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

No. BHE/PW/PUR/SKT-CNI/1053

FOR

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, COMMISSIONING AND HANDING OVER OF CONTROL & INSTRUMENTATION WORKS FOR BOILER AND ITS AUXILIARIES, TURBOGENERATOR AND ITS AUXILIARIES, STATION C&I FOR **2X250 MW SIKKA THERMAL POWER PLANT EXTN. UNIT#3&4.**

AT

VILLAGE MUNGAI, SIKKA, GARVA AND NANIKHAVRI

DIST-JAMNAGAR, GUJRAT

VOLUME – I

CONSISTING OF:

- **Notice Inviting Tender,**
- **Volume-IA : Technical Conditions of Contract-,**
- **Volume-IB : Special conditions of Contract,**
- **Volume-IC : General conditions of Contract**
- **Volume-ID : Forms & Procedures**

BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
POWER SECTOR - WESTERN REGION
345, KINGS WAY - NAGPUR 440 001

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BHARAT HEAVY ELECTRICALS LIMITED

(A GOVERNMENT OF INDIA UNDERTAKING)
POWER SECTOR - WESTERN REGION
SHREEMOHINI COMPLEX
345, KINGS WAY - NAGPUR 440 001

FOR

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, COMMISSIONING AND HANDING OVER OF CONTROL & INSTRUMENTATION WORKS FOR BOILER AND ITS AUXILIARIES, TURBOGENERATOR AND ITS AUXILIARIES, STATION C&I FOR **2X250 MW SIKKA THERMAL POWER PLANT EXTN. UNIT#3&4.**

AT

VILLAGE MUNGAI, SIKKA, GARVA AND NANIKHAVRI

DIST-JAMNAGAR, GUJRAT

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 :

1053

NOTICE INVITING TENDER

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

Bharat Heavy Electricals Limited

Ref: BHE/PW/PUR/SKT-CNI/1053 Date: 12/10/2012

NOTICE INVITING TENDER (NIT)

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

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To

Dear Sir/Madam

Sub : NOTICE INVITING TENDER

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

1.0 Salient Features of NIT

SL NO	ISSUE	DESCRIPTION	
i	**TENDER NUMBER**	**BHE/PW/PUR/SKT-CNI/1053**	
ii	**Broad Scope of job**	HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, COMMISSIONING AND HANDING OVER OF **CONTROL & INSTRUMENTATION** WORKS FOR BOILER AND ITS AUXILIARIES, TURBOGENERATOR AND ITS AUXILIARIES, STATION C&I FOR 2X250 MW SIKKA THERMAL POWER PLANT EXTN. UNIT#3&4 AT VILLAGE MUNGAI, SIKKA, GAGVA AND NANIKHAVRI, DIST-JAMNAGAR, GUJRAT.	
iii	**DETAILS OF TENDER DOCUMENT**		
a	Volume-IA	*Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc*	*Applicable*
b	Volume-IB	*Special Conditions of Contract (SCC)*	*Applicable*
c	Volume-IC	*General Conditions of Contract (GCC)*	*Applicable*
d	Volume-ID	*Forms and Procedures*	*Applicable*
e	Volume-II	*Price Schedule (Absolute value).*	*Applicable*

iv	**Issue of Tender Documents**	***1. Sale from BHEL PS WR office at NAGPUR :*** ***Start : 13/10/2012:*** ***Closes: 03/112012 , Time : 14.00 Hrs*** **2. From BHEL website (www.bhel.com)** Tender documents will be available for downloading from website till due date of submission	*Applicable/* ~~*Not applicable*~~
v	**DUE DATE & TIME OF OFFER SUBMISSION**	***Date : 03/11/2012 , Time : 15.00 Hrs*** ***Place : BHEL PS Regional office at :Nagpur*** Tenders being submitted through representative shall be handed over to any of the following BHEL officials after making entry/registration at the reception: RK Ranade/ Sr. Manager (Purchase) Saravana Kumar/Engineer(Purchase)	*Applicable*
vi	**OPENING OF TENDER**	***Date : 03/11/2012 , Time : 16.30 Hrs*** *Notes:* *(1) In case the due date of opening of tender becomes a non-working day, then the due date & time of offer submission and opening of tenders get extended to the next working day.* *(2) Bidder may depute representative to witness the opening of tender*	*Applicable*
vii	**EMD AMOUNT**	*Rs 2,00,000/- (Rupees Two Lakhs Only)*	*Applicable*
viii	**COST OF TENDER**	*Rs 2000/-.*	*Applicable/*~~*Not Applicable*~~
ix	**LAST DATE FOR SEEKING CLARIFICATION**	*Atleast 3 days before the due date of offer submission* *Along with soft version also, addressing to undersigned & to others as per contact address given below*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**	*Date :*	~~*Applicable/*~~*Not applicable.*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	----------	~~*Applicable/*~~*Not applicable.*
xii	**Latest updates**	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com -->Tender Notifications →View Corrigendums) **and not in the newspapers**. Bidders to keep themselves updated with all such information	***Applicable***

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

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

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

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

- PART-I consisting of 'PART-I A (Techno Commercial Bid)' & 'PART-I B (EMD/COST of TENDER)' in two separate sealed and superscribed envelopes (ENVELOPE-I & ENVELOPE-II)
- PART-II (Price Bid) – in sealed and superscribed envelope (ENVELOPE-III)
- One set of tender documents shall be retained by the bidder for their reference

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

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

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

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

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

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

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

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

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

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

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

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

i). Total number of Packages

Total number of Packages in hand = P
Where

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

ii) Weightage "A" assigned to bidders based on Total number of Packages 'P':

a) If 'P' = 0-9, : "A" will be equal to '4'
b) If 'P' = 10-18, : "A" will be equal to '3'
c) If 'P' = 19-36, : "A" will be equal to '2'
d) If 'P' = 37-60, : "A" will be equal to '1'
e) If 'P' is above 60 : "A" will be equal to '0'

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

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

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

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

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

c) Sum 'S_1 ' of 'Monthly Performance Evaluation' Scores ($S_{1\text{-}1}$, $S_{1\text{-}2}$, $S_{1\text{-}3}$, $S_{1\text{-}4}$, $S_{1\text{-}5}$,…. $S_{1\text{-}N}$) for similar package P_1, for the 'period of assessment' 'T_1' (i.e $S_1 = S_{1\text{-}1} + S_{1\text{-}2} + S_{1\text{-}3} + S_{1\text{-}4} + S_{1\text{-}5} + \ldots S_{1\text{-}N}$). Similarly S_2 for package P_2 for period T_2, S_3 for package P_3 for period T_3, etc for the tendered scope for all Regions. Now calculate cumulative sum 'S_T' of 'Monthly Performance Evaluation' Scores for total similar Packages '$\mathbf{P_T}$' 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_{BEHL}' for the similar Package/Packages** (**under execution**/ executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL)**:**

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

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

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

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

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

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

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

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

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

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

IV. **Explanatory note**:

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

b) Identified Packages (Unit wise)

Table-1

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

26.0 Order of Precedence

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

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

for BHARAT HEAVY ELECTRICALS LTD

AGM/Purchase

Enclosure

01. Annexure-1: Pre Qualifying criteria.
02. Annexure-2: Check List .
03. Annexure-4: Important Infor
04. Other Tender documents as per this NIT

ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, COMMISSIONING AND HANDING OVER OF **CONTROL & INSTRUMENTATION** WORKS FOR BOILER AND ITS AUXILIARIES, TURBOGENERATOR AND ITS AUXILIARIES, STATION C&I, FOR 2X250MW SIKKA THERMAL POWER PLANT EXTN. UNIT#3&4 AT VILLAGE MUNGAI, SIKKA, GAGVA AND NANIKHAVRI DIST-JAMNAGAR, GUJRAT.
TENDER NO	**BHE/PW/PUR/SKT-CNI/1053**

SL NO	**PRE QUALIFICATION CRITERIA**	**Bidders claim in respect of fulfilling the PQR Criteria**	
		Name and Description of qualifying criteria	Page no of supporting document. **Bidder must fill up this column as per applicability**
A	Submission of Integrity Pact duly signed (if applicable) (Note: To be submitted by Prime Bidder & Consortium/Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)	NOT APPLICABLE	
B	**Technical** Bidder must have, executed following works in the last seven (7) years as on latest date of bid submission {i.e. Bidder must meet (B.1.1 or B.1.2) And (B.2.1 or B.2.2 or B.2.3)} B 1.1) Executed CI works for BTG/GT 'OR' CI works consisting of DCS/DDC/Station C&I, in one unit of atleast 100MW rating. OR B 1.2) Executed atleast one contract of CI works consisting of DCS/DDC/Station C&I, in any industry with its executed value of Rs 140 Lakhs or more **AND** B.2.1) Executed One C&I work not less than value of Rs 300 Lakhs.	APPLICABLE	

	OR B.2.2) Executed Two C&I works each of not less than value of Rs 188 Lakhs. OR B.2.3) Executed Three C&I works each of not less than value of Rs 150 Lakhs.		
C-1	**Financial** **TURNOVER** Bidders must have achieved an average annual financial turnover (Audited) of **Rs 113 Lakhs** or more over last three Financial Years (FY) i.e. 2009-2010, 2010-2011, 2011-12.	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	
C-3	PROFIT Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1 above based on latest Audited Accounts.	APPLICABLE	
D	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)	APPLICABLE	By BHEL
E	Approval of Customer (if applicable) **Note:** Names of bidders (including consortium/Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval.	APPLICABLE	BY BHEL
F	Price Bid Opening **Note:** Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E	APPLICABLE	BY BHEL
F	Technical Tie up criteria (if applicable)	NOT APPLICABLE	

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

1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above along with all annexures
2. In case audited Financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e total divided by three.
3. C-2:-NETWORTH : Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
4. C-3:- PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the three financial years as in C-1 above
5. ~~'Additional' Criteria in respect of 'Technical' criteria of PQR (as in 'B' above) for Civil, Electrical, CI, unless otherwise specified :~~
   - ~~1. Bidder should have executed similar work of any one of the following:~~
     - ~~a. One (1) work of value not less than Rs XXX~~
     - ~~OR~~
     - ~~b. Two (2) works of not less than Rs YYY~~
     - ~~OR~~

~~c. Three (3) works of not less than Rs ZZZ~~
~~(Value XXX, YYY, ZZZ shall be as indicated by BHEL~~

~~2. 'Similar' work for criteria 5 above means~~
~~a. Civil or Structures or Civil & Structures or Chimney respectively as applicable to the tendered scope in respect of 'CIVIL' Works~~
~~b. Electrical works in respect of 'ELECTRICAL'~~
~~c. CI works in respect of 'CI' Works~~
~~d. Material Handling and/or Management works in respect of 'MM' works~~

6. Time period for achievement of the 'Technical' criteria of PQR (as in 'B' above) will be the last 7 years ending on the 'latest date' of Bid submission
7. 'EXECUTED' means the Vendor should have achieved the criteria specified in the Technical criteria of PQR (as in 'B' above) even if the Contract has not been completed or closed
8. Unless otherwise specified, for the purpose of 'Technical' criteria of PQR (as in 'B' above), the word 'EXECUTED' means:
    1. "BOILER LIGHT UP" in respect of Boiler & Aux and ESP
    2. "SYNCHRONISATION" in respect of STG/GTG and 'SPINNING' in case of HTG
    3. "STEAM BLOWING COMPLETION" in respect of at least Main Steam Line of Power Cycle Piping
    4. "HYDRAULIC TEST" of the system in respect of Structures, Pressure parts/IBR Piping
    ~~5.~~ ~~"CHARGING" in respect of power Transformers, Bus ducts, HT/LT switchgears~~
    ~~6. "Completion of RCC Shell and liner (steel or brick as per tendered scope) up to the HEIGHT specified using slip form" in case of RCC Chimney.~~
    ~~7. Achievement of physical Quantities as per respective PQRs in respect of Civil & Structures and Piling Works~~
    ~~8. 'Readiness for coal Filling" in respect of Bunker Structure Work.~~
9. Boiler means HRSG or WHRB or any other types of Steam Generator
10. Critical/Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass, LP Bypass lines
11. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating in terms of MW shall be considered for evaluation.
12. In case the experience/PO/WO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR.
~~13. Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine unless otherwise specifically indicated in the PQR.~~
~~14.~~ In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil/Gas Fired Boilers also can be considered unless otherwise specifically indicated in the PQR~~.~~

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

ANNEXURE - 2

CHECK LIST

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

1	Name and Address of the Tenderer			
2	Details about type of the Firm/Company			
3.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	YES / NO
7	Audited profit and Loss Account for the last three years		Applicable	YES/NO
8	Copy of PAN Card		Applicable	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed		Applicable	YES/NO
10	Integrity Pact		Applicable	YES/NO
11	Declaration by Authorised Signatory		Applicable	YES/NO
12	No Deviation Certificate		Applicable	YES/NO
13	Declaration confirming knowledge about Site Conditions		Applicable	YES/NO
14	Declaration for relation in BHEL		Applicable	YES/NO
15	Non Disclosure Certificate		Applicable	YES/NO

16	Bank Account Details for E-Payment	Applicable	YES/NO
17	Capacity Evaluation of Bidder for current Tender	Applicable/	YES/NO
18	Tie Ups/Consortium Agreement are submitted as per format	Applicable	YES/NO
19	Power of Attorney for Submission of Tender/Signing Contract Agreement	Applicable	YES/NO
20	Analysis of Unit rates	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 4: **IMPORTANT INFORMATION**

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

1053

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
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	Project Information
1.1	**INTROUCTION** Sikka Thermal Power Station is presently having two sets (units) of 120 MW units in operating condition. The plant owner M/s Gujarat State Electricity Corporation Limited (GSECL) has undertaken expansion of this power plant by installing two units of 250 MW each (name plate rating) in the same premises. Though both the new units are of 250 MW name plate rating, they are guaranteed to produce an output of 270 MW each. The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is 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.
1.2	**LOCATION AND APPROACH** In Sikka, Jamnagar district, Latitude 22^{O} 26' N & Longitude 69^{O} 49' E. The site is surrounded by villages Mungai, Sikka, Gagva & Nanikkhavri of Jamnagar district of Gujarat state. **Access by Road:** It is connected to State Highway (SH-25) by a 5 km long road through Sikka village. **Access by Railways:** Jamnagar – Okha broad-gauge section is passing at a distance of 12 km form Sikka. **Nearest Airport**: Jamnagar **Nearest Seaport:** Okha & Navalakhinare located 140 Km & 130 Km respectively from the site.
1.3	**Other Salient Information:** 1. Owner — M/s GSECL 2. Owner's Consultant — M/s TCE, Bangalore 3. Project Title — 2x250 MW Sikka TPS Extension Units # 3 & 4 4. Location — 12 km from Sikka, District – Jamnagar, Gujarat 5. Nearest Railway Stn. — Jamnagar

1.4	**CLIMATIC CONDITIONS** 1.Ambient Air Temperature a. Maximum 42 Deg. C b. Minimum 8 Deg. C 2. Relative Humidity c. Maximum 100% d. Minimum 21% 3.Rainfall e. Average annual 650 mm f. Maximum 900 mm g. Minimum 400 mm 4.Wind Data h. Basic wind speed at 10m height 50 m/sec i. Wind pressure As per IS: 875 Part III 5.Seismic Zone Zone IV as per IS: 1893-2002

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

2.0.0 Scope of work involving Erection, Testing, Commissioning, Calibration.

2.1.1

The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship, engineering and construction management. The contractor should ensure timely completion of work. The contractor must have adequate quantity of tools, measuring instruments, calibrating equipment etc. in his possession. He must also have on his rolls adequately trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor should match requirement of sophistication involving microprocessor-based max DNA systems.

2.1.2

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

2.1.3

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

2.1.4

The services, tests and support to be provided by the agency for the work mentioned in the various sections of this tender are indicative and not exhaustive, but not limited to these for the completion of the work in all respects.

2.1.5

Contractor shall calibrate, erect, commission all the equipments, cabinets/panels, instruments and cabling etc. as per sequence prescribed by BHEL at site. The sequence of erection / commissioning methodology will be decided by the BHEL engineers depending upon the availability of materials/work fronts etc. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection / commissioning of similar jobs or for any reasons whatsoever.

2.1.6

The work to be carried out under the scope of this specification covers the complete work of loading, handling, transporting, unloading, preassembly, erection, calibration, testing, air flushing, pre commissioning tests, commissioning of systems, trial run of various auxiliaries, achieving various activities till handing over of the unit to BHEL's customer, providing maintenance team to cater to guarantee responsibilities and maintenance thereafter. The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done departmentally or by engaging other agencies and recoveries will be effected from contractor's bills towards expenditure incurred including 30% departmental charges.

2.1.7

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

2.1.8

Descriptions of certain packages appearing in the rate schedule are available in this section and also in Appendix-I, to give general idea to bidder about the type of equipment to be erected, calibrated, tested and commissioned.

2.1.9

During the course of erection, testing and commissioning of C&I work, certain rework/ modification/ rectification/ repairs/ fabrication etc., will be necessary on account of feed back from various thermal power stations or units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/ maintenance requirements. Contractor shall carryout such rework / modification / rectification / fabrication repairs etc. promptly and expeditiously. Daily log sheets indicating the details of work carried out, manhours, consumables used etc., shall be maintained by the contractor and got signed by BHEL engineer every day. Claims of contractor, if any, for such works will be dealt as per clauses 13.1 to 13.9.

2.1.10

The contractor's scope of work is further described in the clauses hereafter:

2.1.11

All tools, tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables, electrodes including oxygen, acetylene argon etc gases, primers, paints etc. required for this scope of work shall be provided by the contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor’s quoted rates should be inclusive of all such contingencies. Electrodes shall be baked / dried in the electrode drying oven (range 375 – 425 deg C) to the temperature and period specified by BHEL Engineer before their use. Necessary drying oven / portable oven shall be provided by the contractor at his cost.

2.1.12

The scope of work under this tender specification covers transportation, calibration, erection, testing and commissioning, etc. of control / instrumentation and electrical equipments of the following packages.

A. Boiler Control & Instrumentation and its Auxiliaries

Digital Distributed microprocessor based max DNA system panels for FSSS, SADC, HP Bypass, auxiliary PRDS, soot blowers, coal milling system, gravimetric feeder remote /local control panels, Electronic water level indicator, air heaters, electrical panels for DC control supply, electrical heat tracing system, STLD, controlled circulation pumps, starter panel for mill lube oil /fans and field devices/ instrumentation work for above system, piping, cabling etc.

B. Turbo generator Control & Instrumentation and its auxiliaries

Digital distributed microprocessor based maxDNA system panels consist of TSC, EHTC, LPBP, TSI, ATT, LSR/AS, ATRS, turbine protection and monitoring,

Gamp and field instrumentation work / cabling, boiler feed pumps /condensate extraction pump, and misc. System like lube oil, seal oil, hydrogen gas system, vacuum pumps etc.

C. Station C&I / Balance of Plant

Digital Distributed microprocessor based maxDNA system panels for Balance of Plant controls, consisting of Open Loop and Closed Loop controls, interlock and protection systems for various HT, LT, pneumatic, hydraulic drives, remote multiplexed signal acquisition, alarm processing, MMI including computers and accessories, computer furniture, control desk, Large Video Screen, Steam and water analysers, Opacity monitors, Flue gas analysers, instrumentations, cabling, etc, etc.

2.1.13

Equipments /instruments required to be erected for this work, though not limited to but are generally as per rate schedule. For any items or class of work not specified herein but required for total completion of work, the same shall be

carried out as per BHEL requirement. However the payment of these items/class of work shall be regulated as per the General Condition of the contract.

Contractor shall provide necessary resources for completion of such work within the stipulated time schedule. Value of such work shall be included while computing the total value of work finally executed for all contractual purposes, particularly for contract variation purpose.

2.2.0 Collection of materials

2.2.1.1

The contractor shall take delivery of equipment, materials from the storage yard/ stores/sheds of BHEL/customer. He shall also make arrangements for verification of equipment, safe custody, watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The contractor should note that the transport of equipments to erection site, assembly yards etc. should be done by the prescribed route in the most professional manner without disturbing other ongoing works of various contractors. Special equipments such as laboratory equipments, measuring and control equipments, gauges, panels, console inserts, switches, transmitters, **controllers, power cylinders, cables, conduits etc. shall be stored when** taken over by the contractor in appropriate manner as per BHEL's instructions. The contractor should also note that while taking delivery of materials from BHEL stores (open/closed), it may be necessary to handle other items which could be blocking the exit route of the materials. *This aspect shall be taken care of in the quoted rates and no extra payment shall be done in this regard*. It shall be the contractor's responsibility to arrange necessary cranes/tractors, trailer, trucks, slings, labour, etc., etc., for transport of equipment.

2.2.1.2

The contractor shall take delivery of the components, equipments and special consumables 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.

2.2.1.3

The contractor shall handover all parts/materials remaining extra over the normal requirement with proper identification tags in a packed condition to BHEL stores. In case of any misuse or use over actual design requirements, BHEL reserves the right to recover the cost of parts/materials used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.

2.2.2

Void

2.2.3

All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments/components for checking and cleaning, fabrication of tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing of cut outs/openings for mounting of console inserts, modules, indicators, recorders, drilling of holes for gland entries, reaming, scrapping, cable laying, dressing, fitting up etc. as may be applicable in such erection works are treated as incidentals to erection work and are necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work.

2.2.4

Overhauling, cleaning, revisioning, servicing of equipments / instruments, valves etc. during erection and commissioning stages will be arranged by the contractor. However, gaskets /packing for replacement will be provided by BHEL free of cost. All equipments shall be preserved and protected before and after erection as per the advice of BHEL engineer.

2.2.5

The contractor should take all reasonable care to protect equipment and materials under his custody either in his stores or at site. Copper tubing, brass fittings, brass valves etc. Forming an integral part of equipment or system are liable to greater damages / pilferages /theft / losses. It will be responsibility of contractor to arrange for adequate security round the clock for protection from such damages / pilferages / theft / losses.

2.2.6

All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and/or handling of the equipments without the specific written permission of the engineer. The equipment from the storage yard shall be moved 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.

2.2.7

The contractor shall collect all scrap materials periodically from various levels of power house, working area of the power station, auxiliary and piping around power station and collect the same at one place earmarked for the same. Loads of scraps are 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.

2.2.8

All the surplus, damaged, unused materials, package materials, containers, special transporting frames, gunny bags etc. shall be returned to the BHEL stores/customer's stores by the contractor.

2.2.9

All pipes and tubes, equipments, instruments issued to contractor and kept at site for erection shall be covered with plastic caps/steel caps or shall be closed with suitable plugs by the contractor.

2.2.10

The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are erected in position.

2.2.11

Contractor shall plan and transport equipments/components from storage yard/sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Materials shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. It may be specifically noted that the space available for putting up the thermal power plant is limited and accumulation of material may lead to the necessity of shifting and restacking the materials to enable other agencies to carry on with their work or to comply with customer's requirements. If required, the contractor shall arrange shifting of surplus material expeditiously failing which the same will be arranged by BHEL and all charges together with departmental charges at 30% will be recovered from his bills.

2.2.12

House keeping in the erection and preassembly area is as important as the well-planned and orderly work. The access to site for inspection, approaches by BHEL and customer engineers and leading of the material shall be made available by the contractor at all times. The shifting and reshifting of erection materials, tools and plants and clearance of restrictions, filling of ditches, undulation near the preassembly and boiler area is the responsibility of the contractor. Contractor should visit the site and acquaint himself with

all restrictions and difficulties that he may encounter during erection/commissioning stages.

2.2.13

The work under this scope being quite sophisticated and also quite extensive, for proper planning, monitoring, reporting, etc of ongoing works, the contractor shall establish his own computer(s) and printer(s) at his site office, along with suitable operator(s), consumables, etc*. Non-establishment of above equipment will attract penalty @ Rs 10000 (Rs Ten thousand only) per month.*

BHEL uses its own software SOMS (Site Operation and Management System) for total project execution and billing. The contractor shall also provide adequate and suitable manpower for updating / entries into SOMS in BHEL computers at site.

2.2.14 <u>Troubleshooting during plant operation</u>

During pre commissioning / commissioning stages when the plant will be under various stages of operation, it will be necessary to have continuous (day and night) presence of suitable manpower along with required tools to attend to any defects etc that may arise during such operation. The contractor will be required to put such personnel in shifts in both electrical and C&I area. The bidder must also take this aspect into consideration

2.2.15.0 Pre-commissioning / commissioning and post commissioning activities

2.2.15.1

The work is also inclusive of various commissioning activities of the boiler and turbine package along with its auxiliaries and station C&I package. The various

activities, tests, trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of customer/consultant/ statutory authorities like boiler inspector, electrical inspector etc.

2.2.15.2

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

2.2.15.3

During each stage of commissioning, if any part of the instrument needs repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim, if any, for such repair/rectification/ rework/replacement etc. for reasons not attributable to contractor will be governed by Section-13 of the special conditions of contract. The parts to be replaced shall however be provided by BHEL free of cost.

2.2.15.4

The pre-commissioning activities will start prior to light up of boiler and various trials, commissioning operations shall continue till the unit is handed over to customer. Simultaneous commissioning activities will be in progress in various areas, checking of equipments erected, making ready for trial runs, alkali flushing, chemical cleaning, mass flushing etc. All these works need specialised gangs including electricians/instrument mechanics in each area. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted.

The mobilisation of these commissioning gangs shall be such that planned activities are taken up in time and also completed as per schedule and the work undertaken round the clock if required. It is the responsibility of contractor to discuss on day to day / weekly / monthly basis the requirement of manpower, consumables, tools and tackles with BHEL engineer and arrange for the same. If

at any time the requisite manpower, consumables, T&P are not arranged then BHEL shall make alternate arrangements and necessary recoveries with overhead cost will be made from the bills of the contractor.

2.2.15.5

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

2.2.15.6

In case any rework / repair / rectification / modification / fabrication etc. is required because of contractor's faulty erection which is noticed during commissioning or at any stage, the same has to be rectified by the contractor at his cost. If 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. Claims if any, for such works from the contractor shall be governed by section-13 of Special Conditions of Contract.

2.2.15.7

It is the responsibility of contractor to provide for necessary labour, tools and tackles and consumables till the completion of work under these specifications even in case erection, testing and commissioning of this work is delayed due to reasons not attributable to the contractor.

2.2.15.8

During commissioning activities and carrying out various tests, minor items like gauges, manometers, etc., have to be temporarily erected and put in service to suit the commissioning activities. BHEL will provide the necessary gauges and equipment. Contractor has to carry out the erection, calibration, dismantling of the same. After completion of activities the temporary systems have to be removed and returned to stores. No extra charges will be payable towards these.

2.2.15.9 Commissioning

During pre-commissioning, commissioning, post commissioning and trial operation stages of various systems, certain category of manpower with T&P and consumables will have to be provided to BHEL commissioning engineers exclusively at their disposal. It shall be the responsibility of the contractor to provide Engineers, Electricians, technicians, Helpers, Fitters etc along with necessary consumables, hand tools, calibration equipment etc, for the various commissioning activities in progress. During peak months there could be requirements of separate commissioning gangs simultaneously in even upto 12 to 15 areas. Contractor has to augment the manpower as and when required as per work demand and necessity at site. The quoted rates shall include this.

2.2.15.10

It shall be specifically noted that contractor manpower may have to be engaged round the clock simultaneously at different areas and hence considerable number of personnel and their overtime payment may be involved. *This aspect must be considered by the contractor while quoting their rate.* No additional compensation by for the same shall be payable, irrespective of number of persons engaged or number of working hours per day.

2.2.15.11

For electrical works, 415 volts and above, the contractor has to bring qualified electricians.

2.2.15.12

Certain systems may be supplied with portable programming units, which are to be connected at various locations during pre-commissioning to handing over. Necessary cabling interconnecting the programming units and other connected panels has to be carried out by the contractor and are to be dismantled after work. For the purpose of testing, monitoring, commissioning, etc., these programming units will have to be repeatedly connected and disconnected at various locations. These will be considered as part of commissioning activities and no separate payment will be entertained for the above.

2.2.15.13 Calibration, Testing & Commissioning

Calibration, testing & commissioning activity as specified in this technical specification and rate schedule against various equipments, devices, systems etc. are broadly classified below. However, there may be some overlapping between the activities (erection, calibration and testing, commissioning.) The classification of activity is only a guideline for understanding the total volume of work in each activity. The contractor shall have no claim for performing or providing manpower for such overlapping work, which is also within the scope of the work.

A Calibration

Verification after drawing of material of various types, range of the field devices with respect to instrument schedule, data sheet or system document.

- Codification of instruments as per system tag numbers
- Calibration / adjustment of instrument as per system requirement / set values.
- Providing head correction in case of pressure measurement as per calculated values or actual measured value for the instrument, which are used for interlock protections / monitoring. This is generally applicable for turbine / generator, lube oil systems, lube oil system of fans etc.
- Verification of installation of instruments for range, type, tag number as per physical location of process point as per process, instrumentation diagram.
- Checking and ensuring the proper function of instrument.
- All the recorders shall be made functional with proper chart movement and ink marking.

- Preparation of computerised calibration certificates in the formats specified by BHEL Engineers and getting those signed by the customer is in the scope of the contractor.

- **B Erection**

- Drawal of material from store, verification, inspection as per shipping list, drawings and documents.

- Preservation, up keeping, safe custody of the erected equipments till handing over to the customer.

- Verification of installation as per drawing and document for the correctness of cabling, JBs, impulse pipe, various field device, panels, instruments etc.

- Continuity check and IR value check of cables.

- Verification of correction of cable termination with respect to instrument, electrical hook-up diagram, panel interconnection diagram, JB schedule.

- Checking earthing of the equipments and cable shield wire continuity.

- Energizing the functional group control panels and field devices.

- Flushing of impulse pipe before making the instruments process connections through.

- Any leakages, damages to impulse pipe, field device connections, air connections etc. shall be fully attended by contractor.

- All cable glands/piping/tubing to be fixed as per installation requirement before commissioning.

-**C** **<u>Testing, Commissioning & Trial Operation</u>**

- Checking/verification of binary/analogue input and output signal from field and panel and upto recording/indicating instrument/HMI monitors.

- Adjustment, testing, calibration of pneumatic drive (control valve, trip valve, power cylinder for gate/dampers), electrical actuator operated valve/gate/dampers of other functional elements.

- Checking the operating electrical/pneumatic drive through functional group panel, remote control desk, HMI, CRT operation and repeatability and smooth operation to be checked.

- Checking the interlock, protection and alarm for various processes by simulation of field devices/process changes.

- Functional check of sub-loop control, sub group control and auto loop and fine tuning.

- Adjustment of limit switches/feed back position transmitter checking the actuator for correct Limit switch operation for correct position indication and repeatability shall be ensured.

- Motor IR value measurement, bearing/winding RTD checking, drying out of motor, providing assistance for trial run of motor which includes monitoring temperature rise winding/bearing during trial run.

- Contractor shall prepare calibration/testing report/protocols.

- During trial run of various systems, if the performance of any instrument is found erratic, un-satisfactory and requires re-adjustment, re-calibration etc., the defect shall be attended by contractor.

- Observing and checking the performance of the various devices on load/process variation. Any deficiencies/defect noticed during the variable load conditions, the same should be attended properly.

- Observe the proper functioning of sub-group/sub-loop control.

- Check the operation of various controls in manual/auto mode for smooth functioning.

- Clearing of all bad / invalid signals noticed during commissioning.

- Providing necessary assistance for **Trial Operation** of the unit is in scope of this specification. Trial Operation shall be considered successful on completion of operation of the respective units for a continuous period of 720 hours at maximum available load. Out of this period, 72 hours shall be at full rated load of the unit. Smooth operation and availability of all instrument/controls of the systems installed under the scope herein, shall be ensured by the contractor. Contractor shall provide adequate number of skilled manpower and T&P for this purpose. Interruption in Trial Operation for reasons attributable to the Contractor shall result in re-start of the Trial Operation all over again, consequential extension in Time Schedule / Contract Period shall be to the contractor's account.

- If any small wiring correction or minor modification in control panel wiring is noticed during the commissioning, it shall be carried out as a part of commissioning activity.

D **Post-commissioning**

- Contractor shall rectify the defect observed/informed by customer during the trial run.

- Contractor shall submit the as- built drawing as per guidelines and instruction of BHEL engineer.

- After trial run/handing over of the equipment, if due to unforeseen reasons, certain works crop up, the contractor shall provide all the assistance.

E. **PG Test Assistance**

In case PG test is to be conducted, laying of impulse pipes, cables, etc. and installation of instrument tapping points shall be done by the contractor. Payments will be made as per item rates of comparable similar or identical items in the rate schedule. Such temporary installations shall have to be dismantled and returned to BHEL Stores, after the completion of PG Test for which no separate payment is admissible.

2.3.0 Brief description of work

2.3.1 Installation of Cable trays/cable ducts

2.3.1.1 Various types of sheet metal, galvanised cable tray, i.e. Perforated, ladder type, seal metal duct, solid bottom tray, shall be provided in standard lengths along with accessories like hardware, bends, reducers, coupler plate, tray covers and tray clamps etc.

2.3.1.2

Installation of cable tray/cable duct shall include cutting, laying, jointing, supporting, drilling holes in the support, providing tees/reducers/bends/clamps as per tray route layout, fabrication of bends/tees/reducers from straight length, fixing of tray covers, welding of tray on support, cleaning and application of cold galvanising paint on weld joints (supply of paint is in the scope of contractor). *Installation of tray/duct covers, wherever provided, will be done as a part of tray erection and no extra rates will be payable.*

2.3.1.3

In case cable trays are required to be fabricated from structural steel and installed, unit rate applicable for fabrication and installation of structural steel shall be applicable in such instance.

2.3.1.4

Cable trays/ducts have to be routed underground in cable trench, over head on structure, valves, floors etc. for various application such as cable laying, copper tubes, conduits, thermocouple, temperature gauge capillary etc.

2.3.1.5

Installation of Copper tubes/SS tubes/copper pipes shall include cutting into required length, laying, bending, cleaning, brazing wherever required, fixing of brass fittings like compression fittings/tees/end connectors/straight

connectors/bulk heads/valves etc., supporting clamping including supply of clamps and hardware, flushing and conducting leak test.

2.4.0 Cable laying (power / control / instrumentation shielded / unshielded cables / plug-in cables / coaxial / UTP / STP / data highway, armoured / un-armoured, single / multi-core, PVC/HR PVC/FRLS/TEFLON/XLP insulation, optical fibre)

2.4.1

Cable laying includes cutting to the required length, laying in overhead/underground cable trench/through pipes/flexible conduits, dressing/clamping in tray, drilling of holes in gland plates in panels and junction box, glanding, splicing, dressing of spliced wire inside the panel and JBs, providing PVC numerical/alphabetical / printed ferrules, termination by using crimp type copper tinned/aluminium lugs, insulated/un-insulated, termination (crimp, soldering, etc.), plug-in connections with insert type crimping, providing identification PVC/aluminium cable tags (at both the ends and at 15 m intervals throughout the route length and also at each bend), continuity checking, insulation resistance checking, high voltage test on HT cables.

Laying, etc of Optical fibre cables on cable trays /cable trench shall necessarily be done using flexible conduit

2.4.2

Entry to the panels and JBs may be at top, sides or bottom. All cables are required to be properly supported and clamped near to the JB/panel.

2.4.3

Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, prefab plug-in cables, etc., for such cases cables may have to be lifted inside the panel by either making cut-out in gland plate and providing rubber profile for sharp edge protection or alternatively, providing 4” or 6” PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.

2.4.4

Copper tinned lugs of various types (pin, ring, fork, snap-on) upto 4 sq.mm, PVC cable ties, PVC ferrules, PVC button and tapes, cable identification tag of PVC/metallic, clamping and dressing material with hardware, PVC sleeves etc. shall be supplied by the contractor within the quoted rates for cable laying. The quality of material shall be got approved from BHEL engineer prior to their use on job.

2.4.5

All care should be taken to avoid abrasion, tension, twisting, kinking, stretching of cables during installation.

2.4.6

Cable shielding – all signal cables are supplied with bare shielded copper wire/with braided wire shield. Generally shield wire is kept isolated at instrument/field device end and continuity is maintained through JBs and grounded at panel end only. While terminating the shield wire either in panel or JBs, PVC sleeves are to be used to avoid two-point earthing.

2.4.7

Wherever cables run through ducts, conduits, valves, etc., they shall be sealed using fire/weather proof compound. In addition to this, cable entry in panels, MCCs, instruments, electrical actuators etc., are also required to be sealed. The required material for doing so shall be included by contractor in the cabling scope.

2.4.8

Many of the cable trays and cables have to be laid in cable trenches. For this purpose, the cover of the trenches have to be opened for working in site and whenever the cables are to be laid in existing cable tray, all safety precautions have to be observed.

After completing the work, the trenches have to be cleaned and covers put back into position. Contractor shall also carry out de-watering from the trenches if required and arrange pumps etc., at his cost.

2.4.9

Looping wire at terminal block of panels and electrical actuator as shown in the inter-connection diagrams or as required is to be done by contractor at no extra cost.

2.4.10

Contractor shall carefully plan the cutting schedule of each cable drum in consultation with site engineer such that wastage are minimised.

2.4.10.1

The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits;

Sl No.	Item	% Wastage on issued Qty
1.	Fabrication steel	2
2.	Each size of power cables	1
3.	Each size of control/Inst cables	2
4.	Impulse pipe/tubes/GI pipes/copper tube	1

If however, the bidder quotes for more wastage than specified above, the excess portion will be considered for adjustment during the tender evaluation at the quoted supply rate of material.

If the actual wastage be more than the specified figure, then equivalent price of the excess portion will be deducted from the contractor's bill.

2.4.11 Terminal Connections:

The types of cable terminations are generally as detailed below:

SG package, TG package, Station C&I and Auxiliaries

1) All field cables in SG package are crimp type of different sizes.

2) All JBs are both side screw type.

3) All console tiles wiring: screwed or plug-in type to be fabricated at site.

2.5.0 Junction Boxes :

2.5.1 Different type of junction boxes are to erected by the contractor like junction boxes below 48 ways and above 48 ways. The junction boxes are to be located at the locations jointly decided at site during erection. The junction boxes are to be erected on the frames fabricated at site.

2.6.0 Laying of pipes and tubes (impulse pipe & instrument air pipe)

2.6.1

Root valves are generally provided on process pipe line by other agencies. Prior to starting impulse pipe, contractor to identify the process point with respect to PIDs.

2.6.2

Installation of impulse pipe of CS/AS/SS material shall include cleaning, air flushing, cutting to length from running meter, edge preparation, cold bending, welding of sockets / reducers / tee / cross / isolating valves / union, nut and tail pieces / nipples, condensing and other pots, etc., mounting of SS/CS valve manifolds and compression fittings, providing supports, clamping, conducting leak test / hydraulic pressure test, painting as per colour code (primer and two coats) and erection and commissioning of other standard accessories as per instrument hook-up diagram.

Piping works shall involve either arc or TIG welding. Paint, primer etc supply is in the scope of the contractor. Colour codes for impulse piping, etc will be as per

standard codes. Contractor to follow the BHEL supplied welding schedule and welding procedures. The decision of BHEL engineer will be final in this regard.

2.6.3

IBR certified welders shall be deployed for welding of impulse pipe and contractor shall take approval for welder and welding consumables from BHEL site engineer.

2.6.4

Laying of GI pipe for instrument air line shall include air blowing, cutting from the running meter length, threading, installation of elbows/tee/reducer /moisture traps/auto drain pot/check valves/isolating valves, supporting clamping, conducting leak test and also seal welding of threaded joints, if required.

2.6.5

Threaded joints of air line shall be made leak proof by using Teflon tapes or sealing compound. All consumables shall be in the scope of contractor.

2.6.6

All fittings and accessories for impulse pipe and air line shall be provided by BHEL. Quoted rate for piping shall include cost of installation of such fittings and no separate rates are envisaged.

2.6.7

Contractor shall provide GI "U" clamps for impulse pipe and GI pipes within the quoted rates for installation of the same.

2.6.8

Impulse pipes shall be applied with one coat of primer red oxide paint and two coats of synthetic enamel of prescribed shade of final paint. BHEL may prescribe a time gap between first coat and second coat of final paint.

2.7.0 Structural steel fabrication and installation

2.7.1

Structural steel material like MS angles, channels, beams, flats, plates etc. shall be supplied in running meters and same shall be used for fabrication of panel base frame, cable tray supports, canopies, instrument and junction box frames, impulse pipe/instrument air pipe supports and instruments etc.

2.7.2

This shall include cutting into size, conduiting of end connections, if required, welding, grinding of excess weld deposits, drilling of holes for mounting of device/instrument, installation at location, levelling, alignment, providing bracings, painting etc. No gas cut holes will be permitted. Contractor to follow the BHEL supplied welding schedule and welding procedures.

2.7.3

All the fabricated supports/frames shall be applied with one coat of primer red oxide paint before installation and two coat of synthetic enamel of prescribed shade of final paint,. If required, BHEL shall prescribe time gap between first and second coat of final paint. Paint, primer etc supply is in contractor's scope.

2.7.4

Frame installation/cable tray accessories' installation at site may involve mounting either on concrete floor by grouting/using anchor fasteners or on steel structure by welding etc. *All consumables including anchor fasteners shall be arranged by the contractor***.**

2.7.5

In certain packages, galvanised members of junction box frames and instrument racks shall be supplied in cut to sizes and frame assemblies are required to be done as per drawing by bolting/welding. The installation rate as quoted shall include the assembling of the frames.

2.7.6

Gas cutting of tray/impulse pipe support and gas cut holes in frame shall be avoided. Only drilled hole shall be permitted in frame etc.

2.8.1 Installation of panels

Electrical control panels, electronic control panels, etc., are normally supplied in suit of either one/two/three or loose shipping sections with integral base frame or loose supplied.

These panels may have to be installed as stand alone or in groups consisting of number of panels in each row, depending upon the plant layout and foundation arrangement.

2.8.2

Installation of panel shall include fixing of base frame, fabrication of base frame if required, levelling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubicle interconnection hardware, bus bar jointing, wiring interconnection, welding and grouting of panels and base frames, mounting of panel canopy wherever supplied as part of panel, drilling of gland plates and sealing of cable entries. In certain case where canopies are not supplied but have to be fabricated out of MS sheets provided by BHEL, payment will be done on square meter basis.

2.8.3

Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc. which shall be part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc. Panel have to be erected at different locations and elevation in boiler, TG, GTG hall, LT & HT switchgear room, unit control room, ESP control room etc.

2.8.4

Panel and instruments once erected in position should be properly protected using necessary care to prevent ingress of dust/moisture. This will have to be periodically cleaned and surroundings have to be kept tidy.

2.8.5

Wherever the panels to be mounted on cable trenches, channel supports have to be provided across the cable trench over which the base frame of panel shall be mounted. For such work, structural steel fabrication, installation rates shall be applicable.

2.8.6

Normally the panels shall be supplied with instruments, relays, meters, electronic modules etc. mounted and pre-wired. However, if these are supplied loose / separately for safety in transit, contractor shall mount/wire such devices as part of the panel installation work and no separate rates shall be applicable unless otherwise *specially* listed in the rate schedule.

2.8.7

No separate payment shall be made for replacement of any devices like electronic modules, relays, conductors, terminal block, push buttons etc. which are found defective during pre-commissioning / post-commissioning of any equipment / item.

2.8.8

For the panels erected by other agencies, commissioning/calibration work and trouble shooting has to be carried out by the contractor as part of testing and commissioning work as per the quoted rates.

2.8.9

Minor civil works like drilling, chipping, punching holes and opening in concrete floors, slabs and brick walls, grouting, related to Rack, support installation, minor

civil works required for installation of control panels, Junction boxes etc., shall be included in the erection cost of such items. Also all miscellaneous civil works like chipping away and making good as necessary in floor slab/wall for cabling / earthing etc., as required are included in the scope for which no separate payment is applicable. The scope also includes supply of grouting material, if any.

2.8.10

Supplier's instruction manuals, packing slips, door keys etc. received along with the panels should be promptly handed over to BHEL's engineer on opening of the panels.

2.9.0 Control panels

SG, TG, Station C&I system panels are based on Max DNA distributed digital control philosophy. Max DNA system is having communication through UTP cables amongst themselves. The system consists of computer network with servers and workstations and various peripherals like printers, etc. Optical fibre cables are also used for communication, especially for larger distances. The various components/devices are generally located in control room/computer room/diagnostic and shift in charge room. Some panels (viz. network panels) are also located in outdoor plants and other units.

The entire work of erection, testing, commissioning of the connected devices/equipments as listed in rate schedule is to be carried out including laying of peripherals cables (either plug-in or plugs to be fabricated at site), placement of computer furniture in computer room as per lay out. The computer furniture shall be supplied either assembled or in knocked down condition, which have to be assembled at site. The quoted rate shall be inclusive of cable laying, termination and placement of furniture against each device as given in the rate schedule.

2.10.0 Battery/battery charger/UPS

2.10.1

HDP Tubular 550/600AH or NiCd (or similar type) or Lead acid Batteries will be supplied loose along with battery interconnection in the series/parallel links/bus bar, lugs, steel/wooden battery stand either assembled or knocked down condition, cables and associated charger and UPS system.

2.10.2

In case of Lead acid battery, the electrolyte shall be supplied in plastic cans. After installation, the electrolyte has to be filled in batteries and charging/discharging shall be carried out to achieve specific gravity of electrolyte and stability of battery/battery bank. If required, discharging of the charging cycle shall be repeated to achieve the desired results. However, BHEL engineer's decision shall be final. Any preparatory arrangement required to be done for charging and discharging of battery, the contractor shall arrange consumables, safety equipments etc., at his own cost.

2.10.3

In case of NiCd (or similar type) batteries are normally supplied in charged condition, due care shall be exercised while handling/installation of the same. If the battery charge is found to be less than the required level, the charging/discharging cycle shall be carried out as per instruction of BHEL engineer.

2.10.4

Battery charging/discharging is a continuous process and skilled manpower shall be deployed by the contractor round-the-clock.

2.10.5

Contractor shall arrange suitable load, cables, safety equipments and consumables for discharging the battery during charging and discharging cycle at his cost.

2.10.6

Contractor shall provide skilled manpower for periodic maintenance after the battery are fully charged for the activities such as checking of electrolyte level, specific gravity, topping up with distilled water and cleaning till the set is handed over to customer and record of the same shall be maintained and submitted before handing over of the system.

2.11.0 Vibration monitoring system for boiler auxiliaries

System comprises of transducers with integral cables, weldable pads, wall mounted cabinet including monitors. The pads required to be welded on SS block on HT motors end shield and fan bearing housing. In case of pad sizes more than the SS block provided on motor, contractor shall get the pads machined as per the required size and blue matching to be carried out before welding on bearing housing. No extra charges will be applicable.

2.11.1 Void

2.11.2 Flue gas analysers

2.11.2.1 Oxygen Analysers

The system consists of Zirconia probes, electronic units Panel for mounting electronic unit, purging and calibration gas arrangements, etc. The probes are meant for direct mounting on duct / chimney, etc., at suitable elevation.

Commissioning support will be provided by vendor.

2.11.2.2 NOX, SOX, CO analysers

NOX, SOX, CO analysers system consist of extraction type sampling probes and shall be mounted on the chimney at a considerable height. This will also consist of other accessories like gas extraction sampling pumps, sampling tubing, electrical heat tracer, insulation, test gas cylinders, purge air compressors, etc, etc.

Commissioning support will be provided by vendor.

2.11.2.3 Opacity Monitor

This consists of transmitters, receivers, Local electronic units and housing, air blower and associated hoses / pipes, JBs and cables.

Commissioning support will be provided by vendor

2.12.0 Field instrumentation

2.12.1

Various type of primary/secondary indicating/recording instrument for pressure, temperature, flow, level and analytical measurement shall be supplied either loose or mounted along with the equipment.

2.12.2

Scope of work under erection/calibration/testing/commissioning shall include calibration, setting, adjustment, writing instrument tag number with paint, report making, installation, servicing, minor repairs/servicing, putting instrument into service, signal checking from field upto the functional group panels and remote indicating instrument, functional checks, interlock and protection/alarm checks by simulating the field devices, trouble shooting during pre-commissioning/post-commissioning till system is handed over to the customer.

2.12.3

It is the responsibility of contractor to make erection, calibration/testing protocols for various C&I equipments/devices and they should get duly certified by customer/BHEL engineer and should be submitted to BHEL engineer regularly. However, sample formats will be given by BHEL and have to be printed by contractor in adequate numbers.

2.12.4

Contractor shall establish calibration laboratory with adequate facilities and they should arrange standard test instruments duly calibrated from recognized agencies and calibration report of the same to be submitted prior to start of calibration of the field instruments/devices.

2.12.5

Wherever thermowells are supplied along with temperature gauges, thermocouples, temperature switches, thermostats, etc., the contractor has to co-ordinate with the mechanical contractor for identification and fixing of thermowells on the pipeline. However actual fixing of thermowells on pipeline and seal welding shall be done by mechanical contractor and is not a part of instrument installation.

2.12.6

Installation of instrument shall also include drilling of holes and tapping for mounting of instrument and local instrument frames/panels and supply of hardware for mounting of the instrument.

2.12.7

Some devices line solenoid valves, position feedback transmitters, limit switches, air filter regulators, airlock relays, positioners etc., are supplied assembled along with mechanical equipments like pneumatic control valves, power cylinders, trip valves, dampers, motorised actuators, etc. These will need removal, calibration/testing, refixing, adjustment, etc., and commissioning. Separate payment shall not be made for this. The rates quoted for the commissioning of these equipments (viz., pneumatic control valves, power cylinders, trip valves, dampers, etc.) should take care of the above. Also, the contractor shall remove such devices prior to erection either at site or at store to avoid damages/pilferages and keeping in safe custody and the same shall be installed prior to commissioning of such equipment.

2.12.7.1

Transmitter enclosure / open racks for various packages which are to be erected and commissioned at various locations of the Boiler, turbine and outdoors, shall be supplied with internal tubing, air filter regulators, rotameters, provision of continuous or intermittent purging arrangements wherever required, etc. The quoted rates for these racks / enclosures shall include the erection and commissioning of all such items inside these racks / enclosures.

2.12.8

Sometimes recalibration of equipments may become necessary due to reasons not attributable to the contractor, e.g. Lapse of Time after first calibration, Need for change in range/parameter, etc. If re-calibration is required due to no fault of the contractor, the rates payable for re-calibration shall be as under:

Recalibration Charges = 60% of the Percentage Stage Payment for Calibration as per split-up defined in Terms of Payment (Chapter-7)

The contractor shall keep record of such instrument with the reason for re-calibration and certified by the BHEL Engineer.

Note: For recalibration of skid mounted items or other systems where lumpsum rates are quoted, the recalibration charges, if admissible, will be calculated from the relevant unit rates quoted for same / similar items elsewhere in the rate schedule. The decision of BHEL Engineer shall be final and binding on the contractor.

2.12.9

For the very few cases where required, the contractor shall carry out re-orientation of bottom/top entry arrangement for process connection if needed due to site condition in existing instrument rack/enclosure/JB and re-location of existing instrument including removing of the existing tubing and re-installation of the same at appropriate location due to any change in grouping of the instrument and no extra payment shall be applicable.

2.12.10

In certain cases instruments / devices are supplied on equipment or drawn by other agencies as part of mechanical package. The same are to be received or to be collected from other agencies for keeping in safe custody to avoid damages. The same are to be erected back after calibration for which unit rate shall be applicable for erection and calibration. Contractor shall maintain record of such instrument duly certified by BHEL engineer. However for removal of such instrument, no separate rate/payment shall be applicable.

2.13.0 Unit control desk and components

2.13.1 Unit control desk will be supplied in a single shipping section for erection at site.

Console Inserts shall be supplied either mounted on console grid or supplied loose. Also, the items (indicators, pushbuttons, etc.) of the console insert may be supplied mounted in the console insert or may be supplied loose. The lumpsum rates quoted for console inserts should take the above into consideration. No separate payment will be done for the erection of individual components of console inserts. However, for the other items like recorders, indicators, etc., unit rate shall be applicable. Alarm facia on the control desk may be supplied mounted or loose. Mounting these, if required, will not attract any extra payments. The commissioning of these will constitute a part of the panel commissioning from where the alarm is driven.

2.13.2

Wherever control desk / panel is not supplied by BHEL or is in customer scope of supply and installation, loose item supplied by BHEL if any, shall have to be mounted by the contractor.

2.13.3

Console/console tiles shall have plug-in/screwed/soldering/crimp snap-on, connection. Interconnecting cable between console and process control panel shall be either of pre-fabricated plug-in cable or plugs are required to be made at site with crimp insertion type of pins. BHEL shall provide plugs and any special lugs at free of cost. However, other ordinary lugs required for the work shall be arranged by contractor.

2.13.4

Generally, 0.5 sq.mm multi pair shielded cables are envisaged for console cabling. Cable may have to be terminated at different console tiles, spliced wire of individual cable need to be routed through PVC sleeves upto the plug end of the tiles.

2.14 Final painting

2.14.1 All the fabricated frames, instrument racks, Junction box frame, trays / impulse pipes, supports, panel base frame, etc., wherever applicable shall be first painted with one coat of primer paint (metal red oxide) and then two coats of synthetic enamel paint of approved shade (decided by BHEL Engineer) after thoroughly cleaning the surface of dust, rust, scale, grease, oil, etc., by wire brushing, scrapping or any other suitable method. The quoted rates should be inclusive of all these including supply of paints and consumables.

2.14.2

Other equipments like JBs, Panels, transmitter racks, Local gauge boards etc., shall be painted with two coats of synthetic enamel paint. The quoted rates should be inclusive of application of two final coats of synthetic enamel paint. All the consumables such as wire brush, other cleaning materials, painting implements, etc., is to be arranged by the contractor at his own cost. All equipment painting will be done by spray painting. The quoted rates should be inclusive of all these including supply of paints and consumables.

2.14.3

All the weld joints of GI cable trays and GI structural members shall be applied with a coat of cold galvanising zinc paint. Paint, etc shall be arranged by contractor at his cost.

2.15.0 Misc. Other instrument/equipment erection, calibration and commissioning.

2.15.1

Wherever panels, pneumatic power cylinders and control valves have been erected by the mechanical contractor, calibration/ commissioning has to be carried out by the contractor.

2.15.2

SADC power cylinders are to be erected by contractor in coordination with other agencies as per instructions of BHEL. For SADC power cylinders, copper tubing and accessories will be supplied by BHEL. The copper tubing work from the instrument line header to the power cylinder and the internal connection to be carried out by the contractor as per site requirement. *Necessary security against pilferage is to be arranged by contractor.*

2.15.3

In the case of electronic water level indicator , electrodes may be supplied loose and the same need to be fixed in the pressure vessel as per the drawings. No extra charges will be payable.

2.15.4

The calibration of position transmitters of the NRVs in the turbine extraction system has to be carried out by the contractor. Position transmitters are to be erected by contractor if supplied loose.

2.15.5

The solenoids in the corner valves / HEA will be received in mounted condition and will be erected by the mechanical contractor. The contractor has to provide the services required for dismantling the solenoids and reinstalling the same after servicing/adjustment. Payments will be made as per testing/commissioning portion of the rate quoted for these items and no extra charges will be payable for removal and refixing. Small items like speed regulators, etc. will have to be fitted in the copper tubing route of corner stations. No separate rate will be applicable for such devices.

2.15.6

Dimension and weight as mentioned against control panels, MCCs, etc. in rate schedule are only approximate and there may be changes in dimension and weight in actual supply of the equipment and no rate variation shall be applicable on this account.

2.15.7

Wherever brief description of the system is given under various sub-heads, it is only for the understanding system requirements. It does not indicate the total specification of work. For such system, other clauses are also applicable wherein work details are specified.

2.15.8 VOID

2.15.9

Normally, cable glands on junction boxes side are received in mounted condition. While terminating the cables as per drawings, the cable glands are to be removed and fixed. Wherever cable glands are not received along with junction boxes, the cable glands as per the requirement will be provided by BHEL and the contractor has to make necessary holes/adjust the available holes in the JB for fixing these. No separate payment will be made for drilling of holes and fixing the cable glands to the junction boxes. Nameplates for JBs will be supplied separately. These are to be suitably written and fixed onto the JBs. Wherever nameplates for JBs are not supplied, the JB no. are to be written with paint on JBs for indentification. Separate payment will not be made for this.

2.15.10

The push buttons and indicators in C&I systems are provided as loose with different type of connectors. The fixing of connectors and their wiring from push buttons to indicators shall be the responsibility of contractor. No separate payment will be made for fixing of connectors. The cable laying and termination charges will be paid as per applicable rate schedule.

2.16.0 Guidelines for erection

2.16.1 Impulse Pipelines

2.16.1.1

All impulse lines, air lines shall be thoroughly cleaned by removing the dust, burrs etc., and any foreign matter inside the pipe/air line is to be cleaned by compressed air or any other suitable means before installation.

2.16.1.2

The routing of pipe lines shall include sufficient flexibility near tap off points to allow for thermal expansion of process equipment.

2.16.1.3

The pipes shall be cold bent using hydraulic bending machines only.

2.16.1.4

The horizontal impulse lines shall be laid with proper slopes towards the tapping point.

2.16.1.5

Supports for piping and tubing shall be adequate and in no case exceed limits shown below:-

A) 1/4" OD / 3/8" OD copper	continuous
B) 1/2" NB pipe/tube	5 ft.
C) 3/4" NB pipe/tube	5 ft.
D) 1" NB pipe/tube	8 ft.

2.16.1.6

All CS impulse line welding shall be done through welding generator/rectifier and only structural welding may be done with welding transformer.

2.16.1.7

Impulse pipes of alloy steel/SS/carbon steel etc. shall be TIG welded. Contractor shall arrange for necessary TIG welding sets, electrodes etc.

2.16.1.8

Minimum number of fittings shall be used on all lines wherever possible, to keep threaded joints to a minimum wherever threaded connections are to be made.

2.16.1.9 Testing

On completion of pipeline installation, the pipelines shall be hydraulically tested. Contractor shall arrange for water filling pump, hydraulic test pump and standard gauges and conduct the test satisfactorily.

2.16.1.10

The impulse lines shall be isolated from instruments and tested at 2 times the maximum working pressure. The fall in pressure shall not be more than 1 kg/cm^2 or 1% of the working pressures whichever is less, in 30 minutes and there shall be no leaks at any of joints/welds when isolated from source of pressure.

2.16.1.11 Air Piping

All instrument air pipelines shall be isolated from the instruments and pressurised pneumatically to maximum work pressure. They shall then be isolated from the source of pressure and fall shall be less than 1 PSI in 20 minutes.

2.16.1.12 Pneumatic Signal Lines

All pneumatic signal lines shall be disconnected and blown through with instrument air. The line shall be blanked off and pressurised pneumatically 20 psi and checked with soap solution for leaks and attended accordingly.

2.17.1 Electrical cabling /wiring

All the cables will be properly laid in cable trays, dressed and clamped with aluminium flats. The cable will be terminated at both ends with suitable lugs and *printed ferrules* and will be glanded properly. Suitable equipment and consumables for ferrule printing has to be arranged by the contractor at his own cost. For cable identification, the contractor shall provide at his cost aluminium tags at regular intervals (15 m) through each run of cable.

2.17.1.1

All electrical connections shall be tested for polarity and proper connections.

2.17.1.2

Insulation test of the various circuits shall be done.

2.17.1.3

The checking of operation of individual equipment and instruments to which the cabling/wiring connected shall also be done by the contractor.

2.17.1.4

Wherever supplied, GI cable trays shall be of bolted construction only with fixing screws and coupler plates.

2.17.1.5

To the extent possible, all the trays shall be fixed in vertical orientation

2.17.1.6

Sharp bends of cable trays shall be avoided in all type of cable trays.

2.17.1.7

Installation of cable racks and supports structure shall be carried out in all the required areas. Steel embedment shall be provided in the cable trenches, ceiling slabs and concrete blocks for installing the cable racks and support structures.

A) Ladder perforated type cable trays shall be used in cable trenches and vertical risers.

B) Perforated cable trays shall be used in higher elevations in boiler and TG area.

2.17.1.8

Cable racks in the trenches and control room are to be shared with other contractors installing cables in different areas wherever required. Contractor shall cooperate with the other contractors in sharing the cable trays and proper dressing and clamping the cables.

2.17.1.9

Where power and control cables are to be laid in the same route, suitable barriers to segregate them physically shall be employed.

2.17.1.10

Space equal to the diameter of cable shall be provided between power cables of six over 50 mm in diameter.

2.17.1.11

When cables pass through floors, walls etc., it shall be passed through a pipe for mechanical protection and the pipe ends sealed suitably.

2.17.1.12

Care shall be taken to avoid short bending and kinking of conductor damaging insulation and stressing the cable beyond pulling force recommended by the manufacturer. Cable shall be protected at all times from mechanical damage.

2.17.1.13

The minimum radius of formed bend of an insulated cable shall be 12d for un-armoured cables and 15d for armoured cables where ‘d’ is the overall diameter of the cables.

2.17.1.14

No cable shall be laid in ducts or trenches where other services such as oil pipes, steam or water pipes are laid.

2.17.1.15

Where cabling passes through brickwork or concrete work, the contractor shall provide suitable local protection against mechanical damage wherever necessary.

2.17.1.16

The layout of all cables shall be arranged to give adequate clearance from other services and cables shall be routed to avoid hot zones.

2.17.1.17

Jointing of cables shall be avoided as far as practicable. However, jointing if at all necessary shall be done by crimping type cable joints after getting approval of BHEL engineer.

2.17.1.18

The cable schedules indicating cable sizes, tentative cables routing information will be furnished by BHEL at site to the contractor. Required steel inserts on cable trenches, ceilings of the platforms in TG hall for erecting the cables will be provided by BHEL. The contractor shall design number of cable/racks to accommodate the cables on racks/trays properly.

2.17.2.0 Earthing installations

2.17.2.1

All equipments shall be earthed by two separate and distinct connections. Earthing terminals will be available in all equipment supplied by BHEL.

2.17.2.2

The earthing conductors shall be of mild steel/GI strip/ wires. All connections from equipment to main earthing conductors shall be made as illustrated in earthing drawing / as per instruction of BHEL engineer.

2.17.2.3

A continuous earthing conductor shall be installed in all cable trays and securely clamped to each tray section by suitable connectors to form a continuous earthing system. When two or more trays supporting power cables run in parallel, a continuous earthing conductor shall be provided on trays only with tap offs to the control cable trays. All valve and damper motors and rapping motors will be earthed to this conductor.

2.17.2.4

All joints in the earthing system shall be welded type. Earthing connections to all equipments including motors shall be bolted type.

2.17.2.5

Earthing connections shall be free from tinning scale paint, enamel, grease, rust or dirt at the time of making joint.

2.17.2.6

Metallic sheaths, screens/shields and armour of all multicore cables shall be bonded and earthed.

2.17.2.7

Earthing conductors along their run on columns, beams, walls etc. shall be supported by suitable cleats at intervals of 750 mm.

2.17.2.8

Welded joints on GI earthing conductors shall be coated with one coat of bituminous paint in case of buried earth grid or earth flats to be laid in cable trench. For site welded GI strips/wires which are exposed these are required to be painted with one coat of cold galvanising zinc paint. Contractor to arrange the required paints and other items at his cost.

2.18.0 Instruments and equipments

2.18.1

All field mounted instruments are to be located in such a way as not to obstruct walk-ways or plant equipment access but shall be easily accessible for maintenance. Hand rails shall not be used for mounting or supporting instruments.

2.18.2

Racks/stands and supports for instruments and transmitters shall be fixed on RCC column/floor by chipping and grouting or by welding to steel structure. In no case these shall be welded to floor grills.

2.18.3

The power cylinders support/base erection will be welded to steel structure or by grouting. The power cylinder will be properly aligned and linkage mechanism

wherever required shall be connected to the driven equipment. All accessories for power cylinders line air sets, solenoid valves, air lock, limit switches, if supplied loose, shall be fixed, aligned and connected up.

2.18.4

When installing flow and pressure transmitters/switches for Liquid /steam/condensate vapour services, the instrument is to be mounted below its primary element or tapping point. For gas service applications, the instrument is to be mounted above Primary element tapping point.

2.18.5

During erection and commissioning stage, the site mounted instrument shall be protected suitably. Contractor shall provide suitable security arrangement in main control room, and other areas where equipments are positioned, at no extra cost.

2.18.6

All brackets/racks and support steel work for tubing impulse lines/instruments shall be painted with two coats of primer and two coats of final colour prior to installation. Paints, etc supply in the scope of contractor.

2.18.7

Contractor shall arrange for own fire fighting equipments for the materials stored under contractor's custody.

2.19.0 Guidelines for handling and storage of electronic cubicles / subassemblies / loose items.

2.19.1

Immediately after unloading at site, the electronic equipment should be kept in a covered area. Handling and lifting of package should be done without jerks or

impacts. Packing case should not be dropped or slid along the floor under any circumstances. Suitable forklift should be used to move the case to its final position. All above points are to be strictly followed as electronic equipments may get damaged due to vibration and shock.

2.19.2

After unloading at site, the package of the equipment shall be inspected for external damage. In case the package is damaged, package number and details of damage should be noted. The details of damage should be reported to concerned site engineer.

2.19.3

Cases should be opened/unpacked using correct nail pullers. While opening the planks, care should be taken to see that equipment inside is not damaged. Cases should not be unpacked in areas where they are exposed to rain, water/liquid splashing, dust or other harmful materials like chlorine gas, sulphur dioxide etc.

2.19.4

After opening the case, all supports provided for transport are to be removed with due care.

2.19.5 Hinged frames should not be opened when equipment is not secured to floor as this is likely to cause it to topple over. The hinged frame can be opened only if the equipment is still fixed on to bottom wooden pallet.

2.20.0 Storage

2.20.1

The equipment should be preferably in its original package and should not be unpacked until it is absolutely necessary for its installation or advised by BHEL

engineer. The equipment should be best protected in its cases. It should be arranged away from walls.

2.20.2

The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damps, sinking into around and to circulate air under the stored equipment. This will also help in lifting packing with fork-lifter.

2.20.3

Periodic inspection if silica gel placed inside the equipment is necessary. It has to be replaced or regenerated when decolourisation takes place.

2.20.4

Due care should be taken to ensure that the equipment is not exposed to fumes, gases etc., which can affect electrical contacts of relays and terminal boards.

2.20.5

The storage room and the equipment should be checked at regular interval to ensure protection from termites, mould growth, condensation of water etc., which can damage the equipment.

2.20.6

All the equipments, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site engineer.

2.20.7

The packing material shall be retained if the cubicle is to be repacked after inspection.

2.21.0

Sub-assemblies

2.21.1

All subassemblies should be kept in a separate place where it is easily accessible.

2.21.2

Subassemblies should have a protective cover in case it is stored without wooden packing/case to prevent accumulation of dust. Silica gel packets should also be kept along with it.

2.21.3

Subassemblies should not be stacked one above the other.

2.22.0 Loose items

The loose items supplied for the main equipment falls into various categories like tools, cables, prefabricated cables, console inserts, recorders, VDU/CRT, other display units, printers, sensors and transducers, cable glands, cable ducts, frames, racks, etc. These are to be categorised and stored separately.

2.23.0 Guidelines for handling of electronic modules

2.23.1 *All the modules shall be handled by qualified persons only.*

2.23.2 Electronic modules should only be touched when it is absolutely essential to do so.

2.23.3

Before touching any electronic module, the operator should discharge the static electricity by earthing himself or better still, ensure constant discharge by wearing an earthed wrist strap.

2.23.4

The operator should not wear clothing made entirely from synthetic fibres, but a mixture containing at least 65% cotton.

2.23.5

The PCB should always be held by front panel or by module frame and electronic components / connectors should never be touched.

2.23.6

The electronic modules should not be placed close to television sets or CRT units.

2.23.7

Soldering irons and any other tools used must be grounded.

2.23.8

All modules using CMOS components are packed in antistatic bags when transported loose to avoid ESD failures. The antistatic bags must always be used to transport modules at site from one place to the other.

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	Space will be provided if available; Location will be finalized after joint survey with owner.
b	*Labour Colony with internal roads, sanitation, complying with statutory requirements*		Yes	
3.2.0	***ELECTRICITY***			
3.2.1	***Electricity For construction purposes*** *of Voltage 415/440 V*			FREE
a	*Single point source*	Yes		at one point near the erection site.
b	*Further distribution including all materials, Energy Meter, Protection devices and its service*		Yes	
c	*Duties and deposits including statutory clearances if applicable*		Yes	
3.2.2	***Electricity for the office, stores, canteen etc of the bidder***		**Yes**	Electricity charges shall be as per the tariff plan applicable in the site.

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
a	*Single point source*		Yes	At a distance of 200 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		Chargeable as per standard rates
a	*Single point source*	Yes		
b	*Further distribution including all materials, Energy Meter, Protection devices and its service*		Yes	
c	*Duties and deposits including statutory clearances if applicable*		Yes	
3.3.0	***WATER SUPPLY***			
3.3.1	***For Construction purposes:***			FREE
a	*Making the water available at single point*	Yes		In case of inadequate supply / non-availability of construction water from customer, contractor shall have to arrange construction water at his own expenses.
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***			FREE
a	*Making the water available at single point*	Yes		
b	*Further distribution as per the requirement of work including supply of materials and execution*		Yes	
3.3.3	***Water supply for Living Purpose***			
a	*Making the water available at single point*		Yes	

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
b	*Further distribution as per the requirement of work including supply of materials and execution*		Yes	
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, intranet, e-mail etc*		Yes	
3.6.0	***COMPRESSED AIR wherever required for the work***		Yes	
3.7.0	***Demobilization of all the above facilities***		Yes	
3.8.0	***TRANSPORTATION***			
a	*For site personnel of the bidder*		Yes	
b	*For bidder's equipments and consumables (T&P, Consumables etc)*		Yes	

Sl.No	Description **PART II** **3.9.0 ERECTION FACILITIES**	Scope / to be taken care by		Remarks
		BHEL	**Bidder**	
3.9.1	Engineering works for construction:			
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		
d	Shipping lists etc for reference and planning the activities	Yes		
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	″
g	Weekly erection schedules based on Sl No. e		Yes	″
h	Daily erection / work plan based on Sl No. g		Yes	″
i	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	
L	Arranging the materials required for preassembly		Yes	

A: TOOL & PLANTS

List of major testing & measuring equipments/ tools and tackles to be arranged/ brought by contractor.

Sl. No.	Description	Quantity
I. Instruments		
01	Dead weight tester rated 400 Kg/cm2 and with weights and test gauge facility. Make 'Budenberg or 'Ravika'	2 no.
02	Oil temperature bath suitable to calibrate the instruments range 0 – 200 deg. C with standard temperature gauges and thermostatic control	4 nos.
03	Muffle furnace – 800 deg. C with standard temperature gauges	2 no.
04	Standard gauges 12" dial size make "Budenberg" or "H Guru" or "Odin"	
	A) – 1-0 kg/cm2 pressure gauge(vacuum gauge) B) 0 – 5 or 6 kg/cm2 pressure gauge C) 0 – 10 kg/cm2 – do – D) 0 – 25 kg/cm2 – do – E) 0 – 60 kg/cm2 – do – F) 0 – 100 kg/cm2 –do – G) 0 – 250 kg/cm2 – do – H) 0 – 600 kg/cm2 – do – I) 0.2 to 1 kg -- do --	2 no. 2 no. 2 no. 2 no. 2 no. 2 no. 2 no. 2 no. 2 no.
05	Manometers (+/-) 1000 mm water column With hand bulb for lab and small manometers for field purpose.	4 nos.
06	Manometer (+/-) 500mm mercury column with hand bulb for lab and small manometer for field purpose.	2 no.
07	Inclined manometer (+/-) 300 mm water column	2 no.
08	Portable air compressor with drier and regulator make "Toshniwal" / "Khosla" rated for 7 to 10 kg/cm2	5 nos.
07	Soldering iron "Soldron" make 25 watt	5 nos.
09	Vacuum pump	2 no.

Sl. No.	Description	Quantity
10	Multimeters	
A) B) C)	Digital, 3 1/2 digit Motwane/HIL/Fluke Analog: Motwane make Digital, 4 1/2 digit Motwane/HIL/Fluke	12 nos 6 nos. 8 nos.
11	Standard milliamps / millivolts source of reputed make. Range 0 to 50 ma and 0 to 100 mv	4 nos.
12	Insulation tester hand operated 250V / 500V / 1000V rated mains/battery operated	2 no. Each
13	DC power supply 0-50 VDC, 5 A make "Aplab" or equivalent (variable source)	4 nos
14	Single phase variac 250 V, 8 amp	2 no
15	3 phase variac rating 5 amps	2 no.
16	Glass thermometer 0-120 deg. C, 0-200 deg.c and 0-600 deg.c	2 no. Each
17	Tong tester AC 5/10 and 25/60/300 amp of reputed make	2 no. Each
18	Tong tester DC 30/60/300 amp	2 no.
19	Secondary current injection kit upto 300 amp	1 no.
20	Tarpaulin fire proof	20 nos.
21	DC shunt 400 amp 75 mv	2 no.
22	Tachometer non-contact type 0 to 4000 rpm	2 no.
23	Industrial type vacuum cleaner	2 no.
24	RTD/Pt 100 source	4 nos.
25	Decade resistance box	4 sets.
26	Teletalk 2 wire system/Group Mobiles	12 sets
27	Equipment and consumables for LPI/MPI test on impulse pipes	2 set
28	Function generator	2 no

Note:
Instruments shown above are for the regular works only. However, separate sets of tools and instruments are to be arranged and provided to commissioning gang. If contractor fails to arrange the testing instruments as listed above, BHEL site will arrange the instruments at the cost of contractor. Contractor to submit calibration report from recognised agency prior to deployment of same at site and periodical calibration of the same to be arranged by contractor as per procedure of BHEL.

Sl. No.	Description	Quantity
II. Handling equipment		
1	Turn buckles	As per reqmt
2	D-shackles	
3	Steel wire ropes	
4	Manila ropes	
5	Chain pulley block/turfer	
III. Major T&P		
1	Pipe bending machine – 2" size	6 nos
2	Grinding machine	12 nos
3	Drilling machines 1/4", 1/2", 3/4" & 1"	2 no. Each
4	Copper tube bender and cutter sizes 6mm, 8mm, 1/2", 1/4"	2 no. Each
5	Die sets for threading upto 2" pipe.	4 nos
6	Spirit level	4 nos.
7	Tap sets for both BSP and NPT threads upto 1" each	2 set each
8	Measuring instruments like micrometers and callipers	2 set each
9	Welding generators	8 nos.
10	Welding transformer	8 nos.
11	TIG welding set	4 no.
12	Mechanical tool kit for fitters	12 sets.
13	Electrician tool kit	16 sets.
14	Crimping tool	8 nos.
15	Flood light fittings	16 nos.
16	Fire extinguishers as required	2 set.
17	Distribution boards with power cable complete as required	2 set
18	Painting brush	As per reqmt.
19	Fire proof tarpaulin	As per reqmt.
20	Safety belts and safety helmets	As per reqmt.
21	24V AC transformer & hand lamps	16 nos.
22	Ferrule printing machine	4 nos
23	Electrode drying ovens	As required
24	Personal computer and accessories, Printer	1 set
25	Cranes, trucks etc for transportation and erection of equipment	As required

Note:

The list of instruments / equipments to be brought by the contractor as shown above is only indicative. Any other instruments / equipments required for the execution of the work is to be necessarily arranged by the contractor. The testing/calibration instruments which are used to be duly calibrated in the interval prescribed by BHEL engineer from the BHEL approved agencies. And test certificate to be furnished.

The following materials/consumables are to be arranged by the contractor for erection and commissioning as part of the scope.

Sl. No.	Description
01.	Welding electrodes for welding AS/CS/SS pipe and other welding from BHEL approved vendors only
02.	Filler wire for argon welding
03.	Argon, oxygen and acetylene gas
04.	Provision for temporary scaffoldings.
05.	GI "U" clamps with nuts and washers for impulse and GI pipe clamping.
06.	Round aluminium tags (30mm dia x 3mm thick)
07.	Teflon tape and insulation tape.
08.	Hold tight / bitumen tape for GI pipe coupling.
09.	Required paints and primer from BHEL approved vendors only.
10.	Solder wire (60/40)
11.	Protocol/calibration report sheets as per BHEL format.
12.	Panel/JB sealing compound material (for cable entry from bottom/top of panel).
13.	PVC cable tie, aluminium strip and hardware for clamping of cables, copper tube, and temperature gauge capillary.
14.	Copper lugs up to 4 sqmm, PVC sleeve of different size, PVC button & tape
15.	Ferrules (PVC) and suitable for ferrule printing

Pl note: The above list is only indicative. The contractor to arrange consumables as required as per scope of contract.

List of T&P/instruments and consumables that will be made available by BHEL free of hire charges (on sharing basis).

01	EOT crane in TG hall shall be made available on sharing basis for handling panels	1 no

Note

Above T&P will be provided for specific erection/commissioning activities wherein these equipment will be required. While taking delivery, contractor shall check for proper working of the equipment and the same shall be returned after the work is completed to BHEL stores in good working condition subject to normal wear and tear.

6.0 TIME SCHEDULE AND MOBILIZATION:

6.1 TIME SCHEDULE & MOBILIZATION

6.1.1 INITIAL MOBILIZATION AND TENTATIVE SCHEDULE

CONTRACTOR SHALL REACH SITE, MAKE HIS SITE ESTABLISHMENT AND BE READY TO COMMENCE THE WORK **WITHIN TWO WEEKS** FROM THE DATE OF FAX LETTER OF INTENT (LOI) OR AS PER DIRECTIONS OF CONSTRUCTION MANAGER OF BHEL.

THE CONTRACTOR HAS TO SUBSEQUENTLY AUGMENT HIS RESOURCES IN SUCH A MANNER THAT THE ENTIRE WORK IS COMPLETED TO ACHIEVE THE FOLLOWING TENTATIVE SCHEDULE:

SN	Activity	Unit#3	Unit#4
01	Boiler light up	13/01/2013	13/04/2013
02	Turbine box-up	03/05/2013	03/08/2013
03	Synchronisation	27/08/2013	27/11/2013
04	Coal Firing	05/09/2013	05/12/2013
05	Reliability Run	10/10/2013	10/01/2014
06	PG Test	10/12/2013	10/03/2014

6.1.1 Contract Period

The Contract period shall be 15 months from the start of work. Erection, Testing, Calibration and Commissioning of permanent equipments required for completion of system shall be completed within the time schedule given above.

BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule by upto 15%. This will result in advancement of various milestones. Contractor shall plan his activities and mobilise additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.

6.1.2 Void

6.2

The contractor should reach site and establish his site office and mobilise to commence the work as per directions of BHEL engineer. The date of starting the work at site shall be fixed in consultation with BHEL's engineer and the same will be recorded in measurement book while entering the first RA bill.

6.3

Subject to availability of materials and other inputs, it is the responsibility of the contractor to carry out work to achieve the monthly progress and keep up the schedules.

6.4

Contractor shall draw the monthly erection programme along with BHEL engineer indicating the work to be achieved and event to be completed as per clause 11.1. Once the programme is drawn, he shall adhere to the same. Contractor shall plan and erect the materials as it is received at site. The monthly planned percentage shall take into consideration the material available at site before the start of the month and also any material received during the month. Contractor shall mobilise his resources required to achieve the monthly programmes.

6.6 DEFINITION OF WORK COMPLETION

The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities are completed satisfactorily and so certified by BHEL site in charge. The decision of BHEL in this regard shall be final and binding on the contractor.

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

TERMS OF PAYMENT FOR C&I

Sl. No.	Activity/Work Description		% of unit rate
A	**Main E&C Equipments/Items**		
I	**PRO RATA PAYMENTS (85%)**		
1.0	**Cable tray and accessories**		
1.1	Fabrication and fixing/welding/bolting in position		60%
1.2	Earthing of cable trays		15%
1.3	Tagging of cable trays (painting cable tray numbers on sides)		5%
1.4	Covering of trays where ever envisaged		5%
		Total =	**85%**
2.0	**Cable laying (Power Cables)**		
2.1	Laying of cables		45%
2.2	Glanding, Termination and tagging of cables		15%
2.3	Dressing and clamping of cables		10%
2.4	Testing and charging of cables		15%
		Total =	**85%**
3.0	**Cable laying (Control and Signal Cables)**		
3.1	Laying of cables		45%
3.2	Glanding, Termination and tagging of cables		15%
3.3	Dressing and clamping of cables		10%
3.4	Shielding of cables		5%
3.5	Testing and charging of cables		10%
		Total =	**85%**
4.0	**Junction box/Push button station (local)**		
4.1	Erection including fixing of terminal blocks where ever applicable		75%
4.2	Name plate fixing where ever applicable , Labelling (both inside and outside) and Commissioning of connected equipment		10%
		Total =	**85%**
5.0	**Conduits/impulse pipe/tubes**		
5.1	Fabrication, Laying and Erection		50%
5.2	Leak Test/Hydraulic Test (where ever applicable, other wise clubbed with next activity)		20%
5.3	Dressing, clamping, tagging and painting where ever applicable		8%
5.4	Testing & commissioning of associated equipment/system		7%
		Total =	**85%**

6.0	**Miscellaneous Structural steel including frames for Panels/Racks/Instruments, supports for cable tray/pipes/tubes, Canopies etc**		
6.1	Fabrication, Erection, Alignment , Welding/bolting and where ever applicable chipping/grouting/painting		65%
6.2	Erection of associated Items/Equipments/Systems as applicable		20%
		Total =	**85%**
7.0	**Panels/Cubicles/Desks/Racks/Enclosures/Monitors/Computers/Computer peripherals/PLCs/UPS/Batteries**		
7.1	Erection and alignment		50%
7.2	Fixing of loose items/instruments where ever applicable		5%
7.3	Pre commissioning checks, Charging of panel and Loop testing etc		15%
7.4	System commissioning		15%
			85%
8.0	**Instruments/Devices including Sensors/Cells/Probes etc**		
8.1	Calibration/Testing/Pre erection checks		30%
8.2	Erection/Placement and fixing of loose items/accessories		30%
8.3	Pre commissioning checks/loop testing/Simulation testing as required		10%
8.4	Remote/local commissioning as required		15%
		Total =	**85%**
9.0	**Commissioning and Testing activities for Equipments erected by other agencies, like control valves, on/off valves, electrical/pneumatic valves, actuators, solenoid valves, valves, limit switches, ERV controllers, power cylinders, Pressure & Temperature Guages/Transmitters,etc**		
9.1	Removal & refixing/Fixing loose supplied components, including tubing/hose, regulators, etc		30%
9.2	Calibration/Local testing - commissioning readiness		30%
9.3	Local Commissioning & Loop Testing as required		10%
9.4	System Commissioning or Remote Commissioning as required		15%
		Total =	**85%**
10.0	**Power Cylinders**		
10.1	Erection and alignment of Power Cylinders		30%
10.2	Fixing of loose items and Commissioning readiness		30%
10.3	Loop Checking, Calibration and Local commissioning		20%
10.4	System/Remote commissioning as required		5%
		Total =	**85%**
11.0	**Miscellaneous items (items not covered under above heads)**		
11.1	Erection		50%
11.2	Alignment		10%
11.3	Testing		15%
11.4	Completion		10%
		Total =	**85%**

II	**STAGE/MILESTONE PAYMENTS (15%)**	**% of unit rate**	
1	Boiler Light Up		1%
2	ABO		1%
3	Steam Blowing		0%
4	Safety Valve Floating (Electromatic Relief valves)		1%
5	Oil Flushing (TG)		0%
6	Barring Gear (TG)		0%
7	Rolling and Synchronisation		2%
8	Coal Firing		0%
9	Full Load		2%
10	Trial Operation of Unit		3%
11	Painting		0%
12	Area cleaning, temporary structures cutting/removal and return of scrap		1%
13	Punch List points/pending points liquidation		1%
14	Submission of 'As Built Drawings'		1%
15	Material Reconciliation		1%
16	Completion of Contractual Obligation		1%
		Total for Milestone/Stage payments (15%)	**15%**
	Total		
B	**OTHERS**		
1	Laboratory Instruments installation and demonstration where ever applicable		100%
2	PG Test Instruments installation (50%) and removal (50%)		100%

8.0 TAXES, DUTIES, LEVIES (Consolidated Rev 02 dated 20/09/2012)

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

8.1.1

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

However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

8.1.2 Service Tax & Cess on Service Tax

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

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

1. **The name, address and the registration number of the contractor,**
2. **The name and address of the party receiving taxable service,**
3. **Description, classification and value of taxable service provided and,**
4. **The service tax payable thereon.**

All the Four conditions shall be fulfilled in the invoice before release of service tax payment.

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

8.1.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT)/CST on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be inclusive of the same and in no case input or output VAT/CST will be reimbursed extra.

In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. Contractor will submit all the details of VAT/CST paid for the contract in the prescribed format of the respective state VAT laws. Also, the contractor will issue the tax Invoices to BHEL as per the Tax laws of respective state on monthly basis. Contractor shall also be required to furnish to BHEL necessary proof of VAT remittance on monthly basis.

Deduction of tax at source shall be made as per the provisions of law and is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made.

Further, if BHEL, at the instance of customer or otherwise adopts the specific route for discharging output VAT liability itself, benefit of the reduction in liability of the contractor will be passed on to BHEL.

In case, BHEL is forced to pay any VAT liability on behalf of contractor, the same will be recovered from contractor's bill or otherwise as deemed fit

~~**8.2 'Enabling Works'**~~

~~The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.~~ ~~**(i.e. rates quoted by bidder shall be inclusive of Service Tax, VAT/WCT and all other taxes and duties)**~~

~~However, Since the proposed work is in the nature of 'Works Contract service' as per Service tax law, Hence, For non-corporate contractors being Individual, HUF, Proprietary Firm, Partnership Firm or Association of Persons (AOP), BHEL shall recover the applicable Service Tax under reverse charge mechanism from the contractor and remit the same with the Government as per the provisions of Law. Necessary advice/confirmation of remittance shall be issued to the contractor. The contractor shall not be eligible for any refund/reimbursement of such service tax from BHEL. It shall be the responsibility of the contractor to submit proper invoice giving all the requisite details as per Service Tax Law for the determination of the service tax liability of BHEL under reverse charge mechanism. BHEL reserves the right to determine such liability based on the invoice submitted by the contractor or otherwise independently and remittance of the same with the Government.~~

8.3 New Taxes/Levies

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

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

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

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

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

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

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

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

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

9.0 SPECIAL INCLUSIONS:

Consumables/items to be provided by BHEL free of charge

01 Metallic Cable glands

02 Steel for fabrication

03 Lugs beyond 4 Sq.MM size

10.0 Exclusions

The following are specific exclusions from this work.

1. Attachment welding of thermocouple pads for boiler tube metal temperature measurement and fixing of thermo wells in the pipelines.

2. Erection of flow nozzles.

3. Erection of valves, actuators along with valves, damper actuators along with dampers, burner tilt power cylinder, seal air dampers and scanner air emergency dampers and control valves. *(However, SADC power cylinder installation will be in the scope of the contractor)*

4. Erection of electro hydraulic actuators.

Note:

The aforesaid exclusions should not be construed as exhaustive. They are meant for general guideline. BHEL reserves the right to include or exclude any item which is required for completing the job as per rates indicated in rate schedule. Contractor should carry out all such jobs as per the instructions of BHEL engineer.

Annexure- I

Details (wherever required) of items listed in the rate schedule

Please Note:

1. All the items in general are to be erected and commissioned by the contractor, unless specifically mentioned otherwise.

2. In such cases where systems are described with component quantities (viz., Vibration monitoring systems, Lube Oil skids, etc., etc.) lumpsum rates are to be quoted. No separate payment will be made for the component items of those systems, although these systems may have certain items for which separate unit rates are also available elsewhere.

3. The dimensions and weights mentioned are only approximate. No extra claims will be entertained due to change in dimensions/weight.

- **Sl No I1.0.1 to I1.0.4: Cable trays and accessories**

  Flexible GI cable support system, consisting of single/double channels, base plates, cantilever arms as per BOQ given. Wherever necessary, the base plate and beam clamps will be supplied for bolting. Otherwise, the base plates are to be welded to the racks or beams. Necessary 90 deg. angle fittings, flat plate fittings, clamps for single & double channels, fasteners etc. will be supplied for fixing trays and cantilever arms and for this no separate erection charges will be paid. Rates shall be accommodated in support channel and cantilever arm erection. Support channels will be supplied in standard running lengths, and shall be cut at site depending on requirement, and exposed metal portion shall be painted as per specification given in the relevant sections. Payment for erection will be made on per metre basis. No separate rate will be paid for cutting & painting.

  Cantilever Arm for 150 mm tray, complete with 4 Nos. spring nuts, 2 Nos. bolts & washers for fixing to main channel support and for fixing cable tray.

  Cantilever Arm for 100 mm tray, complete with 4 Nos. spring nuts, 2 Nos. bolts & washers for fixing to main channel support and for fixing cable tray.

Base Plate (For Single Channel) complete with 2 Nos. spring washers, bolts and nuts for fixing main support channel

- **Sl No I6.0.5 to I6.0.7: Assembly of JB mounting frames:**

Galvanised members will be supplied. These are to be assembled as per drawings. Some frames are suitable for one side JB mounting and others are suitable for JB mounting on both sides. Rate quoted should include assembly and installation.

- **Sl No I7.0.2 to I7.0.7: Control panels**

These are microprocessor based sophisticated electronic control panels in majority. Weights range from 400 to 2000 Kgs from I7.0.2 to I7.0.6 respectively.

Also includes 12 nos. Gravimetric feeder panels with approx. weight 400kg (Per Panel) and 1200(L) x 2365(H) x 600(D) mm dimension.

- **Sl No I7.0.10: Unit Control panel**

Dimension approx. 1352(W) x 2355(H) x 1000(D) mm. Shipped in one or two sections. Pushbuttons, LEDs, console inserts, vertical indicators, recorders, digital indicators, analog indicators (about 100 nos), LED/PB stations (about 200 nos), etc, are located in these panels in suitable tiles. Alarm annunciation facia are also mounted. The individual items may come mounted or loose. Other than what is envisaged for certain items (viz., console inserts) in the rate schedule, no separate charges will be entertained. Erection, calibration (as the case may be) testing and commissioning of analog indicators and LED Pushbutton Stations located in these panels will be considered as a part of Unit control panel Erection and commissioning and no separate payment will be done for the same.

Lumpsum price to be quoted.

- **Sl No I7.0.11: Electrical control panel**

Dimension approx. 2216(W) x 2355(H) x 1000(D) mm.

This panel houses the electrical mimic diagram of the plant and consists of various switches, indicators, semaphore indicators, digital indicators etc., in suitable tiles. Alarm annunciation facia are also mounted The individual items

may come mounted or loose. Other than what are envisaged in the rate schedule, no separate charges will be entertained. Erection, calibration (as the case may be) testing and commissioning of analog indicators and LED Pushbutton Stations located in these panels will be considered as a part of Unit control panel Erection and commissioning and no separate payment will be done for the same.

Lump sum price to be quoted.

❖ **Sl No I7.0.12: Network panels**

Dimension of Panel: 800(W)x800(D)x2415(H),Weight=300 kgs per Panel.

These panels are used basically for housing Ethernet switches which are to be wired up with various other max stations. System interface network panels also house computer CPUs, monitors, etc.

❖ **Sl No I7.0.14: Vibration monitoring system for Fans and Pulverisers**

The scope covers installation of equipment, integration of system, commissioning etc. including drilling and tapping, welding of pads, etc. Vibration Monitoring System (VMS) for Fans (6 nos.) and Mills (6 nos.) consists of the following (approximate quantities):

The scope covers installation of equipment, integration of system, commissioning etc. including drilling and tapping, welding of pads, etc. Vibration Monitoring System (VMS) for Fans (6 nos.) and ,Mills (6 nos.) consists of the following (approximate quantities):
3 Nos. of VMS Local Cabinets, each of size 400 x 300 x 300 mm, along with monitor/ VDU.

Piezoelectric Transducer -24 Nos., Extension cable -24 nos., Phase sensors -12 nos., 8 mm extension cable -8 nos., Junction Boxes-12 nos..

❖ **Sl No I7.0.15: Vibration Monitoring system for Main turbine/ Generator**

Vibration analysis system for Main turbine: 1no. panel (2415x800x800 1000kg), 1 PC, 14 nos. Piezo Velocity Sensors, Extension Cables for sensor 10 meters-14 nos., Displacement sensors- 14 nos., Extension cable for VL sensor – 14 nos., Driver (for relative shaft vibration)-14 nos., Displacement sensor with 1 meter cable-6 nos., Extension cable-6 nos., Drivers-6 nos., Complementary differential expansion monitors -2 nos., 19” Instrument Rack-2, Black-14 nos., Mounting Pads-10 nos.,

Junction boxes-9 nos., Cable seals-9 nos., Cable conduit for sensor-200 mtrs., Ethernet switch-1 nos., 4 Triad 0.5 sq.mm IS/OS cable – 2000 mtrs.

Lumpsum rate per set is to be quoted.

- **Sl No I7.0.16: Vibration monitoring system for BFP/CEP/ACWP**:

Vibration monitoring system for BFP / CEP / ACWP consists of the following (approximate quantities):

- 72 Nos. Piezo velocity transducer and sensor extension cable.
- 13 Nos. non-contact sensor, extension cable, driver etc.
- 19" vibration monitor rack with 18 Nos. vibration monitor, local & host communication module, dual redundant instrument rack, power supply unit etc.
- 36 Nos. mounting pads, 13 Nos. mounting bracket, 36 Junction boxes, driver housing etc.
- Size of Control Cabinet: 800 x 800 x 2415 mm; approximate weight 600 kg.

Lumpsum rate per set is to be quoted.

- **Sl No I7.0.17: Vibration monitoring system for CW pumps**

The scope covers installation of equipment, integration of system, commissioning etc. including drilling and tapping, welding of pads, etc. Vibration Monitoring System (VMS) for pumps consists of the following (approximate quantities):

1 Nos. of VMS Cabinet, each of size 2415x800x800 600kg, along with monitor/ VDU.
Piezoelectric Transducer -24 Nos., Extension cable -24 nos., Phase sensors -6 nos., 6 mm extension cable -8 nos., Junction Boxes-12 nos.

Lumpsum rate to be quoted.

- **Sl No I7.0.18: DC motor starter box for scanner fan**

DC starter box for scanner fan dimension approx 900(W) x 1120(H) x 375(D) weight approx 50 KG.

❖ **Sl No I7.0.19: Burner tilt Shear pin failure indication box**

One set consist of 4 Nos. shear pin alarm boxes with 4 Nos. Shear pin failure contact switches. These are to be erected and commissioned.

❖ **Sl No I7.0.20: Electronic water level indicator (EWLI)**

2 nos Electronic Water Level Indicator EWLI comprises of the following: Details are per unit:

2 No. 16 Port pressure vessel & 2 No. 8 port pressure vessel with loose supplied electrodes (24 nos)

2 Nos. of Ascertor Units (Local) with Display, each of dimension: 600 x 350 x 600 mm; Weight: 25 kg each

2 Nos. of Remote Display Unit (99 x 194 x 81 mm)

Interconnecting cables between local panel and 24 electrodes (included in cabling BOM)

Display units (2 nos.) to be mounted in backup desk

Lumpsum rate per set is to be quoted.

❖ **Sl. No. I7.0.21: LP dosing system**

LP dosing system consist of 2 nos. of control panels for Ammonia and Hydrazine dosing (Approx. dim.1000 x 800 x 300, 3.0 MT) with local/remote starter box, alarm facia, auto stroke controller etc., 4 nos. dosing pumps with actuator for auto stroke controller, 4 nos. of pressure gauges, 6 nos. level switches, 4 nos. level gauges. 4 nos. of agitator pumps.

Lumpsum rate per set to be quoted.

❖ **Sl No I7.0.22: Condenser Vacuum Pump (CVP) system**

Removal, calibration and commissioning of CVP skid mounted instruments including CVP PLC and motor mounted on the skid. The approximate quantity of skid mounted instruments shall be

- Pressure Indicators – 2

- Flow Switches – 2
- Level Switches – 2
- Pressure/DP – 3
- Temp. Indicators – 2
- Flow Indicators – 1
- Solenoid valves – 4 nos.

Lumpsum rate per set is to be quoted.

❖ **Sl No I7.0.25 and I7.0.26: LIRs and LIEs**

Local instrument racks are open type housing for field instruments. These have to be located in suitable places, impulse piping and cabling to be done. Number of instruments in each LIR will vary.

Local instrument enclosures are closed type housing for field instruments. These have to be located in suitable places, impulse piping and cabling to be done. Number of instruments in each LIE will vary.

❖ **Sl No I7.0.29: Computer furniture**

Computer table =15 nos (1500(W) X750(D) X735(H)) mm)

Printer table (laser) = 3 nos (900(W) X600(D) X740(H)) mm

Printer table (dot matrix & line printer) = 2 nos (680(W) X475(D) X760(H)) mm

The furniture will be delivered in knocked down condition and will have to be assembled at site by contractor.

Lump sum rate to be quoted.

❖ **Sl No I7.0.30: Plant Control Desk**

To be erected in the PCR (Plant Control Room).

This consists of 7 nos. of modular operator desks, integrated into a single curved Operator control desk (approx. dimension 7767(W) x 1195(D) x 825(H) mm. Relevant CPUs will be housed inside.

Lump sum rate to be quoted.

- **Sl No I7.0.31: LVS**

Other than the LVS (80" diagonal), rear Projection, Resolution 1400 x 1050 pixels mentioned in the rate schedule, accessories like video switches, associated cabling (prefab and otherwise) etc are also included.

LVS erection and commissioning supervision in scope of other agency (supplier).

Lump sum rate to be quoted.

Sl No I7.0.32: Laboratory Setup for Customer-common for both unit.

Package consists of various standard laboratory instruments, which are to be installed in Customer's lab. Tentative list is as follows:

Mechanical:

S.NO.	Description	UOM	Qty
1	Hand operated wire tool	No	1
2	Bench wise	No	1
3	Magnetic screw driver	No	1
4	SS & copper tube cutter/blender	No	1
5	Standard tool box	No	2
6	Electrically operated wire wrap 0.2mm to 1.0mm	No	1
7	Portable flue gas analyzer	No	1
8	Portable H2 analyzer	No	1

9	Dead weight tester-0-600kg/cm2	No	1
10	Vacuum tester	No	1
11	Wet & dry bulb hygrometer	No	1
12	Radial drilling machine	No	1
13	T/C test furnace	No	2
14	Portable ultrasonic flow meter for measuring flow in the pipes (100 dia to 1600mm dia).	No	1
15	Tool maker clamp jaw 50mm wide	No	1
16	Tool maker clamp jaw 100mm wide	No	1
17	Coil winding machine	No	1
18	Aneroid barometer	No	1
19	Jewelers lathe	No	1
20	Air set	No	1
21	Flow meter calibrator 0-1000mm wci	No	1
22	Flow meter calibrator 0-6000mm wci	No	1
23	Flow meter calibrator 0-30000mm wci	No	1
24	Pneumatic test bench	No	1
25	Portable calibrator for pressure(low & high)	No	2
26	Test pressure gauges(different type)	set	1
27	Table mounted pressure calibrator (low & high).	No	5
28	Portable calibrator for vacuum	No	1
29	Table mounted vacuum calibrator	No	1

30	Fortin barometer 28.3 to 31.8 inches of Hg.	No	1
31	U-tube manometer(Hg filled)	No	2
32	Test manometer(Hg well type)	No	2
33	Hg thermometers	No	13
34	Table mounted TC,RTD calibrator	No	3
35	Portable infrared radiation thermometers.	No	1
36	Temperature bath	No	1
37	Pressure & vacuum air	No	1

Electrical:

S.No..	Description	UOM	Qty
1	Electronic test bench	No	1
2	Test RTD	No	1
3	Vibration/shock puls analyzer	No	1
4	Digital oscilloscope	no	1
5	Frequency counter	No	1
6	Insulation tester	No	1

- **Sl No I7.0.33: 220/240VAC UPS**

  Parallel Redundant UPS Power supply system with isolation transformer, inverter and SCVS, 2X100 KVA rating consisting of UPS panels 5 nos. UPS Panels (App dim 1200x1000x2215), Oil cooled variac (app. 250 Kg without oil), AC distribution boards 2 nos (dim. 1600x1000x2110), Battery of 258 Nos. HDP tubular, KBH 500 AH cells and charger. Scope includes laying and termination of approx 220 sqmm 3C copper / aluminium cable (about 200 meters) between

the panels, battery banks, ACDBs, Cable connectors (120 sq.mm Copper, L=2900, Qty.:4 nos.; L=1000, Qty. 16 nos.; L=1200 Qty: 32; L=700 Qty.:16; L=400, Qty. 64 nos.) etc, Equal connectors(Copper) : 259 nos, Interlock Connector(Copper): 904 nos,

Commissioning supervision in the scope of the supplier. Contractor to provide erection and commissioning support only.

Lump sum rate per set is to be quoted.

- **Sl No I7.0.34: 24V DC Batteries and charger with DCDB for SG & TG Package**

Float cum boost 24 V DC- 2 sets per unit. Battery charger system for SG, TG for 565 amperes. Each charger system shall comprise of : 100% capacity float cum boost charger -2 nos., 24 V DC system battery (Ni-CD type) with accessories(to be assembled) for half an hour (30 min.) duty cycle at 100% load (20 cells) – 2 sets., DCDB distribution board with bus coupler arrangement – 1 no., Battery isolating box- 2nos., set of 24V DC.

Erection supervision and commissioning in the scope of the supplier.

Lump sum rate per set is to be quoted

- **Sl No I7.0.35 and I7.0.36: 24V DC charger with DCDB for FOPH Package and 24V Batteries Charger.**

Float cum boost 24 V DC- 2 sets per unit. Battery charger system for SG, TG for 25 amperes. Each charger system shall comprise of : 100% capacity float cum boost charger -2 nos., 24 V DC system battery (Ni-CD type) with accessories(to be assembled) for half an hour (30 min.) duty cycle at 100% load (20 cells) – 2 sets., DCDB distribution board with bus coupler arrangement – 1 no., Battery isolating box- 2nos., set of 24V DC.

Erection supervision and commissioning in the scope of the supplier.

Lump sum rate per set is to be quoted

- **Sl No I7.0.37: 24V DC Batteries and charger with DCDB for BOP Package:**

Float cum boost 24 V DC- 2 sets per unit. Battery charger system for SG, TG for 565 amperes. Each charger system shall comprise of : 100% capacity float cum boost charger -2 nos., 24 V DC system battery (Ni-CD type) with accessories(to be assembled) for half an hour (30 min.) duty cycle at 100% load (20 cells) – 2 sets., DCDB distribution board with bus coupler arrangement – 1 no., Battery isolating box- 2nos., set of 24V DC.

- **Sl No I8.0.2: Furnace temperature probes**

Consist of Type K thermocouple, advance/retract/park mechanism with limit switch tripping, pressure switch, solenoid valve, local pushbutton cum control

box, remote control station at control room, etc. The temperature probes will be erected by mechanical agency. The local control box (600x600x300, 75 Kgs) shall be erected by the contractor.

Lump sum rate per set is to be quoted.

- **Sl. No. I8.0.13: CWP Butterfly valve**

CWP Butterfly valve consist of 1 no. Local Control Panel (Appox. Dim. 900 x 700 x 300 mm,), 1 No. Hydraulic Power pack unit per CWP.

Each power pack unit consists of 1 no. 15 HP pump, 3 nos. of pressure switches, 4 nos. of solenoids etc.

Local control panel consists of main contactors, auxiliary contactors, timers etc.

4 nos. of limit switches for butterfly valve position.

Lumpsum rate per set to be quoted.

- **Sl No I8.0.37: Direct water level gauge**

Direct Water Level Gauge commissioning (consisting of illuminator assembly, fibre port system illuminator, transformer, lights, etc.).

Lump sum rate per set is to be quoted.

- **Sl No I8.0.50: HEA Exciter System**

H.E.A. Exciter box along with retractor assembly, flexible spark rod, spark tip, flexible HT cable assembly, S.S. Hose (1 Mtr long, 6.35 mm ID), *Air Filter Regulator*, HEA Exciter transformer, limit switches etc. Lump sum rate per set is to be quoted.

- **Sl No I8.0.51: Flame Scanner head assembly**

It includes erection of fibre optic cable of length 120", Lens Barrel Assembly, Miniature 6 way Junction Box etc.

Lumpsum rate per set is to be quoted.

❖ **Sl No. I8.0.58: Flue Gas Analyzer**

Flue Gas Analyzer consists of:

- SOX, NOX and 2 nos. of CO2 analyser with Sampling type - Combined analyser /Probe (2 nos) located at approx. 88 mts on Flue Chute / Chimney.
- One Panel with AC, housing SHS components , abv Analyser , heat trace tubing..etc.. / Dimension approx. 1200 mm x 800 mm x 1900 mm.

Lumpsum rate to be quoted.

❖ **Sl No I8.0.61 and I8.0.62: SWAS system**

The scope of work includes all equipments including recorders etc, which may be fitted in any of the panels. Ph, sensors (8 nos.) conductivity analyser (11 nos.), sodium analysers(1 nos.), silica analyser(2nos), DO2 analyser (3 nos.), hydrazine analyser (1 nos.), pH analyser (6nos)and sensors for these analysers will be supplied loose with integral / prefab cables, to be mounted and wired up in relevant panels.

Lump sum rate to be quoted.

❖ **Sl No I9.0.1: Rack mounted Instruments commissioning**

Involves removal, calibration and refixing of rack mounted instruments, checking solenoid valves, drives, including wiring on the rack etc.

LP Bypass rack –1 set consisting of

- Pressure Gauges: 11 Nos, Pressure Switches: 1 Nos

EHG Rack –1 set consisting of

- Pressure Gauges: 10 Nos, Pressure Switches: 4 Nos

Supply Unit Racks for HPV-1, HPV-2, IPV-1&2 - 1 set consisting of

- Pressure Gauges: 17 Nos, Pressure/DP Switches: 15 Nos

Lumpsum rate per set is to be quoted.

- **Sl No I9.0.2: Coal Feeder local instruments**

  Involves only cabling and commissioning of local cabinet and peripherals like load cells, coal motion monitor, several switches, etc.

  Lumpsum rate per set is to be quoted.

- **Sl No I9.0.8: ERV Controller**

  The controller box to be erected near the ERV and impulse piping to be done. It has 220V DC rated pressure switches inside which are to be calibrated. Dimension: 350 x 290 x 180 mm; weight: 5 kg each. Remote console is to be mounted at control room backup desk. Lump sum rate per set is to be quoted.

- **Sl No I9.0.11: Fan Lube oil skid**

  The scope of work includes removal of instruments, calibration, refixing, checking cable connection from JB to instruments, motor connection, meggering and improving IR value of motor etc. and commissioning the skid

  The approximate total quantity of instruments *for all the 6 Nos. skids put together* is given below:

  Pressure/DP Gauges - 44 Nos.

  Temperature Gauges – 18 Nos.

  DP Switches – 6 Nos.

  Pressure Switches - 28 Nos.

  Level Switches - 6 Nos.

  Lump sum rate per set is to be quoted.

- **Sl No I9.0.12: Pulveriser Lube oil skid**

  The scope of work includes removal of instruments, calibration, refixing, checking cable connection from JB to instruments, motor connection, and meggering and improving IR value of motor etc. and commissioning the skid.

  Equipment per set:

  DP/ Pressure Switch - 5 Nos.

  .Level Switches – 3 nos.

  Temperature switch- 2 Nos.

  Lump sum rate per set is to be quoted.

- **Sl No I11.0.1: Master and slave clock system**

  This equipment consists of one control panel (approx. dimension 1200 x 900 x 2415 mm) housing power supplies, clock modules etc. GPS antenna is also to be suitably located and cabled up under this scope. About 6 nos slave clocks will have to be installed at various locations throughout the plant. Commissioning supervision will be provided by the supplier of Master clock system.

- **Sl No I11.0.2: HART Management system**

  Consists of panel (2400 x 800 x 2415) approx weight 500 Kgs. Also consists of PC, printer, Hart communicators for field use, etc. Erection supervision and commissioning is in the scope of the supplier. The Contractor to provide erection and commissioning support only.