**Weightage/ Factor "X" w.r.t Total Price**
1	CS Piping (other than CW Piping)	1A, 3A,	5,377.46	MT	0.00012238000280815000
2	CS Piping (CW Piping)	1D	2,774.00	MT	0.00010700908302684900
3	SS Piping	1B, 3B	37.21	MT	0.00030580243841105000
4	Hanger&Supports,tanks,vessels,panel, instru,Eqpt,Str & misc items	1C, 3C	356.88	MT	0.00008559739473392580
5	Insulation- Wool Matress	2A	25.00	MT	0.00007760154142478150
6	Insulation- Iron Parts	2B	3.05	MT	0.00009951639273208550
7	Insulation- Al Cladding Sheets	2C	8.00	MT	0.00011159541042952800

Note: The quantity indicated in the BOQ is approximate only and is liable for variation. Payment will be as per actual quantity executed as certified by BHEL Engineer above Unit rate of individual items of BOQ.

This Chapter consists of Part A & Part B of Volume II "Price bid":

CONTENTS	
Description	Remarks
PART A: Instructions to the Bidders	Instructions
PART B: % weightage for amount of individual items of Schedule of quantity	Refer Latest Chapter-XXI of Vol-IA TCC (BILL OF QUANTITIES AND % WEIGHTAGE OF INDIVIDUAL ITEMS)
PART C: Total Lump Sum Price for entire scope of Work	This part is implanted in the E- Procurement portal entitled as "Part-C of Vol-II Price Bid".

Part A: Instructions to the Bidders

1. **Bidders shall quote Total Lump-sum Price for the entire scope of work at the place implanted in the E-Procurement Portal titled as "Part-C of Vol-II Price Bid".** Price mentioned elsewhere in the offer of the bidder shall be treated as Null and Void.

2. BHEL has fixed the % weightages as in "Part-B" for the amount of individual items of Schedule of Quantity w.r.t. the total price of Price Bid Vol-II.

3. Based on the pre-fixed % weightages, amount of individual items shall be derived by BHEL. This amount shall not be rounded off.

4. Based on the quantities of individual item and the amount arrived in Sl No 3 above, item rate of individual items shall be derived by BHEL. This item rate shall be rounded off up to two decimal places and shall be used to calculate the total amount of an item.

5. For the convenience of bidders, BHEL has issued an excel sheet with all requisite formulae as detailed above. ***However this excel sheet shall not form part of contract document. Further, this sheet should not be uploaded at the e-Portal.***

6. Bidders to note that this is an '**Item rate contract'**. Payment shall be made for the actual quantities of work executed at the Unit rate arrived at as per serial no 4 above.

PART B: % weightage for amount of individual items of Schedule of quantity w.r.t. the total price (as quoted by the bidder in "Part C of Vol-II-Price Bid")

Annexure I - BHEL T&P Hire Charges – is issued through Vol-I-E Technical Specification

Annexure II - Approved Welding electrode suppliers - is issued through Vol-I-E Technical Specification.

Annexure III - Erection Welding schedules for reference is issued through Vol-I-E Technical Specification.

- Annexure IV - Painting scheme QPC 11 – PC Chennai
- Annexure IV - Painting scheme QPC 12 – PC Chennai
- Annexure IV - Painting scheme – PESD Hyderabad

Above reference documents are issued through Vol-I-E Technical Specification.

Following drawings are enclosed for reference;

- Annexure V - Reference drawing1- Plot Plan
- Annexure V - Reference drawing2 - Layout for Intake water piping system
- Annexure V - Reference drawing3 - Layout CW and ACW Piping
- Annexure V - Reference drawing4 - revised service & potable water distribution pid bhusawal r01
- Annexure V - Reference drawing5 - revised plant water system pid r03 bhusawal
- Annexure V - Reference drawing6 - revised CW ACW system pid pe-dg-415-165-n001-r03..
- Annexure V - Reference drawing7 -revised DMCW system pid r03 pe-dg-415-179-n001
- Annexure V - Reference drawing8 - P&ID of IGES Rev-03
- Annexure V - Reference drawing9 - PY-DP-1-M102-8315-06_Rev. 04-S1&S2_Fire water pumping system
- Annexure V - Reference drawing10 - PYDP1M102831501-R2_ Scheme of Hydrant system_S1&S2 (1)
- Annexure V - Reference drawing11 - PYDP1M102831507-R02-Scheme of HVW Spray system
- Annexure V - Reference drawing12 - PYDP1M102831508-R02-Scheme of MVW Spray system

Above reference documents/drawing are issued through Vol-I-E Technical Specification.