

# **E-TENDER SPECIFICATION**

<b>Sl No</b>	<b>E-Tender Specification Number</b>	<b>Unit Number &amp; Project</b>
1	<b>BHE/PW/PUR/NTPRT-BLR U1/2092</b>	800 MW PVUNL PATRATU Boiler Unit#01 (Package A)
2	<b>BHE/PW/PUR/NTPRT-BLR U2/2093</b>	800 MW PVUNL PATRATU Boiler Unit#02 (Package B)

**PACKAGE - A:** Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of

1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, **Auxiliary boiler and its auxiliaries** and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#1 at 3X800 MW PVUNL PROJECT Patratu.

And

2. Erection of Bunker & allied works including supply & installation of items as per BOQ of **Unit-1** at 3X800 MW PVUNL Project Patratu.

And

### **3. Common systems of SCR.**

**PACKAGE - B:** Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of

1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#2 at 3X800 MW PVUNL PROJECT Patratu.

And

2. Erection of Bunker & allied works including supply & installation of items as per BOQ of **Unit-2** at 3X800 MW PVUNL Project Patratu.

## **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**
- **Volume-IE : Plot Plan**



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

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NIL	Tender Specification Issue Details	(Part of <b><u>Vol-IA-Tech Bid-2092-2093</u></b> )
NIL	Notice Inviting Tender	(Part of <b><u>Vol-IA-Tech Bid-2092-2093</u></b> )
I-A	Technical Conditions of Contract	<b><u>Vol-IA-Tech Bid-2092-2093</u></b>
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2092-  
2093

# NOTICE INVITING TENDER

Bharat Heavy Electricals Limited



**BHEL PSWR  
Notice Inviting Tender**

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Date: 10/04/2019

**NOTICE INVITING E-TENDER (NIT)**

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

To,  
Dear Sir/Madam,

**Sub : NOTICE INVITING E-TENDER**

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

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

**1.0 Salient Features of NIT**

Sl No	ISSUE	DESCRIPTION
i	E-TENDER NUMBER	BHE/PW/PUR/NTPRT-BLR U1/2092 BHE/PW/PUR/NTPRT-BLR U2/2093
ii	Broad Scope of job	<b>PACKAGE - A:</b> Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of 1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, <b>Auxiliary boiler and its auxiliaries</b> and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#1 at 3X800 MW PVUNL PROJECT Patratu. And 2. Erection of Bunker & allied works including supply & installation of items as per BOQ of <b>Unit-1</b> at 3X800 MW PVUNL Project Patratu. And 3. Common systems of SCR.

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<b>Sl No</b>	<b>ISSUE</b>	<b>DESCRIPTION</b>	
		<p><b>PACKAGE - B:</b> Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning &amp; Trial Operation including application of Insulation, Refractory, supply &amp; touch-up painting as and where required etc. of</p> <p>1. Boiler &amp; auxiliaries, Air Pre Heaters, Ducts &amp; Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, and piping, SCR and its auxiliaries, including duct supporting structure, , lining &amp; insulation, application of touch-up painting (As and wherever required) package OF UNIT#2 at 3X800 MW PVUNL PROJECT Patratu. And</p> <p>2. Erection of Bunker &amp; allied works including supply &amp; installation of items as per BOQ of <b>Unit-2</b> at 3X800 MW PVUNL Project Patratu.</p>	
<b>iii</b>	<b>DETAILS OF TENDER DOCUMENT</b>		
A	Volume-IA	<i>Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc.</i>	<i>Applicable</i>
B	Volume-IB	<i>Special Conditions of Contract (SCC)</i>	<i>Applicable</i>
C	Volume-IC	<i>General Conditions of Contract (GCC)</i>	<i>Applicable</i>
D	Volume-ID	<i>Forms and Procedures</i>	<i>Applicable</i>
F	Volume-II	<i>Price Bid as specified in E-Procurement Portal</i>	<i>Applicable</i>
<b>iv</b>	<b>Issue of Tender Documents</b>	<p><b>From <a href="https://bhel.abcprocure.com">https://bhel.abcprocure.com</a></b> (Tender documents will be available for downloading from BHEL e-Procurement website till due date of submission) Brief information of the tender shall also be available at Central Public Procurement portal (<a href="https://eprocure.gov.in">https://eprocure.gov.in</a>) and BHEL website (<a href="http://www.bhel.com">www.bhel.com</a>).</p>	<i>Applicable</i>
<b>v</b>	<b>DUE DATE &amp; TIME OF OFFER SUBMISSION</b>	<p><b>Date: 24/04/2019, Time: 15.00 Hrs</b> <b>Place: on E-Tender Portal</b> <b><a href="https://bhel.abcprocure.com">https://bhel.abcprocure.com</a></b></p> <p><b>• Offer to be submitted online only through e-procurement Portal</b></p>	<i>Applicable</i>
<b>vi</b>	<b>OPENING OF TENDER (Techno-Commercial</b>	<p><b>Date: 24/04/2019, Time: 16.00 Hrs</b> Notes: (1) In case the due date of opening of tender becomes a non-working day, then the due date &amp;</p>	<i>Applicable</i>

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Sl No	ISSUE	DESCRIPTION	
	Bid)	time of offer submission and opening of tenders get extended to the next working day. <i>(2) This tender being an e-tender, it shall be opened online only through the E-Procurement Portal. Participating bidders may witness the Opening online only.</i>	
vii	EMD AMOUNT	<i>Rs. 70,00,000/- (Rupees Seventy Lakhs Only) [To be submitted as described in the NIT below]</i>  <i>Important Note: Bidders kindly to take note that EMD (Earnest Money Deposit) shall be furnished by MSE bidders as well, as per the amount and procedure indicated in the NIT/GCC.</i>	Applicable
viii	COST OF TENDER	<i>Rs 2000/- [To be submitted in the form and manner as mentioned below]</i>	Applicable
ix	LAST DATE FOR SEEKING CLARIFICATION	<i>Date: 19/04/2019</i>  <i>Along with soft version also, addressing to undersigned &amp; to others as per contact address given below. Bidders may consider to seek clarifications through email.</i>	Applicable
x	SCHEDULE OF Pre Bid Discussion (PBD)	-	Not Applicable
xi	INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)	<b>Mrs. Pravin Tripathi, IA &amp; AS (Retd.) and Shri D R S Chaudhary, IAS (Retd),</b>  (Please refer Annexure-04 "Important Information" of NIT for more details)	Applicable
xii	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage ( <a href="http://www.bhel.com">www.bhel.com</a> -->Tender Notifications →View Corrigendum), Central Public Procurement portal	

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		<a href="https://eprocure.gov.in">https://eprocure.gov.in</a> ) & on e-tender portal <a href="https://bhel.abcprocure.com">https://bhel.abcprocure.com</a> and not in the newspapers. Bidders to keep themselves updated with all such information.

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

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

4.0 Unless specifically stated otherwise, bidder shall deposit EMD 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. Copy of ~~One Time EMD Certificate~~ or the proof of Demand Draft/Payorder duly **digitally** signed is to be uploaded with the Techno Commercial offer **on e-tender portal <https://bhel.abcprocure.com>**. However Original Demand Draft shall be sent to the officer inviting tender within a reasonable time failing which the offer is liable to be rejected.

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

NAME OF THE COMPANY	BHARAT HEAVY ELECTRICALS LTD
ADDRESS OF THE COMPANY	SHREE MOHINI COMPLEX 345, KINGSWAY,NAGPUR
NAME OF BANK	STATE BANK OF INDIA
NAME OF BANK BRANCH AND BRANCH	SBI,KINGSWAYBRANCH,BRANCH CODE-

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CODE	00432
CITY	NAGPUR
ACCOUNT NUMBER	31380025872
ACCOUNT TYPE	CURRENT A/C
IFSC CODE OF THE BANK BRANCH	SBIN0000432
MICR CODE OF THE BANK BRANCH	440002002

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

Procedure for Earnest Money Deposit					
Description / Mode of Submission	EFT	Cash	DD/Pay Order	FDR (Refer GCC clause no 1.9.1(iv) for FDR)	Bank Guarantee (Refer GCC clause no 1.9.1(iv) for Acceptable Portion of EMD in the Form of BG)
Proof of EMD along with the offer			Scan Copy has to be uploaded	Scan Copy has to be uploaded	Scan Copy of BG has to be uploaded.
Submission of EMD to BHEL PSWR, Nagpur	Receipt of Amount Transferred into BHEL Account	Receipt of cash deposit at BHEL office	Original DD/ Pay order to be sent through Registered Post	The Original FDR to be sent through Courier/Post to BHEL PSWR Nagpur.	The Original Bank Guarantee/any extensions /amendments shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Purchase Department, BHEL PSWR, Nagpur.

In addition to the EFT, Cash, DD/Pay order and Bank Guarantee, Fixed Deposit Receipt (FDR) issued by Scheduled banks / Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) can also be submitted towards EMD.

**Further, it is to be noted that, the EMD amount in excess of Rs. 2 Lakh may also be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at-least six months. (Proforma of Bank Guarantee for Earnest Money shall be as provided in Vol-ID "FORMS & PROCEDURES".)**

~~Copy of One Time EMD Certificate or~~ The proof of Demand Draft/ Payorder/FDR or BG or receipt of Electronic Fund Transfer duly **digitally** signed is to be uploaded with the Techno Commercial offer on '**e-tender portal**' → <https://bhel.abcprocure.com>. In case of Demand

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**Draft/ Payorder/FDR/BG, Original Demand Draft/ Payorder/FDR/BG shall be sent to the officer inviting tender within a reasonable time failing which the offer is liable to be rejected.**

**5.0 Procedure for Submission of Tenders:**

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

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

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

**b) Digital Signature**

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

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

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

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

**Note**

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

The Tenderers must submit their Tenders, as detailed below:

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

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

SN	Description	Remarks
<b>Part-I A</b>		
i.	Covering letter/Offer forwarding letter of Tenderer (in the techno commercial compliance sheet provided)	
ii.	Duly filled-in 'No Deviation Certificate' as per prescribed format. <b>Note:</b> <ol style="list-style-type: none"> <li>a. In case of any deviation, the same should be submitted separately, indicating respective clauses of tender against which deviation is taken by bidder. It shall be specifically noted that deviation recorded elsewhere shall not be entertained.</li> <li>b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. <ol style="list-style-type: none"> <li>i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL</li> <li>ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender</li> </ol> </li> </ol>	
iii.	Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that a credential certificates issued by clients shall distinctly bear the name of organization, contact phone no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/Errata etc. pertinent to this NIT.	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	If applicable
vi.	Duly filled-in annexures, formats etc. as required under this Tender Specification/NIT	
vii.	Notice inviting Tender (NIT)	
viii.	Volume - I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume - I B : Special Conditions of Contract (SCC)	
x.	Volume - I C : General Conditions of Contract (GCC)	
xi.	Volume - I D : Forms & Procedures	
xii.	Volume - IE: Plot Plan	
xiii.	<del>Volume - II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item</del>	
xiv.	Any other details preferred by bidder with proper indexing.	

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<b>PART-I B</b>	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in this Tender <u>OR</u> Documentary evidence for 'One Time EMD' with the Power Sector Region of BHEL floating the Tender  2. <del>Cost of Tender ( Demand Draft or copy of Cash Receipt as the case may be)</del>  Note: Refer Clause No-3 and 4 of NIT for further details
<b>PART-II</b>	
ii	Volume II – PRICE BID ( Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures)

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

6.0 Void

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

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

**9.0 Assessment of Capacity of Bidders:**

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

- I. **LOAD:** Load takes into consideration **ALL** the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The cut off month for reckoning 'Load' shall be the 3<sup>rd</sup> Month preceding the month corresponding to the 'latest date of bid submission', in the following manner -  
**(Note:** For example, if latest bid submission is in Jan 2017, then the 'load' shall be calculated up to and inclusive of Oct 2016)

Total number of Packages in hand = Load (P)

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

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II. **PERFORMANCE:** Here 'Monthly Performance' of the bidder for all the packages (under execution/ executed during the 'Period of Assessment' in all Power Sector Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding and including the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the 3<sup>rd</sup> Month preceding the month corresponding to 'latest date of bid submission', in the following manner:

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

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

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for all the similar Package/packages', divided by the total number of Package months for which evaluation should have been done, as per procedure below:

- a)  $P_1, P_2, P_3, P_4, P_5, \dots, P_N$  etc. be the packages (under execution/ executed during the 'Period of Assessment' in all Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced. Total number of similar packages for all Regions =  $P_T$  (i.e.  $P_T = P_1 + P_2 + P_3 + P_4 + \dots + P_N$ )
- 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 ' $T_T$ ' for total similar Packages ' $P_T$ ' for all Regions (i.e.  $T_T = T_1 + T_2 + T_3 + T_4 + \dots + T_N$ )
- c) Sum ' $S_1$ ' of 'Monthly Performance Evaluation' Scores ( $S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, S_{1-5} \dots S_{1-T_1}$ ) for similar package  $P_1$ , for the 'period of assessment' ' $T_1$ ' (i.e.  $S_1 = S_{1-1} + S_{1-2} + S_{1-3} + S_{1-4} + S_{1-5} + \dots + S_{1-T_1}$ ). Similarly,  $S_2$  for package  $P_2$  for period  $T_2$ ,  $S_3$  for package  $P_3$  for period  $T_3$  etc. for the tendered scope for all Regions. Now calculate cumulative sum ' $S_T$ ' of 'Monthly Performance Evaluation' Scores for total similar Packages ' $P_T$ ' for all Regions (i.e. ' $S_T = S_1 + S_2 + S_3 + S_4 + S_5 + \dots + S_N$ ')
- d) **Overall Performance Rating ' $R_{BHEL}$ ' for the Similar Package/Packages** (under execution/ executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL

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

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

- 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
		(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	
(i)	(ii)								(x)
1	Similar Packages for all Regions →  (under execution/ executed during period of assessment)	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>	...	P <sub>N</sub>	Total No. of similar packages for all Regions = P <sub>T</sub>  i.e. Sum (Σ) of columns (iii) to (ix)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of assessment' for corresponding Similar Packages ( as in row 1)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	...	T <sub>N</sub>	Sum (Σ) of columns (iii) to (ix)  = T <sub>T</sub>
3	Monthly performance scores for the corresponding period (as in Row 2)	S <sub>1-1</sub> , S <sub>1-2</sub> , S <sub>1-3</sub> , S <sub>1-4</sub> , ... S <sub>1-T1</sub>	S <sub>2-1</sub> , S <sub>2-2</sub> , S <sub>2-3</sub> , S <sub>2-4</sub> , ... S <sub>2-T2</sub>	S <sub>3-1</sub> , S <sub>3-2</sub> , S <sub>3-3</sub> , S <sub>3-4</sub> , ... S <sub>3-T3</sub>	S <sub>4-1</sub> , S <sub>4-2</sub> , S <sub>4-3</sub> , S <sub>4-4</sub> , ... S <sub>4-T4</sub>	S <sub>5-1</sub> , S <sub>5-2</sub> , S <sub>5-3</sub> , S <sub>5-4</sub> , ... S <sub>5-T5</sub>	.. ... ... ... ...	S <sub>N-1</sub> , S <sub>N-2</sub> , S <sub>N-3</sub> , S <sub>N-4</sub> , ... S <sub>N-TN</sub>	-----

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Sl. No.	Item Description	Details for all Regions							Total
		(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	
4	Sum of Monthly Performance scores of the corresponding Package for the corresponding period (as in row-3)	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	...	S <sub>N</sub>	Sum (Σ) of columns (iii) to (ix)  = S <sub>T</sub>

- ii). Calculation of Overall 'Performance Rating' (R<sub>BHEL</sub>) in case at least 6 evaluation scores for 'similar Package/Packages' for the tendered scope ARE NOT AVAILABLE, during the 'Period of Assessment':

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

- a) 'Period of Assessment' i.e. 6 months preceding and including the cut-off month
- b) 12 months preceding and including the cut-off month
- c) 24 months preceding and including the cut-off month
- d) 36 months preceding and including the cut-off month

In case, R<sub>BHEL</sub> cannot be calculated as above, then Bidder shall be treated as 'NEW VENDOR'. Further eligibility and qualification of this bidder shall be as per definition of 'NEW VENDOR' described in 'Explanatory Notes'.

- iii). Factor "L" assigned based on Overall Performance Rating (R<sub>BHEL</sub>) at Power Sector Regions:

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

**III. 'Assessment of Capacity of Bidder':**

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

Max number of packages P<sub>Max</sub> = (R<sub>BHEL</sub> - 60) divided by corresponding value of 'L', i.e. (R<sub>BHEL</sub> - 60)/L

Note:

- i). In case the value of P<sub>Max</sub> results in a fraction, the value of P<sub>Max</sub> is to be rounded off to next whole number

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- ii). For  $R_{BHEL} = 60$ ,  $P_{Max} = '1'$
- iii). For  $R_{BHEL} \geq 80$ , there will be no upper limit on  $P_{Max}$

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

**IV. Explanatory note:**

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

**Table-1**

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

- iii). Bidders who have not been evaluated for at least **six package** months in the last 36 months preceding and including the Cut-off month in the online BHEL system for contractor performance evaluation in BHEL PS Regions, shall be considered "NEW VENDOR".

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

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

The "FIRST TIMER" tag shall remain till completion of all the contracts against which vendor has been tagged as First Timer or availability of 6 evaluation scores within last 36 months preceding and including the Cut-off month in the online BHEL system for contractor performance evaluation in BHEL PS Regions.

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

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

- iv). Consequent upon applying the criteria of 'Assessment of Capacity of Bidders' detailed above on all the bidders qualified against Technical and Financial Qualification criteria, if the number of qualified bidders reduces to less than four, then for further processing of the Tender, BHEL at its discretion reserves the right to also consider the bidders who are "not qualified" as per criteria of 'Assessment of Capacity of Bidders' and for this, procedure described in following three options shall be followed:
- a) All the bidders having Overall Performance Rating ('RBHEL')  $\geq 60$  shall be considered qualified against criteria of 'Assessment of Capacity of Bidders'.
  - b) If even after using option "a", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a", "First timer" bidders having average of available performance scores  $\geq 60$  upto and including the Cut Off month shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.
  - c) If even after using option "a" and "b", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a" and "b", "First timer" bidders for whom no performance score is available in the system upto and including the Cut Off month, shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.

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

- v). 'Under execution' shall mean works in progress as per the following:
- a. Up to execution of 90% of anticipated Contract Value in case of Civil, MM, Structural and Turbo Blower Packages
  - b. Up to Steam Blowing in case of Boiler/ESP/Piping Packages
  - c. Up to Synchronization in all Balance Packages

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

- vi). Contractor shall provide the latest contact details i.e. mail-ID and Correspondence Address to SCT Department, so that same can be entered in the Contractor Performance Evaluation System, and in case of any change/discrepancy same shall be informed immediately. Login Details for viewing scores in Contractor Performance Evaluation System shall be provided to the Contractor by SCT Department.
- vii). Performance Evaluation for Activity Month shall be completed in Evaluation Month (i.e. month next to Activity Month) or in rare cases in Post Evaluation Month (i.e. month next to Evaluation Month) after approval from Competent Authority. In case scores are not acceptable, Contractor can submit Review Request to GM Site/ GM Project latest by 25<sup>th</sup> of Evaluation Month or 3 days

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after approval of score, whichever is later. However, acceptance/rejection of 'Review Request' solely depends on the discretion of GM Site/GM Project. After acceptance of Review Request, evaluation score shall be reviewed at site and the score after completion of review process shall be acceptable and binding on the contractor.

- viii). Project on Hold due to reasons not attributable to bidder -
- a. **Short hold:** Evaluation shall not be applicable for this period, however Loading will be considered.
  - b. **Long hold:** Short hold for continuous six months and beyond or hold on account of Force Majeure shall be considered as Long Hold. Evaluation as well as Loading shall not be considered for this period.
- ix). Performance evaluation in CL 9 above is applicable to prime bidder and Consortium partner (or Technical tie up partner) for their respective scope of work.

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

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

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

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

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

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- 15.0 Bidders shall submit Integrity Pact Agreement (Duly Digitally/ signed by authorized signatory who signs in the offer), **if applicable**, along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation. **The names and other details of Independent External Monitor (IEM) for the subject tender is as given at point (1) above.**
- 16.0 The Bidder has to satisfy the Pre-Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the Pre-Qualification Criteria specified in this NIT as per Annexure-I (as applicable), past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right not to consider offers of parties under HOLD.
- 17.0 In case BHEL decides on a 'Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorized representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of any or all Unsuccessful/Disqualified bidders under intimation to the respective bidders.
- 18.0 Validity of the offer shall be for **six months** from the latest due date of offer submission (including extension, if any) unless specified otherwise.
- 19.0 BHEL reserves the right to decide the successful bidder on the basis of Reverse Auction process. In such case all qualified bidders will be intimated regarding procedure/ modality for Reverse Auction process prior to Reverse Auction and price will be decided as per the rules for Reverse Auction. .
- However, if reverse auction process is unsuccessful as defined in the RA rules/procedures, or for whatsoever reason, then the sealed 'PRICE BIDS' will be opened for deciding the successful bidder. BHEL's decision in this regard will be final and binding on bidder.
- 20.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.
- 21.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents. For the tenders requiring services of Original supplier of equipment/services, offer is preferred from the OEM/Principal. However, if the OEM/Principal insists on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/supplier in the same tender. Moreover, either the agent could bid on behalf of manufacturer / supplier or manufacturer / supplier could bid directly but not both. In case bids are received from both manufacturer / supplier and the agent, bid from agent shall be ignored.

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- 22.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.
- 23.0 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre-Qualifying Requirement (PQR) criteria, and in such a case the following shall be complied with:
- 23.1 Prime Bidder and Consortium Partner or partners are required to enter into a consortium agreement with a validity period of six months initially. In case the consortium is awarded the contract, then the Consortium Agreement between the Prime Bidder and Consortium Partner or partners shall be extended till contractual completion period including extension periods if any applicable.
- 23.2 'Standalone' bidder cannot become a **'Prime Bidder' or a 'Consortium bidder' or 'Technical Tie up bidder' in a consortium (or Technical Tie up) bidding.** Prime bidder shall neither be a consortium partner to other prime bidder nor take any other consortium partners. However, consortium partner may enter into consortium agreement with other prime bidders. In case of non-compliance, consortium bids of such Prime bidders will be rejected.
- 23.3 Number of partners for a consortium Bidding (or Technical Tie up) shall be as specified in the PQR.
- 23.4 Prime Bidder shall be as specified in the Pre-Qualification Requirement, else the bidder who has the major share of work.
- 23.5 In order to be qualified for the tender, Prime Bidder and Consortium partner or partners shall satisfy (i) the Technical 'Pre Qualifying Requirements' specified for the respective package, (ii) "Assessment of Capacity of Bidder" as specified in clause 9.0.
- 23.6 Prime Bidder shall comply with additional "Technical" criteria of PQR as defined in 'Explanatory Notes for the PQR'.
- 23.7 Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified.
- 23.8 In case customer approval is required, then Prime Bidder and Consortium Partner or partners shall have to be individually approved by Customer for being considered for the tender.
- 23.9 Prime Bidder shall be responsible for the overall execution of the contract.

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- 23.10 In case of award of job, Performance shall be evaluated for Prime Bidder and Consortium Partner or partners for their respective scope of work(s) as per prescribed formats.
- 23.11 In case the Consortium partner or partners back out, their SDs shall be encashed by BHEL. In such a case, other consortium partner or partners meeting the PQR have to be engaged by the Prime Bidder, and if not, the respective work will be withdrawn and executed on risk and cost basis of the Prime Bidder. The new consortium partner or partners shall submit fresh SDs as applicable.
- 23.12 In case the prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.
- 23.13 After execution of work, the work experience shall be assigned to the Prime Bidder and the consortium partner or partners for their respective scope of work. After successful execution of two similar works with the same consortium partner or partners under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'standalone' bidder for similar works, subject to certification from BHEL about the active involvement of the Prime Bidder for satisfactory execution of the works.
- 23.14 The consortium partner shall submit SD equivalent to 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. The 100% SD value to be submitted by the consortium partner/(s) shall be remitted before start of work. All the terms & conditions of the SD clause in Vol-IC GCC shall be applicable for this SD except clauses no 1.10.1, 1.10.4 & 1.10.6 of Vol-IC GCC. For "**modes of deposit**" of this SD, clause no 1.10.3 of Vol-IC GCC shall be applicable.
- 23.15 In case of a Technical Tie up, all the clauses applicable for the Consortium partner shall be applicable for the Technical Tie up partner also.
- 24.0 The bidder shall submit/upload documents in support of possession of 'Qualifying Requirements' duly self-certified and stamped by the authorized signatory (**through Digital Signature**), as per the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.
- 25.0 The bidder may have to produce original document for verification if so decided by BHEL.
- 26.0 Order of Precedence  
In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below:

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

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

For BHARAT HEAVY ELECTRICALS LTD

Addl. General Manager - Purchase)

**Enclosure**

- 01. Annexure-1: Pre Qualifying criteria.
- 02. Annexure-2: Check List.
- 03. Annexure-3: Integrity Pact
- 04. Annexure-4: Important Information.
- 05. Annexure-5: Declaration for Reverse Auction.

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**ANNEXURE - 1**

**PRE QUALIFYING CRITERIA**

<b>E-Tender Specification Number: BHE/PW/PUR/NTPRT-BLR U1/2092 BHE/PW/PUR/NTPRT-BLR U2/2093</b>			
<b>JOB</b>	<p><b>PACKAGE - A:</b> Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning &amp; Trial Operation including application of Insulation, Refractory, supply &amp; touch-up painting as and where required etc. of</p> <ol style="list-style-type: none"> <li>Boiler &amp; auxiliaries, Air Pre Heaters, Ducts &amp; Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, <b>Auxiliary boiler and its auxiliaries</b> and piping, SCR and its auxiliaries, including duct supporting structure, , lining &amp; insulation, application of touch-up painting (As and wherever required) package OF UNIT#1 at 3X800 MW PVUNL PROJECT Patratu.</li> </ol> <p align="center">and</p> <ol style="list-style-type: none"> <li>Erection of Bunker &amp; allied works including supply &amp; installation of items as per BOQ of <b>Unit-1</b> at 3X800 MW PVUNL Project Patratu.</li> </ol> <p align="center">And</p> <p><b>3. Common systems of SCR.</b></p>		
	<p><b>PACKAGE - B:</b> Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning &amp; Trial Operation including application of Insulation, Refractory, supply &amp; touch-up painting as and where required etc. of</p> <ol style="list-style-type: none"> <li>Boiler &amp; auxiliaries, Air Pre Heaters, Ducts &amp; Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, and piping, SCR and its auxiliaries, including duct supporting structure, , lining &amp; insulation, application of touch-up painting (As and wherever required) package OF UNIT#2 at 3X800 MW PVUNL PROJECT Patratu.</li> </ol> <p align="center">And</p> <ol style="list-style-type: none"> <li>Erection of Bunker &amp; allied works including supply &amp; installation of items as per BOQ of <b>Unit-2</b> at 3X800 MW PVUNL Project Patratu.</li> </ol>		
<b>S No</b>	<b>PRE QUALIFICATION CRITERIA</b>	<b>Applicability</b>	<b>Remarks</b>
<b>A</b>	<p>Submission of Integrity Pact duly signed (if applicable)</p> <p><del>(Note: To be submitted by Prime Bidder &amp; Consortium /Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)</del></p>	<b>APPLICABLE</b>	

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<b>B</b>	<p><b><u>TECHNICAL PQR:</u></b></p> <p><b><u>B.1: Not Applicable</u></b></p> <p><b><u>B.2: Technical Criteria:</u></b></p> <p>Bidder must have <b>Executed</b> Erection &amp; Commissioning of At least One Boiler (Consisting of “Pressure Parts” and “Structure” of the same unit as standalone Bidder (i.e. without any consortium)) of a Unit of rating <math>\geq 400</math> MW in the last seven (7) years as on latest date of offer submission.</p>	<b>APPLICABLE</b>	
<b>C-1</b>	<p><b><u>Financial TURNOVER</u></b></p> <p>Bidders must have achieved an average annual financial turnover (audited) of <b>Rs. 1800 Lakhs</b> or more over last three Financial Years (FY) i.e. 2015-16, 2016-17 &amp; 2017-18.</p>	<b>APPLICABLE</b>	
<b>C-2</b>	<p><b><u>NETWORTH</u></b> (only in case of Companies)</p> <p>Net worth of the Bidder based on the latest Audited Accounts as furnished for ‘C-1’ above should be positive.</p>	<b>APPLICABLE</b>	
<b>C-3</b>	<p><b><u>PROFIT</u></b></p> <p>Bidder must have earned profit in any one of the three financial years as applicable in the last three financial years as furnished for ‘C-1’ above.</p>	<b>APPLICABLE</b>	
<b>C-4</b>	<p>Bidder must not be under Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR, which will render him ineligible for participation in this tender, and shall submit undertaking to this effect.</p>	<b>APPLICABLE</b>	
<b>D</b>	<p><b>Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)</b></p> <p>The “Assessment of Capacity of Bidders” for this Tender shall be carried out by considering the identified similar package as “Boiler”.</p>	<b>APPLICABLE</b>	<b>BY BHEL</b>

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<b>E</b>	<b>Approval of Customer (if applicable)</b>  <b>Note:</b> Names of bidders ( <del>including consortium/Technical Tie-up partners in case consortium bidding is permitted</del> ) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval	<b>APPLICABLE</b>	<b>BY BHEL</b>
<b>F</b>	Price Bid Opening <b>Note:</b> Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E		<b>BY BHEL</b>
<b>G</b>	Consortium tie-ups	<b>NOT APPLICABLE</b>	

**Explanatory Notes for Technical Criteria (B):**

1. Void.
2. Unless otherwise specified, for the purpose of 'Technical' criteria of PQR ( as in 'B' above), the word 'EXECUTED' means achievement of milestones as defined below -
  - a. "ACHIEVEMENT OF PHYSICAL QUANTITIES" as per PQRs.
  - b. "READINESS FOR COAL FILLING" in respect of Mill Bunker.
  - c. "CHARGING" in respect of Power Transformers/ Bus Ducts/ "HT/LT Switchgears" / "HT/LT Cabling".
  - d. For C&I works: "SYNCHRONISATION" in case of power project and "WORK COMPLETION of the value as defined in PQR" in case of industry.
  - e. **"BOILER LIGHT UP" in respect of Boiler / CFBC / ESP.**
  - f. "GAS IN" in respect of HRSG.
  - g. "STEAM BLOWING COMPLETION" in respect of Power Cycle Piping.
  - h. "HYDRAULIC TEST" of the system in respect of Pressure parts/ LP Piping/CW Piping.
  - i. "FULL LOAD OPERATION OF THE UNIT" in respect of Insulation work.
  - j. "SYNCHRONISATION" in respect of STG / GTG.
  - k. "SPINNING" in respect of HTG.
  - l. "COMPLETION AND HANDING OVER FOR MECHANICAL ERECTION" in respect of STG Deck and Machine/Equipment foundation.
3. Boiler means HRSG or WHRB or any other types of Steam Generator.
4. Critical/Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass.
5. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5 TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating of the same in terms of MW shall be considered for evaluation.

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6. Scope for Capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine.

7. In case the tendered scope is not a Pulverized Fuel Boiler, experience of Oil/Gas Fired Boilers can also be considered.

**Common Explanatory Notes:**

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

2. Completion date for achievement of the technical criteria specified in the Common QR should be in the last 7 years ending on the 'latest date of Bid Submission' of Tender irrespective of date of the start of work.

3. "Executed" means the bidder should have achieved the technical criteria specified in the Technical criteria of PQR (as in 'B' above) even if the Contract has not been completed or closed.

4. In case the Experience/PO/WO certificate enclosed by bidders do not have separate break up of prices for the E&C portion for Electrical and C&I works (i.e. the certificates enclosed are for composite order for supply and erection of Electrical and C&I and other works if any), then value of Erection & Commissioning for the Electrical and C&I portion shall be considered as 15% of the price for supply & erection of Electrical and C&I, unless otherwise specifically indicated in the PQR.

~~5. Following shall be complied with in case of consortium:~~

~~a. The Prime Bidder and Consortium Partner(s) are required to enter in to a consortium agreement with a validity period of six months initially. Thereafter, the Prime Bidder and Consortium Partner(s) shall certify to BHEL regarding existence and validity of their consortium agreement on six monthly basis.~~

~~b. Prime Bidder and Consortium partners shall be approved by Customer for being considered for the tender (applicable if customer approval is required).~~

~~c. Number of partners including prime Bidder shall be NOT more than 3 (three).~~

~~d. Prime Bidder alone shall necessarily comply with "B1 Technical Criteria" except for mechanical package where B1 criteria is not applicable.~~

~~e. Prime Bidder and Consortium Partner shall together comply with the 'Pre-Qualification Requirements' specified for the respective category of technical requirement as per "B2 technical criteria".~~

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

~~g. All other conditions shall be read in conjunction with clause no 23.0 of NIT.~~

~~h. Prime Bidder shall be the Bidder who has a major share of work.~~

~~i. Prime Bidder shall be responsible for the overall execution of the Contract.~~

~~j. Performance shall be evaluated for Prime Bidder and the Consortium partner for their respective scope of work.~~

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~~k. In case the Consortium partner backs out, another consortium partner meeting the QRs, has to be engaged by Prime Bidder and if not, the respective work will be withdrawn and executed on risk and cost basis of the prime bidder.~~

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

~~m. After successful execution of one work with a consortium partner under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'standalone' bidder for works similar to that for which consortium partner was engaged, for subsequent tenders.~~

~~n. The Consortium partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the Prime Bidder for the total contract value.~~

**Explanatory Notes for PQR -C (Financial):**

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. If financial statements are not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by Chartered Accountant.
4. **C-2:** Net Worth (Only in case of companies) of the bidder should be positive.  
**Note:** Net worth shall be calculated based on the latest Audited Accounts as furnished for 'C-1' above.  
Net worth = Paid up share capital\* + Reserves  
(\* : Share Capital OR Partnership Capital OR Proprietor Capital as the case may be)
5. **C-3:** Bidder must have earned profit in any one of the three financial years as applicable in the last three financial years as furnished for 'C-1' above.  
**Note:** PROFIT shall be PBT earned during any one year of last three financial years as in 'C-1' above.
6. **C-4:** Bidder must not be under Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR, which will render him ineligible for participation in this tender, and shall submit undertaking to this effect.

**Annexure A**

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

$$P = R + 0.425 \times R \times (XN - X0) + 0.425 \times R \times (YN - Y0)$$

~~X0 Y0~~

~~Where~~

~~P = Updated value of work~~

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~~R = Value of executed work~~

~~XN = All India Avg. Consumer Price index for industrial workers for three months prior to the month of latest due date of bid submission (e.g. If latest bid submission date is 02-Mar-17, then bid submission month shall be reckoned as March'17 and index for Dec'2016 shall be considered).~~

~~X0 = All India Avg. Consumer Price index for industrial workers for last month of work execution~~

~~YN = Monthly Whole Sale Price Index for All Commodities for three months prior to the month of latest due date of bid submission (e.g. If latest bid submission date is 02-Mar-17, then bid submission month shall be reckoned as March'17 and index for Dec'2016 shall be considered).~~

~~Y0 = Monthly Whole Sale Price Index for All Commodities for last month of work execution~~

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

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**ANNEXURE - 2**

**CHECK LIST**

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

1	Name and Address of the Tenderer	
2	Details about type of the Firm/Company	
3.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:- <del>ONE TIME EMD</del> / 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 <b>PRE QUALIFICATION CRITERIA</b> (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable/ <del>Not Applicable</del> YES / NO
7	Audited profit and Loss Account for the last three years	Applicable/ <del>Not Applicable</del> YES/NO
8	Undertaking for QR C-4	Applicable/ <del>Not Applicable</del> YES/NO
9	Copy of PAN Card	Applicable/ <del>Not Applicable</del> YES/NO
10	Whether all pages of the Tender documents including annexures, appendices etc. are read understood and signed	Applicable/ <del>Not Applicable</del> YES/NO
11	Integrity Pact	Applicable/ <del>Not Applicable</del> YES/NO
12	Declaration by Authorized Signatory	Applicable/ <del>Not Applicable</del> YES/NO

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

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**ANNEXURE-3**

**INTEGRITY PACT**

**Between**

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

**And**

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

**Preamble**

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

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

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

**Section 1 - Commitments of the Principal**

- 1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -
  - 1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
  - 1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
  - 1.1.3 The Principal will exclude from the process all known prejudiced persons.
- 1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

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

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.
- 2.1.1 the Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The bidder(s)/ Contractors(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidders (s)/ Contractor(s) shall disclose the name and address of agents and representative in India and India Bidder(s)/Contractor(s) to disclose their foreign principals or associates. The Bidders (s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

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

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

**Section 4 – Compensation for Damages**

- 4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover

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from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

**Section 5 – Previous Transgression**

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on his subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

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

- 6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.
- 6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

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

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

**Section – 8 Independent External Monitor(s)**

- 8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- 8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The Bidder(s)/ Contractors(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s)/ Sib-contractor(s) with confidentiality in line with Non-disclosure agreement.
- 8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meeting could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

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- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.
- 8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organization.
- 8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.
- 8.12 The word 'Monitor' would include both singular and plural.

**Section 9 – Pact Duration**

- 9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidder 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.
- 9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

**Section 10 – Other Provisions**

- 10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.
- 10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

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- 10.3 If the contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
  - 10.4 Should one or several provisions of this agreement turn out to be invalid, the reminder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
  - 10.5 Only those Bidders/ Contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

-----  
For & On Behalf of the Principal

-----  
For & On Behalf of the Bidder/ Contractor

(Office Seal)

(Office Seal).

**Place** -----

**Date**-----

Witness: \_\_\_\_\_

Witness: \_\_\_\_\_

(Name & Address) \_\_\_\_\_

(Name & Address) \_\_\_\_\_

\_\_\_\_\_

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**ANNEXURE-4**

**IMPORTANT INFORMATION**

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

**Postal Address:**

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

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

AGM Purchase, Email: [prchiwarkar@bhel.in](mailto:prchiwarkar@bhel.in). Ph: +91 - 712 - 3048 - 633

Sr Engineer Purchase, Email: [shubh@bhel.in](mailto:shubh@bhel.in), Ph: +91 - 712 - 3048 - 742

Sr Engineer Purchase, Email: [svm@bhel.in](mailto:svm@bhel.in), Ph: +91 - 712 - 3048 - 715

- 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](http://www.bhel.com) → Tender Notification → List of Banned Firms )**
- 2. Refer Chapter XII of Volume IB Special Conditions of Contract regarding Suspension of Business Dealings: The abridged version of extant 'Guidelines for suspension of business dealings with suppliers/ contractors' has now been uploaded on [www.bhel.com](http://www.bhel.com) on "supplier registration page" at the following link: [http://www.bhel.com/vender\\_registration/pdf/Suspension\\_guidelines\\_adbridged.pdf](http://www.bhel.com/vender_registration/pdf/Suspension_guidelines_adbridged.pdf)**
- 3. The offers of the bidders who are under suspension as also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site [www.bhel.com](http://www.bhel.com).**

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

3.1. Commitment by BHEL:

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

3.2. Commitment by Bidder/ Supplier/ Contractor:

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

3.2.2. The bidder/ supplier/ contractor will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other

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intermediaries in connection with the award of the contract and shall adhere to relevant guidelines issued from time to time by Govt. of India/ BHEL.

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

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

- 4. “Pradhan Mantri Kaushal Vikas Yojna:** The contractor shall, at all stages of work deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute/Industrial Training Institute/ National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/ certified by State/ Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs.100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding”.
- 5. All Statutory Requirements as applicable for this project shall be complied with.**
- 6. BHEL Fraud Prevention Policy: “The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.”**
- 7. Following clause shall form part of the HSE documents issued under Chapter IX of Volume IB ‘Special Conditions of Contract’**

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

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**8. Modality Tendering and Ordering Philosophy**

- i. This is a combined tender for E & C of 2 units of 800 MW Boiler Package and Erection of bunker Structures, SCR etc of Unit#01 & Unit#02 at PVUNL Project Patratu.
- ii. Tender specification (Volume I) is common for both units/packages  
-Unit#01 (Pkg-A) & Unit#02 (Pkg-B).
- iii. Vol-II Price bid is invited only for Unit#01 (Package-A).
- iv. Unit#01 (Pkg-A) & Unit#02 (Pkg-B) shall be awarded to separate agencies.
  
- v. **Award of U#1 (Package A) :**
  - 1. L-1 Bidder shall be considered for award of Unit#01 (Package-A).
  
- vi. **Award of U#2 (Package B) :**
  - 1. For award of UNIT#02 (Package-B), next bidder in the order of their price competitiveness (i.e L-2, then L-3 and hence forth) shall be given an option to match their price/rate, with the Awarded/Finalized price/rates of Unit#01 (Package-A). In case none of the bidders agree to match the Awarded RATE of Unit#01 (Package A), then BHEL may consider awarding the Unit#02 (Package B) to L-1 bidder or opt any other suitable method to finalize Unit#02 (Pkg-B).
  - 2. Price matching philosophy for award of U#2 (Package B) as detailed in sl no. 1 above shall be at BHEL's discretion. BHEL may opt any other suitable method to finalize Unit#02 (Pkg-B)

<b>Package</b>	<b>Package A</b>
<b>TS No.</b>	<b>BHE/PW/PUR/NTPRT-BLR U1/2092</b>
<b>JOB</b>	<p><b>PACKAGE - A:</b> Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning &amp; Trial Operation including application of Insulation, Refractory, supply &amp; touch-up painting as and where required etc. of</p> <p>3. Boiler &amp; auxiliaries, Air Pre Heaters, Ducts &amp; Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, <b>Auxiliary boiler and its auxiliaries</b> and piping, SCR and its auxiliaries, including duct supporting structure, , lining &amp; insulation, application of touch-up painting (As and wherever required) package OF UNIT#1 at 3X800 MW PVUNL PROJECT Patratu.</p> <p style="text-align: center;">and</p> <p>4. Erection of Bunker &amp; allied works including supply &amp; installation of items as per BOQ of <b>Unit-1</b> at 3X800 MW PVUNL Project Patratu.</p> <p style="text-align: center;">And</p> <p><b>3. Common systems of SCR.</b></p>

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Package	Package B
TS No.	BHE/PW/PUR/NTPRT-BLR U2/2093
JOB	<p><b>PACKAGE - B:</b> Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning &amp; Trial Operation including application of Insulation, Refractory, supply &amp; touch-up painting as and where required etc. of</p> <p>1. Boiler &amp; auxiliaries, Air Pre Heaters, Ducts &amp; Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, and piping, SCR and its auxiliaries, including duct supporting structure, , lining &amp; insulation, application of touch-up painting (As and wherever required) package OF UNIT#2 at 3X800 MW PVUNL PROJECT Patratu. and</p> <p>2. Erection of Bunker &amp; allied works including supply &amp; installation of items as per BOQ of <b>Unit-2</b> at 3X800 MW PVUNL Project Patratu.</p>

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

2.24 **PERFORMANCE GUARANTEE FOR WORKMANSHIP**

2.24.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of **18 months commencing from the date of Completion of contract as certified by BHEL Engineer**, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the Guarantee money.

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

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

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

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

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

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- .....
- b) Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works/ during working at BHEL Units/ Offices/ townships and premises/ Project sites.
  - c) Compensation in respect of each of the victims:
    - (i) In the event of death or **permanent disability** resulting from **Loss of both limbs**: Rs 10,00,000/- (**Rs Ten Lakh**)
    - (ii) In the event of **other permanent disability**: Rs 7,00,000/- (**Rs Seven Lakh**)
  - d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to Section 2(I) of the Employee's Compensation Act, 1923.

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

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

- i) Two major Intermediate Milestones are mentioned as M1 & M2 in Chapter VI: Time Schedule of Vol IA Technical Conditions of Contract.
- ii) In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to Form 14.
- iii) In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of Executable Contract Value\*, limited to maximum 2% of Executable Contract Value, will be withheld.
- iv) In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of Executable Contract Value\*, limited to maximum 3% of Executable Contract Value, will be withheld.
- v) Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone.
- vi) Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.
- vii) Final deduction towards LD (if applicable as per clause 2.7.9 above), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.
- viii) In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery.

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

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**13. Acceptance of Bank Guarantee (BG)**

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

**Clause No. 1.10.3 (iii) of Vol IC GCC is revised as below: -**

“Bank Guarantee issued by:

a. Any of the BHEL consortium bank listed below:

State Bank of India  
ABN Amro Bank N.V.  
Bank of Baroda  
Canara Bank  
Citi Bank N.A.  
Corporation Bank  
Deutsche Bank  
HDFC Bank Ltd.  
The Hongkong and Shanghai Banking Corporation Ltd  
ICICI Bank Ltd.  
IDBI Ltd.  
Punjab National Bank  
Standard Chartered Bank  
State Bank of Travancore  
State Bank of Hyderabad  
Syndicate Bank

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

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

**Note: “Bank Guarantees issued by Co-operative Banks are not acceptable”.**

**14. Broad Terms & Conditions of Reverse Auction**

In continuation to Clause 19.0 of NIT (Notice Inviting Tender) following are the broad terms and conditions of Reverse Auction for which Declaration Proforma by bidder has been given in Annexure 5 of NIT:

BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on [www.bhel.com](http://www.bhel.com)) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit ‘Process compliance form’ (to the designated service provider) as well as

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'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on [www.bhel.com](http://www.bhel.com)).

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

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

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

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

***Note:- In case of enquiry through e-procurement the sealed electronic price bid (e-bid) submitted on BHEL e-procurement portal is to be treated as sealed envelope price bid.***

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

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

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

**16. Health Safety and Environment Plan at PVUNL Patrattu Site : In the clause no. 9.1 of VOL I B 'SCC', "Document No HSEP:14:Rev 00" is to be read as "Doc no. WRHPP:PVUNL REV 00 dtd 01/05/2018". Bidders to take note of this revised HSE Plan for the subject tender which is provided along with VOL I BCD.**

**17. Integrity Pact:**

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



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**ANNEXURE-5**

**Declaration for Reverse Auction**

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

To,

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

Dear Sir,

**Sub: Declaration for Participation in Reverse Auction (RA)**

**Ref:** NIT/Tender Specification No: .....

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

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

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

Yours Faithfully,

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

Date:

2092  
&  
2093

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - I: Project Information

Sl No	DESCRIPTION	Chapter
<b>Volume-IA</b>	<b>Part-I: Contract specific details</b>	
1	Project Information	Chapter-I
2	Scope of Works	Chapter-II
3	Facilities in the scope of Contractor/BHEL (Scope Matrix)	Chapter-III
	Annexure-2 Approved list of welding electrodes supplier	Annexure-2
4	T&Ps and MMEs to be deployed by Contractor	Chapter-IV
	Annexure 1- BHEL T&P Hire Charges	Annexure 1
5	T&Ps and MMEs to be deployed by BHEL on sharing basis	Chapter-V
6	Time Schedule	Chapter-VI
7	Terms of Payment	Chapter-VII
8	Taxes and Duties	Chapter-VIII
9	Estimated Weight for various systems in scope of work (BOQ)	Chapter-IX
	Annexure-3 List of approved vendors for cladding sheets supplier	Annexure-3
10	General	Chapter-X
11	Progress of work	Chapter-XI
12	Foundation & Grouting	Chapter-XII
13	Material Handling, Transportation and Site Storage	Chapter-XIII
14	Erection	Chapter-XIV
15	Welding, Heat treatment & Radiography and Non-destructive testing	Chapter-XV
16	Hydraulic test	Chapter-XVI
17	Testing, Pre - Commissioning & Commissioning And Post Commissioning	Chapter-XVII
18	Painting	Chapter-XVIII
	Chapter-XVIII- Painting Scheme	Attachment
19	Lining & Insulation	Chapter-XIX
20	Preservation & Protection Of Components	Chapter-XX
21	Welding Schedule	Chapter-XXI
22	Weightages / Factor	Chapter-XXII

BHEL-PSWR

Technical Conditions of Contract –Volume I A (Part I: Contract Specific Details)

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - I: Project Information

### 1. Project Information

Project Name: 3x800 MW Patratu Vidut Utpadan Nigam Ltd. (PVUNL) Patratu STPP. The proposed site is located near Patratu town in Ramgarh district of Jharkhand.

The latitudes and longitudes of the site are as follows:

1	Project Name	3x800 MW Patratu Vidut Utpadan Nigam Ltd. (PVUNL) Patratu STPP	
2	Plant Site Location	Near Patratu town in Ramgarh district of Jharkhand	
3	Location Co-ordinate	Main Plant & Township:	
3.1	Corner name	Latitude	Longitude
3.2	Top Corner	23° 39 ' 00" N	85° 17' 51.5" E
3.3	Bottom Corner	23° 38 ' 12.5" N	85° 17' 27" E
3.4	Left Corner	23° 38 ' 22.5" N	85° 17' 10.6" E
3.5	Right Corner	23° 38 ' 40" N	85° 17' 57" E
4	Nearest Town/City	Patratu -03 Kms, Ramgarh- 30 Kms, Ranchi - 37 Kms	
5	Nearest Railway Station	Patratu-4 Kms	
6	Nearest Airport	Ranchi-45 Kms	
7	Nearest Seaport	Kolkata-424 Kms	
8	Nearest Road Access	Ranchi Patratu Ramgarh Rd	
9	Site Elevation	377 M above MSL	
10	Ambient Temperature		
10.1	Mean of Daily Maximum Temperature	40°C (During May)	
10.2	Mean of Daily Minimum Temperature	10.7°C (During December)	
10.3	Wet Bulb Temperature	27°C (Maximum)	

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - I: Project Information

11	Annual Rainfall	311 mm average annually
12	Wind Speed	0 to 39 Km/Hr
13	Wind Direction	East North East to West South West
14	Seismic Zone	Zone III as per IS:1893

The vicinity map of the project is shown below



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

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - II: Scope of Works

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

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

**2.1** The scope of work for each package as follows:

**PACKAGE - A:** Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of

1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, **Auxiliary boiler and its auxiliaries** and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#1 at 3X800 MW PVUNL PROJECT Patratu.

And

2. Erection of Bunker & allied works including supply & installation of items as per BOQ of **Unit-1** at 3X800 MW PVUNL Project Patratu.

And

3. **Common systems of SCR.**

**PACKAGE - B:** Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of

1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#2 at 3X800 MW PVUNL PROJECT Patratu.

And

2. Erection of Bunker & allied works including supply & installation of items as per BOQ of **Unit-2** at 3X800 MW PVUNL Project Patratu.

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

Handling of Materials at BHEL / Client's Stores / Storage Yard and transportation to site of Erection, Testing & Assistance for commissioning and Trial Operation including touch-up Painting (as and where ever required) of Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers up to ESP inlet, Boiler Integral Piping, Structure for bunker, Fans, Bowl mills, Rotation Equipments, Auxiliary boiler and auxiliaries-Only

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - II: Scope of Works

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for package-A, SCR and its auxiliaries, including duct supporting structure, lining & insulation, application of touch-up painting etc.,

2.2.1 Erection, alignment and welding, bolting, fastening, grouting as applicable of:

- ✓ Duct supporting structure, ducts, dampers from BOF to ESP inlet.
- ✓ Handling arrangements for rotating machines for fans, SCR, Mills & APH.

**2.3** The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipments at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, grinding, radiography, LPI/ MPI/ UT testing wherever needed, heat treatment, carrying out air tightness test by soap solution / kerosene, hydraulic test, steam / air blowing, light up, chemical cleaning, passivation, steam blowing and safety valve floating including inter connection of all the termination points, erection and dismantling of all temporary piping, valves, pumps, tanks etc., required for the above operations, all pre-commissioning tests and trial runs of the Boiler & Aux, Rotating Equipments, SCR, touch-up Painting (as and where required) for Unit#1 (Pkg A) & Unit#2 (Pkg B) of 3x800 MW Sets.

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

**2.5** The PG wise breakup of Boiler and Auxiliaries, rotating machinery etc. are indicated in the relevant chapters of this tender specification, but the contractor is required to erect actual tonnage which may be necessary to complete the work in all respects as detailed in the tender specifications, for which payments shall be released on finally settled rates. The weights and dimensions of material shown are approximate and are liable to vary. No increase in quoted / accepted rates / prices shall be allowed due to change in weights and dimensions of the equipment / materials.

**2.6** The weights given in the Chapter-IX are approximate and these are subject to change as per site conditions.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - II: Scope of Works

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- 2.7** Supervisors / Engineers, consumables etc., required for the scope of work shall be provided by the contractor. All the expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor's quoted rates should be inclusive of all such contingencies.
- 2.8** It shall be specially noted that the contractor's labour and staff may have to work round the clock to meet the completion schedules / plans, which may involve payment of considerable overtime. The contractor's quoted rates should be inclusive of all such contingencies.
- 2.9** The terminal points can be inferred from the relevant drawings and any further clarifications can be obtained / decided by BHEL and that is final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.
- 2.10** The contractor shall submit a copy of license to undertake construction / repair of Boilers & Piping issued by Boiler inspectorate before commencement of Pressure Parts / Piping Erection.
- 2.11** The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be effected from contractor's bill towards expenditure incurred including BHEL's overhead charges.
- 2.12** Contractor has to work in close co-ordination with other erection agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less/more at a particular given time. Activities and erection program have to be planned in such a way that the milestone

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - II: Scope of Works

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events like boiler light up, steam blowing, SV Floating etc., are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

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

**2.14** The storage yard is located within the plant boundary and nearby (Approx 10-12 KM) of the plant premises in 2-3 locations. ODC consignments will be unloaded near to erection site as per the space availability. Some other materials may also be unloaded near to erection site as per space availability. All other materials have to be transported from storage yard to construction area by the contractor at his own cost.

### **2.15 Steam Generator & Auxiliaries**

Steam Generators of 800 MW capacity each including all related auxiliary equipments as specified below. The steam generator will be of once through, two pass, single reheat, radiant furnace, dry bottom, balanced draft, outdoor type, pulverized coal fired having super critical parameters with all necessary auxiliaries, integral piping, etc. Scope includes Erection, alignment and welding, bolting, fastening, grouting as applicable of:

1. Boiler structure, Bunker structure, Bunker, Transfer point(houses), Trestles, Galleries
2. Water cooled furnace complete with separators, water wall, headers, steam generating tubes, furnace bottom hoppers, drains, observation ports, etc.
3. Super heaters including safety valves with silencers, motorised main steam stop valves with integral bypass valve, start up vents, air vents, nitrogen connections, etc. Re-heaters including safety valves with silencers, drains, air vents, etc.
4. In line, bare tube economizer, including vents, drains etc.
5. De superheating spray system, sprays for Super heaters and Re heaters.
6. Steam soot blowing system including long fully retractable rotary blowers for super heater, re heater and economizer; Sweep action soot blowers for regenerative air preheater along with necessary accessories. Soot blower System will be complete with drains, entire piping, fittings, control valves, safety valves etc
7. Complete draft plant for the balanced draft system
  - a) 2 nos. Forced draft fans with drives, associated auxiliaries and accessories.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - II: Scope of Works

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- b) 2 nos. Induced draft fans with drives, associated auxiliaries and accessories.
  - c) 2 nos of Primary air fan with drives, associated auxiliaries and accessories.
  - d) Regenerative air pre-heater 2 nos for secondary air & 2 nos for primary air systems.
  - e) 4 nos. steam coil air pre-heater (SCAPH) with drain collection system.
  - f) Air and Gas duct work with necessary metallic expansion joints, dampers and support steel work up.
  - g) Duct stiffening devices, mating flanges, access doors and brackets, supporting structure as applicable.
- 8. Raw coal feeders system
  - 9. 2 nos Seal Air Fans
  - 10. 09 Nos of coal pulverizers (bowl mills), complete with all necessary accessories (including classifiers, seal air fans, etc).
  - 11. 2 nos Scanner air fans.
  - 12. Fuel oil system will cater to Heavy Furnace Oil (HFO) and Light Diesel oil (LDO) firing requirements of each Steam Generator. Fuel oil burners will be complete with diffusers, tips extension pipes, atomizers, burner shut off valves, flexible hoses and all other ancillaries.
  - 13. Valves, dampers etc with actuators.
  - 14. Hoists and cranes.
  - 15. Thermal insulation & refractory.
  - 16. Application of touch-up Painting
  - 17. Auxiliary Boiler (Only in Package A)
  - 18. Ducts and dampers BOF to ESP inlet,
  - 19. **Refractory and Thermal insulation.**
  - 20. **SCR systems (Selective catalytic reduction systems).**

Refractory application (Castable & Pourable) in the furnace pent house, Goose neck, etc., Thermal insulation and cladding will be provided for the entire steam generator, flue gas / air ducting, etc. The insulation selected will meet the functional requirement. The steam generator will be provided with ribbed aluminium cladding and the ducts will have plain aluminium cladding.

### **2.16 MILL BUNKER STRUCTURE, COAL BUNKER, TRANSFER POINTS, TRESTLES AND GALLERIES, SILOS & HOPPERS INCLUDING FEEDER AND BUNKER FLOORS, PIPE RACKS, ESP CONTROL ROOM ETC.**

Erection, alignment, welding, bolting, grouting and touch-up painting as applicable for fabricated structures (supplied from BHEL units) of Mill bunker structures, Coal bunkers, Transfer points, Trestles, Conveyor galleries, Ash Pipe rack, Silos etc

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter - II: Scope of Works

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,ESP control room, Supply and installation of items as per Chapter-IX clause 9.2 BOQ for Bunker structural works in Mill Bunker structures, Transfer points, Trestles and Galleries etc.

Where ever the design & supply together is covered in the scope of bidder necessary approvals from BHEL / PVUNL shall be taken by bidder for the design, inspection procedure & vendor. List of items for which such approvals required will be frozen during execution of the contract.

**Contractor shall procure and supply the items to PVUNL project Patratu site as per the BOQ for structural works from BHEL / PVUNL approved vendors, meeting the specification (enclosed), Drawings and instructions of the Engineer.**

**2.17 Touch-up Painting (Applicable in entire scope of work): All Boilers structures/ components shall be supplied from BHEL units/ workshops with finish coats of paint. Therefore final painting is not applicable in the scope of contractor. However touch up painting (wherever required), incidental to the work, shall be in the scope of the contractor, including supply of the required paints and primers and associated consumables.**

Though the final painting is not there in the scope of the contractor, in case any shop painted structure/component is required to be repainted due to the reasons attributable to the contractor such as Mis-handling, damage during erection process, other reasons incidental to the work etc, such re-painting/finish painting of the components/structures shall be in the scope of the contractor including the supply of paints and primers along with all required consumables.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – III: Facilities in the scope of Contractor/BHEL**  
**(Scope Matrix)**

Sl. No	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
<b>3.1</b>	<b>ESTABLISHMENT</b>			
<b>3.1.1</b>	<b>FOR CONSTRUCTION PURPOSE:</b>			
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	
<b>3.1.2</b>	<b>FOR LIVING PURPOSES OF THE BIDDER</b>			
a	Open space for labour colony (as per availability)		<b>Yes</b>	Agency has to make his own arrangement at his own cost.
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – III: Facilities in the scope of Contractor/BHEL**  
**(Scope Matrix)**

<b>3.2</b>	<b>ELECTRICITY</b>			
3.2.1	Electricity For construction purposes only of Voltage 415/440 V, 3 phase, 50Hz	Yes		At Single point on free of charge Basis
a	Single point source	Yes		At a distance of 500 M from site (Distance is only tentative, 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	
3.2.2	Electricity for the office, stores, canteen etc of the bidder			
a	Single point source	Yes		At a distance of 500 M from site (Distance is only estimated, it may vary up-to an extent depending on site condition). On chargeable basis.
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		<b>Yes</b>	Agency has to make his own arrangement at his own cost.
a	Single point source		Yes	
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – III: Facilities in the scope of Contractor/BHEL**  
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c	Duties and deposits including statutory clearances if applicable		Yes	
<b>3.3</b>	<b>WATER SUPPLY</b>			
3.3.1	For construction purposes: <b>(Single point source provided by BHEL on chargeable basis)</b>			
a	Making the water available from single point		<b>Yes</b>	Agency has Agency has to make his own arrangement at his own cost.
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	Water supply for bidder's office, stores, canteen etc.			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	<u>Water supply for Living Purpose</u>			
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	
<b>3.4</b>	<b>LIGHTING</b>			
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	

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – III: Facilities in the scope of Contractor/BHEL**  
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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	
<b>3.5</b>	<b>COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER</b>			
a	Telephone, fax, internet, intranet, e-mail etc.		Yes	
<b>3.6</b>	<b>COMPRESSED AIR</b> wherever required for the work		<b>YES</b>	
a	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc		Yes	
b	Installation of above system and operation & maintenance of the same		Yes	
c	Supply of the all the consumables for the above system during the contract period		Yes	
<b>3.7</b>	<b>Demobilization of all the above facilities</b>		<b>Yes</b>	
<b>3.8</b>	<b>TRANSPORTATION</b>			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

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**Chapter – III: Facilities in the scope of Contractor/BHEL**  
**(Scope Matrix)**

Sl. No	Description <b>PART II</b> <b>3.9 ERECTION FACILITIES</b>	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.9.1	Engineering works for construction:	Yes		
a	Providing the erection drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes	Yes	In consultation with BHEL
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
d	Shipping lists etc for reference and planning the activities	Yes		In consultation with BHEL
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on SL No. e		Yes	In consultation with BHEL
h	Daily erection / work plan based on SL No. g		Yes	In consultation with BHEL
i	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	

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**(Scope Matrix)**

Sl. No	Description <b>PART II</b> <b>3.9 ERECTION FACILITIES</b>	Scope / to be taken care by		Remarks
		BHEL	Bidder	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	Not Applicable
L	Arranging the materials required for preassembly		Yes	

**3.10 ELECTRICITY:**

3.10.1 The construction power (415V) will be provided at a single point for construction purpose only on free of cost . Further distribution is to be arranged by the bidder at his cost. Construction power shall be provided from the nearest Substation / tapping point.

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

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

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

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

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

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

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

### **3.11 CONSTRUCTION WATER**

3.11.1 Water (Raw water) required for construction purposes will be provided at one single point within the plant area on chargeable basis. The required water meter for measuring the consumption shall be provided and installed by the contractor. The required pumps & accessories, pipes for drawing water from the points and further distribution will be arranged by the contractor at their cost.

3.11.2 The water charges may vary from time to time as per PVUNL water conditions, Any dispute regarding consumption, the BHEL engineer decision will be final. In case of non-availability of water, the contractor shall make his own arrangements of water suitable for construction to have uninterrupted work. No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure for providing water supply. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

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

### **3.12 DRINKING WATER**

Bidder shall provide drinking water at the work spot at their cost.

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**3.13 ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM (SCMS):**

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

**3.14 CONSUMABLES:**

- 3.14.1 Such of those consumables as indicated as consumables provided by BHEL alone will be provided to the contractor by BHEL free of charge for erection activities. Other required consumables like electrodes, all gases, and other materials for this scope of work are to be arranged by the contractor at their cost.
- 3.14.2 All the required electrodes (in his scope) as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding, suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc.
- 3.14.3 Only TIG welding wires for CS, AS & SS welding will be supplied by BHEL free of cost for Boiler for applicable Pressure Parts as provided by manufacturing units. All other electrodes including stainless steel electrodes required for shall be arranged by the contractor at his cost. However BHEL will provide imported electrodes as provided by manufacturing units. The bidder shall use the Customer approved quality welding electrodes only. The utilization of the TIG welding wires issued by BHEL shall be duly accounted for exercising maximum care and ensuring economical usage for minimum wastage. If during erection, it is found that the consumption of filler wire is more than the actual requirement due to improper usage, the cost for the additional quantity so consumed shall be recovered from the contractor.
- 3.14.4 The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), all gases (inert, welding, and cutting), soldering material, dye penetrants, radiography films. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials, hardware items etc required for

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – III: Facilities in the scope of Contractor/BHEL

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temporary works such as supports, scaffoldings, bed are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.

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

**Note: List of approved vendors attached as file Named: ‘Annexure-2 Approved list of welding electrodes supplier’.**

#### **3.15 MATERIAL SUPPLY:**

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

#### **3.16 LIGHTING FACILITY:**

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

#### **3.17 GASES:**

- 3.17.1 All the required gases like Oxygen / Acetylene / argon / Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non availability of gases cannot be considered as reason for not attaining the required progress. BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

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

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

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

**3.18 ELECTRODES SUPPLY AND STORAGE**

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

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

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

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

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

3.18.6 In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bills at market value plus departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.

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

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**3.19 OTHER FACILITIES**

3.19.1 Adequate water less urinals (at least 4 nos in alternate levels) shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas like boiler structure, with proper disposal arrangement.

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

3.19.3 Agencies are to get registered (to take membership) from Safety Council of India, Mumbai/National Safety Council.

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

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

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

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

**3.19.8 Hydras are not allowed for materials transport, only pick and carry cranes shall be deployed by the agency.**

3.19.09 First aid centre will be maintained by BHEL and cost will be proportionately recovered from vendors.

3.19.10 Vendor has to arrange land within his quoted rate for making labour colony. Vendors labour colony has to be maintained with proper hygiene, drinking water, bathroom water, lighting arrangement, sewerage system. These facilities are to be regularly maintained including drains, surrounding, upkeepment of labour colony.

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BHEL/NTPC & local statutory authorities will visit labour colony from time to time and all healthy conditions are to be maintained by vendor.

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

**3.20. DEWATERING:**

Contractor shall ensure at all times that the work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL.

**3.21 SITE ORGANISATION**

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

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

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

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

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### Chapter – IV: T&Ps and MMEs to be deployed by Contractor

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

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY PER UNIT	REMARKS
1.	Crawler Crane	75/80 MT	01 Nos.	Crane to be made available at site from the start of Boiler work till the actual event of Synchronization.
2.	Tyre mounted	35/40 MT	02 No	The cranes shall be made available at site from commencement of work till as per Site requirement.
3.	Tyre mounted mobile crane	18/20 MT	02Nos.	As per requirement
4.	Tyre mounted mobile crane	12/14 MT	02 Nos.	As per requirement
5.	Tyre mounted mobile crane	10/12 MT	02 Nos.	As per requirement
6.	Trailer with prime mover	20 MT	02 No	As per requirement
7.	Trailer with prime mover	40 MT	01 Nos.	As per requirement
8.	Low bed trailer Low bed trailer with min 70-100 feet span	60 MT	01 No.	As per requirement
9.	Ultrasonic hardness testing machine (Ultrasonic contact impedance (UCI))		As required	GE or Kraut Kramer or Microdur make or reputed branded ultrasonic hardness testing machine. (Hardness test may be Brinell, Vickers and Rockwell tests as per the discretion of BHEL.)
10	DG SET – 250 KVA	As required	02 set	For continuous/uninterrupted back up power during welding & post weld heat treatment of Girders and HP joints.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
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SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY PER UNIT	REMARKS
11	Tube expander	As required	1 No	As required
12	Air compressor (electric/diesel operated)	210 CFM, 7 KG/CM2	02 nos.	Before pressure parts erection.
13	Tig welding set	As required	As required	Before pressure parts erection.
14	Submerged ARC WELDING M/C		Adequate nos.	
15	Oxy Acetylene Gas cutting Machine		Adequate nos.	
16	DC arc welding machine		As required.	
17	3-phase distribution board with complete set up for drawl of construction power	As required	As required	
18	Power cable for drawl of construction power	As required	As required	
19	Pre heating / stress relieving set (heating control panel, cables, heating elements, thermometers etc.)	As required	As required	Since Boiler erection start
20	Radiography arrangement with radioactive isotope source	Iridium-192	2 sets	Required Since Boiler erection start, (quantity may vary as per site requirement.)
21	Radiography arrangement with radioactive isotope source	Cobalt-60	As required	
22	Theodolite of required accuracy	To ensure verticality of structural columns.	02 Nos.	Required Since Boiler erection start

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – IV: T&Ps and MMEs to be deployed by Contractor**

<b>SN</b>	<b>DESCRIPTION</b>	<b>CAPACITY (MINIMUM)</b>	<b>MINIMUM QUANTITY PER UNIT</b>	<b>REMARKS</b>
23	Self drilling cum tapping machine for screws of boiler	As required	6 nos. (As required)	
24	Arrangement for UT of higher thickness joints with recording facility & required calibration blocks.	Type USN 50 or equivalent/ up graded type	02 SET (As required)	During pressure parts pre assembly & erection
25	Electro-hydraulic pipe bending machine	Up to 2" nb and 12 mm thick pipes	2 Nos	During Trim piping erection work.
26	Welding rectifiers (electrical)	300 ampere rating	As required	Since Boiler erection start
27	Welding generator (diesel operated)	300 ampere rating	As required	
28	Radiography film viewer	As required	4 Nos	Since Boiler erection start
29	Hydraulic pipe bending machine (manual)	For bending of pipes up to 50 mm nb size	4 Nos	During Trim piping erection work.
30	Pipe chamfering machine /Tube Cutting	4-14"	1 Set	During pressure parts pre assembly & erection
31	Pipe chamfering machine /Tube Cutting	14-20"	1 Set	During pressure parts pre assembly & erection
32	Pipe cutting & beveling machines		Adequate nos.	During pressure parts pre assembly & erection
33	Chain pulley blocks of various & Suitable capacities		As Required ( as per the instructions of BHEL Engineer)	Since Boiler erection start
34	Baking oven with thermostat and temperature gauge for welding electrodes	As required	(As per Required)	Since Boiler erection start

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SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY PER UNIT	REMARKS
35	Holding oven with thermostat and temperature gauge for welding electrodes	As required	(As per Required)	Since Boiler erection start
36	Portable oven for welding electrodes	As required	(As per Requirement)	Since Boiler erection start
37	Electric winch	2/3/5/10/15 ton capacity	As per requirement (approx 40 Nos.)	
38	Hydraulic test/pressurizing pump	Upto 400 kg per cm <sup>2</sup>	As per site requirement	
39	Furnace maintenance platform (sky climber)	Adequate capacity	2 nos.	to cover one length and one width of furnace
40	Hand winch	0.5 ton capacity	3 nos	
41	Scaffolding materials with clamps.	Suitable for working at various heights	As required	For Alignment, welding & Insulation works
42	Profile making m/c	For aluminium sheet cladding work	as required	
43	Nibbling m/c	For refractory and other required activities	as required	
44	Shearing m/c		as required	
45	Water pump to lift water to top of boiler		2 set	Before start of refractory application.
46	Portable grinding m/c	As required	as required	Since Boiler erection start
47	Portable drilling m/c	As required	as required	

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<b>SN</b>	<b>DESCRIPTION</b>	<b>CAPACITY (MINIMUM)</b>	<b>MINIMUM QUANTITY PER UNIT</b>	<b>REMARKS</b>
48	Hoisting and pulley devices/pulleys	Assorted capacities	As required	Since Boiler erection start
49	Fire retardant tarpaulins	As required	As required	Since Boiler erection start
50	Fire extinguisher	As required	as required	
51	Hydraulic Jacks	10/20/50/100 MT	as required	
52	Dewatering pumps(Electrical & Diesel engine operated)		as required	
53	Various sizes of clamps/ fixtures for assembling		as required	
54	Portable hardness tester		as required	
55	Hardness testing equipment ( Equotip or Microdur make ) 33 Stress relieving equipment with temperature		As per requirement	
56	Magnetic particle testing equipment-DRY & WET Type		as required	
57	Temperature recorder for 0-1000C 6/12 points with thermo couples / rods and compensating cable		as required	Since Boiler erection start
58	Spectrometer for metal testing		as required	
59	elcometer for paint thickness checking		as required	
60	Hand Operated Megger 500 / 1000 V		as required	

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – IV: T&Ps and MMEs to be deployed by Contractor**

<b>SN</b>	<b>DESCRIPTION</b>	<b>CAPACITY (MINIMUM)</b>	<b>MINIMUM QUANTITY PER UNIT</b>	<b>REMARKS</b>
61	Tong Tester 10, 20 Or 50 Amp + / - 3 % Accuracy		as required	
62	Digital and Analogue Multimetres		as required	
63	U Tube Manometer 0-2000 mm Water Column		as required	
64	Inclined Manometer 0-50 mm Water Column		as required	
65	Bolt Tension Calibrator		as required	
66	Special Slings for Erection of Ceiling Girders & other heavy components		as required	Since Boiler erection start
67	Concrete Blocks		As required	For making bed of steel structure for checking dimensional accuracy, configuration and minor rectification.
68	Wooden sleeper 1.5 Mtr length	Since beginning	As required	For material storage at site.
	<b>T&amp; P for chemical cleaning</b>			
69	<b>Circulating Pump</b>	200T/Hr,200 M Head Centrifugal, single/multi stage back pull out design, impeller and casing made of cast steel with base frame, motor, starter, cables. essential spares etc	3 Nos	3 NOS STARTER AND ALONG WITH REQUIRED CABLE AND LUGS

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SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY PER UNIT	REMARKS
70	<b>ACID/CHEMICAL HANDLING PUMP</b>	50 T/Hr, 200 M Head, for handling 31% concentration Hcl or 40% EDTA concentration ph 5.5 to 6.0/ 25% CONCENTRATE D AMMONIA	3 nos	3NOS STARTER AND ALONG WITH REQUIRED CABLE AND LUGS
71	PORTABLE MAGNETIC STRUCTURESCOPE Capacity/Specification		01 No	
72	Calibrated Power driven HSFG bolt tightening machines with set value facility.		10 Nos	As per Site requirements
73	PMI		01 Nos.	From Start of Pressure part erections as per site requirement. Additional PMI machine shall be deployed as per requirement.
74	Water Pump to lift water to top of boiler	for refractory and other required activities	1 Set	Water Pump to lift water to top of boiler
	<b>List of suggestive safety Equipments/PPEs to be included in List of minimum T&amp;P:</b>			
75	Safety Net (Conforming IS 11057:1984) Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12mm diameter polypropylene rope (tested as per IS: 5175).Two meters length shall be provided at all four corners.			Min-100 Nos/unit

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – IV: T&Ps and MMEs to be deployed by Contractor**

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY PER UNIT	REMARKS
76	<p>Fall Arrester 'Rope grab fall arrester' &amp; anchorage line.                      Anchorage Line: 14mm- 16 mm diameter, three strand twisted Polyamide rope.</p> <p>Rope Grab fall arrester: Openable &amp; Guided type Fall Arrestor (on flexible line) conforming EN 353-2 &amp; works on 14-16 mm diameter polyamide rope.                      Material: Nickel Chrome plated Steel</p> <p>Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN),                      material: Steel</p>			<p>Min. 200 nos. of Rope Grab Fall arrester' and Karbiner each.</p> <p>Min 90 nos. anchorage line, 30 metre long each,</p> <p>30 nos. anchorage line, 40 metre long each</p>
77	<p><b>Horizontal life line</b>                      Stainless Steel Wire rope of 8mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end).</p>			<p>Min 40 nos. of wire rope, each 40 metre long                      Min 90 nos. of wire rope, each 25 metre long.</p>
78	<p><b>Ladders on column</b>                      The minimum design live load on metallic ladder shall be a single concentrated load of 100 kilo grams. All rungs shall have a minimum diameter of 1.90 centimeters, and minimum clear length of rungs shall be 40.6 centimeters. The distance between rungs shall not exceed 30.5 centimeters. Each ladder shall have maximum height of 9.0 metre.                      The ladder shall have proper fastenings for attaching it to a column using positive means such as bolt, weld or other type of fasteners.</p>			<p>Cumulative length of ladders is 1200 metres</p>

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – IV: T&Ps and MMEs to be deployed by Contractor

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### **Note:**

#### **PASSENGER CUM GOODS ELEVATOR**

**“The contractor has to erect the passenger cum goods lift (temporary lift ,1.5 MT), as per instruction of BHEL Engineer,. Civil Foundation shall be provided by BHEL as per drawing submitted by the agency. Necessary grouting including supply of grout materials shall be in the scope of the bidder. The dismantling of the erected lift, Transport / removal from site is also covered in this scope of work. The contractor has to arrange operators, technicians for round the clock operation and maintenance is to be carried out by the contractor at his cost. The operation and maintenance shall be carried out till the end of contract period, or the date, on which the lift is dismantled as per the directives of BHEL, whichever is earlier”** Foundation drawing for the proposed passenger lifts **shall be submitted by the agency.**

Said elevator in boiler to facilitate access to various platform elevations up-to top floor. The elevator shall conform to the national standard and industrial safety code as applicable. These shall be deployed at the time of start of pressure parts work in consultation with BHEL site engineer.

The probable suppliers for the elevator are:

01. M/s Avon cranes pvt ltd, Gurgaon
02. M/s Mekaster engineering & equipment pvt ltd, Halol

Laying of sleepers and rails and routine maintenance of the dip trolley system including assembly and dismantling are in Contractor’s scope.

#### **4.2 MEASURING AND MONITORING DEVICES (MMD):**

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

#### **4.3 FACILITY TO BE PROVIDED BY THE CONTRACTOR FOR P91 WELDING**

- 4.3.1 Required no. of operators/ Technicians/ Electrician for installation, commissioning & operating continuously.
- 4.3.2 Gas Burners arrangement with required gas for maintaining temperature in the event of power failure.
- 4.3.3 Ultrasonic Flaw detector with recording device & complete accessories (Digital Type – Krautkramer Model USN 50 or equivalent) capable of storing calibration

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – IV: T&Ps and MMEs to be deployed by Contractor

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data. All recordable indications will be stored in memory of digital flaw detector and in PC (to be provided by the contractor) for review at later period.

4.3.4 EQUOTIP or MICRODUR make or equivalent portable hardness tester.

4.3.5 MPI/LPI Kits with required consumables.

### 4.3.6 Consumables

4.3.6.1 Glass fibre cloth – 1mm x 1000mm – Temp rating – 1260 °C.

4.3.6.2 Glass fibre cord – Dia 3mm (twisted) Temp rating – 1260 °C.

4.3.6.3 Ceramic fibre Blanket – RT Grade, density 96Kg/M<sup>3</sup> – Temp rating – 1260 °C.

4.3.6.4 Ceramic fibre rope – Fibre Glass braided, Dia 12mm – Temp rating – 1260 °C.

4.3.6.5 K Type Thermocouple – 0.5mm Dia Single Strand individual fibre glass insulated

4.3.6.6 Heavy duty TC connectors for – K Type Thermocouple – 0.5mm Dia Single Strand individual fibre glass insulated.

4.3.6.7 All other consumables/ equipment required to carry out the work.

4.3.7 Adequate no of DG Set, operator and fuel for P-91 welding is in Bidders scope.

### Note to Point no 4.3.7:

1) The induction heating equipment and other equipment shall be drawn from BHEL stores, transported and installed & commissioned wherever required. For routine maintenance & attending all type of break-down maintenance, contractor shall deploy sufficient manpower, tools and plant within the quoted rate.

2) The contractor shall provide electrical cables & switches required for extending power supply to the induction heating equipment. All the equipment shall be protected by providing covers or sheds at site by the contractor with in the quoted rate.

### NOTE:

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

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

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – IV: T&Ps and MMEs to be deployed by Contractor

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3. Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work.
4. Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be to Contractor's account.
5. Contractor has to submit the Calibration certificates of all the precision Equipement to BHEL. BHEL may ask for recalibration of the MMEs /precision equipments for ensuring quality of work. Contractor must re-ascertain/ recheck range and accuracy of each IMTE from BHEL Engineer well in advance before arranging calibration/ deployment.
6. Any T&Ps, Cranes, Slings, D-shackles and other lifting tackles, Trailers required for shifting of material from store to site shall be arranged by contractor over and above T&Ps/ crane provided by BHEL.
7. T&P and the mobilization shown in the above mentioned list is suggestive requirement considering parallel working in Main plant structural area. Mobilization schedule as mutually agreed at site for major T&Ps, have to be adhered to. Numbers / time of requirement will be reviewed time to time at site and contractor will provide required T&P / equipments to ensure completion of entire work within schedule / target date of completion without any additional financial implication to BHEL. Vendor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipments. Also on completion of the respective activity, demobilization of T&P in total or in part can be done with the due approval of engineer in charge. Retaining of the T&Ps during the contract period will be mutually agreed in line with construction requirement.
8. In the event of need of change of type of any of major T&Ps, approval shall be taken from BHEL Engineer in-charge prior to mobilization. The decision of Number of T&P required due to replacing the enlisted T&P as per above table, shall be taken after analyzing the production capacity and suitability of both the T&Ps.
9. Crane operators deployed by the contractor shall be tested by BHEL before they are allowed to operate the cranes.
10. The above list is only indicative and these T&Ps may not be required for entire contract period but contractor shall ensure the availability of the T&Ps as per work requirement and T&P Deployment schedule. T&P Deployment schedule shall be finalized at site in consultation with BHEL Engineer based on the work

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – IV: T&Ps and MMEs to be deployed by Contractor

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fronts/work requirement. BHEL decision shall be final and binding regarding the T&P deployment schedule. Contractor shall mobilize / maintain the T&P's as per the deployment schedule notified time to time by BHEL Engineer.

11. APR- Contractor has to deploy T&P, MMD, IMTE as per requirement of site and as decided by BHEL Engineer.
12. Any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL in writing in a reasonable period within two weeks from the written instruction from BHEL.
13. T&P's mentioned above shall be specifically deploy as per the respective packages. However, as per work requirement and availability of T&Ps the inter use in Material Handling and Mechanical works may be permitted as per the instruction of the BHEL Engineer.
14. If the work related to T & Ps mentioned above is completed then, BHEL can release that T & P during contract period / extended period if any. However, written permission shall be taken by contractor from BHEL construction Manager for releasing the T&P.
15. In case of any specific requirement of higher capacity crane apart from the vendors scope shall be provide by the BHEL on sharing basis & free of charge.
16. The T&P deployment as specified in above table is only indicative, however the contractor has to ensure the availability of required T&P till completion of all the work under his scope in this tender.
17. In the eventuality of contractor not deploying cranes / abnormal down time of cranes in his scope during the period specified above, and BHEL arranges for the same [either BHEL's own cranes / hired cranes], prevailing BHEL Corporate Crane hire charges (may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed as part of VOL I as File titled "**Annexure 1- BHEL T&P Hire Charges**". (Please note that these charges are as valid up to May 31, 2019 and may get revised further).
18. For loading and transportation, all necessary T&P such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor.
19. The contractor has to furnish a list of Tools and plants including cranes / tractors / trailers / trucks etc. which he has proposed to deploy for this work.

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – IV: T&Ps and MMEs to be deployed by Contractor

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

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter – V: T&Ps and MMEs to be deployed by BHEL on sharing basis**

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

SL NO	DESCRIPTION & CAPACITY OF T&P	QUANTITY	REMARKS
1	Cranes of Capacity above 75MT.	As decided by BHEL	All cranes (except Contractor scope) required for mentioned work will be arranged by BHEL as per requirement.
2	Induction Heating machine	As required	For welding of P-91, P-23, & pipes as applicable.
3	Air Leak Test equipment with all auxiliaries.	01 Set	For leakage test of Boiler and ducts.
4	Boiler Hydraulic Pressure Testing Pump with accessories	As required	
5	HUCK BOLTING MACHINE COMPLETE SET WITH SPARES	As required	

- 5.2 All the T&Ps mentioned in clause 5.1 above shall be given to contractor on sharable basis and the allotment is made by BHEL on need basis.
- 5.3 HLHR crane is to be used for erection of boiler ceiling structures and equipment/components above boiler ceiling structure, heavy structures of bunker that require services of this crane as decided by BHEL. This crane will accordingly be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose.
- 5.4 Contractor shall transport from BHEL stores, install, operate, carry out maintenance, dismantle after use and return to BHEL stores all T&Ps mentioned in Sr no 5.1 for his use.
- 5.5 These cranes are owned or hired by BHEL. Operator for BHEL owned crane will be arranged by BHEL. Operators for hired crane will be provided by the hiring agency.
- 5.6 Contractor shall make necessary arrangements like laying of special sleeper beds and steel plates (**sleepers for BHEL owned/hired cranes shall be provided by the BHEL**), assembly and dismantling of heavy attachment, boom, jib etc for movement and operation of the crane. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work. Levelled area in boiler area will be provided by BHEL/customer for the cranes.

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## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### Chapter – V: T&Ps and MMEs to be deployed by BHEL on sharing basis

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- Consolidation of the ground, if required (Area required for movement of crane), and preparation (including civil work with material) for placing crane for operation shall be done by the contractor, at his cost. Necessary plates / sleepers required for marching operation shall also be provided by the BHEL only for BHEL owned cranes.
- 5.7 Contractor shall provide the fuel, and consumables for BHEL provided cranes (hired/owned) for his use. Lubricants for crane (hired/owned) shall be provided by the BHEL.
- 5.8 Cranes are only for erection purpose and shall not be available for material handling or transportation purpose. Contractor shall make their own arrangements for material transportation to erection site.
- 5.9 All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections for the BHEL issued T&Ps shall have to be arranged by the contractor at his cost.
- 5.10 The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to him. Necessary grout materials are to be arranged by the contractor at his cost.
- 5.11 Filling pump for other than main boiler, for hydro test shall be arranged by the contractor, if required. For testing LP lines, necessary hydraulic test pumps/ hand pumps are to be arranged by the contractor.
- 5.12 The day-to-day and routine maintenance including replacement of spares for the BHEL T&Ps will be carried out by the contractor at his own cost. However, BHEL shall supply spare parts free of charges for normal wear and tear only.
- 5.13 Any loss/damage of tools by the contractor shall have to be replaced or otherwise cost thereof shall be recovered from the contractor.
- 5.14 The contractor shall make necessary arrangement like laying of special sleeper beds, assembly & dismantling of heavy lift attachment, boom, jib etc. for movement and operation of crane.
- 5.15 BHEL will provide Huck bolting machine with one set of 12mm and 16mm jaws. Further Requirement of jaws to be arranged by the contractor at his cost. Consumables like O-ring, backup ring, springs, hydraulic fluid for top-up etc., required for maintenance of the huckbolting machine to be arranged by contractor at his cost.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – V: T&Ps and MMEs to be deployed by BHEL on sharing basis

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### **Note: For Crane:**

1. The cranes may be BHEL owned or may be obtained on hiring basis including operating and maintenance crew.
2. Operator and O&M for BHEL owned crane will be provided by BHEL.
3. Operator and O&M for hired crane will be provided by the hiring agency.
4. Contractor shall provide the fuel for BHEL provided cranes (Hired/owned) for his use.
5. Contractor shall provide necessary manpower assistance for initial and final assembly & dismantling and for subsequent operations of boom extension and reduction during execution of work. Contractor shall also make necessary arrangements like laying of special sleeper beds and steel pates (**sleepers for BHEL owned cranes shall be provided by the BHEL**) for movement and operation of the crane.
6. Cranes provided by BHEL will be on sharing basis with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor. Cranes will be deployed at appropriate time as decided by BHEL for suitable duration and intended purpose. Augmentation of BHEL T & P under special circumstances shall be discretion of BHEL.

### **5.16 Facility to be provided by BHEL for P91 Welding.**

- 5.16.1 Induction Heating M/C with accessories as indicated above.
- 5.16.2 Welding Electrodes for P91 welding.
- 5.16.3 The following consumables:
  - One set of annealing cable shall be provided. Additional annealing cables required, if any, till total work completion, shall be procured by the contractor, at his cost.
  - One set of Compensating Cables (Common for all Induction heating machine) Additional compensating cables required till total work completion, shall be procured by the contractor, at his cost.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – VI: Time Schedule

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### 6. TIME SCHEDULE & MOBILIZATION

#### 6.1 INITIAL MOBILIZATION

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

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

The activities for erection, testing etc. shall be started as per directions of Construction Manager of BHEL. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.1.1) as per requirement to commence the work of erection, testing etc. of Boiler, SCR, and auxiliaries, Rotating machines including touchup Painting (as and where required), Bunker, Bunker structure etc progressively augment the resources to match schedule of the project.

6.2.1 The entire work of Boiler, SCR, and auxiliaries, Rotating machines including touchup Painting (as and where required), Bunker, Bunker structure etc. as detailed in the Tender Specification shall be completed within **32 (Thirty Two Months)** months from the date of “Start of Contract period” at site, for Package A& B.

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

6.2.3 The contractor shall have to mobilize his resources earlier than the start of contract period for preparatory work like taking over and chipping of foundations, blue-matching, grouting of packer plates etc. or start of fabrication. The contractor shall complete all the works in the scope of this contract within the contract period. Pending points identified by the customer/BHEL during the execution of the contract are to be liquidated during the contract period itself.

#### 6.3 COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

**Erection/placement on its designated foundation / location, of the first major permanent equipment / component / column covered in the scope of these specifications, (whichever is earlier as decided by BHEL) shall be recognized as “Start of contract period”.** Smaller items like packer plates, shims, anchors, inserts etc. will not be considered as start of contract period. The date of Start of contract

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – VI: Time Schedule

period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy, the decision of BHEL engineer is final.

Based on the availability of civil foundations from BHEL and materials from manufacturing units, contractor may have to advance the start of erection after getting clearance from construction manager, or the start of erection may get delayed due to site condition.

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

### **Boiler & Bunker U#1 (Pkg A) & U#2 (Pkg B):**

SL No.	Milestones	Package A (Unit # 1)	Package B (Unit # 2)
1.	Boiler Erection Start	1 <sup>st</sup> Month	1 <sup>st</sup> Month
2.	Completion of Ceiling Girder erection	8 <sup>th</sup> Month	8 <sup>th</sup> Month
3.	Boiler Hydro Test- drainable	18 <sup>th</sup> Month	18 <sup>th</sup> Month
4.	Boiler Light Up (BLU) & Chemical cleaning completion	24 <sup>th</sup> Month	24 <sup>th</sup> Month
5.	Steam Blowing Completion & Safety Valve Floating	27 <sup>th</sup> Month	27 <sup>th</sup> Month
6.	Synchronization on coal	29 <sup>th</sup> Month	29 <sup>th</sup> Month
7.	Full Load Operation	30 <sup>th</sup> Month	30 <sup>th</sup> Month
8.	Completion of Trial Run	31 <sup>nd</sup> Month (Tentatively by Nov-2021)	31 <sup>nd</sup> Month (Tentatively by Feb-2022)
9.	Completion of Facilities	32 <sup>th</sup> Month	32 <sup>th</sup> Month

### 6.4 CONTRACT PERIOD

The contract period for completion of entire work under scope for each of the packages shall be **32 (Thirty Two) months for Package-A and 32 (Thirty Two) Months for Package-B** from the “START OF CONTRACT PERIOD” as specified earlier for completion of the entire work.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter – VI: Time Schedule

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

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

Milestones	Activities	To be completed by
M1	Completion of Ceiling Girder erection	8th Month from Date of Start
M2	Boiler hydro Test-Drainable	18 th Month from Date of start

**Note:** Refer clause no 12.0 of ANNEXURE-4 IMPORTANT INFORMATION of the NIT regarding modalities against provision of penalty in case of slippage of Intermediate Milestones.

**Note:**

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

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-VII: Terms of Payment

### 7. Terms of payment

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

**7.1** Progressive Payment against monthly running bills will be made upto 85 % of the value of the erected Pro-rata as per SL no 7.1.1 to 7.1.17 of the following table.

SL NO	Contract (Main Package) Identification -->	Boiler				Rotating Machine	Insulation
	Rate schedule Identification ----->	Structure- 1A	Pressure Parts-1B	Non Pressure Parts - 1C	Air Pre Heaters PG 52-2A	1) RM 2) Handling Eqpts -1D	1) Wool mattresses-3A 2) Castable & Pourable-3B 3) Iron Components -3C 4) Aluminum sheeting-3D
	<b>PRO RATA PAYMENTS (85%)</b>						
7.1.1	ON PRE-ASSEMBLY WHEREVER APPLICABLE ( IF NOT APPLICABLE, THIS PORTION SHALL BE CLUBBED WITH PLACEMENT IN POSITION)	20%	20%	25%	--	15%	--
7.1.2	PLACEMENT IN POSITION	15%	10%	10%	--	20%	50%
7.1.3	ALIGNMENT	20%	15%	10%	--	20%	15%
7.1.4	WELDING/BOLTING/FIXING	20%	20%	15%	--	20%	15%
7.1.5	COMPLETION OF NON DESTRUCTIVE EXAMINATION & STRESS RELIEVING/ HEAT TREATMENT (if not applicable, then this portion to be paid along with WELDING/BOLTING/FIXING)	10%	10%	--	--	--	--

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-VII: Terms of Payment**

7.1.6	COMPLETION OF HOPPERS ALONG WITH ALL DOORS, HEATING ELEMENTS, POKING DOORS, ETC						
7.1.7	COMPLETION OF INNER, OUTER ROOF INSULATOR HOUSING, RECTIFIER TRANSFORMERS, PENT HOUSE MONO RAILS, HOISTS ETC						
7.1.8	ERECTION OF EMITTING AND COLLECTING RAPPING SYSTEM WITH ALL DRIVES						
7.1.9	COMPLETION OF ATTACHMENT WELDING, FIN WELDING, SUPPORTS	--	5%	--	--	--	--
7.1.10	COMPLETION OF ROOF SKIN CASING & AI CLADDING WORKS	--	4%	--	--	--	5%
7.1.11	INSTALLATION OF TEMPORARY PIPING	--	--	--	--	--	--
7.1.12	DISMANTLING OF TEMPORARY PIPING, EDGE PREPARATION AND RETURN TO BHEL STORES, AREA CLEANING	--	--	--	--	--	--
7.1.13	HANGERS & SUPPORTS ETC WHEREVER NECESSARY AS PER DRG	--	1%	25%	--	--	--
7.1.14	COMPLETION OF FURNACE ALIGNMENT AND FIRE BALL CHECKING		--	--	--	--	--
7.1.15	COMPLETION OF BACK PASS ALIGNMENT		--	--	--	--	--
7.1.16	COMPLETION OF VIBRATION SNUBBERS, MECHANICAL SPACERS, CASSETTE BAFFLES, STEAM COOLED SPACERS		--	--	--	--	--
7.1.17	EQUIPMENT TRIAL OPERATION	--	--	--	--	10%	--
7.1.18	HYDRAULIC TEST OR PNEUMATIC TEST	--	--	--	--	--	--

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7.1.19	FLOATING OF LINES, FINAL ADJUSTMENT OF SUPPORTS FOR COLD AND HOT VALUES (if not applicable, this portion to be clubbed along with hydraulic test/pneumatic test)	--	--	--	--	--	--
7.1.20	<b>AIR PRE HEATERS (PG 52)From the total amount payable for the PGMA weight at tonnage rates, payment will be regulated as under:</b>	--	--	--	--	--	--
7.1.20.1	Completion of Support steel squareness and levelling, Expansion arrangement, Housing panel erection and alignment, Erection, alignment and welding of pedestals	--	--	--	11%	--	--
7.1.20.2	Completion of Erection, alignment and welding of Support Bearing, Guide Bearing, Rotor post, Bottom and Top centre sections, Hot and cold end connecting plates	--	--	--	14%	--	--
7.1.20.3	Completion of erection and alignment of modules	--	--	--	15%	--	--
7.1.20.4	Completion of erection, alignment and welding of Pin Rack assembly and Drive assembly	--	--	--	12%	--	--
7.1.20.5	Completion of seals setting	--	--	--	17%	--	--
7.1.20.6	Erection, alignment and welding of Lube oil systems, Cleaning Device, Fire sensing device, Deluge and water wash lines, Observation port and lighting assemblies and other accessories	--	--	--	13%	--	--
7.1.20.7	Completion of PGMA	--	--	--	1%	--	--
7.1.20.8	Air preheater Trial Run	--	--	--	2%	--	--
	<b>TOTAL FOR PRO RATA PAYMENTS (TOTAL 85%)</b>	<b>85%</b>	<b>85%</b>	<b>85%</b>	<b>85%</b>	<b>85%</b>	<b>85%</b>

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7.2 Further 15 % payment on pro-rata basis common to all PGs of Boiler shall be released on achievement of the following stage / milestones events (as per Cl no 7.2.1 to 7.2.4 of the following table) for the tonnage erected.

	Contract (Main Package) Identification ---->	Boiler			Rotating Machine		Insulation
		Structure -1A	Pressure Parts-1B	Non Pressure Parts - 1C	Air Pre Heaters-2A	1) RM 2) Handling Eqpts 1D	1) Wool mattresses-3A 2) Castable & Pourable-3B 3) Iron Components- 3C 4) Aluminum sheeting-3D
	Rate schedule Identification ----->						
<b>II</b>	<b>STAGE/MILESTONE PAYMENTS (15%)</b>						
7.2.1	AIR & GAS TIGHTNESS TEST	--	--	5%	--	--	--
7.2.2	GAS DISTRIBUTION TEST						
7.2.3	CHARGING OF ESP FIELDS						
7.2.4	COMPLETION OF AIR & GAS TIGHTNESS TEST FOR FURNACE	--	2%	--	--	--	--
7.2.5	BOILER HYDRAULIC TEST (DRAINABLE)	--	2%	--	--	--	--
7.2.6	BOILER HYDRAULIC TEST (NON DRAINABLE)	--	1%	--	--	--	--
7.2.7	REHEATER COILS HYDRAULIC TEST	--	2%	--	--	--	--
7.2.8	CLEAN AIR FLOW TEST	--	--	--	--	1%	--
7.2.9	BOILER LIGHT UP	--	1%	--	2%	1%	1%
7.2.10	ABO/CHEMICAL CLAENING	--	1%	1%	2%	1%	1%
7.2.11	STEAM BLOWING	--	--	2%	1%	1%	1%
7.2.12	SAFETY VALVE FLOATING	--	2%	--	2%	--	1%
7.2.13	READINESS FOR COAL FEEDING	--	--	--	--	--	--

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7.2.14	COAL FIRING	--	--	2%	2%	2%	1%
7.2.15	FULL LOAD	--	--	--	--	1%	1%
7.2.16	TRIAL OPERATION OF UNIT	--	--	--	--	2%	2%
7.2.17	Completion of sheet covering for Boiler roof, burner roof, lift shaft cladding, completion of gutters	3%	--	--	--	--	--
7.2.18	Completion of all drains and vents to respective locations and placement of instrument sensors after steam blowing	--	--	--	--	--	--
7.2.19	Painting	2%	--	1%	1%	2%	--
7.2.20	Area cleaning, temporary structures cutting/removal and return of scrap	1%	1%	1%	1%	1%	3%
7.2.21	Punch List points/pending points liquidation	4%	1%	1%	2%	1%	1%
7.2.22	Submission of 'As Built Drawings'	--	--	--	--	--	--
7.2.23	Material Reconciliation	4%	1%	1%	1%	1%	2%
7.2.24	Completion of Contractual Obligation	1%	1%	1%	1%	1%	1%
	<b>TOTAL FOR STAGE/MILESTONE PAYMENTS (15%)</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>

**7.3 Mill bunker structure including PG 34, coal bunkers, transfer houses, Conveyor galleries, trestles etc., Pipe and cable racks: This is split into two types as below:**

- 1) BHEL supplied items:
- 2) Contractor supplied items that go as permanent part of the system

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### Chapter-VII: Terms of Payment

#### **7.3.1 BHEL supplied items**

7.3.1.1: Progressive Payment against monthly running bills will be made up-to 85 % of the value of the erected tonnage Pro-rata as per SL no 7.4.1.1 to 7.4.1.6 of the following table.

<b>Sr no</b>	<b>Description</b>	<b>Percentage</b>
7.3.1.1.1	On pre-assembly wherever applicable (if not applicable, this portion shall be clubbed with placement in position)	15%
7.3.1.1.2	Placement in position	20%
7.3.1.1.3	Alignment	20%
7.3.1.4	Welding / bolting / fixing	15%
7.3.1.1.5	Completion of non-destructive examination & stress relieving/ heat treatment (if not applicable, then this portion to be paid along with welding)	10%
7.3.1.1.6	Hangers & supports etc, Readiness of floors for concrete pouring as applicable	5%
		<b>85%</b>

7.3.1.2 Further 15 % payment on pro-rata basis shall be released on achievement of the following stage / milestones events (as per SL no 7.3.1.2.1 to 7.3.1.2.8 of the following table) for the tonnage erected.

<b>Sr no</b>	<b>Description</b>	<b>Percentage</b>
7.3.1.2.1	READINESS FOR COAL FEEDING (1% for each Mill) & completion of side cladding	9%
7.3.1.2.2	COAL FIRING	1%
7.3.1.2.3	TRIAL OPERATION OF UNIT	1%
7.3.1.2.4	Painting	2%
7.3.1.2.5	Area cleaning, temporary structures cutting/removal and return of scrap	0.5%
7.3.1.2.6	Punch List points/pending points liquidation	0.5%
7.3.1.2.7	Material Reconciliation	0.5%
7.3.1.2.8	Completion of Contractual Obligation	0.5%
		<b>15%</b>
	<b>Total of 7.3.1.1 and 7.3.1.2</b>	<b>100%</b>

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-VII: Terms of Payment

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### **7.3.2 Contractor supplied items that go as permanent part of the system: Progressive payment:**

**7.3.2.1 Interim Payment (95%)** Interim bills in the form of monthly running bills prepared by the contractor shall be based on the quantities executed and measured.

**7.3.2.2** 5% of the item rate shall be released after submission of the quality check formats / documents as per the quality plan for the quantum of work billed and duly certified by engineer.

**7.3.2.3** On submission and of final bills BHEL Site Engineer, at discretion, may operate the part rate of the items where supply and installation are involved, on receipt of the materials at site.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-VIII: Taxes and Duties

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

1. All taxes excluding GST, GST Cess & BOCW Cess but including, Royalties, fees, license, deposits, commission, any State or Central Levy and other charges whatsoever, if any, shall be borne by you and shall not be payable extra.
2. Any increase of the taxes excluding GST, GST Cess & BOCW Cess, at any stage during execution including extension of the contract shall have to be borne by the contractor. Quoted/ accepted rates/ price shall be inclusive of all such requirements. Please note that since GST on output will be paid by BHEL separately as enumerated below, your quoted rates/ price should be after considering the Input Credit under GST law at your end.
3. **GST :**  
The successful bidder shall furnish proof of GST registration .GST along with Cess (as applicable) legally leviable & payable by the successful bidder as per GST Law, shall be paid by BHEL. Hence Bidder shall not include GST along with Cess (as applicable) in their quoted price.
4. GST charged in the Tax Invoice/Debit note by the contractor shall be released separately to the contractor only after contractor files the outward supply details in GSTR-1 on GSTN portal and input tax credit of such invoice is matched with corresponding details of outward supply of the contractor and has paid the GST at the time of filing the monthly return
5. Bidder shall note that the GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred there under) wherein the 'Bill To' details will as below :-  
BHEL GSTN – As per **Annexure -1**  
NAME -- Bharat Heavy Electricals Limited  
ADDRESS – Site address
6. Bidder to immediately intimate on the day of removal of Goods (in case of any supply of goods) to BHEL along with all relevant details and a scanned copy of Tax Invoice to below email ids to enable BHEL to meet its GST related compliances :-  
Email id ---- to be intimated later on.  
  
In case of delay in submission of the abovementioned documents on the date of dispatch, BHEL may incur penalty /interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from the successful bidder, if such delay is not attributable to BHEL.
7. In case of raising any Supplementary Tax Invoice (Debit / Credit Note) Bidder shall issue the same containing all the details as referred to in Section 34 read with Rule 53.
8. Bidder shall note that in case GST credit is delayed/ denied to BHEL due to delayed / non receipt of goods and /or tax invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from the vendor along with interest levied / leviable on BHEL, as the case may be.

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-VIII: Taxes and Duties

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9. Bidder shall upload the Invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Bidder shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the bidder along with interest levied / leviable on BHEL.
10. **Way Bill:** Successful Bidder to arrange for way bill / e-waybill for any transfer of goods for the execution of the contract.  
The Bidder has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit/ Way Bill, if required, shall be arranged by the contractor and BHEL will not supply any Road Permit/ Way Bill for this purpose.
11. **New taxes and duties:-**Any New taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period including extension, if the same is not attributable to you, shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.  
Benefits and/or abolition of all existing taxes must be passed on to BHEL against new Taxes, if any, proposed to be introduced at a later date.
- In case any new tax/levy/duty etc. becomes applicable after the date of bidder's offer but before opening of the price bid, the bidder must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of the price bids. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.
12. For transportation work, bidder shall declare in his quotation whether he is registered under GST, if yes, whether he intends to claim GST on forward charge basis. In absence of this declaration, BHEL will proceed further with the assumption that bidder intends not to claim GST on forward charge basis. However, in case of GST registered transporter, the amount to the extent of goods and service tax will be retained till BHEL avails the credit of GST. Further, transporter shall issue tax invoice which inter alia includes gross weight of the consignment, name of the consigner and the consignee, registration number of vehicle in which the goods are transported, details of goods transported, details of place of origin and destination, GSTIN of the person liable for paying tax whether as consigner, consignee or goods transport agency, and also containing other information as mentioned under rule 46.
13. **TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills unless exemption certificate from the appropriate authority/ authorities is furnished.**
14. **TDS under GST shall be deducted at prevailing rates on applicable value from the running bills.**
15. Refer Annexure – 2 for BOCW Act & Cess Act.

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-VIII: Taxes and Duties

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### ANNEXURE-1

#### State wise GSTIN no.s of BHEL

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

### ANNEXURE-2

#### BOCW Act & Cess Act

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

1. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
2. It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities.
3. It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work.
4. It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may , by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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5. It shall be sole responsibility of the contractor as employer to get registered every Building Worker, who is between the age of 18 to 60 years of age and who has been engaged in any building or other construction work for not less than ninety days during the preceding twelve months as Beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996.
6. It shall be sole responsibility of the contractor as employer to maintain all the registers, records, notices and submit returns under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
7. It shall be sole responsibility of the contractor as employer to provide notice of poisoning or occupation notifiable diseases, to report of accident and dangerous occurrences to the concerned authorities under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the rules made thereunder and to make payment of all statutory payments & compensation under the Employees' Compensation Act, 1923.
8. It shall be the responsibility of the sub-contractor as employer to make payment/deposit of applicable cess amount on the extent of work involving building or construction workers engaged by the sub-contractor within a period of one month from the receipt of payment. It shall also be responsibility of the Contractor to furnish BHEL on monthly basis, Receipts/ Challans towards Deposit of the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder along with following statistics :
  - (i) Number of Building Workers employed during preceding one month.
  - (ii) Number of Building workers registered as Beneficiary during preceding one month.
  - (iii) Disbursement of Wages made to the Building Workers for preceding wage month.
  - (iv) Remittance of Contribution of Beneficiaries made during the preceding month
9. BHEL shall reimburse the contractor the Cess amount deposited for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.
10. It shall be responsibility of the Building Worker engaged by the Contractor and registered as a beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board , within the fifteen days from such deduction.

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## Chapter-VIII: Taxes and Duties

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11. Bidders may please note that though the quoted price is exclusive of BOCW (which will be reimbursed by BHEL as per sub-clause 9 above) , however, If at any point of time during the contract period, non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder is observed, BHEL reserves the right to deduct the applicable cess (1%) on the contract value and penalty ( if any, imposed by Cess Authorities) from the payables on account of non-compliance.
  
12. The contractor shall declare to undertake any liability or claim arising out of employment of building workers and shall indemnify BHEL from all consequences / liabilities / penalties in case of non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
**IN SCOPE OF WORK (BOQ)**

**BILL OF QUANTITY**

**Summary of Weight of BOQ for Boiler, Mill bunker structure, Coal bunkers, ESP control room, transfer houses, ID- Ducts, Structure, Gates & dampers, Rot. M/c, Aux. Boiler, Insulation:-**

<b>Sr. No.</b>	<b>DESCRIPTION</b>	<b>Pkg-A (Unit#1) Weight in MT</b>	<b>Pkg-B (Unit#2) Weight in MT</b>	<b>Rate Schedule ID</b>
1	Structure	19,517.984	19,407.981	1A
2	Pressure Parts	12,757.779	12,080.658	1B
3	Non Pressure Parts	12,917.058	12,786.605	1C
4	Rotating Machines	4,621.210	4,607.020	1D (FANs & Mills) & 2A (APH)
5	Insulation- Wool Matress	2,169.204	2,151.900	3A
6	Insulation- Pourable and Castable	349.278	295.000	3B
7	Insulation- Iron Parts	260.662	447.500	3C
8	Insulation- Aluminium Cladding Sheets	449.075	19,407.981	3D
9	<b>Total</b>	<b>53,042.25</b>	<b>52024.76</b>	

**Note to weight schedule:**

1. The weights mentioned above are approximate and liable to vary as per design consideration. There will be change in PG, weight, description etc. However payments will be made for the tonnage actually erected at the quoted rate. Quantity Variation will be dealt as per clause 2.14 of General Conditions of Contract (Volume I BCD).
2. Besides PG / PGMA indicated in the weight schedule, there is likely hood of addition product groups integral to Boiler and its aux. The quoted rate shall be applicable for such product groups also. There may be variation or addition of PGMAs, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted / accepted rate in the respective category at the discretion of BHEL.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
**IN SCOPE OF WORK (BOQ)**

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3. The erection & dismantling of temporary piping, pumps, tanks, dummy plates & blanks, valves, pressure gauges and other miscellaneous equipment required for the test. for pre-commissioning and commissioning activities like hydraulic test, chemical cleaning, steam blowing etc. are covered in this contract and shall be carried out as a part of work. Payment will be made at the rate applicable for **Non-pressure parts** (1C) for items. Weight for the same will be based on jointly measured quantity and corresponding standard weights. No payment will be made for the equipments brought by the Contractor such as pumps etc and foundations made by the Contractor for temporary systems. Weight for the same will be based on jointly measured quantity and corresponding standard weights.

Payment terms for temporary piping:

- a. 50% on completion of installation of temporary piping.
- b. 25% on dismantling
- c. 15% on return of BHEL Stores
- d. 10% on Material reconciliation. The Erection of HT MOTORS are covered in this scope of contract. However, dry out, testing and commissioning is not in the scope of this contract.

Note: Required pipes, valves, blanks, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL. All thermo well points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded.

4. Imported electrodes / TIG welding wires released under XX992 will be given by BHEL. All other electrodes / TIG welding wires are to be supplied by contractor under his scope.
5. Fixing components for insulation: The scope of works covers welding of all attachment on the pressure parts for fixing insulation & refractory.
6. Welding of ESP Inlet funnel with ESP Inlet Duct is the scope of Boiler Vendor.
7. The erection and dismantling of air blowers and connecting pipes and ducts, providing blanks / dummies at the required locations and conducting gas tightness test is in the scope of the contractor and shall be carried out within the quoted rate.
8. For aux. boiler, tube expansion as per the drawing is in the scope of contractor. Modification / rectification of tubes before tube expansion shall be carried out by the contractor within the quoted rate. (-Package A)

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
**IN SCOPE OF WORK (BOQ)**

**9. Extra work rates for welding:**

The quantum of welding joints indicated in **Welding schedule 'Chapter XXI of Vol-I** of Technical Conditions of Contract is approximate and is liable for variation in PG, description, size, materials, NDT requirements etc. The indicated joints will be grouped into category of carbon steel (inclusive of SA106GrC or equivalent) and Alloy steel (inclusive of T91/P91) and convert them in to equivalent joints (Dia 63.5x6.3mm) as per the formula below:

$$\begin{aligned} \text{No. of equivalent Joints} &= \text{Dia X Thickness} / (63.5 \times 6.3) \\ &= \text{Dia X Thickness} / 400.05 \end{aligned}$$

If the total no of equivalent joints in each category exceeds 25% of the total equivalent joints in that category contractor will be paid extra as per the rate indicated below:

- a) One extra Equivalent joints of Carbon Steel (CS) = Rs 254/-
  - b) One extra Equivalent Joints of Alloy Steel (AS) = Rs 561/-
- Non Destructive Testing (NDT) and Stress Relieving (SR) if applicable shall be carried out by the contractor within these rates.

**Detailed (PGMA wise) weight of BOQ for Boiler, Mill bunker structure, Coal bunkers, Transfer houses, Conveyor galleries, Trestles, ID- Ducts, Structures, Gates & dampers, Rot. M/c, Aux. Boiler, Insulation:**

**3x800 MW PVUNL PROJECT PATRATU**  
**APPLICABLE PGMA LIST OF BOILER PACKAGE**  
**UNIT#1 (Pkg A) & UNIT#2 (Pkg B)**

PGMA	DESCRIPTIONS	Billable Weight U#1 (Pkg A) in MT	Billable Weight U#2 (Pkg B) in MT	CATEGORY	RATE SCHEDULE ID	Remarks
<b>STRUCTURES</b>						
8-003	FURN UPR BKSTYS-SIDE	220.00	220.00	Structure	1A	
8-901	FURN KEY BKSTYS-UPR	13.00	13.00	Structure	1A	
8-911	Bulk Bps Items-Upper	0.25	0.25	Structure	1A	
8-001	FURN UPR BKSTYS-F&R	99.00	99.00	Structure	1A	
8-501	FURN B P BKSTYS-F&R	240.00	240.00	Structure	1A	

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
**IN SCOPE OF WORK (BOQ)**

				re		
8-503	FURN B P BKSTYS-SIDE	300.00	300.00	Structure	1A	
8-111	FURN REAR ARCH BKSTYS	32.00	32.00	Structure	1A	
8-006	FURN INT BKSTYS	410.00	410.00	Structure	1A	
8-912	Bulk Bps Items-Inter	2.00	2.00	Structure	1A	
8-7	FURN LWR BKSTYS	50.00	50.00	Structure	1A	
8-380	FURN BOT SUPRTS	470.00	470.00	Structure	1A	
8-400	FURN GUIDES	10.00	10.00	Structure	1A	
8-913	Bulk Bps Items-Lower	2.50	2.50	Structure	1A	
8-910	EX.MOVT MEAS COMP	1.25	1.25	Structure	1A	
<b>Total weight for PG-08</b>		<b>1,850.00</b>	<b>1,850.00</b>			
34-101	Bunker Columns 1st Tier	358.00	358.00	Structure	1A	
34-441	Bunker Horizontal Beams Tier 1	31.00	31.00	Structure	1A	
34-442	Bunker Horizontal Beams Tier 2	31.00	31.00	Structure	1A	
34-443	Bunker Horizontal Beams Tier 3	31.00	31.00	Structure	1A	
34-511	Bunker Vertical Bracings Tier 1	25.00	25.00	Structure	1A	
34-512	Bunker Vertical Bracings Tier 2	25.00	25.00	Structure	1A	
34-513	Bunker Vertical Bracings Tier 3	25.00	25.00	Structure	1A	
34-102	Bunker Columns 2nd Tier	200.00	200.00	Structure	1A	
34-103	Bunker Columns 3rd Tier	200.00	200.00	Structure	1A	
34-390	Misc. Structures	25.00	25.00	Structure	1A	
34-444	Bunker Horizontal Beams Tier 4	31.00	31.00	Structure	1A	
34-445	Bunker Horizontal Beams Tier 5	31.00	31.00	Structure	1A	
34-514	Bunker Vertical Bracings Tier	25.00	25.00	Structure	1A	

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
**IN SCOPE OF WORK (BOQ)**

	4			re		
34-515	Bunker Vertical Bracings Tier 5	25.00	25.00	Structure	1A	
34-104	Bunker Columns 4th Tier	200.00	200.00	Structure	1A	
34-105	COLM-Q ROW LOWE TIER	200.00	200.00	Structure	1A	
34-200	BUNKER SUPPORT BEAMS	146.00	146.00	Structure	1A	
34-810	FLOOR GRILLS	3.00	3.00	Structure	1A	
34-820	STAIRS	5.00	5.00	Structure	1A	
34-300	BUNKER BAY HORIZONTAL BRACINGS	16.00	16.00	Structure	1A	
34-850	HAND RAILS	5.00	5.00	Structure	1A	
<b>Total weight for PG-34</b>		<b>1,638.00</b>	<b>1,638.00</b>			
35-811	FLOOR GRILLS AND GUARD PLATE	116.39	116.39	Structure	1A	
35-10	FOUNDATION MATERIALS	12.00	12.00	Structure	1A	(Only Packers and erection material Not foundation bolts or templates, These would be in Civil package)
35-131	Middle Columns RHS 1st Tier	204.00	204.00	Structure	1A	
35-141	Auxiliary Columns LHS 1st Tier	132.00	132.00	Structure	1A	
35-311	HORIZONTAL BRACING I	19.00	19.00	Structure	1A	
35-312	HORIZ BRACING II PAS	23.00	23.00	Structure	1A	
35-321	HORIZ BRACING I PASS	22.00	22.00	Structure	1A	

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35-381	Landing & Connecting Platforms Tier-1	29.00	29.00	Structure	1A	
35-441	Horil Beams First Pass-Tier-1	41.00	41.00	Structure	1A	
35-451	Hor Beam-Second Pass- Tier-1	33.00	33.00	Structure	1A	
35-511	Front Bracing-Tier-1	17.00	17.00	Structure	1A	
35-521	Side Bracing-Tier-1	46.00	46.00	Structure	1A	
35-531	Rear Bracing-Tier-1	23.00	23.00	Structure	1A	
35-700	HSFG FASTENERS	36.00	36.00	Structure	1A	
35-993	CONSUMABLES AND RECTI	9.00	9.00	Structure	1A	billable in case of short supply of Peguar material, modification, additional fabrication with proper record of issues and purpose of use
35-322	HORIZ BRACING II PAS	28.00	28.00	Structure	1A	
35-331	HORIZ BRACING I PASS	23.00	23.00	Structure	1A	
35-332	HORIZ BRACING II PAS	33.00	33.00	Structure	1A	
35-382	Landing & Connecting Platforms Tier-2	29.00	29.00	Structure	1A	
35-442	Horil Beams First Pass-Tier-2	41.00	41.00	Structure	1A	
35-452	Hor Beam-Second Pass- Tier-2	33.00	33.00	Structure	1A	
35-453	Hor Beam-Second Pass- Tier-3	33.00	33.00	Structure	1A	
35-512	Front Bracing-Tier-2	17.00	17.00	Structure	1A	

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**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
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35-513	Front Bracing-Tier-3	17.00	17.00	Structure	1A	
35-522	Side Bracing-Tier-2	46.00	46.00	Structure	1A	
35-523	Side Bracing-Tier-3	13.00	13.00	Structure	1A	
35-532	Rear Bracing-Tier-2	23.00	23.00	Structure	1A	
35-821	STAIRS - LOWER	7.00	7.00	Structure	1A	
35-185	Main Columns 5th Tier	184.00	184.00	Structure	1A	
35-341	HORIZ BRACING I PASS	21.00	21.00	Structure	1A	
35-342	HORIZ BRACING II PAS	23.00	23.00	Structure	1A	
35-351	HORIZ BRACING I PASS	19.00	19.00	Structure	1A	
35-352	HORIZ BRACING II PAS	27.00	27.00	Structure	1A	
35-383	Landing & Connecting Platforms Tier-3	29.00	29.00	Structure	1A	
35-443	Horil Beams First Pass-Tier-3	41.00	41.00	Structure	1A	
35-454	Hor Beam-Second Pass- Tier-4	33.00	33.00	Structure	1A	
35-455	Hor Beam-Second Pass- Tier-5	33.00	33.00	Structure	1A	
35-524	Side Bracing-Tier-4	46.00	46.00	Structure	1A	
35-534	Rear Bracing-Tier-4	23.00	23.00	Structure	1A	
35-535	Rear Bracing-Tier-5	23.00	23.00	Structure	1A	
35-822	STAIRS - MIDDLE	9.00	9.00	Structure	1A	
35-146	Auxiliary Columns LHS 6th Tier	66.00	66.00	Structure	1A	
35-211	CEILING STRUCTUREMAI	310.00	310.00	Structure	1A	
35-212	CEILING STRUCTUREMAI	300.00	300.00	Structure	1A	
35-214	CEIL STRUCT -CROSS W	73.00	73.00	Structure	1A	
35-361	HORIZ BRACING I PASS	20.00	20.00	Structure	1A	

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35-384	Landing & Connecting Platforms Tier-4	29.00	29.00	Structure	1A	
35-385	Landing & Connecting Platforms Tier-5	29.00	29.00	Structure	1A	
35-386	Landing & Connecting Platforms Tier-6	29.00	29.00	Structure	1A	
35-823	STAIRS - UPPER	11.00	11.00	Structure	1A	
35-851	HAND RAILS AND POSTS	26.00	26.00	Structure	1A	
35-995	CHUTE PIPE AND LADDE	27.00	27.00	Structure	1A	
35-157	Auxiliary Columns RHS 7th Tier	66.00	66.00	Structure	1A	
35-213	CEIL STRUCT -CROSS W	75.00	75.00	Structure	1A	
35-221	CEILING STRUCTURE RO	45.00	45.00	Structure	1A	
35-222	CEILING STRUCTURE RO	45.00	45.00	Structure	1A	
35-231	CEILING STRUCTURE HO	9.00	9.00	Structure	1A	
35-375	Horizontal Bracing@87500(MBL-8) 2nd Pass	16.00	16.00	Structure	1A	
35-390	MISC STRUCTURES	96.00	96.00	Structure	1A	
35-444	Horil Beams First Pass-Tier-4	41.00	41.00	Structure	1A	
35-445	Horil Beams First Pass-Tier-5	41.00	41.00	Structure	1A	
35-514	Front Bracing-Tier-4	17.00	17.00	Structure	1A	
35-515	Front Bracing-Tier-5	17.00	17.00	Structure	1A	
35-518	Front Bracing-Tier-8	13.00	13.00	Structure	1A	
35-525	Side Bracing-Tier-5	46.00	46.00	Structure	1A	
35-533	Rear Bracing-Tier-3	23.00	23.00	Structure	1A	
35-701	HSFG FASTENERS	16.00	16.00	Structure	1A	
35-812	Edge Strip And Guard Plate	13.00	13.00	Structure	1A	
35-132	Middle Columns RHS 2nd Tier	204.00	204.00	Structure	1A	

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**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS**  
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				re		
35-133	Middle Columns RHS 3rd Tier	204.00	204.00	Structure	1A	
35-134	Middle Columns RHS 4th Tier	184.00	184.00	Structure	1A	
35-135	Middle Columns RHS 5th Tier	137.00	137.00	Structure	1A	
35-136	Middle Columns RHS 6th Tier	66.00	66.00	Structure	1A	
35-137	Middle Columns RHS 7th Tier	66.00	66.00	Structure	1A	
35-142	Auxiliary Columns LHS 2nd Tier	132.00	132.00	Structure	1A	
35-143	Auxiliary Columns LHS 3rd Tier	132.00	132.00	Structure	1A	
35-144	Auxiliary Columns LHS 4th Tier	132.00	132.00	Structure	1A	
35-145	Auxiliary Columns LHS 5th Tier	132.00	132.00	Structure	1A	
35-147	Auxiliary Columns LHS 7th Tier	66.00	66.00	Structure	1A	
35-151	AUXCOL LHSLWR 1&2PAS	132.00	132.00	Structure	1A	
35-152	AUXCOL RHSMID 1&2PAS	132.00	132.00	Structure	1A	
35-153	AUXCOL RHSUPR 1&2PAS	132.00	132.00	Structure	1A	
35-154	Auxiliary Columns RHS 4th Tier	132.00	132.00	Structure	1A	
35-155	Auxiliary Columns LHS 7th Tier	132.00	132.00	Structure	1A	
35-156	Auxiliary Columns RHS 6th Tier	66.00	66.00	Structure	1A	
35-181	Main Columns 1st Tier	132.00	132.00	Structure	1A	
35-182	Main Columns 2nd Tier	184.00	184.00	Structure	1A	
35-183	Main Columns 3rd Tier	184.00	184.00	Structure	1A	
35-184	Main Columns 4th Tier	184.00	184.00	Structure	1A	
35-186	Main Columns 6th Tier	118.00	118.00	Structure	1A	
35-187	Main Columns 7th Tier	66.00	66.00	Structure	1A	

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35-232	CEILING STRUCTURE HO	9.00	9.00	Structure	1A	
35-362	HORIZ BRACING II PAS	27.00	27.00	Structure	1A	
35-371	Horizontal Bracing@79100 (MBL-7)1st Pass	16.00	16.00	Structure	1A	
35-372	Horizontal Bracing @79100(MBL-7)2nd Pass	13.00	13.00	Structure	1A	
35-374	Horizontal Bracing@87500(MBL-8) 1st Pass	150.00	150.00	Structure	1A	
35-387	Landing & Connecting Platforms Tier-7	29.00	29.00	Structure	1A	
35-388	Landing & Connecting Platforms Tier-8	13.00	13.00	Structure	1A	
35-446	Horil Beams First Pass-Tier-6	41.00	41.00	Structure	1A	
35-447	Horil Beams First Pass-Tier-7	41.00	41.00	Structure	1A	
35-448	Horil Beams First Pass-Tier-8	13.00	13.00	Structure	1A	
35-456	Hor Beam-Second Pass- Tier-6	33.00	33.00	Structure	1A	
35-457	Hor Beam-Second Pass- Tier-7	33.00	33.00	Structure	1A	
35-458	Hor Beam-Second Pass- Tier-8	13.00	13.00	Structure	1A	
35-516	Front Bracing-Tier-6	17.00	17.00	Structure	1A	
35-517	Front Bracing-Tier-7	17.00	17.00	Structure	1A	
35-526	Side Bracing-Tier-6	46.00	46.00	Structure	1A	
35-527	Side Bracing-Tier-7	13.00	13.00	Structure	1A	
35-528	Side Bracing-Tier-8	63.00	63.00	Structure	1A	
35-536	Rear Bracing-Tier-6	13.00	13.00	Structure	1A	
35-537	Rear Bracing-Tier-7	63.00	63.00	Structure	1A	
35-538	Rear Bracing-Tier-8	19.00	19.00	Structure	1A	
35-190	GIRDER PIN CONNECTIO	16.00	16.00	Structure	1A	
<b>Total weight for PG-35</b>		<b>6,862.39</b>	<b>6,862.39</b>			

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36-812	FLOORGRILLSANDGUARDP	231.90	231.90	Structure	1A	
36-811	FLOORGRILLSANDGUARDP	218.64	218.64	Structure	1A	
36-311	MAIN FLOOR I MBL 1ST	63.00	63.00	Structure	1A	
36-312	MAIN FLOOR I MBL 2ND	114.00	114.00	Structure	1A	
36-315	NON-MBL FLOOR BETWEE	56.00	56.00	Structure	1A	
36-821	STAIRS AND LADDERS	10.00	10.00	Structure	1A	
36-822	STAIRS AND LADDERS	10.00	10.00	Structure	1A	
36-324	NON-MBL FLOOR BETWEE	105.00	105.00	Structure	1A	
36-325	NON-MBL FLOOR BETWEE	117.00	117.00	Structure	1A	
36-326	NON-MBL FLOOR BETWEE	109.00	109.00	Structure	1A	
36-313	NON-MBL FLOOR BETWEE	86.00	86.00	Structure	1A	
36-331	MAIN FLOOR III MBL 1	97.00	97.00	Structure	1A	
36-333	NON-MBL FLOOR BETWEE	114.00	114.00	Structure	1A	
36-322	MAIN FLOOR II MBL 2ND	78.00	78.00	Structure	1A	
36-323	NON-MBL FLOOR BETWEE	65.00	65.00	Structure	1A	
36-344	NON-MBL FLOOR BETWEE	142.00	142.00	Structure	1A	
36-371	Floor Beams @ 79100 (MBL-7) 1st Pass	64.00	64.00	Structure	1A	
36-372	Floor Beams @ 79100 (MBL-7) 2nd Pass	116.00	116.00	Structure	1A	
36-851	HANDRAILS AND POSTS	26.00	26.00	Structure	1A	
36-345	NON-MBL FLOOR BETWEE	60.00	60.00	Structure	1A	
36-346	NON-MBL FLOOR BETWEE	95.00	95.00	Structure	1A	
36-852	HANDRAILS AND POSTS	26.00	26.00	Structure	1A	
36-111	COLUMNS NEAR APH Tier 1	250.00	250.00	Structure	1A	

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36-112	COLUMNS NEAR APH Tier 2	240.00	240.00	Structure	1A	
36-113	COLUMNS NEAR APH Tier 3	240.00	240.00	Structure	1A	
36-151	BEAMS AND BRACINGS NEAR APH Tier 1	295.00	295.00	Structure	1A	
36-152	BEAMS AND BRACINGS NEAR APH Tier 2	295.00	295.00	Structure	1A	
36-153	BEAMS AND BRACINGS NEAR APH Tier 3	295.00	295.00	Structure	1A	
36-343	NON-MBL FLOOR BETWEE	64.00	64.00	Structure	1A	
36-353	NON-MBL FLOOR BETWEE	143.00	143.00	Structure	1A	
36-354	NON-MBL FLOOR BETWEE	151.00	151.00	Structure	1A	
36-362	MAIN FLOOR VI MBL 2ND	133.00	133.00	Structure	1A	
36-364	NON MBL FLOOR ABOVE MBL VI	126.00	126.00	Structure	1A	
36-365	NON MBL FLOOR ABOVE MBL VI	58.00	58.00	Structure	1A	
36-814	FLOORGRILLSANDGUARDP	123.00	123.00	Structure	1A	
36-993	CONSUMABLESANDERECIT	10.00	10.00	Structure	1A	Billable In actual issued qty with proper reason of issue and use.
36-341	MAIN FLOOR IV MBL 1ST	79.00	79.00	Structure	1A	
36-352	MAIN FLOOR V MBL II ND	80.00	80.00	Structure	1A	
36-355	NON-MBL FLOOR BETWEE	151.00	151.00	Structure	1A	
36-356	NON-MBL FLOOR BETWEE	132.00	132.00	Structure	1A	
36-361	MAIN FLOOR VI MBL 1ST	68.00	68.00	Structure	1A	
36-363	NON_MBL FLOOR ABOVE	128.00	128.00	Structure	1A	
36-366	NON MBL FLOOR ABOVE MBL VI	72.00	72.00	Structure	1A	
36-373	Floor Beams @ 83400 (Tier-8)	90.00	90.00	Structure	1A	

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36-374	Floor Beams @ 87500 (MBL-8) 1st Pass	77.00	77.00	Structure	1A	
36-375	Floor Beams @ 87500 (MBL-8) 2nd Pass	64.00	64.00	Structure	1A	
36-376	Floor Beams @ 90500 (Tier-8) 2nd Pass	64.00	64.00	Structure	1A	
36-377	Floor Beams 2nd Pass Tier-8	64.00	64.00	Structure	1A	
36-610	BOILER ROOF STRUCTUR	271.00	271.00	Structure	1A	
36-611	BOILER ROOF SHEETING	53.00	53.00	Structure	1A	
36-853	HANDRAILS AND POSTS	88.00	88.00	Structure	1A	
36-342	MAIN FLOOR IV MBL 2ND	86.00	86.00	Structure	1A	
36-351	MAIN FLOOR V MBL IST	72.00	72.00	Structure	1A	
36-813	FLOORGRILLSANDGUARDP	202.00	202.00	Structure	1A	
36-321	MAIN FLOOR II MBL IST	54.00	54.00	Structure	1A	
36-332	MAIN FLOOR III MBL 2	117.00	117.00	Structure	1A	
36-334	NON-MBL FLOOR BETWEE	91.00	91.00	Structure	1A	
36-335	NON-MBL FLOOR BETWEE	106.00	106.00	Structure	1A	
36-336	NON-MBL FLOOR BETWEE	101.00	101.00	Structure	1A	
36-337	NON-MBL FLOOR BETWEE	99.00	99.00	Structure	1A	
36-338	NON-MBL FLOOR BETWEE	78.00	78.00	Structure	1A	
36-823	STAIRS AND LADDERS	13.00	13.00	Structure	1A	
36-314	NON-MBL FLOOR BETWEE	108.00	108.00	Structure	1A	
36-316	NON-MBL FLOOR BETWEE	65.00	65.00	Structure	1A	
36-701	Fasteners	20.00	20.00	Structure	1A	
36-740	POSTS AND HANGERS	97.00	97.00	Structure	1A	
36-700	Hsfg Bolts	65.00	65.00	Structure	1A	

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36-999	RAIN CUTTER PIPING	16.00	16.00	Structure	1A	
36-381	LAND & CONN PLAT LOW	58.00	58.00	Structure	1A	
36-382	LAND & CONN PLAT MID	58.00	58.00	Structure	1A	
36-394	MISCELLANEOUS PLATFO	20.00	20.00	Structure	1A	
36-613	RAIN WATER PIPES and	46.00	46.00	Structure	1A	
36-620	BOILER SIDE CLADDING	142.00	142.00	Structure	1A	
36-391	MISCELLANEOUS PLATFO	102.00	102.00	Structure	1A	
36-392	MISCELLANEOUS PLATFO	129.00	129.00	Structure	1A	
36-393	APH, SCAPH, HANDLING	110.00	110.00	Structure	1A	
36-396	Slide Bearing Plates	33.00	33.00	Structure	1A	
36-621	BOILER SIDE CLADDING	33.00	33.00	Structure	1A	
36-395	MISCELLANEOUS PLATFO	26.00	26.00	Structure	1A	
<b>Total weight for PG-36</b>		<b>8,054.54</b>	<b>8,054.54</b>			
38-810	FLOORGRILLS AND GUAR	133.06	133.06	Structure	1A	
38-611	ELEVATOR CLADDING SH	21.00	21.00	Structure	1A	
38-210	INTER CONN PLATFORMS	11.00	11.00	Structure	1A	
38-410	MILL MAINTANANCE PLA	140.00	140.00	Structure	1A	
38-510	LIFT BEAMS AND BRACI	81.00	81.00	Structure	1A	
38-850	HAND RAILS AND HAND	15.00	15.00	Structure	1A	
38-710	LIFT MACHINE ROOM DE	74.00	74.00	Structure	1A	
38-299	MILL HANDLING MONORA	274.00	274.00	Structure	1A	
38-310	CONN PLATFORMS TO MI	87.00	87.00	Structure	1A	
38-610	ELEVATOR CLADDING ST	33.00	33.00	Structure	1A	

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38-381	ECO HANDLING STRUCTU	110.00	110.00	Structu re	1A	
38-993	CONSUMABLES AND EREC	13.00	13.00	Structu re	1A	Billable In actual issued qty with proper reason of issue and use.
38-820	STAIRS AND LADDERS	11.00	11.00	Structu re	1A	
<b>Total weight for PG-38</b>		<b>1,003.06</b>	<b>1,003.06</b>			
<b>Total Weight Structures</b>		<b>19,407.9 8</b>	<b>19,407.98</b>			
<b>PRESSURE PARTS</b>						
4-147	Supports for Collectr & Separatr Vessel	17.00	17.00	PP	1B	
4-347	Seperator/Collecting Vessel Supp DD	0.20	0.20	PP	1B	
4-547	Seperator/Collecting Vessel Supp Shop	2.80	2.80	PP	1B	
4-321	VERTICAL SEPARATOR	37.40	37.40	PP	1B	
4-323	STORAGE TANK	62.60	62.60	PP	1B	
<b>Total weight for PG-04</b>		<b>120.00</b>	<b>120.00</b>			
5-231	FUR UPPER FRNT OUTLET HDR	14.00	14.00	PP	1B	
5-251	FUR UPPER SIDE OUTLET HDRS	26.00	26.00	PP	1B	
5-330	FUR INTERMEDIATE FRNT HDR	16.00	16.00	PP	1B	
5-350	FUR INTERMEDIATE SIDE HDRS	26.00	26.00	PP	1B	
5-227	FUR UPPER REAR OUTLET HDR	16.00	16.00	PP	1B	
5-327	FUR INTERMEDIATE REAR HDR	16.00	16.00	PP	1B	
5-137	EVAPORATOR INLET HDR - FRNT	20.00	20.00	PP	1B	
5-147	FUR LWR REAR INLET HDR	20.00	20.00	PP	1B	
5-155	FUR LWR SIDE INLET HDRS	16.00	16.00	PP	1B	
<b>Total weight for PG-05</b>		<b>170.00</b>	<b>170.00</b>			
6-745	FUR REAR SPIRAL TO vert TRANSITION PANEL	16.00	16.00	PP	1B	
6-431	Front Upper Ww Panel Attachment	0.05	0.05	PP	1B	
6-731	FUR VERTICAL WALL PANELS - FRNT	63.00	63.00	PP	1B	

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6-732	FRONT WW PNL + ATT	58.00	58.00	PP	1B	
6-752	FUR LWR VERTICAL WALL PANELS - SIDE	130.00	130.00	PP	1B	
6-400	FUR BURNER PANELS	50.00	50.00	PP	1B	
6-441	Rear Upper WW Panel -OS	0.20	0.20	PP	1B	
6-444	Rear Intermediate WW Panel - OS	60.00	60.00	PP	1B	
6-447	Rear Lower WW Panel -OS	42.00	42.00	PP	1B	
6-451	Side Upper Ww Panel Attachment	0.20	0.20	PP	1B	
6-453	Side Intermediate WW Panel - OS	90.00	90.00	PP	1B	
6-500	FUR SOFA PANELS	25.00	25.00	PP	1B	
6-734	FUR UPPER FRNT SPIRAL PANEL	85.00	85.00	PP	1B	
6-735	FUR FRNT SPIRAL TO VERTICAL TRANS. PANEL	16.00	16.00	PP	1B	
6-741	FUR REAR ARCH PANELS	45.00	45.00	PP	1B	
6-747	FUR LWR RR SPRL PNL WITH I/T TERM TUBES	125.00	125.00	PP	1B	
6-751	FUR VERTICAL WALL PANELS - SIDE	90.00	90.00	PP	1B	
6-759	FUR SIDE SPIRAL TO VERT TRANSITION PANEL	25.00	25.00	PP	1B	
6-434	Front Intermediate WW Panel - OS	45.00	45.00	PP	1B	
6-753	FUR UPPER SIDE SPIRAL PANELS	160.00	160.00	PP	1B	
6-401	Burner Panel- OS	0.20	0.20	PP	1B	
6-501	Sofa Panels -OS	0.35	0.35	PP	1B	
6-515	Corner SOFA panels	25.00	25.00	PP	1B	
6-744	FUR UPPER REAR SPIRAL PANEL	85.00	85.00	PP	1B	
6-437	Front WW Lower Panel-OS	42.00	42.00	PP	1B	
6-455	Side Lower WW Panel -OS	20.00	20.00	PP	1B	
6-737	FUR LWR FRNT SPRL PNL WITH I/T TERM TUBE	110.00	110.00	PP	1B	
6-755	FUR LWR SIDE SPIRAL PANELS	62.00	62.00	PP	1B	
<b>Total weight for PG-06</b>		<b>1,470.00</b>	<b>1,470.00</b>			
7-509	MISC PR.PART COMPNTS	0.70	0.70	PP	1B	
7-405	WW SCR.HDR SUSPN.	29.00	29.00	PP	1B	
7-991	Welding Electrodes-Part-1	0.20	0.20	PP	1B	

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						billable in case of short supply of Particular material, modification, additional fabrication with proper record of issues and purpose of use
7-993	EREC MATLS, CONSUMES	1.00	1.00	PP	1B	
7-102	LINKS FROM SEPARATOR TO STORAGE TANK	40.00	40.00	PP	1B	
7-223	FUR SCREEN AND HANGER ASSEMBLY	90.00	90.00	PP	1B	
7-402	WW FRT HDR SUSPN	1.00	1.00	PP	1B	
7-403	WW SIDE HDR SUSPN	1.00	1.00	PP	1B	
7-502	Ww Front Header Suspns Shop Item	1.00	1.00	PP	1B	
7-503	Ww Side Header Suspension Shop Item	1.50	1.50	PP	1B	
7-505	Ww Screen Header Suspns Shop Item	1.20	1.20	PP	1B	
7-110	DOWNCOMER TO CONNECTING SPHERE	10.00	10.00	PP	1B	
7-331	Riser Tube Support DD Item	0.40	0.40	PP	1B	
7-393	Consumables & Erection Materials-DD	0.10	0.10	PP	1B	
7-531	Riser Tube Support Shop Item	2.10	2.10	PP	1B	
7-217	SCREEN RELIEF TUBES	1.00	1.00	PP	1B	
7-309	Furnace Wall Supports Front-DD	1.00	1.00	PP	1B	
7-315	FUR SIDE RISERS	50.00	50.00	PP	1B	
7-316	FUR REAR RISERS	29.00	29.00	PP	1B	
7-318	FUR FRNT RISERS	15.00	15.00	PP	1B	
7-409	Furnace wall Supports front	32.00	32.00	PP	1B	
7-461	Furnace wall Supports rear	30.00	30.00	PP	1B	
7-125	Connecting Sphere	4.00	4.00	PP	1B	
7-362	Furnace Wall Support Side L&R DD Item	0.70	0.70	PP	1B	
7-431	RISER TUBE SUPPORT	8.00	8.00	PP	1B	
7-462	Furnace wall Supports Sides L & R	30.00	30.00	PP	1B	
7-423	Furnace Screen Tubes Attachment	0.20	0.20	PP	1B	
7-992	Welding Electrodes			PP	1B	Consumables -Non billable

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						Item
7-231	FUR SPIRAL WALL OUTLET TERM TUBES	2.50	2.50	PP	1B	
7-232	FUR VERTICAL WALL INLET TERM TUBES	10.00	10.00	PP	1B	
7-360	Furnace Spiral Wall Support DD Item	0.10	0.10	PP	1B	
7-361	Furnace Wall Support Rear DD Item	1.00	1.00	PP	1B	
7-460	Furnace Spiral Wall supports Misc items	24.00	24.00	PP	1B	
7-883	FILLER PLATES -FURNACE WALLS	2.00	2.00	PP	1B	
7-560	Furnace Spiral Wall Support Shop Item	1.00	1.00	PP	1B	
<b>Total weight for PG-07</b>		<b>420.70</b>	<b>420.70</b>			
9-304	Seal Boxes For Furnace Openings-DD	0.50	0.50	PP	1B	
9-3	MATL FOR INST TAPPG	1.00	1.00	PP	1B	
9-4	SEAL BOX FURN OPENG	16.50	16.50	PP	1B	
9-5	SEAL BOX INST OPENG	4.00	4.00	PP	1B	
<b>Total weight for PG-09</b>		<b>22.00</b>	<b>22.00</b>			
10-191	SH FUR ROOF INLET HDR	13.40	13.40	PP	1B	
10-235	FUR ARCH SUPPPORT OUTLET HDR	16.20	16.20	PP	1B	
10-291	SH FUR ROOF OUTLET HDR	24.70	24.70	PP	1B	
10-174	FINISH SH INLET HDR	26.70	26.70	PP	1B	
10-178	SH PLATEN INLET HDR	23.40	23.40	PP	1B	
10-284	BP EXT FLOOR OUTLET HDR WITH TERM TUBES	13.50	13.50	PP	1B	
10-182	BP LWR REAR HDR	18.00	18.00	PP	1B	
10-183	BP UPPER SIDE INLET HDR	25.20	25.20	PP	1B	
10-135	FUR ARCH SUPPPORT INLET HDR	16.20	16.20	PP	1B	
10-185	BP LWR FRNT HDR	15.30	15.30	PP	1B	
10-276	SH PLATEN FRONT OUTLET HEADER(S-28)	20.70	20.70	PP	1B	
10-278	SH PLATEN OUTLET HDR	23.40	23.40	PP	1B	
10-176	SH PLATEN FRONT INLET HEADER(S-26)	20.10	20.10	PP	1B	
10-274	FINISH SH OUTLET HDR	63.00	63.00	PP	1B	
10-285	BP FRNT OUTLET HDR	27.00	27.00	PP	1B	
10-184	BP EXTENDED SIDE INLET	16.20	16.20	PP	1B	

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	HDR					
10-283	BP LWR SIDE HDRS	27.00	27.00	PP	1B	
<b>Total weight for PG-10</b>		<b>390.00</b>	<b>390.00</b>			
11-74	FINISH SH FRNT ASSY WITH I/T TERM & COT	376.00	376.00	PP	1B	
11-791	SH FUR ROOF FIN WELDED PANEL	43.00	43.00	PP	1B	
11-991	SH FUR ROOF TUBES	47.00	47.00	PP	1B	
11-378	SH PLATEN ASSY WITH TERM TUBES - RIGHT	280.00	280.00	PP	1B	
11-684	BP EXTENDED SIDE FIN WELDED PANEL	37.60	37.60	PP	1B	
11-78	SH PLATEN ASSY WITH TERM TUBES - LEFT	280.00	280.00	PP	1B	
11-716	BP UPPER REAR PANEL	32.90	32.90	PP	1B	
11-787	BP REAR ROOF PANELS	37.00	37.00	PP	1B	
11-987	SHSC RR ROOF PNL RT	37.00	37.00	PP	1B	
11-491	SH Radiant Roof Tubes (Left)-OS	0.10	0.10	PP	1B	
11-606	BP FRNT WALL PANELS	47.00	47.00	PP	1B	
11-916	SH REAR WALL PANELS UPPER (RIGHT)	32.90	32.90	PP	1B	
11-967	BP UPPER SIDE PANEL-RIGHT	37.60	37.60	PP	1B	
11-968	SH SIDE WALL PANELS INTER (REAR)	37.60	37.60	PP	1B	
11-467	SH Sc Side Pnl Upper Left Attachment	0.10	0.10	PP	1B	
11-487	BP LTRH Hanger Tube Attchment	2.50	2.50	PP	1B	
11-717	SH REAR WALL PANEL INTER(LEFT)	32.90	32.90	PP	1B	
11-767	BP UPPER SIDE PANEL-LEFT	37.60	37.60	PP	1B	
11-768	SH SIDE WALL PANELS INTER (FRONT)	37.60	37.60	PP	1B	
11-917	SH REAR WALL PANEL INTER (RIGHT)	32.90	32.90	PP	1B	
11-374	FINISH SH REAR ASSY WITH O/T TERM & COT	325.00	325.00	PP	1B	
11-406	SH Frnt Upper Pnl Attachment	0.30	0.30	PP	1B	
11-474	SH Vertical Spaced Coil Attachment	0.30	0.30	PP	1B	
11-608	BP FRNT WALL PANEL - LWR	37.60	37.60	PP	1B	
11-718	BP LWR REAR PANEL	32.90	32.90	PP	1B	

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11-769	BP LWR SIDE PANEL - LEFT	54.00	54.00	PP	1B	
11-918	SHSC RR WL PNL LR RT	32.90	32.90	PP	1B	
11-494	SH Extended Bottom Panels-OS	0.10	0.10	PP	1B	
11-694	BP EXTENDED SIDE FLOOR FIN WELDED PANEL	23.50	23.50	PP	1B	
11-469	SH Sw Panels Lower Front (L&R)-OS	0.10	0.10	PP	1B	
11-969	BP LWR SIDE PANEL - RIGHT	54.00	54.00	PP	1B	
<b>Total weight for PG-11</b>		<b>2,030.00</b>	<b>2,030.00</b>			
12-517	Suspn of R.Roof Headers Shop Item	1.00	1.00	PP	1B	
12-924	SUSPN-SH BAKPASS HDR	15.00	15.00	PP	1B	
12-944	SUSPN-SH PLATEN HDRS	3.00	3.00	PP	1B	
12-954	SUSP-VERT SPACD HDRS	11.00	11.00	PP	1B	
12-914	EXPN-SH RAD ROOF HDR	1.50	1.50	PP	1B	
12-948	SUSP-VERT SPACD ASSY	71.00	71.00	PP	1B	
12-991	Welding Electrodes-Part-1	0.50	0.50	PP	1B	
12-993	EREC MATLS, CONSUMES	6.00	6.00	PP	1B	billable in case of short supply of particular material ,modification, additional fabrication with proper record of issues and purpose of use
12-524	Suspension of SH Rear Wall Shop Item	2.50	2.50	PP	1B	
12-850	SH CONNECTING PIPE	30.00	30.00	PP	1B	
12-927	SUSPN OF REAR ROOF	18.00	18.00	PP	1B	
12-928	SUSPN - SH REAR WALL	23.00	23.00	PP	1B	
12-314	Suspn of SH R.Roof Headers DD Item	0.10	0.10	PP	1B	
12-324	Suspension of SH Rear Wall DD Items	0.10	0.10	PP	1B	
12-544	Suspn of Vert. Spaced Assy Shop Item	4.00	4.00	PP	1B	
12-554	Suspn of Vert. Spaced Assy Shop Item	4.00	4.00	PP	1B	
12-803	SH STEAM COOLED SPACER TUBES	1.50	1.50	PP	1B	
12-327	Suspension of SH Rear Wall DD Items	0.40	0.40	PP	1B	
12-368	RH Vert Platen Frnt Coil Left	0.95	0.95	PP	1B	

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	DD Item					
12-907	RAD&RR ROOF SUPPORTS	6.50	6.50	PP	1B	
12-917	SUSPN OF RADINT ROOF	11.00	11.00	PP	1B	
12-968	SUSPN OF PLATEN ASSY	45.00	45.00	PP	1B	
12-992	Welding Electrodes			PP	1B	Consumables - Non billable Item
12-405	SH Hanger Tube Attachment	4.00	4.00	PP	1B	
12-528	Suspension of SH Rear Wall Shop Item	0.15	0.15	PP	1B	
12-805	BP FRNT WALL SCREEN TUBES	56.00	56.00	PP	1B	
12-179	LINK TO FINISH SH INLET HDR	50.00	50.00	PP	1B	
12-900	SH DESUPERHEATER	7.00	7.00	PP	1B	
12-178	LINK TO SH DESUPERHEATER	37.00	37.00	PP	1B	
12-181	FUR ARCH SUPPORT LINKS	16.00	16.00	PP	1B	
12-393	SH Misc Components DD Item	0.20	0.20	PP	1B	
12-506	SH Spprt For Lines And Links Shop Item	1.20	1.20	PP	1B	
12-800	SH DESUP-STAGE II	6.00	6.00	PP	1B	
12-906	SH LINK SUPPORTS	3.00	3.00	PP	1B	
12-187	SH BYPASS PIPES	16.00	16.00	PP	1B	
12-306	SH Spprt For Lines And Links DD Item	0.10	0.10	PP	1B	
12-317	Suspn of R.Roof Headers DD Item	0.10	0.10	PP	1B	
12-328	Suspension of SH Rear Wall DD Items	0.30	0.30	PP	1B	
12-344	Suspn of Vert. Spaced Assy DD Item	0.05	0.05	PP	1B	
12-348	Suspn of Vert. Spaced Assy DD Item	0.25	0.25	PP	1B	
12-354	Suspn of Vert. Spaced Assy DD Item	0.05	0.05	PP	1B	
12-514	Suspn of SH R.Roof Hdrs Shop Item	3.00	3.00	PP	1B	
12-184	BP EXTENDED SIDE CONNECTION LINK	36.00	36.00	PP	1B	
12-852	LINKS TO SH PLATEN INLET HDR	38.00	38.00	PP	1B	
12-883	FILLER PLATE -BACK PASS	0.50	0.50	PP	1B	

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	PANEL					
12-903	SH MISCL COMPONENTS	7.00	7.00	PP	1B	
12-994	PORT IN FOR THK MSMT	0.05	0.05	PP	1B	
<b>Total weight for PG-12</b>		<b>538.00</b>	<b>538.00</b>			
15-136	LTRH INLET HDR	16.00	16.00	PP	1B	
15-178	FINISH RH INLET HDR	38.00	38.00	PP	1B	
15-278	FINISH RH OUTLET HDR	40.00	40.00	PP	1B	
15-236	LTRH OUTLET HDR	28.00	28.00	PP	1B	
<b>Total weight for PG-15</b>		<b>122.00</b>	<b>122.00</b>			
16-270	LTRH PENDANT ASSY WITH O/T TERM TUBES	180.00	180.00	PP	1B	
16-278	FINISH RH ASSEMBLY WITH TERMINAL TUBES	165.00	165.00	PP	1B	
16-379	RH VERPLN FR COIL RT	10.00	10.00	PP	1B	
16-201	LTRH UPPER ASSEMBLY	240.00	240.00	PP	1B	
16-202	LTRH INTERMEDIATE ASSEMBLY	655.00	655.00	PP	1B	
16-203	LTRH LWR ASSEMBLY WITH INLET TERM TUBES	295.00	295.00	PP	1B	
<b>Total weight for PG-16</b>		<b>1,545.00</b>	<b>1,545.00</b>			
17-476	RH V.S. Centre Cross Over Tube Attchmt	6.00	6.00	PP	1B	
17-919	RH FRONT SUSPENSION	24.00	24.00	PP	1B	
17-904	RH HDR SUPRT AB ROOF	10.00	10.00	PP	1B	
17-991	Welding Electrodes-Part-1	1.00	1.00	PP	1B	
17-992	Welding Electrodes			PP	1B	Consumables -Non billable Item
17-174	LINK TO RH DESUPERHEATER	90.00	90.00	PP	1B	
17-304	RH Sprrts For Lines And Links DD Item	0.10	0.10	PP	1B	
17-306	RH Suprt For Lines And Links DD Item	0.10	0.10	PP	1B	
17-319	RH Frnt Suspension DD Item	0.10	0.10	PP	1B	
17-504	RH Suprts For Lines And Links Shop Item	7.00	7.00	PP	1B	
17-506	RH Suprt For Lines And Links Shop Item	0.20	0.20	PP	1B	

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17-807	RH STM COOL SPACERS	0.10	0.10	PP	1B	
17-906	RH SUPRT LINES & LIN	2.00	2.00	PP	1B	
17-900	RH DESUPERHEATER	9.00	9.00	PP	1B	
17-903	RH MISCL COMPONENTS	89.10	89.10	PP	1B	
17-407	RH Sc Spacer Tube Attchment	0.10	0.10	PP	1B	
<b>Total weight for PG-17</b>		<b>238.80</b>	<b>238.80</b>			
18-2	1 PASS ROOF SKINCASG	0.15	0.15	PP	1B	
18-10	PR PARTS ATTACH-CASG	0.35	0.35	PP	1B	
18-1	FUR ROOF SKIN CASING	19.40	19.40	PP	1B	
18-701	Furnace Roof Skin Casing BOI Item	0.10	0.10	PP	1B	
<b>Total weight for PG-18</b>		<b>20.00</b>	<b>20.00</b>			
19-904	ECO HDR SUPT AB ROOF	55.00	55.00	PP	1B	
19-991	Welding Electrodes-Part-1	0.10	0.10	PP	1B	
19-507	Eco Feed Pipe Suspns Shop Item	13.00	13.00	PP	1B	
19-992	Welding Electrodes			PP	1B	Consumables -Non billable Item
19-402	Eco Hanger Tube Attachment	1.00	1.00	PP	1B	
19-702	ECO OUTLET HDR	35.00	35.00	PP	1B	
19-704	ECO II INLET HEADER	10.00	10.00	PP	1B	
19-802	ECO LWR HANGER TUBES	350.00	350.00	PP	1B	
19-804	ECO UPPER HANGER TERMINAL TUBES	36.00	36.00	PP	1B	
19-814	ECO UPPER ASSY - LEFT	200.00	200.00	PP	1B	
19-763	ECO JUNCTION HDR	11.00	11.00	PP	1B	
19-783	ECO JUNCTION HDR	11.00	11.00	PP	1B	
19-884	ECO INTER ASSY - LEFT	375.00	375.00	PP	1B	
19-753	ECO JUNCTION HDR	11.00	11.00	PP	1B	
19-701	ECO INLET HDR	30.00	30.00	PP	1B	
19-905	ECO HDR SUPT BL ROOF	0.40	0.40	PP	1B	
19-851	LINKS FROM ECO OUT. HDR TO ECO MIX LINE	185.00	185.00	PP	1B	
19-907	ECO,FEEDPIPE SUPPORT	15.00	15.00	PP	1B	
19-914	ECO UPPER ASSY - RIGHT	200.00	200.00	PP	1B	
19-793	ECO JUNCTION HDR	11.00	11.00	PP	1B	
19-903	ECO.MISCL COMP	150.00	150.00	PP	1B	
19-984	ECO INTER ASSY - RIGHT	375.00	375.00	PP	1B	
19-824	ECO LWR ASSY -LEFT	425.00	425.00	PP	1B	

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19-852	ECO MIXING LINE	40.00	40.00	PP	1B	
19-853	LINKS FROM ECO MIX LINE TO FURN I/T HDRS	50.00	50.00	PP	1B	
19-924	ECO LWR ASSY-RIGHT	425.00	425.00	PP	1B	
19-92	ECO OUTLET TERM TUBES	25.20	25.20	PP	1B	
19-306	Eco Supports For Line & Links DD Item	0.10	0.10	PP	1B	
19-506	Eco Supports For Line & Links Shop Item	30.00	30.00	PP	1B	
19-906	ECO LINE&LINK SUPORT	30.00	30.00	PP	1B	
19-307	Eco Feed Pipe Suspnn DD Item	0.10	0.10	PP	1B	
19-850	ECO INLET LINKS	100.00	100.00	PP	1B	
<b>Total weight for PG-19</b>		<b>3,199.90</b>	<b>3,199.90</b>			
20-962	TR PROBE DUP PT&AC	2.03	2.03	PP	1B	
20-204	WALL BOX NPR-RW5E	4.37	4.37	PP	1B	
20-54	WALL BOX NPR LRSB MI	1.58	1.58	PP	1B	
20-201	WALL DESLAGGER RW5E	30.69	30.69	PP	1B	
20-794	WALL BOX NPR FOR TP	0.06	0.06	PP	1B	
20-988	SB COMMG SPARES			PP	1B	Non billable Item
20-998	SPL TOOLS FOR SB	0.01	0.01	PP	1B	
20-51	LONG RETRACT SB M11E	94.35	94.35	PP	1B	
20-511	DA HEAD VALVE ASSY	0.23	0.23	PP	1B	
<b>Total weight for PG-20</b>		<b>133.31</b>	<b>133.31</b>			
21-606	SB Piping Supports - BOI Items	0.00	0.00	PP	1B	
21-600	S.B. PPG & FITTINGS	24.72	24.72	PP	1B	
21-800	SB VALVES (BHEL)	3.98	3.98	PP	1B	
21-603	Sb Piping - BOI Items	0.02	0.02	PP	1B	
21-601	S.B PIPING SUPPORTS	2.17	2.17	PP	1B	
21-602	Sb Piping - DD Items	2.52	2.52	PP	1B	
21-604	SB Piping Supports - OS items	8.68	8.68	PP	1B	
21-605	SB Piping Supports - DD Items	0.01	0.01	PP	1B	
21-850	SB SAFETY VALVE BHEL	0.05	0.05	PP	1B	
21-825	SB VALVES (SUBDELY)	0.88	0.88	PP	1B	
21-700	BULKED BPS COMP	0.52	0.52	PP	1B	
21-992	WELDING ELECTRODES			PP	1B	Consumables -Non billable Item

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21-987	COMMG SPARES SB SV	0.00	0.00	PP	1B	
21-988	COMMG SPARES-SD			PP	1B	Non billable Item
<b>Total weight for PG-21</b>		<b>43.56</b>	<b>43.56</b>			
24-836	Start-Up Vent, Diffuser, Sil Supp-OS	4.50	4.50	PP	1B	
24-837	Start-Up Vent, Diffuser, Sil Supp-DD	0.01	0.01	PP	1B	
24-885	SILENCERS(BHEL)	87.40	87.40	PP	1B	
24-825	SILENCER SUPPORTS	0.06	0.06	PP	1B	
24-826	Silencer Supp - OS Items	29.90	29.90	PP	1B	
24-835	STARTUP VENT DIFFUSER SILEN SUP	0.88	0.88	PP	1B	
24-881	SAFETY VALVES AND ERV(BHEL) SD	1.55	1.55	PP	1B	
24-805	LINK TO BOILER RECIRCU SYSTEM	39.80	39.80	PP	1B	
24-810	H and S FOR STARTUP SYSTEM	21.30	21.30	PP	1B	
24-700	BULKED BPS COMP	0.49	0.49	PP	1B	
24-880	SAFETY VALVES	4.90	4.90	PP	1B	
24-993	CONSUME & EREC MATLS	0.88	0.88	PP	1B	Billable In actual issued qty with proper reason of issue and use.
24-806	MIXING VESSEL	6.47	6.47	PP	1B	
24-807	RECIRCU PUMP SUCTION LINE	39.00	39.00	PP	1B	
24-808	RECIRCU PUMP DISCHARGE LINE	14.36	14.36	PP	1B	
24-809	BOILR RECIR LINK FROM BF LINE	15.86	15.86	PP	1B	
24-811	Fur Link to Flash tank HWL1&2	97.00	97.00	PP	1B	
24-350	BLR FILLING PIPING	2.86	2.86	PP	1B	
24-352	Boiler Fill Piping - DD Items	0.17	0.17	PP	1B	
24-351	H&S BLR FILLING PPG	0.05	0.05	PP	1B	
24-353	H&S For Boiler Fill Piping - OS Items	1.00	1.00	PP	1B	
24-354	BOI Items for Blr Trim Piping	0.00	0.00	PP	1B	
24-800	BOILER TRIM PIPING	61.40	61.40	PP	1B	
24-801	SUPPORTS-TRIM PIPING	5.22	5.22	PP	1B	

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24-803	Boiler Trim Piping - DD Items	0.41	0.41	PP	1B	
24-804	Supports - Blr Trim Piping - OS Items	35.97	35.97	PP	1B	
24-813	Supports - Blr Trim Piping - DD Items	0.01	0.01	PP	1B	
24-992	WELDING ELECTRODES-TRIM PPG			PP	1B	Consumables - Non billable Item
24-817	H&S For Start-Up System - OS Items	11.90	11.90	PP	1B	
24-818	H&S For Start-Up System - DD Items	0.21	0.21	PP	1B	
24-855	RECIRCULATING PUMB COMP	19.72	19.72	PP	1B	
24-860	VALVES (BHEL)	79.00	79.00	PP	1B	
24-822	De-Superheater Pipes - OS Items	0.23	0.23	PP	1B	
24-824	Exhaust Pipe For Sv - OS Items	7.48	7.48	PP	1B	
24-842	Sample Cooler and Suprts-DD items	0.01	0.01	PP	1B	
24-865	CTL VALVES FOR SPRAY PIPING SD	14.67	14.67	PP	1B	
24-867	CTL VAL FOR STARTUP RECIRCU SYS	12.38	12.38	PP	1B	
24-815	SPRAY WATER SYSTEM	27.58	27.58	PP	1B	
24-820	EXHAUS PIPE SAFETY VLV	63.05	63.05	PP	1B	
24-821	SAFETY VAL PIPE & DRAIN-IMPORT	9.49	9.49	PP	1B	
24-823	De-Superheater Pipes - DD Items	0.10	0.10	PP	1B	
24-827	Exhaust Pipe For Sv - DD Items	0.87	0.87	PP	1B	
24-828	Exhaust Pipe For Sv - BOI Items	0.01	0.01	PP	1B	
24-840	SAMPLE COOLER AND SUPPORTS	0.96	0.96	PP	1B	
24-841	Sample Cooler & Supports - OS Items	0.17	0.17	PP	1B	
24-883	Safety Valves (Bhel) - Non HT	4.90	4.90	PP	1B	
24-950	SPECIAL TOOLS	0.16	0.16	PP	1B	
24-987	BHEL-SV/ERV COMG SPARES	0.00	0.00	PP	1B	
24-989	BHEL VALVE COMG SPAR	0.04	0.04	PP	1B	
24-960	LAP TOOL-CON VAL(BHEL)	0.03	0.03	PP	1B	
24-955	LAP TOOL SV&ERV	0.04	0.04	PP	1B	

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24-988	COMMG SPARES/SD			PP	1B	Non billable Item
24-994	NAME PLATES	0.27	0.27	PP	1B	
<b>Total weight for PG-24</b>		<b>724.72</b>	<b>724.72</b>			
42-5	INSTRUMENT FITTINGS	0.40	0.40	PP	1B	
42-30	Hfo Heater Set	41.00	41.00	PP	1B	
42-158	Piping,Opr'G Floor Steam-Ibr	4.50	4.50	PP	1B	
42-150	Piping, Operating Floor Hfo & Tracer	4.60	4.60	PP	1B	
42-200	SUB.DEL FO SYSTEM	3.50	3.50	PP	1B	
42-120	PIPING,PH FUEL OIL	3.50	3.50	PP	1B	
42-988	O&G SYS COMMG SPARE			PP	1B	Non billable Item
42-992	IMPORTED ELECTRODES			PP	1B	Consumables -Non billable Item
42-700	BULKED BPS COMPONENT	1.00	1.00	PP	1B	
42-65	DRAIN OIL TANK	5.60	5.60	PP	1B	
42-10	LFO PUMP SET	10.00	10.00	PP	1B	
42-20	Hfo Pump Set	17.50	17.50	PP	1B	
42-157	PIPING,OP.FLR AIR	0.02	0.02	PP	1B	
42-300	BHEL VALVE F.O. SYS	2.70	2.70	PP	1B	
42-358	Bhel Valve,Opr'G Floor Stm-Ibr	0.65	0.65	PP	1B	
42-46	DO PUMP-MOTOR ASSY	0.30	0.30	PP	1B	
42-152	PIPING,OP.FLR LFO	0.80	0.80	PP	1B	
42-2	STEAM BLOW MATERIALS	2.20	2.20	PP	1B	
42-1	PNEUMATIC FITTINGS	0.25	0.25	PP	1B	
42-70	BURNER STN SKID ASLY	6.80	6.80	PP	1B	
42-128	Piping,Pump House Steam - Ibr	0.70	0.70	PP	1B	
42-154	PIPING,OP.FLR DO	0.50	0.50	PP	1B	
42-710	Fuel Oil System - DD Items	4.00	4.00	PP	1B	
42-858	Fuel Oil System - Shop items	21.00	21.00	PP	1B	
42-997	OILSYS-MANDTRY SPARE			PP	1B	Non billable Item (Spares)
<b>Total weight for PG-42</b>		<b>131.52</b>	<b>131.52</b>			

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45-801	WINDBOX AND SOFA TUBE ATTACH	42.00	42.00	PP	1B	
45-802	WINDBOX ASSEMBLY - 32" WIDTH	200.00	200.00	PP	1B	
45-710	Wind Box & SOFA Assembly - DD items	0.10	0.10	PP	1B	
45-804	WINDBOX - SOFA ASSEMBLY	27.20	27.20	PP	1B	
45-805	WINDBOX SUPPT AIR CYL MOUNTG	30.00	30.00	PP	1B	
45-858	Wind Box & SOFA Assy - Shop items	40.00	40.00	PP	1B	
45-806	WINDBOX ASSEMBLY - CORNER SOFA	26.40	26.40	PP	1B	
45-200	Windbox - Sub Delivery	4.00	4.00	PP	1B	
45-997	COAL BR-MANDTRY SPAR			PP	1B	Non billable Item (Spares)
<b>Total weight for PG-45</b>		<b>369.70</b>	<b>369.70</b>			
95-88	FSSS FLAME SCANNER	0.55	0.55	PP	1B	
<b>Total weight for PG-08</b>		<b>0.55</b>	<b>0.55</b>			
97-297	MTM CLAMPS & PADS	0.30	0.30	PP	1B	
97-284	FIELD GAUGES	0.40	0.40	PP	1B	
97-298	MTM Thermocouples & Junction Boxes	8.00	8.00	PP	1B	
97-282	FLOWMETERS	2.60	2.60	PP	1B	
97-599	PNEU.ACTUR A&FG SYS	3.50	3.50	PP	1B	
<b>Total weight for PG-97</b>		<b>14.80</b>	<b>14.80</b>			
	Deaerator	206.5	206.5	PP	1B	
<b>Total weight for Deaerator</b>		<b>206.50</b>	<b>206.50</b>			
81-036	CW STORAGE TANK 16-25 CUM	7.60	7.60	PP	1B	
81-xxx	Special tanks and vessels	60.00	60.00	PP	1B	
80-370	HP DRAIN FLASH TANK VENT TO ATMOSPHERE	102.00	102.00	PP	1B	
<b>Total weight Tanks</b>		<b>169.60</b>	<b>169.60</b>			
<b>Ammonia Handling system of SCR</b>		<b>500</b>		PP	1B	
<b>Total Weight PP</b>		<b>12,580.66</b>	<b>12,080.66</b>			
<b>NON-PRESSURE PARTS</b>						
28-220	DOORS	14.20	14.20	NPP	1C	
28-700	BPS FASTENERS	1.65	1.65	NPP	1C	

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<b>Total weight for PG-28</b>		<b>15.85</b>	<b>15.85</b>			
29-200	SCR System	3500	3500	NPP	1C	
<b>Total weight for PG-29</b>		<b>3,500.00</b>	<b>3,500.00</b>			
30-224	Antivibration Baffles	32.00	32.00	NPP	1C	
30-211	FUR REAR ARCH ENCL	6.20	6.20	NPP	1C	
30-235	ENCL SUPPORT STEEL	73.00	73.00	NPP	1C	
30-223	GAS DIST BAFFLES	0.55	0.55	NPP	1C	
30-234	2ND PASS DECK SPRT	70.00	70.00	NPP	1C	
30-219	VERT ROOF ENCL	140.00	140.00	NPP	1C	
30-105	FUR BOTTOM ENCL FRAM	62.00	62.00	NPP	1C	
30-215	MAIN BOILER ENCL	38.50	38.50	NPP	1C	
30-233	IST PASS DECK SPRT	80.00	80.00	NPP	1C	
<b>Total weight for PG-30</b>		<b>502.25</b>	<b>502.25</b>			
41-350	ACOIL GUN ASSY	0.70	0.70	NPP	1C	
41-390	OIL GUN VICE&RACK	1.25	1.25	NPP	1C	
41-997	OIL BR-MANDTRY SPARE			NPP	1C	Non billable Item (Spares)
41-500	HEA IGNITOR	1.00	1.00	NPP	1C	
41-710	Oil Gun Assembly - DD items	0.01	0.01	NPP	1C	
41-988	O&G BURN COMMG SPARE			NPP	1C	Non billable Item
<b>Total weight for PG-41</b>		<b>2.96</b>	<b>2.96</b>			
43-4	ASSY SCNR&GUN AIR SY	6.00	6.00	NPP	1C	
43-710	Seal Air & Scanner Air System - DD items	0.30	0.30	NPP	1C	
43-5	ASSY MILL AIR SYSTEM	28.00	28.00	NPP	1C	
43-104	M/C SCNR&GUN AIR SYS	20.00	20.00	NPP	1C	
43-200	SUBDEL,IGNR,SCNR AIR	14.00	14.00	NPP	1C	
43-997	Seal / Scanner Air Mand. Spares			NPP	1C	Non billable Item (Spares)
43-105	M/C MILL AIR SYSTEM	92.00	92.00	NPP	1C	
<b>Total weight for PG-43</b>		<b>160.30</b>	<b>160.30</b>			
47-283	FUEL PIPE MISC ITEMS	50.00	50.00	NPP	1C	
47-289	ST PIPE SHOP BEND REST OF MILL	1160.00	1160.00	NPP	1C	
47-858	Fuel Piping - Shop items	35.00	35.00	NPP	1C	

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47-281	FUEL PIPE SUPPORTS	50.00	50.00	NPP	1C	
47-200	Fuel Piping - Sub-delivery	38.00	38.00	NPP	1C	
47-710	Pulverised Fuel Piping - DD items	5.00	5.00	NPP	1C	
47-997	Coal Piping Mand. Spares			NPP	1C	Non billable Item (Spares)
<b>Total weight for PG-47</b>		<b>1,338.00</b>	<b>1,338.00</b>			
48-19	AIRDUCT SUP FDN MATL	6.30	6.30	NPP	1C	
48-386	DUCT - ECO TO ECO HOPPER	262.50	262.50	NPP	1C	
48-915	Man Hole Doors (450X450)	15.60	15.60	NPP	1C	
48-202	DUCT - AH-WIND BOX	283.50	283.50	NPP	1C	
48-207	FLOWMTR-SEC AIRFLOW	36.75	36.75	NPP	1C	
48-208	DUCT-SEC.AIR TO WB	157.50	157.50	NPP	1C	
48-206	CLH/VLH -Hot Air	21.00	21.00	NPP	1C	
48-212	DUCT - WIND BOX CONN	136.50	136.50	NPP	1C	
48-214	EXPJT - WIND BOX CONN	15.75	15.75	NPP	1C	
48-224	EXPN PCS AH-HOT AIR BUS	21.00	21.00	NPP	1C	
48-12	DUCT - -FDFAN TO A.H	190.00	190.00	NPP	1C	
48-14	EXP.JT - -FDFAN TO A.H	10.00	10.00	NPP	1C	
48-15	SUPPORT-FDFAN TO A.H	26.25	26.25	NPP	1C	
48-482	DUCT - ESP TO ID FAN	420.00	420.00	NPP	1C	
48-485	SUPPORT - ESP TO ID FAN	52.50	52.50	NPP	1C	
48-494	EXPNJT - IDFAN-CHIMNY	26.25	26.25	NPP	1C	
48-700	BULKED BPS COMPONENT	8.40	8.40	NPP	1C	
48-205	SUPORT AH-WIND BOX	52.50	52.50	NPP	1C	
48-484	EXPNJT - ESP TO ID FAN	31.50	31.50	NPP	1C	
48-912	Slide Brg Pl-Id Sys	2.10	2.10	NPP	1C	
48-993	ERECTON-MATERIALS	52.50	52.50	NPP	1C	Billable In actual issued qty with proper reason of issue and use.
48-225	SUPPORT AH-HOT AIR BUS	31.50	31.50	NPP	1C	
48-384	EXPNJT - ECO-HOPPER	60.90	60.90	NPP	1C	
48-222	SQ DUCT AH-HOT AIR BUS	210.00	210.00	NPP	1C	
48-262	Rect Duct Aihtr Toprinozzle And Seca	183.75	183.75	NPP	1C	
48-432	DUCT - AH-BLROUTFL	210.00	210.00	NPP	1C	

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48-434	EXPJT - AH-BLROUTFL	10.50	10.50	NPP	1C	
48-435	SUPORT AH-BLROUTFL	36.75	36.75	NPP	1C	
48-492	DUCT - IDFAN-CHIMNY	315.00	315.00	NPP	1C	
48-495	SUPORT IDFAN-CHIMNEY	52.50	52.50	NPP	1C	
48-498	DUCT - ,ID FAN-CHIM,	470.00	470.00	NPP	1C	
48-265	Supports Aihtr Toprinozzle And Seca	31.50	31.50	NPP	1C	
48-662	CIRCULAR DUCT HOT BUS MILLS	157.50	157.50	NPP	1C	
48-664	EXPN PCS HOT BUS MILLS	21.00	21.00	NPP	1C	
48-665	SUPPORTS HOT BUS MILLS	31.50	31.50	NPP	1C	
48-667	FLOW METER	26.25	26.25	NPP	1C	
48-18	MISC. DUCT&SPRT MATL	63.00	63.00	NPP	1C	
48-204	EXPJT - AH-WIND BOX	53.55	53.55	NPP	1C	
48-264	Expn Piece Aihtr Toprinozzle and Seca	26.25	26.25	NPP	1C	
48-267	FLOW METER- SOFA	5.25	5.25	NPP	1C	
48-362	SQ DUCT-OVERFIREAIR	105.00	105.00	NPP	1C	
48-364	EXPNPCS OVERFIREAIR	15.75	15.75	NPP	1C	
48-365	SUPPORT OVERFIREAIR	21.00	21.00	NPP	1C	
48-372	DUCT - ECO HOPPER TO AH	40.95	40.95	NPP	1C	
48-382	DUCT - ECO-HOPPER	264.60	264.60	NPP	1C	
48-385	SUPPORT - ECO-HOPPER	94.50	94.50	NPP	1C	
48-395	CLH/VLH-FLUE GAS	15.75	15.75	NPP	1C	
48-464	EXPJT - BLROUTFL-EP	59.85	59.85	NPP	1C	
48-465	SUPORT BLR OUTFL-EP	78.75	78.75	NPP	1C	
48-911	Slide Brg Pl & Pac Bellow-Blr	2.10	2.10	NPP	1C	
48-200	INS TAPPINGS ON DUCT	8.40	8.40	NPP	1C	
48-462	DUCT - BLROUTFL-EP	656.25	656.25	NPP	1C	
48-342	SCR Inlet Ducting	315.00	315.00	NPP	1C	
48-354	EXPJNT-SCR outlet ducting	15.75	15.75	NPP	1C	
48-344	EXPJNT-SCR inlet ducting	15.75	15.75	NPP	1C	
48-345	Supports-SCR Inlet ducting	21.00	21.00	NPP	1C	
48-352	SCR outlet ducting	315.00	315.00	NPP	1C	
48-355	Supports-SCR outlet ducting	21.00	21.00	NPP	1C	
48-114	EXP.JT - -PAFAN-PRI-AH	6.30	6.30	NPP	1C	
48-141	SEAL AIR HAG&ID GATE	9.45	9.45	NPP	1C	
48-142	DUCT - -COLDAIRBUS	136.50	136.50	NPP	1C	
48-144	EXP.JT - -COLDAIRBUS	10.50	10.50	NPP	1C	

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48-145	SUPPORT-COLDAIRBUS	15.75	15.75	NPP	1C	
48-115	SUPPORT-PAFAN-PRI-AH	31.50	31.50	NPP	1C	
48-235	SUPORT HOT AIR BUS	21.00	21.00	NPP	1C	
48-112	DUCT - -PAFAN-PRI-AH	262.00	262.00	NPP	1C	
48-232	DUCT - HOT AIR BUS	105.00	105.00	NPP	1C	
48-234	EXPJT - HOT AIR BUS	10.50	10.50	NPP	1C	
<b>Total weight for PG-48</b>		<b>6,500.00</b>	<b>6,500.00</b>			
<b>DATE,DAMPER AND ACTUATORS</b>						
57010	GATE-FD FAN OUTLET	35	35	NPP	1C	
57033	DAMPER-SA SCAPH INLET	18.8	18.8	NPP	1C	
57063	DAMPER-SA SCAPH OUTLET	21	21	NPP	1C	
57083	DAMPER-SA SCAPH BYPASS	21	21	NPP	1C	
57110	GATE-PA FAN OUTLET	25.6	25.6	NPP	1C	
57113	DAMPER-PA FAN OUTLET	15.1	15.1	NPP	1C	
57141	SEAL AIR HAG AND ID FAN OUTGAT	30	30	NPP	1C	
57143	DAMPER-COLD AIR TO MILL	8.85	8.85	NPP	1C	
57160	GATE-COLD AIR TO MILLS	20.9	20.9	NPP	1C	
57173	DAMPER-PA APH INLET	13.25	13.25	NPP	1C	
57203	DAMPER-SA APH OUTLET	40.75	40.75	NPP	1C	
57209	MTG BKT FOR CL DAMPER AIR CYL	5.2	5.2	NPP	1C	
57223	DAMPER-PA APH OUTLET	19.1	19.1	NPP	1C	
57270	GATE-HOT AIR TO MILLS	32.8	32.8	NPP	1C	
57273	DAMPER-HOT AIR TO MILL	15.25	15.25	NPP	1C	
57430	FLUE GAS AH OUT GATE	89.8	89.8	NPP	1C	
57460	GATE-ESP INLET	93.4	93.4	NPP	1C	
57466	PLATFORMS AND LADDERS	77.58	77.58	NPP	1C	Platforms of installed gate/actuaer and dampers are in scope of agency
57577	ELECT ACTUATOR FOR	66	66	NPP	1C	Actuators

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	GATE,DAMPER					of installed gates /dampers only in scope of agency
57578	ELECTRICAL ITEMS FOR GATE,DAMP	0.07	0.07	NPP	1C	
57620	GATE-SCR BYPASS	117	117	NPP	1C	
57988	DUCTS COMMISSIONING SPARES	0.05	0.05	NPP	1C	
<b>Sub Total GATE AND DAMPERS</b>		<b>766.5</b>	<b>766.5</b>			
95-489	COAL FLOW MONITER	0.25	0.25	NPP	1C	
<b>Total weight for PG-95</b>		<b>0.25</b>	<b>0.25</b>			
96-588	ELECT.ACTUATOR-A&FG	0.50	0.50	NPP	1C	
<b>Total weight for PG-96</b>		<b>0.50</b>	<b>0.50</b>			
99-501	QUICK ERECT SCAFFOLD			NPP	1C	Non billable Item
99-514	FURN CRADL-4WALC			NPP	1C	Non billable Item
99-99	MISC CHAIN PULLY BLO			NPP	1C	Non billable Item
<b>Total weight for PG-99</b>			<b>0.00</b>			
<b>Total Weight NPP</b>		<b>12,786.61</b>	<b>12,786.61</b>			
<b>INSULATIONS (WOOL MATRESS)</b>						
33-21	BLR PP MINRL WOOL	905.00	905.00	Insulations	3A	
33-221	DUCT MINERAL WOOL	1212.50	1212.50	Insulations	3A	
55-919	AXIAL FD FAN INSULATION WOOL	20.40	20.40	Insulations	3A	
55-939	AXIAL PA FAN INSULATION WOOL	14.00	14.00	Insulations	3A	
<b>Total weight for (Miniral wool)</b>		<b>2,151.90</b>	<b>2,151.90</b>			
<b>INSULATIONS (Porable and castable)</b>						
33-210	MAIN BLR CAST REF GR	180.00	180.00	Insulations	3B	

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33-230	MAIN BLR POUR INSUL	90.00	90.00	Insulations	3B	
PEM Supply		25	25	Insulations	3B	
Total weight for (Pourable and castable Refractory)		295.00	295.00			
<b>INSULATIONS (Iron Parts)</b>						
31-10	COMPS WELDED TO PR	1.70	1.70	Insulations	3C	
31-104	FUR REAR ARCH SKIN	3.20	3.20	Insulations	3C	
32-10	FICOM BLR PP INSUL	5.10	5.10	Insulations	3C	
32-210	FIX COMP-DUCT INSULN	104.50	104.50	Insulations	3C	
33-970	MISC EQPTS EXP METAL	18.00	18.00	Insulations	3C	
33-975	MISC EQPTS SEAL COMP	0.50	0.50	Insulations	3C	
33-924	MISC EQPTS PCK MATLS	0.40	0.40	Insulations	3C	
37-10	BLR OUTER CSG COMPS	48.00	48.00	Insulations	3C	
37-810	BLR OUTER CASING	66.70	66.70	Insulations	3C	
Total weight for PG-37		248.10	248.10			
<b>INSULATIONS (Aluminium Cladding sheets)</b>						
32-700	BULKED DD COMPONENT	107.50	107.50	Insulations	3D	
32-810	EQUIPMENT OUTER CASING	340.00	340.00	Insulations	3D	
Total weight forinsulation (Al Cladding Sheets)		447.50	447.50			
Total Weight Insulation		3,142.50	3,142.50			
<b>ROTARY MACHINES (Fans - FD+PA+ID+Seal air fans)</b>						
55-000	AXL FAN TOOL & FIXTU			RM	1D	Non billable Item
55-011	FD FAN FOUNDATION MATL	1.80	1.80	RM	1D	
55-017	FD FAN C&I ITEMS	0.04	0.04	RM	1D	
55-021	AXL IDFAN FDN MATL	4.00	4.00	RM	1D	

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55-024	ID SEALING/COOLING FANS	3.00	3.00	RM	1D	
55-027	ID FAN C&I ITEMS	0.06	0.06	RM	1D	
55-031	PA FAN FOUNDATION MATL	1.40	1.40	RM	1D	
55-037	PA FAN C&I ITEMS	0.10	0.10	RM	1D	
55-091	FISRT FILL LUBRICANTS	4.00	4.00	RM	1D	
55-216	AXIAL FD FAN ROTOR	7.00	7.00	RM	1D	
55-328	AXIAL 2 REACTION ID FAN ROTOR	48.50	48.50	RM	1D	
55-335	AXIAL 2 REACTION PA FAN ROTOR	7.60	7.60	RM	1D	
55-516	AXIAL FD FAN STATOR	41.50	41.50	RM	1D	
55-628	AXIALID FAN COUPLING	117.00	117.00	RM	1D	
55-635	AXIALPA FAN STATOR	23.00	23.00	RM	1D	
55-810	AXL FD FAN COUPLING	1.20	1.20	RM	1D	
55-820	AXIAL ID FAN COUPLING	8.00	8.00	RM	1D	
55-830	AXIAL PA FAN COUPLING	1.40	1.40	RM	1D	
55-910	AXIAL fd FAN LUBE OIL SYSTEM	3.00	3.00	RM	1D	
55-911	AXIAL FD FAN SILENCER	67.50	67.50	RM	1D	
55-920	AXIAL ID FAN LUBE OIL SYSTEM	7.00	7.00	RM	1D	
55-930	AXIAL PA FAN LUBE OIL SYSTEM	4.00	4.00	RM	1D	
55-931	PA FAN SILENCE	56.00	56.00	RM	1D	
56-077	SEAL AIR FAN C & I ITEMS	0.02	0.02	RM	1D	
56-161	RADIAL PENT HOUSE VENTILATION FAN	1.20	1.20	RM	1D	
56-173	RADIAL SEAL AIR FAN ROTOR	1.65	1.65	RM	1D	
56-373	RADIAL SEAL AIR FAN BEARINGS	0.31	0.31	RM	1D	
56-473	RADIAL SEAL AIR FAN STATOR	7.60	7.60	RM	1D	
56-670	RADIAL SEAL AIR FAN MOTOR	2.30	2.30	RM	1D	
56-870	SEAL AIR FAN COUPLING(RADIAL)	0.09	0.09	RM	1D	
	FD FAN MOTOR	33.00	33.00	RM	1D	
	PA FAN MOTOR	32.00	32.00	RM	1D	
	ID FAN MOTOR			RM	1D	
<b>Total weight of Fans</b>		<b>485.27</b>	<b>485.27</b>			
65-997	FEEDER MAN.SPARE			RM	1D	Non billable Item

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						(Spares)
65-200	Coal Feeder- Sub-Delivey	1.00	1.00	RM	1D	
65-736	36GRAVIMETRIC FEEDER	63.00	63.00	RM	1D	
65-710	Coal Feeder - DD items	0.20	0.20	RM	1D	
<b>Total weight for PG-65</b>		<b>64.20</b>	<b>64.20</b>			
67-997	Fdr Isolation gate mand spares			RM	1D	Non billable Item (Spares)
67-801	DOWN SPOUT	9.50	9.50	RM	1D	
67-802	BUNKER EMPTYINGCHUTE	26.00	26.00	RM	1D	
67-803	FEED PIPE TO MILL	23.00	23.00	RM	1D	
67-200	Coal Feeding System- Sub dely.	1.00	1.00	RM	1D	
67-204	RAW COAL GATES	4.20	4.20	RM	1D	
67-276	FEEDER INLET GATE- 36" CHAIN	8.60	8.60	RM	1D	
67-283	FEEDER OUTLET ISOLATION GATE	12.50	12.50	RM	1D	
67-272	BUNKER OUTLET GATE -36" MOTOR	9.40	9.40	RM	1D	
67-710	Coal Feeding System - DD items	0.50	0.50	RM	1D	
<b>Total weight for PG-67</b>		<b>94.70</b>	<b>94.70</b>			
95-488	FEEDER MOUNTED C&IEQ	2.50	2.50	RM	1D	
95-988	FF CONT COMMG SPARE			RM	1D	Non billable Item
95-487	GRA.FDR.ELEC.PACKAGE	0.05	0.05	RM	1D	
95-485	GRAVI.FDR.REMOTE.CAB	3.00	3.00	RM	1D	
<b>Total weight for PG-95</b>		<b>5.55</b>	<b>5.55</b>			
99-100	FAN HANDLING EQUIPT	14.50	14.50	RM	1D	
99-400	SCAPH,RAPH HANDLG EQ	5.00	5.00	RM	1D	
99-300	PUMP HANDLING EQUIPT	3.70	3.70	RM	1D	
99-600	FO SYSTEM HANDLG EQU	1.00	1.00	RM	1D	
	MILL HANDLING EQUIPMENTS	50.00	50.00	RM		
<b>Total weight for PG-99</b>		<b>74.20</b>	<b>74.20</b>			
61-010	JOURNAL ASSEMBLY	155.52	155.52	RM	1D	
	JOURNAL HEAD ASSY	92.88	92.88	RM	1D	
61-110	PLANETARY GEAR BOX	135	135	RM	1D	
	BOWL & BOWL HUB ASSY	176.4	176.4	RM	1D	

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61-210	MILL SIDE ASSEMBLY	178.47	178.47	RM	1D	
61-310	SEPARATOR BODY ASSEMBLY WITH TRUNNION SHAFTS & JOURNAL OPENING COVER	266.85	266.85	RM	1D	
	SEPARATOR TOP ASSEMBLY	42.66	42.66	RM	1D	
61-410	MDV ASSEMBLY (KNIFE GATVE VALVES)	18	18	RM	1D	
61-310	DYNAMIC CLASSIFIER COMPLETE	106.2	106.2	RM	1D	
	Base plates and foundation bolts	15	15	RM	1D	
	Motors	67.95	67.95	RM	1D	
<b>Total weight for PG-61</b>		<b>1,254.93</b>	<b>1,254.93</b>			
50510		20	20	RM	2A	
52-000				RM	2A	Non billable Item
52-010	LARG AH-ROTOR ASSY	1857.5	1857.5	RM	2A	
52-011	LARG AH-ROTOR POST	66.8	66.8	RM	2A	
52-012	LARG AH-ROTORPINRACK	9.75	9.75	RM	2A	
52-013	LARG AH-ROTORSEALS	20	20	RM	2A	
52-030	LARG AH-ROTORHOUSING	88	88	RM	2A	
52-041	HOT END CONN PLATE	157	157	RM	2A	
52-042	COLD END CONN PLATE	324.7	324.7	RM	2A	
52-054	LARG AH-AXIAL SEAL	1.46	1.46	RM	2A	
52-055	LARG AH-BY PASS SEAL	2.1	2.1	RM	2A	
52-100	LARGE AH ROTOR DRIVE	15.5	15.5	RM	2A	
52-101	LARG AH-AUX ROTDRIVE	10.46	10.46	RM	2A	
52-211	LARG AH-AIRSEAL PIPE	1	1	RM	2A	
52-220	LARG AH-GENS DETAILS	3.5	3.5	RM	2A	
52-261	LARG AH-GUIDE BEARNG	9	9	RM	2A	
52-262	LARG AH-SUPRT BEARNG	25	25	RM	2A	
52-271	OIL PIPING GUIDE BRG	0.7	0.7	RM	2A	
52-272	OIL PIPING SUPRT BRG	0.7	0.7	RM	2A	
52-274	LUB OIL CIRCULATION UNIT	1.4	1.4	RM	2A	
52-275	LARGE AIR HEATER-LUBRICANTS	2	2	RM	2A	
52-301	WASH MANIFLD GAS INL	2.7	2.7	RM	2A	
52-302	WASH MANIFLD GAS OUT	2.9	2.9	RM	2A	
52-338		3.5	3.5	RM	2A	

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52-339	LARGE AH-RETRACT CLNG DEV (HE)	2.5	2.5	RM	2A	
52-988	LARG AH COMMISSIONING SPARE			RM	2A	Non billable Item
<b>Total weight for PG-52</b>		<b>2,628.17</b>	<b>2,628.17</b>			
<b>Total Weight of Rotary Machines</b>		<b>4,607.02</b>	<b>4,607.02</b>			
<b>Total weight of Boiler</b>		<b>52,524.76</b>	<b>52,024.76</b>			

### AUXILIARY BOILER

PGMA	WBS Description	Billable weight #1 (Pkg A)	Billable weight #2 (Pkg B)	Category	Rate Schedule ID	Remarks
<b>Structure</b>						
35-010	Foundation Materials-Boiler	5.42256		Structure	1A	
35-110	Main Columns Left	22.05996		Structure	1A	
35-410	Column Frames-Front Frame	15.52824		Structure	1A	
35-510	Column Bracings-Front Bracing	16.51416		Structure	1A	
35-610	Boiler Roof Structure	4.3134		Structure	1A	
35-611	Boiler Roof Sheeting	1.2324		Structure	1A	
35-810	Temporary Structure For Drum Erection	4.9296		Structure	1A	
36-310	Main Floor I Mbl	14.4144		Structure	1A	
36-811	Floorgrillsandguardplates-Lower	16.2162		Structure	1A	
36-820	Stairs And Ladders	2.16216		Structure	1A	
36-850	Handrails And Hand Rail Post	7.2072		Structure	1A	
81-034	PLATFORM FOR FEED TANK AND DEARTR	0.0028		Structure	1A	
<b>Sub-Total Structure</b>		<b>110.00308</b>	<b>0</b>			

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<b>Pressure Parts</b>						
04-114	Upper Drum + Intl Id 49-60	21.96		PR.PART	1B	
04-144	Upper Drum Sspn Id 49-60	0.549		PR.PART	1B	
04-210	Lower Drum + Intl Id Upto 36	10.736		PR.PART	1B	
04-988	Drum-Commisioning Spares			PR.PART	1B	Non billable Item
05-137	Inlet front lower water wall header	2.5		PR.PART	1B	
05-147	Inlet rear lower water wall header	1.8		PR.PART	1B	
05-231	outlet front upper water wall header	2.5		PR.PART	1B	
05-241	outlet rear upper water wall header	1.8		PR.PART	1B	
06-609	Corner Ww Pnl	3.51795		PR.PART	1B	
06-614	D'Pnl Ww Pnl	9.7305		PR.PART	1B	
06-616	Baffle Ww Pnl	5.5389		PR.PART	1B	
06-630	Front water wall panel	3.6		PR.PART	1B	
06-640	Rear water wall panel	3.6		PR.PART	1B	
06-657	Side Boiler Ww Pnl	6.21255		PR.PART	1B	
07-200	Furnace Tubes	1.00485		PR.PART	1B	
07-201	Raiser tubes	1.2		PR.PART	1B	
07-202	Supply tubes	1.1		PR.PART	1B	
07-204	SH. GUIDE Tubes	0.03		PR.PART	1B	
07-211	Boiler Bank Tubes	30.1455		PR.PART	1B	
07-214	Boiler Side Wall Shield Tubes	3.1059		PR.PART	1B	
07-431	Supports for raiser tubes and supply tubes	0.5		PR.PART	1B	
07-601	Pressure Seals	5.1156		PR.PART	1B	
07-989	Tools For Tube Expansion	0.12789		PR.PART	1B	
07-992	Welding Electrodes			PR.PART	1B	Consumables -Non billable Item
07-993	Consumables & Erection Materials	0.51156		PR.PART	1B	Billable In actual issued qty with proper reason of issue and use.
10-170	Vertical Sh Inlet Hdr	0.9999		PR.PART	1B	
10-270	Vertical Sh Outlet Header	0.9999		PR.PART	1B	
11-170	Sh Vertical Coil Element	10		PR.PART	1B	

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12-850	Sh Connecting Pipe	5.80715		PR.PART	1B	
12-900	Sh Desuperheater	2.1973		PR.PART	1B	
12-901	Sh Hngr,Suprts,Guides & Ties	1.09865		PR.PART	1B	
12-992	Welding Electrodes			PR.PART	1B	Consumables -Non billable Item
12-993	Consumables & Erection Materials	0.87892		PR.PART	1B	Billable In actual issued qty with proper reason of issue and use.
19-850	Eco Inlet Links	0.50008		PR.PART	1B	
19-992	Welding Electrodes			PR.PART	1B	Consumables -Non billable Item
19-993	Consumables & Erection Materials	1		PR.PART	1B	Billable In actual issued qty with proper reason of issue and use.
20-301	Rotary Soot Blower Elec Optd- D5e	0.27		PR.PART	1B	
20-304	Wall Box Non Pressurised For Rb	0.081		PR.PART	1B	
20-621	Blowing Element For Rb	0.041		PR.PART	1B	
20-801	LRs 1E Assembly	0.872		PR.PART	1B	
20-803	Wall box Assembly-PR	0.12		PR.PART	1B	
20-988	Sdot Blower Commissioning Spare			PR.PART	1B	Non billable Item
20-998	Special Tools For Soot Blowers	0.008		PR.PART	1B	
21-600	Soot Blower Piping And Fittings	0.493614		PR.PART	1B	
21-602	Soot Blower Piping & Fittings - Dd	0.109692		PR.PART	1B	
21-603	Soot Blower Piping & Fittings - Boi	0.001828 2		PR.PART	1B	
21-604	Soot Blower Piping Supports - Os Items	1.142625		PR.PART	1B	
21-700	Bulked Bps Components For Sb Piping	0.010969 2		PR.PART	1B	
21-800	Soot Blower Valves (Bhel)	0.237666		PR.PART	1B	
21-992	Imported Electrodes			PR.PART	1B	

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						Consumables -Non billable Item
24-350	Boiler Filling Piping	0.121878		PR.PART	1B	
24-351	Hangers And Supports Of Blr Filling Pipe	0.002708 4		PR.PART	1B	
24-352	Boiler Fill Piping - Dd	0.013542		PR.PART	1B	
24-353	Hangers & Supports For Boiler Fill Pipin	0.216672		PR.PART	1B	
24-600	Boiler Trim Piping And Fittings	1.293261		PR.PART	1B	
24-601	Boiler Trim Piping Supports	0.20313		PR.PART	1B	
24-603	Boiler Trim Piping - Dd Items	0.027084		PR.PART	1B	
24-604	Supports - Boiler Trim Piping - Os	0.717726		PR.PART	1B	
24-620	Safety Valve Esc Pipe&Drain - Pack Blr	1.171383		PR.PART	1B	
24-624	Exhaust Pipe For Safety Valve - Os Items	0.54168		PR.PART	1B	
24-625	Silencer Support-Safety Valves	1.3542		PR.PART	1B	
24-626	Silencer support	1.000753 8		PR.PART	1B	
24-627	Exhaust Pipe For Safety Valve - Dd Items	0.060939		PR.PART	1B	
24-628	Exhaust Pipe For Safety Valve - Boi Item	0.002708 4		PR.PART	1B	
24-635	Slncr&Suprt-Starting Vent - Pack Blr	0.33855		PR.PART	1B	
24-640	Sample Cooler And Supports	0.372405		PR.PART	1B	
24-641	Sample Cooler & Supports	0.13542		PR.PART	1B	
24-642	Sample Cooler & Supports - Dd Items	0.002708 4		PR.PART	1B	
24-660	Valves (Bhel) Pack Blr	1.042734		PR.PART	1B	
24-665	Valves & Fittings (Sd) Pack Blr	0.094794		PR.PART	1B	
24-673	Direct water level gauge/Bi colour LG	0.12		PR.PART	1B	
24-680	Erv And Safety Valves(Bhel)	0.236985		PR.PART	1B	
24-685	Safety Valve/Erv Silencers(Bhel)	1.48962		PR.PART	1B	
24-700	Bulked Bps Components For Trim Pipes	0.074481		PR.PART	1B	
24-955	Lapping Tools For Sv&Erv	0.013542		PR.PART	1B	
24-960	Lapping Tools For Conventional Val(Bhel)	0.006771		PR.PART	1B	
24-987	Commg Spares For Safety	0.001354		PR.PART	1B	

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	Valves/Erv	2				
24-988	Commng Spares For Imported Sub-Dely			PR.PART	1B	Non billable Item
24-989	Commng Spares For Conventional Valves	0.013542		PR.PART	1B	
24-992	Imported Electrodes-Trim Piping			PR.PART	1B	Consumables -Non billable Item
24-993	Consumables & Erection Materials	0.002708 4		PR.PART	1B	Billable In actual issued qty with proper reason of issue and use.
24-994	Name Plates	0.081252		PR.PART	1B	
80-300	MS FROM SUPERHEATER TO BOILER STOP VALVE	2.00		PR.PART	1B	
80-345	AUX STEAM TO DEAERATING HEATER	3.50		PR.PART	1B	
80-366	IBD TANK VENT TO ATMOSPHERE	0.85		PR.PART	1B	
80-417	BOILER FEED DISCHARGE PIPING	0.75		PR.PART	1B	
80-418	ERECTION MATERIALS FOR INSTRUMENTS	0.16		PR.PART	1B	
80-420	BOILER FEED PUMP SUCTION	0.70		PR.PART	1B	
80-421	BOILER FEED PUMP RECIRCULATION	0.25		PR.PART	1B	
80-446	DEAERATING HEATER OVER FLOW AND DRAIN	0.55		PR.PART	1B	
80-450	CBD AND EMERGENCY DRUM DRAIN	0.35		PR.PART	1B	
80-451	BOILER INTEGRAL PIPING DRAINS	0.40		PR.PART	1B	
80-453	LP PIPING DRAINS - SG SCOPE	0.25		PR.PART	1B	
80-460	SG AUX COOLING WATER UNIT SYSTEM	0.83		PR.PART	1B	
80-473	DEMINERALISED WATER SYSTEM	0.68		PR.PART	1B	
80-600	HIGH PRESSURE DOSING PIPING	0.15		PR.PART	1B	
80-601	LOW PRESSURE DOSING PIPING	0.10		PR.PART	1B	
80-920	H AND S FOR HYDRO TEST	2.30		PR.PART	1B	

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80-921	H AND S FOR LIGHT UP STEAM LINE	3.10		PR.PART	1B	
80-922	H AND S FOR LIGHT UP - NON STEAM LINES	1.20		PR.PART	1B	
80-936	VLH AND CLH for SG PPG -HERP	1.00		PR.PART	1B	
80-992	WELDING ELECTRODES-1			PR.PART	1B	Consumables -Non billable Item
81-005	INTERMITTENT BLOW DOWN EXPANDER	2.40		PR.PART	1B	
81-127	LOW PRESSURE DOSING SYSTEM	0.10		PR.PART	1B	
81-128	HIGH PRESSURE DOSING SYSTEM	1.00		PR.PART	1B	
<b>Grand Total of PP SubTotal</b>		<b>177.12</b>	<b>0.00</b>			
<b>Non Pressure Parts</b>						
09-001	Seal Boxes For Furnace Opening	0.4002		NPP	1C	
09-002	Seal Boxes For Instrument Inserts	0.2001		NPP	1C	
09-003	Material For Instrument Inserts	0.4002		NPP	1C	
18-001	Furnace Roof Skin Casing	1		NPP	1C	
28-220	Doors	2.0016		NPP	1C	
41-200	Sv-Burner Assy With Oil Gun	4.8075		NPP	1C	
41-500	High Energy Arc Ignitor	0.3		NPP	1C	
42-002	Steam Blow Materials	0.32206		NPP	1C	
42-010	Lfo Pump Set with valves & piping	3.2206		NPP	1C	
42-152	Piping,Opr'G Floor Lfo	0.80515		NPP	1C	
42-200	Subdelivery Fuel Oil System	0.32206		NPP	1C	
42-300	Bhel Valve F.O. System	0.16103		NPP	1C	
42-700	Bps Fasteners	0.080515		NPP	1C	
48-082	Duct-Sa Scaph Bypass	9.8649		NPP	1C	
48-084	Expjt-Sa Scaph Bypass	0.38985		NPP	1C	
48-200	Instrument Tappings On Ducting	0.32205		NPP	1C	
48-207	Flowmeters For Secondary Air Flow	1.9323		NPP	1C	
48-332	Sqduct,Boiler-Chimney	9.00045		NPP	1C	
48-334	Expansion Joint in Flue Gas Duct	0.89835		NPP	1C	
48-335	Supportsetcfluegas Ducts System	0.96615		NPP	1C	

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48-700	Bulked Bps Components	0.0678		NPP	1C	
48-911	Slide Brg Plate & Pacific Bellow-Boiler	0.13		NPP	1C	
48-915	Man Hole Doors (450x450)	0.38985		NPP	1C	
48-993	Erection Materials	0.75		NPP	1C	billable in case of short supply of particular material ,modification, additional fabrication with proper record of issues and purpose of use
80-612	SERVICE AIR FOR INDIVIDUAL UNITS	0.35		NPP	1C	
80-616	INSTRUMENT AIR FOR INDIVIDUAL UNIT	0.47		NPP	1C	
80-650	FUEL OIL SUPPLY AND RETURN PIPING	2.10		NPP	1C	
80-901	SUB DELIVERY VALVES FOR LIGHT UP	0.80		NPP	1C	
81-026	TRAY TYPE DEAERATOR BELOW 100 cuMHR	23.00		NPP	1C	
<b>SubTotal</b>		<b>65.45</b>	<b>0.00</b>			
<b>Steel Stack</b>						
87--010	CHIMNEY FDN MATERIAL	3.3		NPP	1C	
87--100	CHIMNEY SHELL	38.3		NPP	1C	
87-150	CHIMNEY STRAKES	3.1		NPP	1C	
87-200	PAINTER TROLLEY	1.1		NPP	1C	
87-300	PLATFORMS & LADDERS	9		NPP	1C	
87-930	AVIATION LAMPS	0.7		NPP	1C	
87-950	CHIMNEY INSULATION	6		NPP	1C	
87-960	CHIMN INS FIX COMP	3.5		NPP	1C	
<b>Sub Total</b>		<b>65</b>	<b>0</b>			
<b>Grand Total of NPP</b>		<b>130.45</b>	<b>0.00</b>			
<b>Fan (Rotary machine)</b>						
81-104	BOILER FEED PUMP	3.50		RM	2A	
56000	TOOLS & FIXTURE/CONT	0.17		RM	2A	
56011	FD FAN FOUNDATION MATL	0.67		RM	2A	
56017	FD FAN C&I ITEMS	0.02		RM	2A	
56113	RADIAL FD FAN ROTOR	1.75		RM	2A	
56313	RADIAL FD FAN BEARINGS	0.32		RM	2A	
56413	RADIAL FD FAN STATOR	5.2		RM	2A	

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56610	RADL FDFAN MOTOR	2.5		RM	2A	
56810	RADL FDFAN COUPLING	0.06		RM	2A	
<b>Grand Total of Rotary machines</b>		<b>14.19</b>	<b>0.00</b>			
<b>Insulation</b>						
33-021	Blr Pr Parts Mineral Wool	10.7237		Insulation	3A	
81-318	FIX COM FOR MISCELLANEOUS PPG INSULATION	0.55		Insulation	3A	
81-325	MINERAL WOOL MATTRESS	1.80		Insulation	3A	
81-341	SEALING COMPOUND FOR INSL	0.03		Insulation	3A	
81-350	ALUMINIUM CLADDING FOR INSULATION	3.00		Insulation	3A	
56919	RADIAL FD FAN INSULATION	1.2		RM	3A	
33-201	Main Blr Formed Refractory Is8	13.03342		Insulation	3B	
33-212	Main Blr Castable Refractory Gr C	41.245		Insulation	3B	
30-215	Main Boiler	5		Insulation	3C	
31-010	Skin Casing Comps Welded To Pressure P	0.5336		Insulation	3C	
31-301	Miscellaneous Casing	2.2011		Insulation	3C	
32-010	Fixing Comp For Blr Pr Parts Insul	4.002		Insulation	3C	
37-010	Blr Outer Casing Components	0.825		Insulation	3C	
37-810	Blr Outer Casing	1.575		Insulation	3D	
<b>Grand Total of Insulation</b>		<b>85.72</b>	<b>0.00</b>			
<b>Grand Total of Auxiliary Boiler</b>		<b>517.49</b>	<b>0.00</b>			
<b>Grand weight Including Main boiler &amp; Auxiliary boiler</b>		<b>53042.25</b>	<b>52024.76</b>			

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**9.2 BOQ for Misc. Bunker structural works:-**

**(Note: This is in addition to the BHEL supplies as fabricated items for Structural framing of Bunker house, Bunker, Transfer points, Trestles & conveyor galleries, ESP control room, Cable Trays etc.)**

			Package-A (Unit#1)	Package-B (Unit#2)
ST NO	Item Description	Unit	Quantity	Quantity
A1502	<b>METAL DECK SHEET Type-I</b> , Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate of approved colour over roof purlins for cast-in-situ roof slab as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum <b>0.8mm with</b> minimum trough depth of <b>44mm of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275</b> and shall serve as permanent shuttering to the roof slab <b>40mm thick</b> measured over crest of metal decking & shall have adequate strength to support weight of green concrete and imposed loads of min <b>100 kg/sqm</b> (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with silicon modified polyester(SMP silicon content 30%-50%) paint or super polyester paint of <b>minimum 20 micron DFT on exposed surface</b> (facing operating floor) over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system shall be of industrial finish of product type 4 of AS/NZ2728, including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor <b>studs shall confirm to type B</b> studs specified in AWS D1.1/D1.1M or equivalent as shear connector of <b>16 mm dia &amp; 65 mm</b> length manufactured from cold drawn round steel bars confirming to ASTM A 29 of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet.			
a	Span Upto 1800mm	SQM	1605	1605

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## CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK(BOQ)

B1502	<p><b>METAL DECK SHEET Type-II, Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate</b> of approved colour over floor beams for cast-in-situ roof slab as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum <b>0.8mm</b> with minimum <b>trough depth of 51 mm of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275</b> and shall serve as permanent shuttering to the roof/floor slab <b>150mm thick</b> measured over crest of metal decking &amp; shall have adequate strength to support weight of green concrete and imposed loads of <b>min 100 kg/sqm</b> (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with <b>silicon modified polyster</b>(SMP silicon content 30%-50%) paint or super polyster paint of <b>minimum 20 micron DFT on exposed surface</b> (facing operating floor) and <b>minimum 5 micron on other face</b> over epoxy primer of 5 micron applied over coating (designated class Z275), including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor <b>studs shall confirm to type B</b> studs specified in <b>AWS D1.1/D1.1M</b> or equivalent as shear connector of <b>19 mm dia &amp; 100 mm length</b> manufactured from cold drawn round steel bars confirming to <b>ASTM A 29</b> of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet. Measurement of profile sheeting shall be of the <b>plan area</b> of roof/floor covered by MS trough metal decking. The SMP and polyster paint shall confirm to product type 4 as per AS/NZS 2728</p>		0	0
a	Span Upto 1800mm	SQM	3195	3195
b	Span Exceeding 1800mm and upto 2500 mm	SQM	3195	3195
A1503	Providing and fixing shear connectors of mild steel studs having 16 mm dia and minimum 65 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	1	1
B1503	Providing and fixing shear connectors of mild steel studs having 19 mm dia and minimum 100 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	4.5	4.5
C1503	Providing and fixing special coated fastener conforming to corrosion resistant Class 3 AS3566 and tested 1000 hrs salt spary test to be used for fixing pre-fabricated insulated Metal sandwich Panels with the structural members below.	QUINTAL	5	5

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK(BOQ)

A1504	<p>Designing, providing and fixing <b>External sheet of Permanent colour coated metal cladding</b> with troughed M.S. sheets of minimum <b>0.6mm</b> bare metal thickness of <b>grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150</b> on both sides including fixing to supports / rails by concealed fixing system, corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face The sheet shall be permanently coated with <b>silicon modified polyester paint of atleast 40mm DFT</b> (SMP silicon content 30%-50%) paint or super polyester paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron (nominal) and minimum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system shall be of industrial finish of product type 4 of AS/NZS2728.</p>	SQM	3825	3825
B1505	<p>Design, supply &amp; erection of <b>prefabricated permanent colour coated sandwiched insulated metal cladding</b> of approved color comprising of top sheet as troughed permanently colour coated sheet and bottom sheet as plain permanently colour coated with 50 mm thick insulation sandwiched between the two sheets. Each sheet shall be of minimum 0.6 mm bare metal thickness of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250 GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150. The exposed face of the sheet to be permanently color coated with at least 40 micron DFT silicon modified polyester paint (SMP with silicon content of 30% to 50%) or polyester paint of minimum 20 microns (nominal) SMP or polyester paint on one side ( exposed face) , over 5 micron (nominal) primer coat and minimum 10 micron (nominal) SMP or polyester paint over 5 micron (nominal) primer coat on other side. SMP and polyester paint shall conform to product type 4 of AS/NZS 2728. The sheets shall be of approved profile and shall have such section modulus and moment of inertia per metre width that deflection of sheets is limited to span/250 under design wind pressure for two span conditions. No increase in allowable stresses under wind load condition is allowed. The prefabricated insulated Metal sandwich panels shall be fixed with structural members below using special coated fastener conforming to corrosion resistant class 3 of AS3566 and tested for 1000 hours salt spray test, including flashings complete as per specification. The insulation shall be of bonded mineral wool of minimum thickness 50mm conforming to IS:8183, having a density of 32 Kg/cu.m. for glass wool &amp; 48 Kg/cu.m. for rock wool and is included in this item. (payment shall be made on surface area of the cladding including flashings)</p>	SQM	1645	1645

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK(BOQ)

A 1508	Designing, providing and fixing <b>Inner sheet of Permanent colour coated metal cladding</b> with troughed M.S. sheets of minimum <b>0.6mm</b> bare metal thickness of <b>grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150</b> on both sides including fixing to supports / rails by concealed fixing system (Z purlin), corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face of the sheet shall be permanently coated with <b>silicon modified polyester paint of atleast 40mm DFT</b> (SMP silicon content 30%-50%) paint or super polyester paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system shall be of industrial finish of product type 4 of AS/NZS2728. 'Z' spacers of atleast 2mm thick galvansied steel sheet of grade 350 as per IS 277 would be fixed the inner sheeting on face side at runner locations all complete as per specification.	SQM	100	100
1511	Providing and fixing <b>insulation of resin bonded mineral wool of 50 mm nominal thickness</b> conforming to IS 8183 having a density of <b>32 kg/cum glass wool or 48 kg/cum for rock wool</b> , for cladding/under deck insulation including application of glue and tying with lacing wire, for glass/rock wool as per manufacturer's recommendations.		0	0
a)	For insulation in Sandwich Cladding	SQM	100	100
	<b>Grand Total</b>			
<b>2300</b>	<b>STRUCTURAL WORKS: Structural steel works including all labour, material (unless otherwise specified in BOQ/contract specification), equipments unless otherwise specified, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.</b>			
F2301	Erection of <b>structural steel of mild steel/High strength steel rolled section / built up section / combination of both</b> conforming to IS:2062, pipe sections] true to line, level, plumb & dimension, rectification if any, including collection of factory fabricated parts from BHEL store and assembly, installation of erection/connection bolts and application of final finish paint coat(Payment for final coat of payment shall be made separately as per Item No. B2304) as per approved drawing, specification and approval of engineer in charge. Erection bolts shall be arranged by the bidder and is not payable. the work shall be satisfactorily completed with required tightening of HSG bolts along with DTI (DIRECT TENSION INDICATOR) washers to be supplied by the bidder(Cost of DTI washer is included in this item and not payable). The prefabricated structure shall be supplied in variable length to the maximum length of 10 meters -12 meters and all erection work on ground or at any elevation is included in this item. Payment shall be made for weight of structure & splice plate but not for erection bolts & nuts, DTI washers, gusset plates, stiffeners etc.	MT	3445	2870

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**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK(BOQ)**

2311	Providing and fixing in position of <b>permanent mild steel bolts</b> (class 4.6 as per IS : 1367 and grade `C' as per IS: 1363) and nuts, washers etc. up to and inclusive of 39 mm diameter and upto 300mm long for structural steel work etc all complete.	KG	13460	11160
2312	Providing and fixing in positing of <b>high strength structural bolts</b> (of property class 8.8 and product grade `C' as per IS: 1367) and conforming to IS: 3757 and high strength structural hardened and tempered nuts (of property class `8' as per IS:1367) conforming to IS:6623 with hardened and tempered washers as per IS:6649 etc. up to and inclusive of 39 mm diameter and upto 300 mm long for structural steel work etc all complete.	KG	53840	44640
2313	<b>Dismantling of steel structure</b> , lowering of material and carriage of the dismantled material up to field fabrication shop / projects storage including temporary dismantling, cutting, re-welding, supporting, and restoring to correct position all temporarily dismantled members, re-alignment of all adjacent connected members to their correct positions ( weight of such adjacent members and temporarily dismantled members not payable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	130	85
2314	<b>Addition to, alterations in and/or modifiction of "Erection Marks"</b> including cutting of parts, gauging of welds, cutting, grinding, fabrication, welding, drilling holes, straightening, removal of bends, raising to the required level, painting, transportation, return of unutilised steel pieces to the project store, temporarily dismantling, cutting, re-welding, supporting and restoring to correct position of all the temporarily dismantled members, realignment of adjacent connected members (weight of such temporarily dismantled and adjacent members not payable) etc all complete for the following:		0	0
a	In erected position	MT	50	43
b	In fabrication yard	MT	50	43
2315	<b>Re-erection of dismantled fabricated structural steel</b> members including carriage of modified "Erection Marks" from the field fabrication shop to erection site, lifting to required posiiion, aligning in position, tack welding, final welding and touch up painting including temporary dismantling and re-erection of temporarily dismantled members, cutting, rewelding, supporting and restoring to the correct position of all temporarily dismnatled members, re-alignment of adjacent connected members(weight of such temporarily dismantled members and adjacent members not payable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	100	85
2323	Conducting <b>radiography test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	425	288
2324	Conducting <b>ultrasonic test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	425	288
2325	Conducting <b>ultrasonic test on steel plates</b> as per ASTM-A435 or equivalent wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	SQM	425	288

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**CHAPTER IX - ESTIMATED WEIGHT FOR VARIOUS SYSTEMS IN SCOPE OF WORK(BOQ)**

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2326	Conducting <b>magnetic particle test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	220	145
2327	Conducting <b>dye penetration test on welds</b> wherever specified by the engineer including provision of necessary equipments, measuring devices, gauges etc. all complete (over and above the work already specified in the specifications.)	RM	425	288

**Note: List of Approved supplier for roof/side cladding sheets are attached as file titled ‘Annexure-3 list of approved vendors for cladding sheets supplier’.**

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-X General

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### 10.1 GENERAL

#### Site Visit by the Bidder

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

10.2 The bidder shall satisfy themselves about the following factors:

- i) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.
- ii) Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.
- iii) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.
- iv) Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.
- v) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.
- vi) The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.
- vii) The type of equipment and facilities needed, for and in the performance of the work:
- viii) The extent of lead and lift required for the work in complete form over the entire duration of the contract, and
- ix) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

10.3 Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The applicable erection manuals which are available with BHEL site office are to be referred for compliance and guidance before taking up the work. Any rework on this failure to comply with will be to account of contractor only. BHEL engineer, depending upon the availability of materials, fronts etc., will decide the sequence of erection and methodology. No claims for extra payment from the

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-X General

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- contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs in other projects or for any reason whatsoever.
- 10.4 Contractor has to work in close co-ordination with other erection agencies at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and erection program have to be planned in such a way that the milestones are achieved as per schedule / plans. Contractor shall arrange & augment the resources accordingly.
- 10.5 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works or as bed for pre-assembly works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.
- 10.6 All the works such as cleaning, levelling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.
- 10.7 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor should ensure successful and timely operation of equipment installed. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel.
- 10.8 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess draws at the rate prescribed by manufacturing units.
- 10.9 No member of the already erected structure, platform, pipes, grills, other component and auxiliaries should be cut without specific approval of BHEL engineer.
- 10.10 No temporary supports shall be welded on the pressure parts of piping. Welding of temporary supports, cleats, etc. on the boiler columns shall be avoided. In case of absolute necessity contractor shall take prior approval from BHEL Engineer. Further, any cutting or alternation of member of the structure of platform or other equipment shall not be done without specific prior approval of BHEL Engineer.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-X General

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- 10.11 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies / personnel on ISO 9001 – 2015 Standards.
- 10.12 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like piping, Turbine, Generator erection, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments coming under this scope. Sometimes, more than one agencies may have to work in same location. Sometimes it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.
- 10.13 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.
- 10.14 For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.
- 10.15 If applicable, all boiler, piping layout drawings received from BHEL for pipeline erection to be submitted to Boiler Inspector for approval. After approval of the above drawing, Erection of pipe line to be started. Inspection fee and registration fee as mentioned in Chapter VIII of Special Conditions of contract (Volume-IB in Volume-I Book-II (Vol I BCD)) shall be paid by BHEL.
- 10.16 Contractor should obtain the formal statutory clearance from Chief Inspector of Boilers to carry out erection & Welding of piping under IBR purview. Arrangement for the visit of Boiler inspector for field inspection, hydraulic test etc., is in the scope of contractor, and necessary drawing / details only will be given by BHEL.
- 10.17 All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to the account of the Contractor. However, any registration, statutory inspection fees lawfully pay-able under the provisions of the Indian Boiler Regulations and any other statutory laws and its amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the PVUNL, shall be to the account of the PVUNL. Should any such inspection or registration need to be re-arranged due to the fault of the Contractor, the additional fees for such inspection and/or registration shall be borne by the Contractor.
- 10.18 Contractor shall arrange the necessary clearance from statutory authorities like IBR, Electrical Inspectorate, etc. as required for installation of the plant and equipment and render all assistance, service required in this regard.
- 10.19 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor expeditiously then and there at no extra cost.
- 10.20 Contractor shall submit a copy of license to undertake construction / repair of Boilers & Piping issued by Boiler inspectorate before commencement of Pressure Parts / Piping Erection.

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- 10.21 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.
- 10.22 Upon completion of daily work , the contractor shall remove from the vicinity of work all scrap packing materials, rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer.
- 10.23 During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.
- 10.24 On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.
- 10.25 The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.
- 10.26 The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Contractor and his personnel shall cooperate with personnel of BHEL, BHEL'S Customer, Customer's consultants and other Contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.
- 10.27 Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the Contractor. No claims for extra payment from the Contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.
- 10.28 All necessary certificates and licenses, permits & clearances required including IBR certificates/license/clearances to carry out this work from the respective statutory/ local authorities are to be arranged by the Contractor at his cost in time to ensure smooth progress of work.
- 10.29 The boiler shall be erected as per relevant provisions of latest Indian Boiler Regulations (IBR) and amendments/addendums thereof, if any.

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- 10.30 The work shall conform to dimensions and tolerances specified in the various drawings / documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to Contractor's fault, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the Contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL as per GCC.
- 10.31 The Contractor shall perform any services, tests etc, which may not be specified but nevertheless, required for the completion of work within quoted rates.
- 10.32 The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.
- 10.33 BHEL reserves right to recover from the Contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to Contractor's lapse during any stage of work. Any loss to BHEL due to Contractor's lapse shall have to be made good by the Contractor as per GCC.
- 10.34 All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables etc, except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by Contractor unless otherwise specified in the relevant clauses. The Contractor's quoted rates should be inclusive of all such contingencies.
- 10.35 During the course of erection, testing and commissioning certain rework / modification / rectification / repair / fabrication etc may become necessary on account of feedback / revision of drawing etc. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc shall be maintained by the Contractor for such reworks. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.
- 10.36 All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of structures, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the Contractor as part of the work within the quoted rates.

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- 10.37 The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel for such usage.
- 10.38 The Contractor shall take delivery of the components, equipments, chemicals, and lubricants etc from the BHEL stores/ storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically.
- 10.39 **There are few locations of storage yard within/beside plant premises. Major storage yard is located outside the Main Plant Boundary, in more than one location, at a distance of approximately 10-12 KM from the erection site.** Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the Contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by Contractor most expeditiously as incidental to work.
- 10.40 Plant materials should not be used for any temporary supports / scaffolding/ preparing pre-assembly bed etc. The details of equipments to be erected under this contract are generally as per the schedule given in relevant appendices. These details are approximate and meant only to give a general idea to the tenderer about the magnitude of the work involved. Actual quantum and type of equipments will be based on the relevant erection documents which will be furnished to the Contractor in due course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.
- 10.41 Hangers & suspensions, supports etc for tubes, piping, & ducts etc will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required.
- 10.42 Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/locks, cutting of excess thread length of hanger tie-rod etc have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/instructions, during various stages of erection & testing and after floating of piping/ducting during cold and hot condition will have to be done as part of work. This exercise may have to be repeated till satisfactory results are achieved.
- 10.43 Layout of field routed/ small bore piping shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the

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Contractor. There is a possibility of slight change in routing the above pipe lines even after completion of erection.

- 10.44 Welding of necessary instrumentation tapping points, thermowell, thermocouple pad, metal temp pad and clamps, root valve, condensing vessel, flow metering & measurement devices, and control valves to be provided on boiler & its auxiliaries and piping are covered within the scope of this specification. The installation of all the above items will be Contractor's responsibility even if:
- a) Items are not specifically indicated under the respective product groups as given in the technical specifications.
  - b) Items are supplied by an agency other than BHEL.

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

- 10.45 Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/speed switches of motors, accumulators etc are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to BHEL. C & I erection agency will do storage / re-erection calibration etc.
- 10.46 Fixing and seal welding of thermowells & plugs before Hydro test/ steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermowells after hydro test/steam blowing of lines as part of work.
- 10.47 Actuators/drives of valves, dampers, gates, powered vanes etc may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
- 10.48 All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. BHEL will provide the motorized insulation testers.
- 10.49 In installation of various equipments it may become necessary to install these on temporary supports/ hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions/hangers and later on shift the relevant equipments to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free -returnable basis which shall be returned to BHEL after the use.
- 10.50 The work shall be carried out strictly in accordance to the "Field Quality Plan" approved by BHEL/client. Contractor, jointly with BHEL, shall prepare all necessary records of measurements/readings/ protocols etc.

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- 10.51 Interconnection/ hookup, if any, with the existing system shall form part of work. Such interconnections, hookups may require shut down of running plant and the relevant work have to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.
- 10.52 Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.
- 10.53 It may so happen that certain components like manhole doors, hanger etc may be supplied in loose items. They need to be assembled as per relevant drawings or as per advice of BHEL engineer prior to erection. This forms the part of the scope of work.
- 10.54 The Contractor shall have total responsibility for all equipment and materials in his custody at Contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/finished surfaces should be greased and covered.
- 10.55 BHEL is operating web based computerized E-store system that includes, inter-alia, issue of materials, daily progress reporting, Contractor's running monthly billing and material reconciliation through a computerized data management system. Contractor shall install necessary hardware to hook-up with the BHEL's system and use the same for his scope of work.
- 10.56 In the event the computerized E-store/SOMS is inoperative for any reasons, the Contractor shall take delivery of materials from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer. All these records however shall be updated in the E-store/SOMS as and when the E-store/SOMS is reactivated/normalized.
- 10.57 Gases like argon, oxygen, acetylene etc that are required for erection related activities shall be arranged by the Contractor at his cost. For T-91 material site weld joints argon as per grade-3 of IS 5760: 1998 with oxygen and water vapour restricted to max 6 ppm each and with argon purity level of minimum 99.99% shall be arranged and used by the Contractor. The supply should accompany test certificate for the batch indicating individual element 'ppm' level and overall purity level.
- 10.58 Nitrogen gas, if required, for preservation of boiler and nitrogen capping during chemical cleaning process, will be provided by BHEL free of charge. Contractor shall

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- arrange necessary connector, nipple, regulator, header and piping for usage of such gas from cylinders.
- 10.59 All lubricants and chemicals required for testing, preservation, chemical cleaning / acid cleaning, oil flushing, and the lubricants for trial runs of the equipments and trial operation of the unit will be supplied by BHEL free of charges.
- 10.60 -Scope of work covered under this specification requires quality workmanship, engineering and green belt management along with the supply of all consumables, tools and tackles and testing instruments. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.
- 10.61 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.
- 10.62 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations
- 10.63 The contractor shall carryout additional tests if any, which the Engineer feels necessary because of site conditions and also to meet system specification
- 10.64 The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
- 10.65 All the work shall be carried out as per instructions of BHEL engineer. BHE engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 10.66 Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.
- 10.67 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.
- 10.68 Contractor shall retain all T&P / Testing instrument / Material handling equipment's etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge. The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.

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- 10.69 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.
- 10.70 Contractor has to work in close co-ordination with other agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and Construction program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.
- 10.71 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.
- 10.72 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer in- Charge.
- 10.73 Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and levelled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.
- 10.74 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.
- 10.75 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors.
- 10.76 Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

### **10.77 SITE INSPECTION**

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

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

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

### **10.78 UTILITY POINTS**

10.78.1 Number of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N<sub>2</sub>) etc., shall be indicated in the P & I diagram. Contractor to locate the utility points as advised by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with 'BILL OF MATERIAL' to BHEL for approval.

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

### **10.79 DOCUMENTATION**

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

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

10.79.3 The contractor shall maintain a record in the form as prescribed by BHEL for all operations carried out on each weld and maintain a record indicating the number of welds, the name of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejections if any, percentage of rejection, etc. and submit copies of the same to the BHEL Engineer as required.

10.79.4 Other documents as specified in of Chapter – XI of Technical Conditions of Contract .

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### **10.80 PLATFORMS, CROSSOVERS & CANOPIES**

Platforms, ladders, crossovers and canopies shall also be provided at places where it has not been shown in drawings but if felt necessary by site engineer. Canopies shall be provided for all outdoor pumps and motors. Platforms, ladders, crossovers and canopies shall have to be fabricated from raw materials supplied by BHEL and erected by contractor as per instruction of BHEL and shall be paid as per accepted tonnage rate for “structures” i.e, Rate schedule Id. 1A

### **10.81 Fin /attachment/scallop plates & associated items Cutting , restoration of Tubes, panels of Boiler**

During course of erection in boiler pressure parts fin/attachment/scallop plates & associated items cutting to align difference tubes, panels will be required in boilers and this type of activity will be treated as normal scope of work without any commercial implication on BHEL. Even activity may have to be repeated as per job/Site requirement and for this also no extra work payment will be given to vendors as this type of job will be treated as normal scope of work.

### **10.82 Buck Stay Checking & Rectification**

Vendor has to carry out inspection, rectification, Cleaning of buck stays along with adjoin areas during erection, commissioning, Operation, trial run has to be done from time to time. Buckstay corner link correction after initial erection has to be done and if changes noticed during operation of Unit has to be rectified. For this vendor has to arrange manpower and resources without any extra cost implication on BHEL treating it as normal scope of work. Any surrounding work in connection with inspection, rectification, cleaning of the same will be treated as normal scope of work.

### **10.83 Inspection, cleaning of pressure parts, Furnace, Pent House ,Burners ,ducts/and subsequent restoration, rectification, normalization.**

During erection, pre-commissioning, commissioning, operation ,Stabilisation period trial Run - Inspection, cleaning of pressure parts, Furnace, Burners ,Pent House ,ducts, hoppers, and allied areas are to be carried out. For this vendor has to arrange manpower, T&P, other resources for inspection , cleaning of ash /oil shoots , coal rejects /clinkers and other foreign materials ,associated items from boiler, & surrounding areas. For this installation of sky climbers, scaffoldings and other requirement/resources/consumables as required are to be arranged by vendors for inspection, cleaning, testing followed by restoration/rectification/normalization. Vendor has to repeat this type of activity no. of times till handing over Unit to

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customer without any cost implication on BHEL treating this types of jobs as normal cope of vendor's work.

### **10.84 Statutory approval for Lifts, hoists, Cranes**

Necessary approval for drawings, documents ,Load Testing ,license of hoists, EOT, Boiler lifts, Misc cranes like FANs, Mills ,Compressor House, different buildings erected by bidders has to be arranged for getting statutory fitness certificates ,drawings/documents from Statutory agency/Third party inspectors without any extra commercial implication on BHEL treating as normal scope of work. For electrically operated hoists, cranes ,lifts respective bidders has to arrange Fitters, electricians ,with supporting manpower and T&P /other resources with sufficient testing instruments, IMTE/MMD for erection and commissioning of these systems without any extra commercial implication on BHEL treating as normal scope of work

### **10.85 Mill Reject Handling Systems (MRHS)**

Erection ,Testing& Commissioning of MRHS is to be included in Boiler agency's scope. BHEL will arrange supervision of Erection, Commissioning activities of MRHS & for this supervision of OEM Engineers/Supervisors will be arranged by BHEL from time to time free of cost. Mill reject Disposal till establishment in manual mode is to be done by boiler agencies till handing over to customer. For this vendor has to keep manpower, tractors, trailers of suitable capacity to dispose mill rejects, foreign materials till handing over of Unit to Customer. This is treated as normal scope of work without any cost implication to BHEL.

### **10.86 HFO/LDO Strainers ,HFO/LDO Cleaning ,HFO/LDO Pumps Commissioning/servicing/Rectification**

HFO/LDO Strainers, HFO/LDO Guns cleaning, HFO/LDO Pumps and associated items servicing, rectification, commissioning in HFO/LDO Pump house & in Boiler are to be done by Boiler vendor. Vendor has to arrange the scaffolding , Consumables, Diesel, petrol, Cleaning agents ,tools, T&Ps for these purposes. For carrying out above activities , draining ,cleaning of HFO/LDO from Pumps, Strainers, HFO Heaters and associated items are to be done and contaminated HFO/LDO is/are to be collected in drums/containers/dirty oil tanks and for this vendors has to arrange facilities for disposal of the same. Emptying of dirty oil tank/drums/containers, cleaning and disposal of contaminated oil is in boiler vendor's scope. Extra pumps for disposal of contaminated HFO/LDO are to be arranged by boiler vendors. All above activities are required to be repeated in no.of

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occasions till handing over of Unit(s) and are treated as normal scope of work without any extra commercial implications on BHEL.

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

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

### **10.88 Dewatering**

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

### **10.89 Housekeeping/Area Cleaning**

The contractor has to do area cleaning on every date on daily basis. Noncompliance of the above cleaning shall call for penal recovery of Rs.2000.00 on each instance and at the same time, cleaning of the area shall be done by BHEL at the risk and cost of the contractor. No excuses on this above account shall be entertained by BHEL on whatsoever account.

### **10.90 Approach platforms , fixtures**

Steel items like angles, scaffoldings for erection of bracings, Tie beams are to be arranged by vendor for structural erection treating it as normal scope of work without any cost implication on BHEL.

### **10.91 Assistance during commissioning of panels, Equipment, system, actuators for valves (motor operated/pneumatic), gates, dampers**

Agency has to give assistance for commissioning during initial period and subsequently during unit operation during stabilization period/trial run/PG Test .For this purpose items erected by agency has to provide manpower, other

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resources, diesel, other consumables, scaffoldings, Other T&Ps as required from time to time. These types activities will be repetitive in natures for no. of times and in cases dismantling, reinstallation of items/parts has also to be done till handing over of unit to customer. During case of dismantling /reinstallation logistic supports like Tyre mounted crane/ Crawler Crane /crane/truck/trailers as applicable including manpower are to be arranged by vendor. These types of activity is treated as vendor's normal scope of work without any extra commercial implication on BHEL.

### **10.92 Sky Climber**

Agency has to do regular erection, commissioning, maintenance, shifting, resifting of sky climbers as per site requirement. Taking statutory fitness certificates from Statutory Authorities/Third Party Inspectors as per requirement from time to time lies with boiler vendor. Manpower supports with logistics like cranes/Truck/trailers & other T&Ps are to be arranged by boiler vendor for shifting/resifting/ returning to BHEL Store as per job requirement.

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## Chapter-XI PROGRESS OF WORK

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

- 11.1 Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume - I BCD. Plan and review will be done as per the formats.
- 11.2 The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.
- 11.3 It is the responsibility of the contractor to provide all relevant information on a regular basis regarding progress of work, labour availability, equipment deployment, testing, etc.
- 11.4 Contractor is required to draw mutually agreed monthly work programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.
- 11.5 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.
- 11.6 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.
- 11.7 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 11.8 The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard.

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- 11.9 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.
- 11.10 The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details :-
- a) Progress photographs in colour.
  - b) Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.
  - c) Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan.
  - d) Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas cutters, electricians, crane operators and helpers. Data shall be split up under the work areas like Boiler (pressure parts, structures), Auxiliary boiler, Rotating machines, Electro static precipitator, Bunker structure etc.
  - e) Consumables report giving consumption of all types of gases and electrodes during the previous month.
  - f) Availability report of cranes.
  - g) Safety implementation report in the format.
  - h) Pending material and any other inputs required from BHEL for activities planned during the subsequent month.

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## Chapter-XII FOUNDATIONS & GROUTINGS

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### 12 PREPARATION OF FOUNDATIONS, AND GROUTING OF EQUIPMENT OF BOILER , SCR & AUXILIARIES

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

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

12.2 All temporary foundations and anchor points required for installing erection Equipments and winches, foundations for pumps, tanks etc are in the scope of Contractor. All building materials like cement, steel including re-enforcement bars, grits cements etc for such temporary foundations shall have to be arranged by the Contractor within the quoted rates. All such foundations shall be demolished and normal ground conditions restored after the usage.

12.3 Neutralisation pit for EDTA cleaning is to be made by the Contractor. After completion of job pit has to be dismantled and area is to be levelled before handing over of area to owner. Pit Size shall be approx. 30x30x1.5m. **Cost incurred in construction of neutralization pit shall be borne by the both the agencies equally (Pakg-A & Pkg-B)**

12.4 Effluent has to be disposed off safely from neutralizing pit to a safe area as per instruction of BHEL Engineer.

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

12.5 BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and

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shims over and above the quantity received as a part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting / chiseling / grinding and de-burr the same. However, machining of the packers wherever necessary, shall be arranged by contractor.

- 12.6 Complete grouting of structures equipments, including anchor/ foundation bolts, beneath base, base hollows etc, as may be applicable, is included in the scope of Contractor. Arranging all labour, building materials including cement, ordinary portland as well as quick setting – free flow - non-shrink grout mix (e.g. conbextra gp1/gp2), form work, shuttering, and any other requirements is in the Contractor's scope. Contractor shall obtain approval of BHEL for cement (Ordinary Portland as-well-as quick setting – free flow- non-shrink grout mix) prior to use. Cleaning of foundation surfaces, pocket holes and anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods are within the scope of this specification/ work.
- 12.7 After the grouting has finally set and cured, alignment of equipments involved shall be checked again to verify for any disturbance or any other reason. If required, de-coupling of equipments has to be done for conducting the verification. In case any disturbance is noticed the cause, if any, shall be removed and re-alignment done as part of work.
- 12.8 Foundation for the equipments to be erected shall be provided by BHEL/ clients of BHEL. The dimensions of the foundations and anchor bolt pits shall be checked by the contractor for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench mark etc. All adjustments of foundations surfaces, enlarging the pockets in foundations etc. as may be required for the erection of equipments / plants shall be carried out by the contractor.
- 12.9 Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., dewatering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form / shuttering work are within the scope this Work.
- 12.10 It shall be contractor's responsibility to check the various equipment foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Also minor chipping, dressing of foundations up to 30 mm for obtaining proper face for packer plates / shims, as may be required for the erection

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of the equipment / plants will have to be carried out by the contractor without extra cost.

- 12.11 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments / equipments based on the foundations including shear lug provisions / openings.
- 12.12 Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.
- 12.13 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment. Packer plates should not only be blue matched with foundation but also inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineer's instructions.
- 12.14 Total grouting of the columns / equipments including pocket grouting, grouting at the gap between foundation and base plates top surface of column / equipments is in the scope of the contractor. All the grouting should be carried out by non-shrink cement like conbextra GPI / Conbextra GP II / Shrinkkomp or its equivalent etc. This special nonshrink cement shall be arranged by the contractor at his cost. The quoted rate shall be inclusive of the same.
- 12.15 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification as advised by the Engineer or BHEL after preparing the foundation surface for grouting. The contractor has to arrange, a representative from the supplier of special cement for witnessing the grouting and other works at their cost including any miscellaneous expenditure for this activity. BHEL will not pay any service and incidental charges for arranging the supplier representative. The contractor to take note of this aspect and quote accordingly.
- 12.16 All equipment bases and structural steel bases and foundations pockets shall be grouted and finished as per these specifications after surface preparation unless otherwise recommended by the equipment manufacturers. The surface preparation

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### Chapter-XII FOUNDATIONS & GROUTINGS

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includes soda washing of the foundations to remove oil, grease etc. to ensure proper grouting.

- 12.17 The certificates of the grout is to be submitted to BHEL. If necessary test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.
- 12.18 All the materials required for grouting including special cements as approved by BHEL and other materials like Portland cement, sand chips, gravel etc., are to be arranged by the contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.
- 12.19 Certain packer plates and shims over and above the quantity received as part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / sheets at site by the contractor to meet site requirement. However machining of the packers, wherever necessary, will be arranged by BHEL at free of cost.
- 12.20 **PROCEDURE FOR GROUTING:** Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per the supplier's recommendation / IS standard. Copy of those recommendations is to be submitted to BHEL for records.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIII MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

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

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

- 13.1 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks/ slings/ tools and tackles / labour including operators, fuel, lubricants etc. for loading & unloading of materials will be in the scope of contractor.
- 13.2 The storage yard is located outside the Main Plant Boundary, in more than one location, at a distance of approximately 10-12 KM from the erection site.
- 13.3 Some consignments like ODC consignments may be unloaded near to erection site as per space availability.
- 13.4 Loading at storage yard and transporting to site, unloading at site / pre assembly area or at working area, is in the scope of work. Required cranes for loading & unloading of materials, trailer shall be in the scope of contractor. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, sandbags which are required for temporary supporting of the components at site.
- 13.5 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
- 13.6 Contractor shall plan and transport equipments, components from storage yard to erection site in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.
- 13.7 Sometimes it may become necessary for the contractor to handle certain unrequited components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.
- 13.8 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the

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materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

- 13.9 All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.
- 13.10 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.
- 13.11 The contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its sub-contractors with respect to the transport of Goods, Materials and Labour to the site do not interfere with local traffic in the vicinity of the site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIV ERECTION

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

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

### **14.1 Erection**

- 14.1.1 The contractor will have to follow the instructions provided in the technical manuals, drawings, and specifications provided by BHEL, to the contractor from time to time. In case of ambiguity or deviation the decision/clarification of BHEL engineer will have to be followed.
- 14.1.2 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection /location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage/loss of such equipment at site.
- 14.1.3 Contractor has to arrange required fire proof tarpaulins to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.
- 14.1.4 In case of any class of work for which there is no such specifications as laid down in the contract such as blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.
- 14.1.5 The contractor is strictly prohibited in using any of the Boiler components like angles, channels, hand-rails for any temporary supporting or scaffolding work. In case of such misuse, a sum as determined by BHEL shall be recovered from contractor's bills. Also the contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess draws at the rate prescribed by manufacturing units.
- 14.1.6 Any fixtures, scaffolding materials, approach ladders, concrete block supports, steel structures required for temporary supporting, pre assembly, checking, welding, lifting & handling during pre-assembly and erection shall be arranged by the contractor at his cost.
- 14.1.7 The temporary structures/ items welded to permanent members/pipes are to be cut and removed without any damage. Any damage so to permanent members/ pipes to be made good by the contractor at his cost.
- 14.1.8 In the case of structural members / ducts in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints at no extra cost.
- 14.1.9 Fine fittings and other small bore piping have to be routed according to site

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

- 14.1.10 All welded joints should be painted with anti-corrosive paint, once NDE works are over.
- 14.1.11 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 14.1.12 Work such as minor rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc. are covered in the scope of work.
- 14.1.13 All piping items including pipes, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.
- 14.1.14 Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. For pipes below 2" diameter, shall be sponge cleaned with air flushing.
- 14.1.15 In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.
- 14.1.16 Wherever elbows of 45 deg. or any other angle are required, the same shall be cut from 90 deg. elbow supplied and used. No extra cost shall be paid.
- 14.1.17 Erection of flow switches, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting from BHEL/Customer stores, transportation to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.
- 14.1.18 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles/orifices/metering elements fixed on piping as per the instructions of BHEL Engineer.
- 14.1.19 Welding of all thermo wells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads for permanent system as well as for performance guarantee test is in the scope of work.
- 14.1.20 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIV ERECTION

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- be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc., shall be carried out at site by contractor within the quoted rate.
- 14.1.21 Wherever hanger and support materials are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the system on temporary supports to ensure the progress of work. The required structural steel materials will be issued on free of charges by BHEL, either from scrap/spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports.
- 14.1.22 No separate payment will be made for the edge preparation of pipes, Standard fittings such as bends, Tees etc.,
- 14.1.23 Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive is within the quoted / accepted rate.
- 14.1.24 All the equipments /material to be taken inside the plant building shall be cleaned thoroughly before taking them inside. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints and other components as per instruction of BHEL Engineer during erection within the quoted rate.
- 14.1.25 Contractor shall cut / open works if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value. During commissioning, opening of valves, changing of gaskets, attending to leakages, minor modification, and rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower with T & Ps in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning, the same has to be rectified by the contractor at his cost.
- 14.1.26 Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity.
- 14.1.27 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.
- 14.1.28 Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be removed / attended as per BHEL engineer.
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- 14.1.29 Field Quality Assurance Formats:-It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL and customer as token of their acceptance. Payment to the contractor will be linked with the submission of these FQA log sheets.
- 14.1.30 All test require as per FQP (Field Quality Plan) will be in bidders scope. FQP shall be provided during execution time.

### 14.2 ERECTION OF BOILER & ITS AUXILIARIES AND ROTATING MACHINES

- 14.2.1 Brief list of System / sub-system to be erected by the contractor & approximate weight of individual PGMA's and number of welding joints mentioned in this Tender Specification are meant for giving general idea to the tenderer only about magnitude of the work involved. This should not be taken for billing or any other claims. All weights for such purposes will have to be taken from design documents only (shipping list). This section also gives general idea about various components to be erected with expected accuracy level. However the contractor shall get the correct details from the engineer to avoid mistakes and rework.
- 14.2.2 Preparation of preassembly bed is very much essential for preassembly of MBLs, columns, ceiling girders, panels, coils etc. on consolidated ground and to avoid sagging and shrinking the temporary supports are to be provided. The preassembled component should have minimum three supports to avoid sagging.
- 14.2.3 The column and girder pieces are to be measured individually to check for camber, sweep etc. The level markings on the columns to be checked before erection. The verticality stickers are to be fixed over individual column pieces on both the flanges (90 degree apart in two places). Arranging these stickers shall be done by the contractor.
- 14.2.4 Tier by tier erection method is to be followed. Columns are to be tied up with horizontal and diagonal bracing in each tier before proceeding to next level. Log sheets are to be maintained in line with log sheets which are available with BHEL. After grouting the first tier columns, second tier erection is to be taken up. Adequate curing of the grout is to be ensured. Verticality of the columns is to be ensured either by plumb bob or theodolite. The tolerance shall be as indicated in BHEL's erection drawings. Care should be taken while erecting the vertical and diagonal bracings to maintain the work points as per drawing. Necessary lubricant for the girder pin assembly should be applied as per drawing within the quoted rates.

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- 14.2.5 The following measuring and test equipments with proper calibration certificates are to be made available by the contractor before taking up the structural and other pressure parts erection. Steel tapes minimum 5M,30M in sufficient numbers, torque wrench 650-1000 ft pounds, bolt tension calibrator, torque wrench with calibration, temperature recorder, two theodolite with one second accuracy etc. Periodic calibration of the measuring instruments is to be done once in six months and certificate for the same to be submitted to BHEL for records.
- 14.2.6 Detailed procedure available with BHEL site office should be collected before taking up the job by the contractor for preassembly of ceiling girders. EACH CEILING GIRDER WILL BE SUPPLIED IN MAXIMUM 3 PIECES AND WELDING & NDT TEST ARE TO BE CARRIED OUT, INCLUDING 100% RADIOGRAPHY AND THE REQUIRED UT FOR THE WELDED JOINTS IN CEILING GIRDERS. THE HEAVIEST ASSEMBLED CEILING GIRDER WILL BE AROUND 142 MT approx. AND MAXIMUM ELEVATION OF CEILING GIRDER IS 104 M and TOP OF SILENCER IS 115M MAXIMUM.
- 14.2.7 Camber, sweep and twist are to be checked. The tolerances for individual piece camber and sweep, individual length, level of girder assembly, flatness of the web, out of squareness of assembly, overall length of the assembly etc. to be ensured before taking up the job. Major deviation if any observed should be intimated to BHEL for getting the resolution before proceeding further.
- 14.2.8 Suitable crane to be used for handling / lifting the ceiling girder will be provided by BHEL. Leveled area will be provided by BHEL for erection. However, backfilling and consolidation, if required, shall be carried out by the contractor, at no extra cost. Necessary plates/sleepers required for marching and operation shall be provided by the BHEL for BHEL owned/deployed cranes. Positioning of the crane is to be decided in consultation with BHEL.
- 14.2.9 The erection of the welded beams, rolled beams, boiler roof frame assembly etc. to be taken up along with ceiling girders immediately as the crane moves from first girder to the last. The silencers of various safety valves also to be erected in the respective bays. The completion of the roof sheeting should follow to create a comfortable working space in the boiler cavity giving protection to all work men from rains and sun. It is expected that the contractor will complete the same before drum lifting/pressure parts erection. The materials for boiler roofing and side cladding etc. will be supplied by BHEL and contractor has to erect the same at the quoted /accepted tonnage rate.

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- 14.2.10 The tightening procedures for HSFG bolts are to be obtained from BHEL at site before taking up the work. Normally it is done by turn of nut method. Torque wrenches also can be used. The bolted joints will be checked jointly by BHEL/ Customer engineers for required tightness and retightening is to be done as per requirement. The tightened bolts will be marked with colour paints. Facility for random checking by torque wrench will have to be done. The required calibrated torque wrench will be provided by the contractor.
- 14.2.11 Some platform materials in PG 36 and PG 38, approach ladders, suspension materials etc. will be supplied in running meters. The contractor has to fabricate these materials wherever they are supplied in running meters to the required size / shape, to be welded and erect them within the quoted rates.
- 14.2.12 It shall be the responsibility of the contractor to provide ladders on column for initial works till such time stairways are completed. For this the ladder should not be welded on the column and should be fabricated clamping type ladders. No temporary welding on any structural members is permitted except under special circumstances with the approval of BHEL. The necessary materials for the ladders are to be arranged by bidder within quoted rate. Any ladder supplied by the manufacturing unit for this purpose will be issued to contractor free of cost and the same is to be returned once the platforms are completed.
- 14.2.13 Scrap disposing chutes are to be provided by the contractor within the quoted rate at different areas like along the boiler main column, bunker structure and duct supporting structures. Material for the scrap chute will be provided by BHEL.
- 14.2.14 All normal erection and assembly techniques necessary for completion of works under this specification and magnitude have to be carried out. It is not possible to specifically list out all of them. Absence of any specific reference will not absolve the contractor of his responsibility for the particular operation. These would include
- a) Machine / flame / electric cutting, grinding, welding, radiography and stress relieving.
  - b) Fitting, fettling, filing, straightening, chamfering chipping, scrapping, reaming, cleaning, checking, levelling, blue matching, aligning and assembly.
  - c) Machining, surface grinding, drilling, doweling, shaping.
  - d) Temporary erections for alignment, dismantling of certain equipment for checking, cleaning, servicing and site fabrication.

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- 14.2.15 The contractor should get the formal approval from the Boiler inspectorate to take up the boiler erection work (mainly pressure parts, piping etc.). Necessary assistance will be extended by BHEL for the same.
- 14.2.16 Certain adjustments in length of steel /pipe/tube members may be necessary while erecting high pressure pipelines of boiler and piping ( pre-fabricated lines ) and the contractor should remove the extra lengths to suit the final layout after preparing edges afresh and adopting specified heat treatment procedures at no extra cost, wherever indicated. Depending upon the type of deviation BHEL will consider the reimbursement at man hour rates.- If the drawing provides for erection allowance, then it becomes part of the work and no compensation is payable. The prepared edges in pressure parts shall be applied with weldable primer as preservation and supply of the primer is in contractor scope.
- 14.2.17 Ducts / expansion pieces are dispatched to site in loose walls / plates and these are to be assembled at site before erection.(Walls with stiffeners in welded condition will be provided).
- 14.2.18 All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over. Daily welding reports in the format suggested by BHEL should be submitted by next morning without fail.
- 14.2.19 All the dampers, valves, lifting equipments, power cylinders, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre-commissioning. The bearings of dampers shall be properly cleaned, serviced and lubricated before commissioning at no extra cost. Even after commissioning, if there are problems in the operation they have to be attended by the contractor during the tenure of the contract.
- 14.2.20 In case of any class of work for which there is no such specifications as laid down in the contract such as blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.
- 14.2.21 Spring suspensions / constant load hangers have to be pre-assembled and adjusted for the required loading and erected as per instructions, of BHEL Engineer. Any adjustments, removal of temporary arrestors / lockers, etc., have to be carried out as and when required at no extra cost to BHEL.

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- 14.2.22 No temporary supports shall be welded on the pressure parts of piping. Welding of temporary supports, cleats, etc. on the boiler columns shall be avoided. In case of absolute necessity contractor shall take prior approval from BHEL Engineer. Further, any cutting or alternation of member of the structure of platform or other equipment shall not be done without specific prior approval of BHEL Engineer.
- 14.2.23 The contractor shall fabricate piping, install lube oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lube oil system, carry out the hydraulic test of oil coolers. etc.
- 14.2.24 All hangers, supports and anchors (including concreting or welding) shall be installed as per drawing to obtain a reliable and complete pipe installation as per instructions of BHEL Engineer. Normally supports are issued in running meters. Any additional supports as called for by BHEL Engineer shall be fabricated by the contractor and provided at no extra cost. However, the raw material required for fabrication of such supports shall be supplied by BHEL free of cost. (Any machining or threading is involved will only be done by BHEL).
- 14.2.25 Normally the high pressure valves will have prepared edges for welding. But if it becomes necessary the contractor shall prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like "T" pieces, weld neck flanges, reducers etc., shall be suitably matched with pipes for welding. The valves will have to be checked, cleaned or overhauled in full or in part before erection, after chemical cleaning and during commissioning. Edge preparation becomes the part of erection work. However, payment for new edge preparation reconditioning beyond reasonable limits will be considered as per man day rates. All the valves, after chemical cleaning, have to be checked, cleaned or over hauled in full or part before erection if called for as part of scope.
- 14.2.26 Adjustments like removal of ovalities in pipes and opening or closing the fabricated bends of all piping including high pressure piping to suit the layout shall be considered part of work and the contractor is required to carry out such work free of cost, as per instructions of BHEL, which shall include specific heat treatment procedures etc.,
- 14.2.27 Suspension for piping, pressure parts, ducting etc., will be supplied in running lengths which shall be cut to suitable sizes and adjusted as required within the quoted cost.
- 14.2.28 Fabricated pipes are sent in standard length and will be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient

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will be sent in running lengths with sufficient bends. Bends up to NB 65 mm will have to be fabricated at site adopting specified heat treatment procedures, wherever required at no extra cost.

- 14.2.29 **The enclosed welding schedule in “Chapter-XXI Welding Schedule” is tentative and for reference only. The applicable welding schedules will be issued during erection of work at site.**
- 14.2.30 In the case of structural members / ducts in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints at no extra cost. Normally, the machine profile will be cut out for the structural members but the contractor will have to carry out suitable alteration / adjustments at site, without any extra payment in case it becomes necessary.
- 14.2.31 Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., both for regular measurements and performance testing to be provided on boiler / its auxiliaries or pipelines covered within scope of this tender, will also be the responsibility of the contractor and the same will be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, (a) Product group (PG) under which these items are released are not covered in the scope of this tender, (b) Items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package. Payment will be regulated as per the agreed terms and conditions.
- 14.2.32 The contractor shall fabricate piping, install lub oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lub oil system, carry out the pressure test of oil coolers. etc.,
- 14.2.33 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Sponge ball test shall be carried out for all tubes before erecting the same. Bigger size pipes should be cleaned with flexible wire brush, wherever necessary. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.
- 14.2.34 All attachment welding including those for insulation and refractory work coming on the pressure parts shall have to be done by the contractor. The hooks are suitable for stud welding machines. Contractor's quoted rate shall include all these contingencies. Attachment welding on pressure parts shall be done by

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qualified and certified welders only. Welding of Insulation hooks at site shall be welded on the fins by manual welding / stud welding machines.

- 14.2.35 It is the responsibility of the contractor to do the alignment, checking, etc., if necessary, repeatedly to satisfy BHEL Engineer / customer Engineers with all the necessary tools and tackles manpower, etc., without any extra cost. The alignment will be complete only when jointly certified so, by the BHEL Engineer & customer. Also the contractor should ensure that the alignment is not disturbed afterwards.
- 14.2.36 Burner tilt mechanism will be checked for freeness, serviced and adjusted, if necessary to obtain optimum tilt before and after installation.
- 14.2.37 Fine fittings, boiler trim piping, oil system and other small bore piping have to be routed according to site conditions and hence shall be done only in position. As such, layout of small bore piping in boiler and oil system shall be done as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines when after completion, to suit the site conditions. The contractor should absorb this cost in his quoted rate.
- 14.2.38 Additional platforms for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be assembled and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for erection of structures (Rate schedule ID 1A). The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement. Works of major nature not covered under this clause.
- 14.2.39 Complete penetration of water wall (Panel to panel) tube to tube and fins welding shall be achieved either by single side or double side welding. The decision of BHEL Engineer is final.

**NOTE:** The water wall/spiral wall panels will be supplied with fin cut to a length of 300 mm on ends for alignment and welding of tube to tube of panels at site.

The bidder may require to cut fins further to a maximum length of 1000 mm for alignment and welding of tube to tube in water wall/spiral wall panels and welding of fins on both sides after completion of panel to panel welding within the quoted rate. No extra payment will be made for the above works.

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

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- 14.2.41 Certain extra lengths of various tubes/pipes and fabricated ducts are provided as erection allowance and the same have to be cut/adjusted to suit the site conditions and layouts or certain small lengths may have to be added for adjustments to suit the site conditions. For any mismatch while matching the joints in tubes, the cutting, adjusting, re welding, addition spool pieces should be done by the contractor to match site conditions without any extra payment.
- 14.2.42 Assistance for calibrating / testing the power cylinders / valves, gauges, instruments, etc. and setting to actuators coming under various groups shall be provided by contractor within the quoted rates.
- 14.2.43 Hanger rods are shown in the pressure parts arrangement drawing for boiler. Any cutting / welding and required heat treatment and necessary NDT of such hanger rods will be done by the contractor. The hangers for pressure parts will be tested for even distribution of load with the help of torque wrench.
- 14.2.44 Skin casing sheet for covering the boiler roof panels, and other areas will be supplied as fabricated items. Any cutting and re-fabrication to suit the site conditions shall be carried out within the quoted rates.
- 14.2.45 For all the site routed piping under PG-21, 24 & 42 as built drawings are to be submitted by the contractor immediately after erection. The Number of site welds indicated for PG21, 24 the under the heading "Quantum of HP joints" is approximate. It is to be noted that piping for fine fittings, trim piping, oil system (PG 42) soot blower system shall be supplied mostly in running meters which will be erected and all joints are to be welded as per the drawings/site routing within the quoted rates by the bidder.
- 14.2.46 Hydraulic test of SCAPH has to be carried out on the ground before lifting it to the position.
- 14.2.47 Seal boxes should be reinforced with insulation pins as per drawing releases in attachment drawings and after that all seal boxes to be painted with bituminous paint of IS158 by the bidder. The required paint shall be supplied by the bidder within the quoted rate.
- 14.2.48 Grab Bars for accessing into the furnace area shall be provided in each seal box as per drawings.
- 14.2.49 Before lifting the heavy components like header, panels, burner assemblies, down comer pipes etc. soft materials like gunny bags to be used while lashing the rope to avoid dents, rubbing marks etc. The capacity, number of sheave pulleys, size of the rope, guide pulley locations are to be decided at site with respect to the capacity and positioning of the winch. The end caps provided at

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shop for various stubs are to be removed during final fit up only.

1. While Lifting the headers lifting lugs or shell portion of the headers only to be used. The temporary supports to be removed prior to hydraulic test. While erecting the temporary supports, care should be taken so that they do not affect the erection of permanent supports. Tack welding of suspension rods with bearing plates to be done after final adjustment. Details for welding of bearing plates can be referred in the drawings/check list.
2. Precautions to be used while erecting the collector channel supports. Equal loading of the hangers is to be ensured. Ring headers are erected before erection of water wall bottom hopper panels. Headers are to be arrested before welding to panels/headers/tubes/coils as the case may be. Sequence of welding to be followed while welding higher size joints.
3. Each water wall tube is provided with an orifice assembly in the bottom ring header. Orifice adopter is welded inside the header and welded at shop. After chemical cleaning operations, the orifice assemblies are to be erected at site as per directive of engineer and drawings.
4. Erection of various components is taken up from top to bottom. Planning has to be done every month in consultation with the engineer. Pre assembly of seal boxes for the peep hole openings, pressure tapping, soot blowers etc. can be done on the ground before erection, if feasible. The burner blocks are to be erected in convenient position before closing the furnace with panels. For panel to panel erection and welding panels erection attachments are supplied by units. Furnace alignment with respect to boiler /furnace axis is very vital and important. The alignment is to be achieved. Details to be checked with engineer.
5. The gaps between coils and steam cooled / WW panels /between coils etc. to be maintained in line with drawing. Please check up the permissible tolerance before taking up the work.
6. Preassembly of end bars with crown plates including stress relieving for coil assemblies.
7. Pump case / volute is welded with suction manifold in line with procedures available with site office.
8. The required accuracy level to be ensured before welding as per drawing. Necessary radiography/NDT along with heat treatment to be done.
9. CC pump motor installation is taken up only after completion of system pipe work supports. When mounted the pump should accommodate movement in the pipe without imposing excessive loads on the casing and branches. Sufficient clearance should be available beneath the motor to facilitate removal during maintenance. It is to be assembled as per the directions available with engineer.

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10. Ensure completion of the maintenance hoists meant for CC pumps immediately else the area may be used by other agencies for laying the cables for various equipments coming in that area, inadvertently and they have to be removed later. Heat exchanger installation is also to be completed and necessary cooling water lines, thermocouples, pressure gauges etc. to be completed. The power cable connection made to the pumps should ensure free down ward expansion of the boiler at the level.
11. Down comer pipes erection can be done by carrying out preassembling the pipes whatever feasible as per availability. The suction manifold received in loose pieces and to be pre-assembled in the floor nearby. After welding the suction manifold, it is to be positioned, aligned and then only the down comers from the steam separator/ drum are to be connected. Erection of suction spool pieces, and hand operated valves for the system to be erected. The CC pump volute without impeller is fitted to the bottom of the suction spool .Bottom flange of the volute is carefully levelled and aligned before welding the suction spool. After completion of welding in all respects cutting and trimming of erection attachment to be done. CC pumps volute is to be blanked for carrying out hydro test. After hydro test, the blanks are removed and pump erection taken up. The tightening of the bolts to be done with torque wrench as per the instructions of the supplier.
12. Before taking up the erection of coils, pre erection checks to be carried out like width and length of the coil, availability of flexible connectors, damages on the coils, permanent bows if any, sponge test for the coil and completion of ground inspection by inspector of boilers as deemed. Ensure the removal of the transportataion supports in each coils prior to erection.
13. Erection of LTRH/ Economizer coils as applicable can be done by preassembling the upper and lower coils. Pre erection checks like width, length etc., and sponge test of coils for thoroughness to be done before erection. Required hanger tubes erection to be completed before LTRH / Economizer coils erection. **The preassembly of cassette baffles of LTRH and Eco coils can be carried out before their erection.**
14. Check for the gaps between SH steam cooled front wall and Eco/SH horizontal assemblies, gap between SH steam cooled rear wall and SH horizontal assemblies/ eco assemblies, spacing between rear WW arch and pendant assemblies and finish SH coils. Detailed drawings are to be referred during execution. The items indicated are suggestive only.
15. Check for the inner space between eco coils, LTRH, RH and SH coils as per drawing
16. Ensure proper completion of steam cooled spacers. Check for clearances for soot blower lance tubes.

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Ensure that soot blower lance tube in 0 dead travel position unless until charged. Radiant roof skin casing sheets are to be welded after application of castable refractory.

17. Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.
18. While erecting the safety valves, check for the set pressure and type. The lever arrangement, blow down ring approach for floating should be ensured. Drip pan drains with proper slope to be given to safe location. Check the exhaust pipe arrangement for expansion and proper guides to be given. Ensure anchor points for the above pipes.
19. Ensure removal of drains plugs provided in the silencers, the gap between exhaust pipe and roof is sealed properly.
20. DWLGs to be erected as per drawing. Joint protocol to be made for its correct erection with supports.
21. Other tapping points meant for monitoring the level should be erected and protocol is to be made. Maximum use of the pads and lugs welded on the steam separator/drum to be used for giving supports.
22. Sample coolers are to be erected preferably in clean area. All the lines should be air blown before termination on both ends. Sockets are to be used for sampling lines. **Tig welding must be used for sampling lines instead of arc welding.**
23. All the drain lines should have sufficient slope towards drain. Provide expansion loops in all the vents and drains as per the drawings. Electromatic relief valve controller is supported separately in column so that the vibration from boiler is not transmitted. Provide pre compression springs where required to take care of the load. All the motor operated valve stems should be vertical preferably. All the valve packing with asbestos base to be lubricated once in 6 months till handing over. Necessary gland packing will be supplied by BHEL.
24. Prior to erection of any pressure part like headers, pipes, tubes, panels etc. inspection to be done for any foreign materials and damages and they are to be removed/ attended as per BHEL engineer.
25. Transport binders on all coils are to be removed.
26. Gas distribution baffles and vibration snubbers, mechanical spacer bars etc. are to be erected as per drawings.
27. Buck stays are preassembled and raised to their respective elevations and hung prior to erection of furnace walls. Before fixing them to furnace walls, ensure completion of panel to panel welding and voids in the buck stay region. The necessary scalloped bars/plates/pads are to be welded after

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- leveling. Ensure completion of vertical buck stays including support hangers, links. The erection of leveler channels with guides to be completed.
28. All the furnace guides to be erected as per drawing keeping gap of about 3 mm for free boiler expansion.
  29. The necessary connection to the wind box is to be completed in all respects as per drawing. If any drain holes are envisaged, the same to be provided. No pipe line supports should be taken from the buck stays without getting the approval from engineer.
  30. Sagging of roof tubes results in condensate stagnation during shut down. Hence ensure that radiant roof and back pass roof tubes are erected without sag.
  31. Total boiler is to be examined in all levels for free expansion. All the arrestors are to be removed. Expansion indicators are to be erected in various levels as per drawing / instruction of engineer.
  32. Some of the few important locations for voids filling:-
    - Around penetration for pendent surfaces and radiant roof/SH screen tubes/second pass roof tubes
    - Between loose front ww tubes above front upper panels and below radiant roof
    - Gap between radiant roof tubes at the junction of front wall
    - Extreme rear arch tubes and side ww/extended ww panels
    - Extreme SH screen tubes and SH extended steam cooled walls
    - Gaps between tubes /nipples in the steam cooled rear, side and front wall and respective headers
    - Extreme tubes of front and side ww lower panels
    - Side ww/extended side ww and extreme tubes of radiant roof
    - Extended side steam cooled wall and extreme tubes of SH screen tubes
    - Steam cooled side wall and extreme tubes of second pass roof
    - Between tubes in upper corner tubes
    - Between tubes in lower transition tubes
    - Gap between tubes/nipples of side ww lower header at the ash hopper throat region
    - Voids due to lifting slots in fusion/fin welded panels
    - Voids due to erection slots in fusion/fin welded panels
    - Fusion/fin welded panel fin slits at the panel tube-tube butt joint locations

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- **The above list is suggestive only. Voids are to be closed suitably to retain refractory in position and to achieve the gas tightness**

### 14.2.50 **Erection of Boiler structures and points to be taken care of for achieving verticality of Boiler columns.**

- The column pieces are pre-assembled and site match marks to be provided.
- Pre assembly checks to detect and deviations in the columns like length, camber sweep, twist etc.
- Checking of foundations for its levels distance, diagonal, distance etc.
- Proper tightening of the foundation bolts.
- Erection of columns tier by tier and box by box. Grouting to be done immediately after 1st tier erection.
- Ensuring the availability of guy ropes, etc. during column erection and removal of guy ropes after ensuring the verticality of columns.
- Using calibrated theodolite for verticality measurement of columns.
- Tightening of HSFG bolts to be done by turn of nut method only after ensuring the verticality of the columns.
- Measuring adjacent diagonals of the ceiling girders after its erection.
- Ensuring the verticality of the columns before and after the steam separator erection.

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

14.2.52 The fans shall be checked for blade clearance and other vital tolerances. The Flow control devices in fans like IGV/Damper units shall be serviced. Necessary assistance for balancing of equipment during trial run shall be provided by the contractor.

14.2.53 Vital clearance of mill should be checked at site and adjusted if required.

14.2.54 The HT motor bearings shall be blue matched at site and checked for bearing clearance. Scrapping of bearing housing, if required shall be carried out by the contractor. No extra claim for blue matching of any two surfaces will be entertained. The HT motors will be checked for air gap and adjustment of stator / rotor to magnetic center shall be carried out as part of erection.

14.2.55 The contractor shall fabricate piping, install lub oil systems and carry out the acid cleaning of fabricated piping. The contractor shall also service the lub oil system, carry out the hydraulic test of oil coolers, etc.

14.2.56 D.S.L / equivalent system for hoisting equipments are also to be erected and commissioned including load testing by the contractor within the quoted rates.

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Required manpower including electricians is to be arranged by the contractor for carrying out commissioning of electrical hoist and load testing of the above electrical hoist. Required loads will be provided by BHEL free of cost.

- 14.2.57 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.
- 14.2.58 Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from, all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity. If the contractor does not do this job satisfactory, BHEL will arrange for the same and the expenses incurred with overhead will be recovered from the contractors.
- 14.2.59 Scrap disposing chutes are to be erected by the contractor with in the quoted rate at different areas like Boiler main column, duct supporting structures. Materials for the scrap chute will be provided by BHEL.

### **14.3 MILL BUNKER STRUCTURE, COAL BUNKER, TRANSFER POINTS, GALLERIES, SILOS ETC.**

- 14.3.1 Erection, alignment, welding, bolting, grouting and painting as applicable for fabricated structures (supplied form BHEL units) of Mill bunker structures, Coal bunkers, Transfer points, Trestles, Conveyor galleries etc.
- 14.3.2 Supply and installation of items as per BOQ for Bunker structural works in Mill Bunker structures, Transfer points, Trestles, Galleries etc.
- 14.3.3 Where ever the design & supply together is covered in the scope of bidder necessary approvals from BHEL / PVUNL shall be taken by bidder for the design, inspection procedure & vendor. List of items for which such approvals required will be frozen during execution of the contract.
- 14.3.4 Contractor shall procure and supply the items to PVUNL Patratu project site as per the BOQ for structural works from BHEL / PVUNL approved vendors, meeting the specification (enclosed), Drawings and instructions of the Engineer.
- 14.3.5 The structures of Bunker, Fuel bunker, Junction tower and ~~Trestles & galleries~~ are supplied in respective PGs as mentioned in Chapter IX.
- 14.3.6 Total no. of bunker per Boiler is nine. The bunkers will be supplied in segments. Contractor has to carry out longitudinal welds for joining segments in staggered arrangement and circumferential weld for forming the shell & Hopper. The ring stiffeners will be welded with the shell and will have a site joint at the shell joint location.
- 14.3.7 SS liners will be fixed in the shells and for site joint location it will be supplied as loose, which has to be fixed by the contractor by welding.

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Minimum 4.0 mm thick stainless steel liner of grade SS:304(as manufactured by SAIL Finish Grade 2B (Cold rolled, Annealed & Pickled and Skin passed) ) on M.S. plate for inside surfaces of bunkers including fixing with stainless steel studs, bolting (including countersunk), welding with electrode classification E308L for welding of stainless steel to stainless steel and E309 for stainless steel to mild steel etc. all complete.

14.3.8 Contractor shall provide the temporary structures like scaffolding, Access ladders, working platforms etc. and removal of the same after completion of Bunker erection.

### **14.4 Reconciliation of steel issued by BHEL (free of cost):**

#### **General Notes**

- a. All steel like **structural steel, except MS/GI/SS handrails** as specified in relevant BOQ shall be issued free of cost by BHEL for use in the work covered in this contract from BHEL stores/storage yard. The contractor shall collect these materials from BHEL stores/storage yard at specified places at his own cost and store the same at his stores as per standard norms. Materials issued will be used only for construction of permanent works. Procurement, supply, fabrication, erection and painting of MS/GI/SS handrails as applicable shall be in contractor's scope.
- b. BHEL reserves the right to recover from the contractor any loss arising out of damage/ theft or any other causes or during verification/stacking or at any time under the custody of the contractor.
- c. The contractor shall take care of material issued by BHEL and shall protect the same from damage and weathering.
- d. The contractor shall in no case be entitled for any compensation on account of any delay in supply or non-supply thereof for all or any such materials. However in case of non-availability of any specific section(s) which delays the completion of work, such cases shall be recorded separately in monthly planning format (F 14) and shall be considered for time extension of contract.
- e. Contractor will have to make his own arrangement at his own cost for procurement of any other materials except as mentioned above/ BOQ, as required for the works and of such quality as acceptable to BHEL.
- f. The contractor shall maintain proper store account for all the BHEL issued materials and shall give **Three (03) copies of monthly-computerized reconciliation statement** of such account showing total receipt, consumption and balance at site to the BHEL. BHEL Engineer's certification for the reconciliation of steel shall be final.

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The detailed reconciliation (dia. Wise or as required) shall be done **at least once in three months (03) or before submission of final bill which comes earlier.**

- g.** Contractor shall also carryout in complete association with BHEL, the material management functions and execution like day-to-day update of materials, issued to contractor, accounting for surplus/scrap material returned etc. These functions shall also be carried out through computerized system utilizing suitable software. Contractor shall engage experienced software personnel to associate on dedicated basis for efficient discharge of the same in time.
- h.** The contractor shall solely be responsible for the safety & security of material after it is handed over and issued to contractor by the BHEL.
- i.** BHEL issued materials, shall not be under any circumstances whatsoever, and shall be taken out of the project site unless otherwise permitted by BHEL for outside job.

### **14.5 HANDLING OF MATERIALS ISSUED BY BHEL:**

14.5.1 Materials shall be issued by BHEL based on the weightment basis/linear measurements & sectional weight. However on specific request of the contractor **“as a special case to expedite the job”** the consignment received at BHEL stores can directly be diverted to the work site following issuance procedure of BHEL. Such direct issues shall be as per the Challan/dispatch document/LR received with the consignment. In such cases, contractor shall do unloading of materials from trucks/lorry at their own cost.

14.5.2 All materials issued by BHEL shall be stacked, stored above ground level **by use of concrete or wooden sleepers. No materials shall remain on ground at any time.** All concrete or wooden sleepers required for stacking the materials shall be arranged by contractor at his own cost within the quoted rates. All other equipment like winches, D-Shackles, slings of various sizes, max puller, pulley blocks, jacks, trucks, trailers etc required for such handling of steel from BHEL stores/storage yard etc shall be arranged by contractor within quoted/accepted rates.

14.5.3 Open land for storage purposes shall be provided by BHEL on free of cost/as available basis. Temporary barbed wire fencing of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc wherever required off the land provided to him and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel's to safeguard all such materials in his custody. Materials issued will be used only for construction of

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permanent works. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. Excessive rusting of steel in custody of agency/contractor must be avoided. **In case, due to any cause attributable to the contractor, such rusting of steel occur rendering the same unusable, then such quantity of steel shall be recovered from the interim payment at the penal rate specified in the tender.**

### 14.6 ISSUE OF STEEL

14.6.1 The steel shall be issued to the contractor on the following basis:

- i. Structural Steel: Weighment basis (Unit-MT)
  - ii. ~~Reinforcement Steel and Earthing Rod: Weighment basis (Unit-MT)~~
  - iii. ~~GI Gratings: Weighment Basis (Unit-MT/As Received from manufacturer)~~
- MS Rails: Weighment Basis (Unit-MT)

14.6.2 All the steel (structural, ~~reinforcement, earthing~~ MS rod/GI Flat, GI Grating, ~~Foundation bolts,~~) issued by BHEL shall be properly accounted for. The total quantity of steel required for the work will be calculated from the approved ~~Bar Bending schedule~~, fabrication drawings, ~~approved laps, chairs and lugs etc.~~ The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the following IS/BS/EN specifications.

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Sr No	Name of Standard	Name of Section
1	IS: 808-1964	Beams, Channels and Angles
2	IS: 1730-1961	Plates, Sheets and Strips/Flats
3	BS4-1: 1993	UB/UC sections
4	IS: 12778/equivalence with EN-19-57	For NPB sections
5	IS: 12778/equivalence with EN-53-62	For HE/WPB sections
6	IS: 1786 or grade -1 of IS432 (Part-I)	Rounds including deformed high yield strength bars.

**In case any such sectional weights are not available in the above documents, the manufacturer recommendation shall be binding.**

14.6.3 The steel issued to the contractor shall be mainly in standard length and sections as received from the supplier. However, the contractor shall be bound to accept the steel in length as available in the project stores, no claims for extra payment because of issue of non-standard length will be entertained.

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

14.6.5 The contractor shall submit to BHEL, a statement indicating estimated quantity and steel required during a quarter. In addition, the contractor shall also furnish the estimated requirement of steel during a month by the third week of the previous month indicating his requirement.

14.6.6 Following shall be limit for the maximum quantity of BHEL issue materials that would be with the contractor at any point of time when work is in progress (excluding what has already been incorporated in the works).

SL No.	ISSUE OF MATERIALS	MAX QUANTITY IN CONTRACTORS STORE
01	Reinforcement Steel, MS Rod/GI Flat, GI Grating, Foundation Bolts, MS Rails	ONE MONTH
02	Structural Steel	ONE MONTH

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- 14.6.7 Bidders shall ensure that no lamination material is taken over by them from BHEL.
- 14.6.8 The contractor must note that cement and steel required for the contractor's enabling job like store/ site office/ ~~batching plant~~/temporary work etc shall be arranged by the contractor at his own cost.

### **14.7 RETURN OF MATERIALS**

**14.7.1 Return of Reinforcement Steel and Structural Steel including Scrap:** All surplus steel and all wastage materials will be taken back on weight basis. Surplus, unused and untampered steel shall be sorted section-wise and returned separately at a place directed by BHEL Engineer within the project area. Return of such materials will not be entitled for any handling and incidental charges. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be returned to the stores in consultation with BHEL Engineer and a receipt obtained for material accounting purposes. Return of such material will not be entitled to any transportation and incidental charge. Scrap for ~~reinforcement steel~~ and structural steel shall be returned separately.

### **14.8 Scrap & Serviceable Materials:**

- 14.8.1 All structural steel of length above 2 M except M.S Plate shall be considered as **serviceable materials** provided the materials are free from any physical damage, good condition and un-welded. Structural steel of length less than 2 M shall be treated as scrap.
- 14.8.2 Plates having both side greater than 1 Meter OR if any side is less than 1 M but greater than 0.5 M and the total area is equal or greater than 2 sq. Meter shall be considered as **serviceable materials**.
- 14.8.3 All pipe measuring 2 M and above in length shall be treated as **serviceable materials** provided they are free from any physical damage, good condition and un-welded. Pipe in less than 2 M length shall be treated as Scrap.

### **14.9 Steel Consumption and Wastage**

#### **14.9.1 Reinforcement Steel, Earthing MS Rod/GI Flat, GI Gratings, Foundation Bolts and MS Rails Consumption:**

The theoretical consumption of various sections and/or diameter of reinforcement and earthing rod steel shall be based on approved construction drawing and bar bending schedule. Weight shall be calculated considering the sectional weights as per Indian standards. No extra cost shall be payable to the contractor for any

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deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

### 14.9.1.1 Actual consumption = Issue - Surplus.

14.9.1.2 Surplus = **untempered, unused, uncut quantity of steel including serviceable materials returned by the contractor to BHEL store.**

14.9.1.3 Wastage = Actual consumption - Theoretical consumption.

### 14.9.2 ~~Reinforcement Steel, Earthing MS Rod/GI Flat, GI Gratings, Foundation Bolts and MS Rails Wastage:~~

14.9.2.1 Allowable Wastage: (+3%) of the theoretical consumption shall be considered as allowable wastage.

<b>Wastage and scrap shall be as per actual weighment basis.</b>		
<b>Sl no</b>	<b>Reinforcement steel &amp; MS earthing rod</b>	<b>Basis of issue &amp; penal recovery</b>
R-1	Theoretical consumption (without considering wastage and scrap or loss)	Free
R-2	Wastage limited to plus THREE percent (+3%) of aforesaid theoretical consumption (R-1) towards allowable wastage.	Free
R-3	Wastage beyond THREE percent (+3%) of the theoretical consumption above (R-1).	Penal rate

### 14.9.3 Reconciliation of Materials:

- i. The contractor shall submit a reconciliation statement of steel issued to the contractor with each RA Bill.
- ii. At the time of submission of bills, the contractor shall properly account for the material issued to him as specified herein to the satisfaction of BHEL certifying that the balance material are available in the contractor custody at site.
- iii. At the time of submission of bills, if it is noticed by BHEL that the wastage is high and calls recovery at the penal rate, then, BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified.
- iv. The reference drawings for actual material consumption to be used for the purpose of reconciliation shall be drawings prepared by the BHEL and drawings approved by BHEL for fabrication works and such other drawings approved by

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BHEL. This shall also include the bar bending schedule prepared by the contractor and approved by BHEL.

### 14.10 Recovery of Materials (Penal Rates):

If wastage exceeds the specified limit, the recovery of excess wastage shall be made from monthly RA Bills as per following penal rates:

Sr No	Item	Penal rate (Rs)
P-1	Cement (OPC/ PPC/ PSC).	6,500 per MT
P-2	Reinforcement steel, earthing MS rod/GI Flat etc.	55,000 per MT
P-3	Chequered Plates, MS plates	60,000 per MT
P-4	MS Flats, beams, channel, angles, Pre Fabricated etc. (Rolled Sections)	80,000 per MT
P-5	Foundation Bolts/GI Gratings if any	90,000 per MT

### 14.11 Void

### 14.12 ERECTION OF SCR (SELECTIVE CATELETIC REDUCTION ) SYSTEMS

The contractor's scope includes the material transportations from BHEL Storage yard to site, erection and commissioning erection, commissioning and testing of complete system for Selective Catalytic Reduction (SCR) System along with ammonia unloading, storage and handling system, Cyclone Separators complete in all respects with all components and accessories etc., The SCR System is intended to reduce the emission of NOx in flue gas produced by coal being fired in boiler to the limits specified elsewhere in the technical specification.

#### SCR System includes the following Systems

- 14.12.1 SCR System along with ammonia injection system and cyclone separators shall be individual for each unit. Ammonia unloading, storage and handling system shall be common for three (03) units. Erection and commissioning of the Common systems are in the scope of Pkg-A erection agency.
- 14.12.2 The scope of contractor for SCR System along with ammonia unloading, storage and handling system, Cyclone Separators shall include All ducting, dampers, expansion joints, valves, pumps, supports, structure, trestle etc as required for completeness of this system shall also be in the scope of contractor.
- 14.12.3 The scope of E & C for SCR System along with ammonia unloading, storage and handling system, Cyclone Separators for each unit shall include all items indicated below but will not be limited to that.

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### 14.12.4 Statutory Approval

It shall be the responsibility of the Contractor to obtain the all necessary approvals/permits (CCOE approval in ammonia tank /storage farm area ) from the inspection/regulatory authorities etc. on behalf of the Employer, as may be required for design/calculations, manufacturing and erection procedure, testing etc. As called for under the statutes, regulations and the safety codes. All such documentation required to be submitted to the statutory authorities shall be submitted to the Employer for its review.

### System Description

14.12.5 Flue gas from downstream of economizer shall be taken through two (02) independent streams. Each stream shall have

- one (01) number of cyclone separator
- one (01) number of SCR Reactor.

Cyclone Separator shall be used to reduce inlet dust concentration at the inlet of SCR reactor. Air diluted gaseous ammonia shall be injected before SCR reactor and the mixture of flue gas & ammonia shall be passed through the catalyst placed in layers inside reactor for reduction of NO<sub>x</sub> present in flue gas to nitrogen. Flue gas after NO<sub>x</sub> removal shall be taken to the Air Pre-heater. SCR bypass duct i.e. Economizer to APH shall be provided for facilitating operation of unit without SCR in case of any emergency requirement. This shall also facilitate the online maintenance of SCR system and associated equipment. Economizer flue gas bypass shall also be provided to maintain required flue gas temperature at the SCR reactor inlet at partial load conditions.

Anhydrous ammonia shall be supplied through tank truck and unloaded in ammonia storage tanks with the use of ammonia unloading compressors. Liquid ammonia from the storage tank is sent through ammonia vaporizer and diluted with air before injection on upstream of SCR reactor.

Each SCR System serving one (01) steam generator, shall have two (02) numbers of independently operated SCR reactors (gas streams) along with catalyst modules housed in SCR reactor casings including outside shell, structural steel supports & frame work, access doors & ladders, platforms, safety rails, stairways, walk ways etc. SCR System will be complete in all respects including all components and accessories.

### 14.12.6 SCR Reactor and auxiliary system

- a. Each SCR reactor shall have three (03) working catalyst layers and one (01) spare (future) catalyst layer

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- b. Catalyst modules with test sample for all working layers along with sealing system.

### **14.12.7 Each SCR reactor shall include, but not limited to the following:**

- a. Inlet and outlet hood with guide vanes
- b. Static Mixer (if required)
- c. Flue gas flow straightener / rectifier at inlet of SCR reactor
- d. Connection nozzles for media (e.g. flue gas, steam, pressurized air etc.),
- e. Ash hoppers for SCR reactors/duct (if required) complete with level monitors and indicators, poke holes, access doors, walkways beneath the hoppers along with associated ash handling system.
- f. Catalyst module support structure
- g. Access for Catalyst module loading/ unloading for each catalyst layer.
- h. Control & instrumentation
- i. Inspection opening(s) for every catalyst layer.
- j. Gas sampling system including online gas analysers at inlet and outlet of SCR reactor for measurement of NO<sub>x</sub>, SO<sub>x</sub>, O<sub>2</sub>, CO<sub>2</sub> etc
- k. In-situ type or extraction type ammonia analyser at the outlet of SCR reactor.
- l. NO<sub>x</sub> grid measurement (if applicable)

### **14.12.8 Catalyst De-dusting System**

Catalyst De-Dusting System includes the Minimum 4 nos of Sonic horns & 6 nos of Air Cannons shall be provided for each catalyst layer (including future layer) complete with structural supporting frame, access platform, compressed air storage vessel, piping, control & instrumentation, insulation, acoustic enclosures etc.

**OR**

Minimum four (04) nos of Rake retractable type steam operated Soot blowers shall be provided for each catalyst layer (including future layer) complete with structural supporting frame, access platform, motors, piping, control & instrumentation, insulation etc.

### **14.12.9 Handling System**

- a. Complete catalyst handling system including platforms for temporary storage of catalyst, monorails with electrically operated hoists including monorail beams for each catalyst layer (including future layer) for lifting of catalyst module from grade, storage & placement inside the reactor.
- b. Handling system with monorail and electrical hoist for other equipments which are weighing more than 500kg and requires to be handled for maintenance/replacements.

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### 14.12.10 Ducts and Dampers

The scope of ducting and damper as below but not limited to the following for SCR system for each steam generator:

- a) Inlet duct from economizer outlet to each SCR reactor inlet
- b) Outlet Duct from SCR reactor outlet to APH Inlet
- c) SCR bypass duct i.e. Economizer to APH
- d) Economizer bypass duct from economizer inlet/intermediate position to SCR inlet duct
- e) Flue gas ducting system shall be complete with adequately sized turning vanes, deflector plates, flow splitters, guide vanes and all necessary gas flow control devices of suitable erosion resistant material, metallic type expansion joints, complete duct stiffening devices, interior bracings, slide plates, access doors, brackets, supporting structures, hangers, sampling connections, etc.
- f) Isolation gates at inlet of each cyclone separator, SCR outlet and SCR bypass duct of each SCR reactor and isolation gate & control damper in economizer bypass duct to each SCR inlet duct.
- g) Ash hoppers for duct, if required based on layout, complete with low and high ash level switches etc.

### 14.12.11 Cyclone Separators

- a. Two (02) nos. of independently operated Cyclone Separators housed in independent casings shall be provided for each unit including outside shell, structural steel supports and frame work, stiffeners, bracings, access ladders, platforms, safety rails, stairways, walk ways, access doors, insulation etc. One (01) cyclone separator shall be provided in each stream of flue gas duct from economizer outlet to SCR reactor inlet.
- b. Ash hoppers complete with level monitors and indicators, poke holes, access doors, walkways beneath the hoppers along with associated ash handling system shall be in the contractor's scope.
- c. Installation of Sampling ports for off-line measurement of ash concentration in flue gas at the inlet and outlet of Cyclone separators.

### 14.12.12 AMMONIA INJECTION AND DILUTION AIR SYSTEM FOR EACH UNIT

- a. Complete Ammonia Injection system for each SCR system consisting of, but not limited to, nozzle lances or ammonia injection grid, ammonia-air mixer, piping for distribution of ammonia/air mixture, valves etc.

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- b. 2x100% dilution air fans with drive motors, coupling, coupling guard, silencer, filter and suitable arrangement to prevent rain water entry to fan motor, air heating system (electrical) if required, dampers etc. for each SCR System. Alternatively, dilution air may be tapped of from Secondary air duct in place of dilution air fans.

### **14.12.13 AMMONIA UNLOADING, STORAGE AND HANDLING SYSTEM (COMMON FOR ALL THREE UNITS)**

**14.12.13.1** A common ammonia unloading, storage and handling system shall be provided having a handling capacity equivalent to SCR Systems of three (03) units. The above ammonia unloading, storage and handling system shall be designed for Anhydrous Ammonia. Common System includes the following systems:

- a. Two (02) nos. anhydrous ammonia unloading system to unload ammonia from trucks, including two (02) nos. ammonia unloading compressor skids with all necessary equipment, fittings, hose connections, monitoring and safety devices.
- b. Three (03) nos. ammonia storage tanks including all supports and other accessories with all fittings, monitoring and safety devices. Each storage tank capacity shall be for 14 days of ammonia requirement of SCR system of one unit.
- c. Two (02) nos. ammonia forwarding pump skids to pump ammonia to ammonia vaporizer (if required). Each pump shall be capable of forwarding ammonia to meet the requirements of SCR system of all three (03) units.
- d. Four (04) nos. Ammonia vaporizer and associated systems. Each ammonia vaporizer shall be capable of vaporizing the ammonia to meet the requirements of SCR system of one unit.
- e. Four (04) nos. ammonia accumulators and associated systems. Each ammonia accumulator shall be capable of handling the ammonia to meet the requirements of SCR system of one unit.
- f. 2x100% Glycol-water recirculation pumps with common water/ glycol heater for each ammonia vaporizer and common overhead make up water/glycol tank.
- g. One (01) no. waste ammonia dilution tank of minimum 10 m<sup>3</sup> storage capacity along with service water connection, outlet pipes, valves, instrumentation etc.
- h. A dyke shall be provided around storage tank area with storage capacity equivalent to one storage tank, for collection of liquid ammonia in case of emergency. This dyke shall be connected to waste water retaining basin.
- i. One (01) no. Waste water retaining basin near ammonia unloading & storage system

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- j. 2x100% waste water/ ammonia disposal pumps with motors for transferring drains to Water Treatment Plant (WTP). Chemical dosing system for controlling PH of waste water before sending to WTP.
- k. , auxiliary systems, nitrogen purging system, complete piping system, hoses for ammonia unloading and necessary piping, heat tracing etc.
- l. Parking pad for tank truck along with bulkhead
- m. Valves such as manual valves, pressure relief valves, excess flow valves, emergency shut-off valves, check valves, Control valves etc
- n. Platform, walkways for maintenance and inspection shall be provided.
- o. Ammonia leak detectors with annunciation system

### **14.12.14 Thermal Insulation, Lagging, Cladding & Refractories**

**14.12.14.1** Thermal Insulation along with aluminum cladding, lagging, reinforcement wire mesh, cleats and supports, shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius.

**14.12.14.2** ~~Corrosion protection painting for structures and equipments/system as described in the specification.~~

**14.12.14.3** Sheathing work for roof/ canopy/ side cladding of SCR system.

**14.12.15 Necessary access, platforms, walkways, handrails, staircase, ladders and gratings etc. for access/approach and safe mobility shall be provided** for all equipment and accessories in the scope agency so that operators and maintenance personnel can function conveniently and safely.

**14.12.16 Necessary approval is required from statutory authorities for the entire Ammonia unloading, storage and handling system will be in the scope of agency**

**14.12.17** Fencing work of Complete ammonia unloading, storage & forwarding system shall be in the scope of agency.

### **14.13 MAIN SUPPORTING STRUCTURES, EXTERNAL STRUCTURES, ELEVATOR STRUCTURES, STAIRWAYS, GALLERIES & PLATFORMS & HANDLING ARRANGEMENT**

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

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- 14.13.2 Contractor shall arrange materials required for temporary cat ladders & working platforms during erection of columns, platforms and other structural components. Such arrangements shall, as far as possible, be only of clamping & bolting type, as welding on columns etc will not be permitted. After the completion of work these shall be removed.
- 14.13.3 All the hand rails and toe guards shall be provided as per drawings and site requirement. hand rails supplied in running lengths shall be suitably cut, edge prepared and welded. Also, hand rails/ guards may have to be provided from the safety point of view in certain places though not indicated in the erection drawings. The weld joints of hand rails shall be ground smooth to flush finish.
- 14.13.4 Electroforged floor grills will be supplied for this project. These may have to be cut to suit requirement. Cutting shall be done only by mechanical cutters **and not by gas cutting**. Cold galvanizing compound is to be applied on the cut surface/edge. Cold galvanizing paint supply is in Contractor scope.
- 14.13.5 Fixing of floor grills shall be done by self-tapping screws **and not by weldable studs**. Special purpose electrically operated hand tools are available in the market for this, which drills, taps and fixes the screws in a single operation. Supply of necessary self-drilling-cum-tapping screws and fixing clips are in contractor scope. Contractor shall deploy the **drilling cum fixing machine** required for this purpose as a regular scope of work.
- 14.13.6 The Contractor shall also install additional platforms of permanent nature for approaching different equipment as per the site requirement and to meet O&M requirements, though these may not indicated in the erection drawings. Materials required for such platforms will be supplied by BHEL in random sizes on free issue basis. These have to be fabricated to suit the requirement. Payment only for erected weight as certified by BHEL engineer shall be made at the rate applicable for structures. No payment is envisaged for fabrication of structures.
- 14.13.7 All relevant provisions as above shall apply, mutatis-mutandis, to the work of external structures, interconnecting structures, elevator structures & equipment handling system etc.

### 14.14 OTHER PRODUCTS AND SYSTEMS AND COMMON REQUIREMENTS

- a) The ducting covered under this scope of work is flue gas ducting up to boiler outlet flange, boiler outlet flange to ESP Inlet , hot and cold secondary air ducting from FD fans outlet to wind box, hot and cold primary air ducting from PA fans to mills including interconnections, flowmeters, dampers/gates and their drives, supports and suspensions etc for these systems.
- b) Ducts / expansion bellows (metallic & non-metallic) are normally supplied in loose components / segments and these are to be assembled and welded/ jointed at site

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before erection. The fabric portion of non-metallic expansion joints (NMEJ) namely bolster, fabric belt and canopy shall be installed by Contractor under supervision/guidence of equipment supplier/BHEL for the first few cases. Contractor shall ensure that all subsequent NMEJ are assembled with due care and proper procedure. In similar manner all joints, connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be made leak proof and tested as per technical instruction / requirement.

- c) Certain structural items like silencer supports, roof cladding structure, platform etc will be supplied in running lengths which shall be cut to required suitable sizes and adjusted/trimmed as part of work.
  - d) Contractor has to make canopies for motors, actuators, lub oil units, control valves, etc. material for this will be supplied in random lengths / sizes. No separate payment for fabrication is envisaged. Only the erection tonnage rate applicable for structure will be paid for this work.
  - e) Actuator / drives of dampers, gates etc may have to be serviced, lubricated before erection, during precommissioning and commissioning, including carrying out adjustments required as incidental of the work.
  - f) All welded joints should be painted with anticorrosive paint / primer immediately after completion of all work. Necessary paints and other consumables for the above work are in the scope of the Contractor.
  - g) Hangers and suspensions, support steels for ducts and other equipments, piping etc will be supplied in running/random lengths/ sizes, which shall be cut to suitable sizes and adjusted as required.
  - h) Touch up and preservative painting of all components issued to and/or erected by Contractor shall form part of scope of work. The Contractor shall arrange all paints, primer and consumables, T&P and facilities.
- 14.15 Any fixtures, scaffolding materials, approach ladder, concrete block supports, steel structures required for temporary supporting, pre-assembly or checking, welding, lifting and handling during pre-assembly and erection shall be arranged by contractor at his cost.
- 14.16 No members of any ladder / structure / platform should be cut without specific approval of BHEL. In case it is necessary to cut, the contractor shall rectify / repair in a manner acceptable to BHEL / customer without any additional cost.
- 14.17 The contractor shall erect scaffolding / temporary platforms for erection. These should be of adequate capacity and shall never be over loaded. These should be replaced when not found suitable during erection work and dismantled on work completion and removed from work site.
- 14.18 It shall be the responsibility of the contractor to provide ladders on columns for initial work till such time stairways are completed. For this, the ladder should not be welded on the column and should be pre-fabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances

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with the approval of BHEL. In case it is absolutely necessary then the contractor shall cut the temporary structure and rectify the column as directed by the engineer.

- 14.19** Certain adjustment in length may be necessary while erecting pipelines / ducts / casings etc. The contractor should remove the extra lengths / add extra lengths to suit the final layout after preparing edges afresh by adopting specified heat treatment procedures.
- 14.20** Suspensions for ducting will be supplied in running lengths, which shall be cut to size and adjusted as required. Ducts / expansion bellows are dispatched to site in loose walls plates / pieces and these are to be assembled and welded at site along with stiffeners etc., before erection within the finally accepted rates. All joints connecting duct expansion piece and dampers shall be seal welded on inside as well as on outside.
- 14.21** Mechanical erection works associated with the power cylinders, valves, valve actuators etc., coming under various groups shall be provided by contractor within the finally accepted rates. The Erection, testing and commissioning of all electrically operated valves, actuators and dampers is covered within the scope of this specification.
- 14.22** The contractor shall carry out trial run of all motors including checking the direction of rotation in the uncoupled condition. Checking of alignment and recoupling of the motor to the driven equipment as per instructions of BHEL engineer and to their satisfaction. All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. Vendor shall all necessary MMDs including the motorized insulation testers for the above test.
- 14.23** The contractor shall fabricate pipe, special bends etc., threading and welding as required for installing lube oil system and carry out the acid cleaning of the fabricated piping. The contractor shall also service the lube oil system, carrying out the hydraulic test of oil coolers etc.
- 14.24** Contractor shall carry out kerosene testing of all bearing housings of various rotating equipment like pumps, fans etc., as per BHEL engineer's instructions. Performance of hydro test of oil coolers of rotating machines and hydro test of other equipment as per BHEL engineer's instructions is included in the scope of work. Forced lube oil system of motors or rotating equipment form parts of the work under this specification.
- 14.25** Certain rotating machinery after initial runs and commissioning of the equipment have to be hot aligned as per the instructions of BHEL engineer. Cleaning fans, ducting etc., free of extraneous steel, scaffolding materials electrodes, all foreign materials etc., before trial run of rotating machinery, and at various stages of precommissioning activities as per BHEL engineer's instruction, is within the scope of work.

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- 14.26** Some of the rotating equipment and electrical motors are provided with protective greases only. Contractor shall arrange for cleaning of the same with kerosene or some other reagent. If necessary, dismantling some of the parts of the equipment would be necessary. He shall arrange for re-greasing / lubricating them with recommended lubricants and for assembling back the dismantled parts, at quoted rate. Lubricants will, however, be supplied free of cost by BHEL.
- 14.27** After initial trial of rotating equipment, control and power cabling for motors and other equipment / instrumentation shall have to be disconnected for checking alignment and re-setting / re-alignment / hot alignment. Contractor shall have to arrange for disconnecting control and power cabling as per BHEL engineer's instructions and clearance and reconnect the control and power cabling after realignment. Quote tonnage rate shall be inclusive of the above.
- 14.28** Packer plates supplied may have to be machined to the correct dimensions. It may also be necessary to blue match the same with each other/ with equipment / with foundations as per BHEL instructions
- 14.29** Contractor shall arrange changing of preservative oil in the gearboxes, journal and other bearing assemblies of rotating equipment when in storage areas or after erection of equipment as the case may be as per the instructions of BHEL engineer. Necessary lubricants / oil will be supplied by BHEL and the same will be drawn by contractor from BHEL / customer's stores and transporting to site. No additional payment will be made for such works even though supply of lube oil might have been made under regular dispatch-able unit (DU) number against product group main assembly (PGMA) and appearing in the shipping list. Prior to the commissioning of the equipment, oil should be drained and collected in drums provided by BHEL and returned to BHEL / customer's stores.
- 14.30** The fans, mills and other rotating machines shall be checked for clearances and other vital tolerances. Necessary assistance for balancing of equipment during trial run, if required, shall be provided by the contractor free of cost.
- 14.31** Whenever required the contractor shall arrange for pre-qualification of process task Performers.
- 14.32** Ducts/ expansion bellows (metallic & non-metallic) are normally supplied in loose wall plates/ segments and these are to be assembled and welded at site before erection. Correction of ovalities/ distortion of ducts, expansion bellows etc occurred during transportation/ handling are to be carried before erection as part of work. Erection of mechanical components of non-metallic joints is included in the scope of work. All joints connecting ducts, expansion pieces and dampers shall be seal welded. These welds have to be made leak proof and tested as per technical instruction / requirement.
- 14.33** Non specified jobs at the interface / terminal points like bolting welding, gasket changing etc. have to be done by the contractor within the quoted price.

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- 14.34 The terminal points decided by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.
- 14.35 Actuators / drives of dampers, gates, powered vanes etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
- 14.36 All rotating machines and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary by dismantling and refitting before erection. If, in the opinion of Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.
- 14.37 All the shafts of rotating equipment shall be properly aligned to those of the matching equipment within design tolerances All bearings, shafts and other rotating parts shall be thoroughly cleaned and suitably lubricated before starting.
- 14.38 All the motors and equipment shall be suitably doweled after alignment of shafts with taper / parallel machined dowels as per the direction of the Engineer. Dowel pins required are to be machined by the contractor at his own cost. However the materials for dowel pins shall be issued by BHEL free of cost.
- 14.39 The HT motor bearings shall be blue matched at site and checked for bearing clearances. The contractor if required shall carry out scraping of bearing housing. No extra claim for blue matching up to 1mm initial gap will be entertained.
- 14.40 The contractor at no extra cost to BHEL shall carry out servicing and realignment of skid mounted equipment.
- 14.41 Certain instruments like pressure gauges, pressure transmitters, temperature gauges, flow switches and indicators, etc., are received in assembled condition as integral part of equipment. Contractor shall be responsible for safe receipt, installation and custody of these instruments supplied mounted on skids / equipment. The calibration of skid / equipment mounted instruments shall be arranged by BHEL through other agency engaged for C&I. Contractor will be informed by BHEL engineer about the details of C&I agency. The contractor shall coordinate with the C&I agency for removal, calibration and re-installation of the instruments. Though C&I agency will remove and reinstall the instruments after calibration, the contractor for this package will maintain the list of all the instruments removed & reinstalled. Instruments prior to removal and after reinstallation shall be considered in custody of the contractor for this package.
- 14.42 All electrical panels, control gears, motors and such other devices shall be properly dried by heating to improve IR value, before they are energized. Bearings, slip rings commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected.

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- 14.43 The contractor shall completely erect and test all the piping systems, covered in the specification including sampling lines up to and including sample coolers, hangers & supports, valves and accessories in accordance with the drawings furnished. This includes all necessary bolting, welding, pre-heating, stress relieving, testing, cleaning and touch up painting. System shall be demonstrated in condition to operate continuously in a manner acceptable to the Engineer. Welding shall be used throughout for joining pipes except where flanged, screwed or other type joints are specified or shown on the drawings. All piping shall be erected true to the lines and elevation as indicated in the drawings.
- 14.44 Pipes sent in standard length shall be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends upto 65-mm nominal bore will have to be fabricated at site. Only cold cutting methods are to be employed for cutting of pipes and tubes irrespective of the size and material. Gas Cutting, if any, will be allowed only in CS LP piping.
- 14.45 The contractor shall ensure lowering of pipes in position with adequate precautions as to avoid any damage to either material or men. Only the anchoring points earmarked for the purpose of lowering the pipes are to be used.
- 14.46 It is possible that a few flanges may not be matching. The contractor shall be required to cut and re-weld the same as and when required without any additional cost.
- 14.47 Wherever piping erected by the contractor is connected to equipment / piping erected by the other agencies the joint at the connecting point shall be the responsibility of the contractor who is erecting the piping under this specifications.
- 14.48 Normally the high-pressure valves will have prepared edges for welding. But, if it becomes necessary, the contractor will prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes within the scope of the work.
- 14.49 All fittings like 'T'-pieces, weld neck flanges, reducers etc., shall be suitably matched with pipes for welding. The valves will have to be checked, cleaned or over hauled in full or in part before erection and during commissioning.
- 14.50 The contractor shall be responsible for correct orientation of all valves so that seats, stems and hand wheels will be in desired location. It is the responsibility of the contractor to obtain the information regarding orientation of valves not fully located on drawings before the same are installed.
- 14.51 Suspension for piping, etc., will be supplied in running lengths, which shall be cut to suitable sizes and adjusted as required.
- 14.52 The adjustment of all hangers & supports erected in both cold & hot conditions for maintaining the proper slopes towards the drain pots and application of cold pull in the piping wherever required is also included in the scope of the contractor.

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- 14.53 Spring suspensions / constant load hangers have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Any adjustments, removal of temporary arrests / locks etc., have to be carried out as and when required.
- 14.54 Contractor shall install piping in such a way that no excessive or destructive expansion forces exists in either the cold condition or under conditions of maximum temperature and pressure. All bends, expansion joints and any other special fittings necessary to take care of proper expansion shall be incorporated as per the advice of Engineer. During installation of expansion joints, anchors, care must be taken to see that full design movement is available at all times from maximum and minimum temperature.
- 14.55 The hanger assemblies shall not be used for attachment of rigging to hoist the pipes into position. Other means shall be used to securely hold the pipe in position till pipe supports are completely assembled and attached to the pipe and building structure.
- 14.56 Layout of small-bore piping, oil systems etc. as required shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipelines even after completion of erection or from aesthetic point of view. Contractor at no extra cost should carry this out. As built drawing is to be submitted by the contractor after erection completion.
- 14.57 All the valves, including motorized valves, flap valves, dampers, actuators, etc. shall be serviced and lubricated to the satisfaction of Engineer before erecting the same and during pre-commissioning also. Welding or jointing of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rates.
- 14.58 Erection and welding of necessary instrumentation tapping points, thermocouple pads, thermo-wells, valves, battery of first root valves, condensing vessels, flow nozzles and control valves to be provided on, auxiliaries and pipe lines are covered within the scope of this specification. This will be the responsibility of the contractor and will be done as per the instructions of BHEL Engineer. The welding of all the above items will be contractor's responsibility even if the:
- a. Product groups, under which these items are released, are not covered in the scope of this tender.
  - b. Items are supplied by any agency other than BHEL.
- 14.59 The contractor shall carry out the tightening of the field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or the turn of part method. The methods used the tools and the equipment deployed shall be subject to the approval of Engineer. The competent technicians shall carry out the bolting work.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIV ERECTION

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- 14.60 The contractor shall prepare as built piping drawing & submit to BHEL Engineer for approval & verification of material used.
- 14.61 Plate Type Heat exchangers will be supplied for cooling of Auxiliary Cooling water lines. Vendor scope covers erection of these PHEs as per the instruction of BHEL engineers.
- 14.62 Contractor has to make canopies for motors, actuators, lub oil units, control valves etc. Material for this will be supplied in random lengths / sizes. No separate payment for fabrication is envisaged. Only the erection tonnage rate applicable for Misc eqpt. / structure steel item no. 3 of rate schedule will be paid for this work.
- 14.63 BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting/chiseling / grinding/machining and de-burr the same. However, machining of the packers wherever necessary shall be arranged by the contractor.
- 14.64 All lifting tackles including wire-ropes slings, shackles, used by the contractor, shall be got approved by BHEL Engineer. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damages to equipment and personnel. Calibration/fitness testing certificates from recognized agency are to be submitted to BHEL site office for equipment/instrument/appliances to be used, as per requirement of BHEL/ISO system. Expenditure on such works forms a part of the scope of work.
- 14.65 The contractor shall erect scaffoldings/Temporary platforms supports etc required during erection before the permanent supports are erected. These should be of adequate capacity and shall never be overloaded. These should be replaced when not found suitable during erection work. All structure materials required for the above shall be arranged by the contractor at his own cost. No such material shall be supplied by BHEL in any case. Welding of temporary supports, cleats etc on the columns shall be avoided. In case of absolute necessity, contractor shall take prior approval from BHEL Engineer. Further, any cutting or alteration of member of the structure or platform or other equipment shall not be done without specific prior approval of BHEL Engineer.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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### **WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING**

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

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

- 15.1 The pressure parts, equipments and piping shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions.
- 15.2 Welding of pressure parts, high tensile structural steel, Piping shall be done by certified high pressure welders who possess valid certificate and who are approved by BHEL Engineer.

#### **Links & Pipes for interlinking SH headers & RH headers are supplied with P91 materials**

- 15.3 All welders including tack welders, structural and high pressure welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification and performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.
- 15.4 Engineer may stop any welder from the work if his performance is unsatisfactory for any technical reason or if there is a high percentage of rejection in the joints welded by him. The welders having passed qualification tests does not absolve the contractor of contractual obligation to continuously check the welder's performance.
- 15.5 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. The Engineer prior to any repair being made shall approve the procedure for the repair of defective welds. After the repair has been carried out, the compliance shall be submitted to the quality engineer.
- 15.6 The contractor shall carry out the root run welding of all HP / LP piping, valves by TIG welding method only. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required. During the root runs of stainless steel joints, the contractor shall before and during welding have to purge the pipes with inert gas.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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- 15.7 All expenses for testing of contractor's welders including destructive and Non-destructive tests conducted by BHEL at site or at laboratory shall have to be borne by the contractor only. Limited quantity of tube and pipe material required for making test pieces will be supplied by BHEL free of cost.
- 15.8 Only BHEL approved electrodes and filler wire will be used. All electrodes shall be baked and dried in the electric electrode-drying oven to the required temperature for the period specified by the Engineer before these are used in erection work. All welders shall have electrodes drying portable oven at the work spot. The electrodes brought to the site will have valid manufacturing test certificate. The test certificate should have a co-relation with the lot number / batch number given on electrode packets. No electrodes will be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven will be also calibrated and test certificate from Govt. approved / accredited test house traceable to National / International standards will be submitted to BHEL before putting the oven in use. The contractor shall also arrange periodical calibration for the same. Separate ovens shall be used for baking and holding.
- 15.9 All butt / fillet welds shall be subject to Non -Destructive testing as per the Drawing/Procedures/Welding Schedules/Documents at no additional cost. **100% RT will be applicable to all the circuits however applicable percentage of RT shall be guided by the field welding schedule.**
- 15.10 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld. He has to maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or otherwise of the welds shall be final.
- 15.11 The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting should be done. Gas cutting will be allowed only wherever edge preparation otherwise is impractical. All slag / burrs shall be removed from the edge and all the hand cuts shall be ground smooth to the satisfaction of engineer. Prepared edges to be preserved / applied with weldable primer.
- 15.12 All welds shall be painted with anticorrosive red oxide paint once radiography and stress relieving works are over. Necessary consumables and scaffolding etc including paints shall be provided by contractor at his own cost.
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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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- 15.13 Pre-heating, radiography and other NDT tests, post heating and stress relieving after welding of tubes, pipes, Non Pressure Parts like Crown Plate support assy, including attachment welding wherever necessary, are parts of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.
- 15.14 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress-relieving operations. The contractor should take a note of the following,
- Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL.
  - All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. Approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost.
- The contractor shall obtain the signature of Engineer or his representative on the strip chart of the recorder prior to the starting of SR operations.
- 15.15 The contractor shall also be equipped for carrying out other NDT like LPI /MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required, will be arranged by contractor within the quoted rate.
- 15.16 The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR or ISO as specified by BHEL.
- 15.17 The contractor for radiography work shall use iridium-192/ ~~Cobalt-60~~; the geometric un-sharpness shall not exceed 1.5 mm. The contractor should take adequate safety precautions while carrying out radiography. Contractor at his cost shall arrange necessary safe guards required for radiography (including personnel from BARC).
- 15.18 Low speed high contrasts, fine grain films (D-7 or equivalent) in 10 cm width only are used for weld joint radiography. Film density shall be between 1.5 and 2.0.
- 15.19 All radiographs shall be free from mechanical, chemical or process marks, to the extent they should not confuse the radiographic image and defect finding. Penetrameter as per ASME or ISO must be used for each exposure.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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- 15.20 Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs. Contract number, joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.
- 15.21 Lead intensifying screens for front and back of the film should be used as per the above-referred ASME specification. The joint is to be marked with permanent mark A, B, C to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the down streamside of the weld. For multiple exposures on pipes, an overlap of about 25-mm of film should be provided.
- 15.22 Radiography personnel with sufficient experience and certified by M/s BARC for conducting radiographic tests in accordance with safety rules laid down by Division of Radiological protection only have to be deployed. These personnel should also be registered with DRP / BARC for film badge service.
- 15.23 All arrangements for carrying out radiography work including dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies will be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.
- 15.24 The contractor shall have a dark room fully equipped with radiography equipment, film (un-exposed), chemicals and any other dark room accessories. All radiography films shall be developed in the dark room at site.
- 15.25 In case of radiography of less than 100%, the joints identified by BHEL at random shall be radiographed.
- 15.26 Contractor shall note that 100% radiography will be done at the initial stages on all the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radiographed shall not be less than the requirement of BHEL welding schedule / IBR / Customer's requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. Radiography on LP piping joints is not envisaged. However other NDT test as called for in the FQP including LPI, MPI and HT will have to be carried out.
- 15.27 All the Radiographs shall be properly preserved and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL / customer.
- 15.28 Since radioisotopes are being used, all precautions and safety rules as prescribed by BHEL/BARC/ Customer shall be strictly followed. BARC /DRP certificate to be provided before taking up the work.
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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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- 15.29 Radiography of joints shall be so planned after welding, that the same is done either on the same day or next day of the welding to assess the performance of HP welders. If the performance of welder is unsatisfactory, he is to be replaced immediately.
- 15.30 Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re- submitted for evaluation.
- 15.31 However, if the defect persists after first repair, further repair work followed with radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radio graphed at contractor's cost.
- 15.32 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including labour, supervisors/ Engineer required for the work as per directions of BHEL.
- 15.33 The contractor shall assist BHEL Engineer in preparing complete field welding schedule for all the field welding activities to be carried out in respect of piping and equipment erected by him involving high pressure welding at least 30 days prior to the scheduled start of erection work at site. The contractor shall strictly adhere to such schedules.
- 15.34 The contractor shall deploy required number of H.P. welders to carry out the H.P. weld joints. The welding works should not be held up due to shortage / want of I.B.R./H.P. welders.
- 15.35 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 15.36 The technical particulars, specifications and other general details of work shall be in accordance with BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.
- 15.37 Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR, enclosed. However percentage radiography shown in the respective drawings shall be final and binding on the contractors.
- 15.38 The field joints are to be radiographed and preheating and post weld heat treatment to be done as per BHEL procedure and manuals.
- 15.39 The percentage of Radiography are tentative, which may be increased depending upon the quality of joints at the discretion of BHEL.
- 15.40 Penetrometer as per ASME/ISO shall be used for all exposures.
- 15.41 Lead numbers and letters (generally of 6mm size) are to be used for identification of radiographic contract No., joints identification, sources used welders identification, SFD used are to be noted down in the paper cover of radiography. Lead intensifying

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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- screens for front and back of the film shall be used as per the instructions of BHEL Engineer
- 15.42 The weld joint is to be marked with permanent mark A, B, C, etc. to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the downstream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.
- 15.43 The contractor shall be fully equipped with radiography equipments, films, chemicals and other dark room facilities. There must be a number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor's radiographers shall also be registered with BARC for film badge service.
- 15.44 Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work.
- 15.45 All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.
- 15.46 Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced immediately.
- 15.47 The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radio graphed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.
- 15.48 Wherever radiographs are not accepted on account of poor exposure, joints shall be re-radiographed and new film submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair as per radiograph, carrying out radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radio graphed at contractor's cost.
- 15.49 The contractor shall also be equipped for carrying out other NDT like liquid penetrant inspection, magnetic particle inspection, etc. as and when required in the interest of work within the quoted rates.
- 15.50 For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL Engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.
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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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- 15.51 It may also become necessary to adopt inter layer radiography / MPT / UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all this into account and quote the price inclusive of all such work and radiography.
- 15.52 The welded surface irrespective of place of welding shall be cleaned of slag and painted at the center with primer paint to prevent corrosion at no extra cost towards this.
- 15.53 All welders shall be tested and approved by BHEL Engineer before they are actually engaged on work though they may possess the required certificate. BHEL reserves the right to reject any welders without assigning any reason. The welder Identification code as approved by the BHEL Engineer shall be stamped by the welder on each joint done by them. The contractor will be responsible for the periodic renewal, retesting of the welders as demanded by BHEL.
- 15.54 BHEL Engineer is entitled to stop any Welder from the work if his work is unsatisfactory for any technical reasons or there is a high percentage of rejection of joints welded by him, which in opinion of the BHEL Engineer will adversely affect the quality of the welding though the Welders, has earlier passed the tests prescribed by BHEL Engineers. The welders having passed qualification tests do not relieve the contractor of a contractual obligation to check the welder's performance.
- 15.55 All charges towards testing of Welders for destructive and non-destructive test, testing and approval of welders for engaging in the erection work shall be borne by the contractor.
- 15.56 The welding process, weld joint details, joint configuration and material specification may change to suit the design requirements. The contractors quoted rates shall be inclusive of each contingency. All welds involved in the erection of temporary pipe lines for hydraulic test, chemical cleaning, steam blowing etc. to be carried out within the quoted rates. The number of joints to be welded as mentioned in the welding schedule consists of butt welds. All other welds viz. attachment welds on pressure parts/non-pressure parts, fillet welds in non-pressure parts welding in the boiler and Rotating Machines has to be carried out by the bidder within quoted rates.
- 15.57 **For uniform heating and better closed loop control, pre heating, post heating, controlled rate of heating & cooling and post weld heat treatment cycles for tube specifications SA213T91 & SA213T92 should be carried out using flexible ceramic pads with suitable heating machine.**
- 15.58 **MPI must be done on joints, those are undergone ultrasonic testing.**
- 15.59 Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance
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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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with BHEL engineer's instructions. Where the electric resistance heating method is adopted Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chinks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

Where ever technically required BHEL will provide the Induction Heating Equipment set for SA 335 P-91 materials piping only. At present BHEL is having two types of Induction Heating Equipment i.e. Old Model and Compact Induction Heating Equipment. Type of equipment to be provided shall depend on the availability of equipment at the time of requirement. The set will comprise of following:

(A) In case of Old model Induction Heating Equipment

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

Contractor shall provide the input electrical power connection including arrangements such as DB, cables etc., thermocouple attachment unit, thermocouple and compensating cables with male female plugs, induction heating annealing cables (from the capacitor panel to joint and for wrapping around the weld joint) (spec: single core 240 sq mm, 1200a, 3khz), Supercera Ceramic Fibre Blanket (25mm thick, Roll Size-7.62x0.61mtr), Cloth Fibre Glass (1mm thick, 1 mtr width), Ceramic Fibre Rope (12mm dia.), Cord Glass Fibre (3 mm dia.), Six Nib Pen Cartridge, Z-Fold Chart Paper, stainless steel nut bolts for connecting interconnection, output and annealing cable and other consumables as may be required. Quantum of annealing cable requirement will depend on many parameters e.g. weld joint size, heat input, type of connection i.e. series or parallel etc.

(B) In case of Compact Induction Heating Equipment

- (i) Main panel
- (ii) Output connecting cable (160 sq mm) from main panel output – 5m length.
- (iii) Input Power Cable with male plug
- (iv) Junction Box

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

### Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

Contractor shall provide the input electrical power connection including arrangements such as DB, cables etc., thermocouple attachment unit, thermocouple and compensating cables with male female plugs, induction heating annealing cables (from the main panel to joint and for wrapping around the weld joint) (spec: single core 160 sq mm, 860amps, 10khz), High Temperature Ceramic Fibre Cloth Bed Role (25mm thick, 500mm width, 7500mtr length), Fibre Glass Cloth (1mm thick, 600mm width), Ceramic Fibre Rope (12mm dia.), Cord Glass Fibre (3 mm dia.), stainless steel nut bolts (M10x40, M10x50) for connecting output cable, annealing cable and other consumables as may be required. Quantum of annealing cable requirement will depend on many parameters e.g. weld joint size, heat input, type of connection i.e. series or parallel etc.

Likely supplier of Annealing cables: Mansfield Cable Co. Noida (UP).

#### 15.60 List of Penalties on Violations on Quality Provisions

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

BHEL-PSWR

Technical Conditions of Contract –Volume I A (Part I: Contract Specific Details)

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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### 15.61 GUIDELINES FOR WELDING, NDE AND HEAT TREATMENT

#### 15.62.1 RECEIPT INSPECTION OF WELDING ELECTRODES / FILLER WIRES

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

#### 15.63 STORAGE & IDENTIFICATION OF WELDING ELECTRODES / FILLER WIRES

##### Scope

- 1.1 This procedure is applicable for storage of welding electrodes / filler wires used at sites.
2. Procedure:
  - 2.1 Only materials accepted (based on receipt inspection) shall be taken into account for storage.
  - 2.2 Storage Facility:
    - 2.2.1 The storage facility shall be identified.
    - 2.2.2 Access shall be restricted to authorized personnel.
    - 2.2.3 The storage area shall be clean and dry.
    - 2.2.4 Steel racks may be used for storage.
    - 2.2.5 Avoid storing wood inside the storage room.
    - 2.2.6 Maintain the temperature of the storage facility above the ambient temperature.
    - 2.2.7 This can be achieved by the use of appropriate heating arrangement .
  - 2.3 The electrodes / filler wire shall be segregated and identified for
    1. Type of electrode e.g. E7018.
    2. Size of electrode e.g. Dia 3.15 mm.
  - 2.4 Colour coding for filler wires:
    - 2.4.1 On receipt of GTAW filler wires, codify the filter wires as per table I below . Both ends shall be coloured.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-XV Welding, Heat Treatment & Radiography and**  
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**Table - 1**

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

(\* or other approved equivalents)

- 2.4.2 Where another set of colour code is followed, maintain a record of coding used
- 2.4.3 Where the filler wire is cut, apply the appropriate colour code at both ends of the piece.
- 2.4.4 For other filler wires, a suitable colour distinct from table 1 shall be applied

**15.64 BAKING AND HOLDING OF WELDING ELECTRODES**

15.64.1 Purpose:

15.64.1.1 This section details activities regarding baking and holding of welding electrodes used at sites.

15.64.2 Procedure:

15.64.2.1 While handling, avoid contact of oil, grease with electrodes. Do not use oily or wet gloves.

15.64.2.2 It is recommended that not more than two days requirements are baked.

15.64.2.3 GTAW Filler Wires:

15.64.2.3.1 These wires do not require any baking

15.64.2.4 Covered Electrodes:

15.64.2.4.1 Baking and holding

15.64.2.4.2 Identify baking oven and holding oven.

15.64.2.4.3 They shall have a temperature control facility upto 3500C for baking oven and 200 Deg. C for holding oven.

15.64.2.4.4 A calibrated thermometer shall be provided for monitoring temperature.

15.64.2.4.5 On opening a packet of electrodes, segregate and place them in the baking oven. Avoid mix up.

15.64.2.4.6 After loading, raise the baking oven temperature to the desired range as per Table below.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XV Welding, Heat Treatment & Radiography and Non-destructive Testing

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15.64.2.4.7 Note the time when the temperature reaches the desired range.  
Maintain this temperature for the duration required as per Table below.

15.64.2.4.8 On completion of baking, transfer the electrodes to holding oven,  
maintain a minimum temperature of 1000C till issue.

15.64.2.4.9 The electrode shall not be subjected to more than two cycles of  
baking. Maintain a register containing following details:

- a. Brand name (e.g. Supratherme)
- b. Size (e.g Dia 4.0 mm)
- c. Quantity (e.g. 110 pieces)
- d. Time at required temperature ie. Above 2500C
- e. Time of Transfer to holding oven. Activities a, b, c to be recorded before loading into the oven.

**Baking and Holding Parameters**

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

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

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

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-XV Welding, Heat Treatment & Radiography and**  
**Non-destructive Testing**

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**15.65 Steel Structure of Boiler, Mill Bunker building including Coal bunkers, Coal transfer points. Coal conveyor galleries and supporting trestles, Ducts, Hoppers, etc.**

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

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

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

(i) 100% RT/UT on butt-welds of plate thickness > 32 mm.

(ii) For plates of 25mm < thickness < 32mm - 10% RT/UT and 100% MPI

(iii) For plates of thickness < 25mm - 10% MPI/LPI.

(iv) All fillet welds of built up plate girders shall be inspected 100% by MPI.

**15.66 NDT and PWHT of Pressure part and integral piping shall be guided by the site erection welding schedule.**

**15.67 Non-destructive examination of welds shall be carried out in accordance with the relevant design/manufacturing codes. However, as a minimum, the following requirements shall be met. Further, statutory requirement, wherever applicable, shall also be complied with.**

(1) Temperature > 400 Deg, C or pressure exceeding 71 bar.

(i) 100% RT/UT on butt welds and full penetration branch welds.

(ii) 100% MPE.

(2) Temperature > 175 Deg, C upto 400 Deg. C or pressure exceeding 17 bar and upto 71 bar.

(i) 100% RT/UT on butt welds and full penetration branch welds for pipe dia more than 100 NB.

(ii) 10% RT/UT on butt welds and full penetration branch for pipe dia upto 100NB.

(iii) 100% MPE.

(3) For all other pipes not covered above, shall be subjected 100% MPE/ DPT in case of under ground pipes and 10% MPE/DPT in case of piping above the ground. Further, 10% of butt welds of underground piping shall be subjected to RT.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVI HYDRAULIC TEST

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

- 16.1 The pressure testing for boiler / piping system shall be carried out as per IBR / Customer / customers' consultant specification / BHEL. Customers' consultant specification forms the part of this tender specification.
- 16.2 All pressure parts and some of the Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall supply necessary labour and other services and make necessary arrangements to carry out the required tests as per the instructions and directions of the BHEL Engineers.
- 16.3 The contractor shall make all necessary arrangements including making of temporary closures on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost.
- 16.4 Soundness of the welds shall be tested hydraulically under the supervision of the BHEL Engineer and Customer, to the pressure indicated in the drawing. Prior to the test, the boiler / piping system shall be inspected by the BHEL Engineer to the extent necessary to ensure compliance with clearance for the test, which will be obtained by the contractor from the Engineer.
- 16.5 Hydraulic testing, as required shall be carried out by the contractor. The servicing, installation, electrical connection, erection, testing and dismantling of Hydraulic Test pump, temporary pipelines, fittings, etc. shall be carried out by the contractor as part of this work.
- 16.6 All the hydraulic tests shall be repeated till all the pipelines / boiler to satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of IBR inspectorate / BHEL / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost. The contractor shall carry out all the required tests and pre-commissioning and commissioning activities required for successful and reliable operation. These would include hydraulic test of piping, pre-boiler system detergent flushing/chemical cleaning, steam blowing, water washing etc. as instructed by BHEL.
- 16.7 Test records shall be made for pressure testing of above piping system. These records shall contain the following information:
  - a) Date of test
  - b) Identification of piping tested
  - c) Test fluid
  - d) Test pressure

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVI HYDRAULIC TEST

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### e) Approval of the Engineer.

- 16.8 Contractor has to arrange required pumps with sufficient capacity for filling water in the tubes and pipes for conducting Hydraulic testing of LP lines. Contractor has to arrange Hydraulic Test pump / Hand Pump at his cost for Hydraulic testing of LP lines.
- 16.9 Hydraulic testing pumps for HP lines (Above 400Kg/cm<sup>2</sup>) shall be provided by BHEL free of hire charges. The testing pumps will be issued to the contractor in working conditions. Installation, electrical connection, erection, testing and dismantling and returning to BHEL stores, etc, shall be carried out by the contractor as part of this work without any extra charges. In case any servicing of the test pump is to be done during the course of the test, the contractor shall provide the necessary labour for the same and spares will be arranged by BHEL.
- 16.10 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
- 16.11 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL. Contractor shall cut steel blanks from steel provided without charging extra. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL Engineer's instructions.
- 16.12 The contractor shall make all necessary arrangements including making of temporary closures / dummy on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost. Necessary blanks will be provided by BHEL.
- 16.13 Hanger adjustment / re-adjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.
- 16.14 In general Hydraulic testing of piping shall be performed after all eventual pipe branches have been completed and valves installed. Should it be required to hasten erection work, pressure tests may be performed by sections. For this scope of work, the erected pipe lines shall be hydraulically tested as per site requirement in segments. For conducting hydraulic test, both ends of pipe lines shall be blanked by welding of plates. Only one or two set of plates and structural materials for blanking required for one segment will be provided by BHEL free of charge. After completion of hydraulic test in one segment, the same plates are to

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVI HYDRAULIC TEST

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be cut and removed and utilized / welded on the other segment of the pipe lines, to carry out the hydraulic test for the respective segments. No separate plates for blanking for each segment will be provided. After completion of Hydraulic test, the required edge preparations shall be carried out on the end of pipe lines and to be welded with the respective pipe lines. In such cases joint connection shall be checked during a final and additional test, if required. The contractor shall note this aspect and quote accordingly.

- 16.15 During hydraulic test, the pipes being tested shall be isolated from the equipments to which they are connected.
- 16.16 Openings on piping for pressure / temperature impulse connections shall be fully closed during the test to prevent dust or foreign matter entering into the instrument piping inadvertently.
- 16.17 The following specifications shall also be completed with during hydrostatic test.
- a. Vent nozzles with valves shall be provided at the highest point of the runs, to eliminate air pockets. At the lowest point drain nozzles, with valves shall be provided to drain water from pipes. The nozzles and valves shall be of the same materials as the pipe.
  - b. The lowest part of the pipe shall always be filled first with water.
  - c. Pressure shall be slowly increased (without shocks) to the stipulated value and maintained as long as required to visually check all joints.
  - d. Following the control specified above the pressure shall be slowly decreased to the design pressure after which the pipe shall be subjected to the peening test, applying knocks every 150 mm approx. especially in the welded joint areas, with a 0.5 – 1.5 kg. Hammer (depending on the pipe wall thickness). The hammer used shall be a round headed one.
  - e. Following the peening test, the pressure shall be increased to the stipulated value and all welded joints shall be visually inspected.
  - f. Following these test, the pipe shall be drained or pumped out to the other section to be hydro test using the drain out pump to be provided by Contractor and wherever necessary shall be flushed with air for all pipes.
  - g. The pressure test is considered satisfactory if no cracks, unjustified pressure reductions, leakages, seepages etc., appear.
  - h. Should defects be found, these shall be repaired in the same manner as these during radiographic examination. Hydraulic test shall be repeated after defects have been repaired.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVII -TESTING, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

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

### **TESTING, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING**

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

- 17.1 The Contactor shall carry out all the required tests and pre-commissioning and commissioning activities required for their successful and reliable operation. These would include Air leak test of Boiler, Ducts, hydraulic test of boiler, land flow test, clean air flow test, ~~Gas Distribution Test~~, chemical cleaning of piping and boiler, water washing, oil flushing of oil system etc. as instructed by BHEL using contractors own consumables, labour and scaffoldings etc. Air leak test on pressure parts preliminary to hydraulic test by compressed air shall also be carried out to check and rectify the various leakage and defects etc. All the chemicals required for carrying out these activities will be supplied by BHEL free of cost.
- 17.2 All required tests (Mechanical and electrical) indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications though some of the tests / activities are not listed in these specifications.
- 17.3 After completion of erection of furnace, ducts and air heaters, a test shall be performed on the steam generator by the contractor to establish the tightness of the erected equipment from the outlet of Forced Draught (FD) fan through the steam generator up to stack.
- 17.4 All the tests may have to be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. The contractor shall do all the repairs for site-welded joints arising out of the failure during testing.
- 17.5 The scope of pre-commissioning activities cover installation of all necessary equipment including temporary piping, supports, valves, blanking, pumps, tanks, with access platforms valves, along with accessories required for hydro test, chemical cleaning, steam blowing or for any other tests. The scope also covers the offsite disposal of effluents.
- 17.6 Chemical cleaning (Acid cleaning of piping / EDTA cleaning / alkali flushing) will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves, and installation of temporary tanks for chemical and for mixing. Necessary temporary access platforms to mixing tank are to be made by the contractor. The dissolving tank, neutralizing tank etc. required for acid pickling will have to be fabricated by the contractor within the quoted rate. Required materials will be provided by BHEL free of cost. Chemicals for chemical cleaning will be provided by BHEL and handling of chemicals & other consumables and other connected activities has to

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVII -TESTING, PRE – COMMISSIONING & COMMISSIONING AND POST COMMISSIONING

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be carried out by the contractor at their cost. All other consumable would have to be provided by the contractor.

- 17.7 Laying of insulation of this temporary piping, tanks are to be carried out by the contractor within quoted rate, and required insulation materials will be provided by BHEL. The welding joints in the temporary pipe lines for acid cleaning and steam blowing are to be welded by HP welders only. Required NDT tests are to be carried out for the above joints as part of work as per customer / BHEL requirement.
- 17.8 All items / material required for conducting hydraulic test, alkali boil out, acid cleaning/EDTA cleaning steam blowing etc., will be supplied by BHEL / its customer. However, servicing, dismantling and returning of the same to stores is the responsibility of the contractor who is erecting the equipment / piping. Broadly the work on temporary systems will be as under:
- Erection etc. of all temporary piping including valves, tanks, effluent pumps, electrical control panel and cabling along with insulation and supports for steam blowing; chemical cleaning and effluent disposal are to be carried out as part of work. Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities. All the pumps, motors and electrical control panels/ switch gear, valves and actuators will be furnished to the contractor after due servicing.
  - Erection etc. of blowers and blanks and putty, temporary fixtures & ducts required for conducting air tightness test and GD Test are to be installed. (Putty to be procured by the contractor).
  - Dismantling of the temporary equipment, piping and return the same to the BHEL stores is also included in the scope of work.

**The above is only a broad breakup of the temporary works. The engineer at site will make final break up. His decision will be final and binding by all the parties.**

- 17.9 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic test and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
- 17.10 Commissioning of the boiler will involve trial run of all the equipment erected. The boiler has to be lighted up for refractory drying, alkali boil out, acid cleaning/ EDTA cleaning, passivation, preservation, steam blowing and floating of safety valves. Flushing of all the lines by air, oil or steam as the case may be, trial run of

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-XVII -TESTING, PRE – COMMISSIONING & COMMISSIONING**  
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- the boiler, servicing of valves and any other works incidental to commissioning are to be carried out. Contractor shall supply manpower round the clock.
- 17.11 It shall be the responsibility of the contractor to preserve the boiler as per BHEL's requirement. The required N<sub>2</sub> will be provided by BHEL for boiler preservation if required.
- 17.12 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables, T&Ps, IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.
- 17.13 It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including engineers/supervisors.
- 17.14 It shall be specifically noted that the above employees of the contractor may have to work round the clock along with BHEL Engineers and hence overtime payment by the contractor to his employees may be involved. The contractors finally accepted rates should be inclusive of all these factors also.
- 17.15 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.
- 17.16 During commissioning, opening / closing of valves, changing of gaskets, Re-alignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. The finally accepted price /rates shall also include all such work.
- 17.17 In case any defect is noticed during tests, trial runs and commissioning such as loose components, undue noise or vibration, strain on connected equipment etc., the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and re-alignment are necessary, the contractor at his cost shall do the same as per Engineer's instructions including repair, rectification and replacement work. The parts to be replaced shall be provided by BHEL.

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- 17.18 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.
- 17.19 The contractor shall carry out cleaning and servicing of valves and valve actuators prior to pre-commissioning tests and / or trial operations of the plant. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.
- 17.20 Cleaning and servicing of all the filters / strainers, in the system shall be done by the contractor within the accepted price. All oils and greases to be filled in the main equipments as first fill and subsequent topping up's will be furnished by BHEL.
- 17.21 At the time of each inspection, the contractor shall take note of the decisions/ changes proposed by the Engineer and incorporate the same at no additional cost.
- 17.22 Hydraulic testing pump for Boiler shall be provided by BHEL free of hire charges. The testing pump will be issued to the contractor in working conditions. Installation, electrical connection, erection, testing and dismantling and returning to BHEL stores, etc, shall be carried out by the contractor as part of this work without any extra charges. In case any servicing of the test pump is to be done during the course of the test, the contractor shall provide the necessary labour for the same and spares will be arranged by BHEL.
- 17.23 All pressure parts and some of the Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall make necessary arrangements including supplying the Low pressure Hydraulic test pump and other services to carry out the required tests as per the instructions and directions of the BHEL Engineers within the quote rates.
- 17.24 The valves, dampers, actuators etc. will have to be checked cleaned and overhauled in full or in part before erection, after acid cleaning, steam blowing and during commissioning as may be necessary.
- 17.25 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable deaeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL Contractor shall cut steel blanks from steel provided within quoted rate. After completion of hydraulic test, welded blanks shall be cut and removed and weld

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- burrs ground finished and cavities / scars of cutting weld filled and ground as per BHEL Engineer's instructions. Seal welding of thermo-wells and blanks of Temperature Element are to be removed by grinding only after steam blowing.
- 17.26 The hydraulic testing of the equipment and piping, covered under this scope of work has to be carried out by the contractor as per instructions of BHEL Engineer. The contractor shall provide all facilities required for hydraulic testing. Before hydraulic test, all the hangers are to be locked by locking pin / plate or temporary support. After completion of Hydraulic test, these are to be removed and all hangers are to be readjusted if required, to the desired value within quoted value.
- 17.27 All the tests shall be repeated till boiler / pipelines / equipments satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of BHEL / Boiler Inspector / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost.
- 17.28 Transportation of oil drums from customer/ BHEL's stores, filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer / BHEL stores. Similarly transport of chemicals for various pre-commissioning activities / processes mentioned in the above clauses and returning of remaining and / or the empty containers of the chemicals to customer / BHEL stores is the responsibility of the contractor.
- 17.29 Replacing / cleaning of filters of the erected equipments, piping system etc. during pre-commissioning / commissioning stage are within the scope of work.
- 17.30 Contractor shall lay the temporary pipelines with fittings, accessories and erection / commission pumps, tanks, valves, fittings, hangers and supports and other installations as instructed by BHEL, Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing / water washing / oil flushing etc. of piping and other equipments are in the scope of work. Necessary, materials for this will be provided by BHEL. Payment will be made at the rate applicable for **Non-pressure parts** (1C) for items. Weight for the same will be based on jointly measured quantity and corresponding standard weights. No payment will be made for the equipments brought by the Contractor such as pumps etc and foundations made by the Contractor for temporary systems. Weight for the same will be based on jointly measured quantity and corresponding standard weights.Overhauling / cleaning / servicing of valves, pumps, fittings in temporary system and acid cleaning tanks etc prior to the above operations / activities will also be carried out by the contractor at his cost. All the chemicals will be supplied by BHEL free of cost.

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- 17.31 Steam blowing lines for Oil piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding have to be arranged by the contractor as a part of the work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate.
- 17.32 During steam blowing operations the required manpower shall be arranged by the contractor as per the instructions of BHEL Engineer within the quoted rates. The manpower for the above operation may be required round the clock if necessary. The contractor shall carry out the above operation as per the instructions of BHEL Engineer within the quoted rates.
- 17.33 During the initial stages of work, trenches for draining water may not be available for alkali flushing or mass flushing for discharging and draining the system and piping. Necessary low point drains and temporary piping for this will have to be erected by contractor from materials provided by BHEL.
- 17.34 After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification.
- 17.35 The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces.
- 17.36 Contractor may have to replace old/damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement. Materials will be given by BHEL.
- 17.37 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. The parts to be replaced shall be provided by BHEL free of cost. If the insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.
- 17.38 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.
- 17.39 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.

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- 17.40 During this period though the BHEL's / Client's staff will also be associated in the work, the contractor's responsibility will be to arrange required tools, man and plants till such time the commissioned units are taken over by BHEL's client.
- 17.41 Contractor shall cut / open works if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value. During commissioning opening of valves, changing of gaskets, attending to leakages, minor modification / rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning the same has to be rectified by the contractor at his cost.
- 17.42 For conducting gas tightness test, it may be required to erect the blowers and connecting ducts and commission the same for tightness test. It is the responsibility of the contractor to erect the blowers & dismantle once the test is over. Contractor shall carry out the work within the quoted rate and BHEL will provide blowers and dummies free of cost for conducting the test.
- 17.43 Contractor has to remove the all temporary supports, structures from inside of ducts and grind the all points after cutting and proper clean the duct and make it free from duct,weldments and burrs.
- 17.44 Contractor to provide necessary commissioning assistance from pre-commissioning state onwards and up to continuous operation of the unit & handing over to customer. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programs made to achieve the schedule agreed with customer.
- 17.45 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part commissioning assistance for a period of six months after synchronization or till handing over of sets to customer, whichever is earlier.
- 17.46 Commissioning of the boiler will involve trial runs of all the equipments erected, lighting up of the boiler for refractory drying, blowing of the steam lines, floating of safety valves, flushing of all the lines by air, oil or steam as the case may be, trial run of the fans, Lub. Oil pumps, Mills, servicing of all equipments like dampers, actuators, valves etc. and any other works incidental to commissioning. Contractor shall provide required workers along with supervisors with all the requisite tools round the clock and material for all these works, which shall form part of the work to be done.

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17.47 After floating of safety valves, the commissioning activities and trial operations will continue up to handing over of the unit. Contractor shall provide the manpower for three months from trial operation or submission of final bill with material reconciliation whichever is later. It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers as per the work requirement along with supervisors including necessary consumable tools etc., during this period. The rate quoted shall indicate all these contingencies also. The various categories of workers required for pre-commissioning, commissioning and post-commissioning activities are as follows:

- a) Pipe fitters
- b) Millwright Fitters
- c) HP& structural welders
- d) Riggers
- e) Unskilled workers
- f) Supervisors
- g) Electricians
- h) Ladders
- i) Sheet metal fabricator/fitter
- j) Any other category of workers as may be required.

Further in addition to the above, contractor has to arrange the following minimum manpower exclusively for assisting BHEL commissioning engineers during stabilization and trial operation period. This manpower will be directly controlled by BHEL commissioning engineers.

- 1. One Engineer in charge for three shifts.
- 2. Two supervisors per shift for three shifts
- 3. Three fitters per shift for three shifts
- 4. Six helpers per shift for three shifts

It shall be specifically noted that the above employees of the contractor may have to work round the clock along with BHEL commissioning Engineers and hence, overtime, may be involved. The contractor's quoted rate shall be inclusive of all these factors also.

17.48 During commissioning any improvement or rectification due to design requirement is involved and if the contractor is asked to carry out the job, they shall be paid at man-day rates. For this purpose, daily labour report indicating therein nature of work carried out, consumables used, etc. shall be maintained by contractor, and got signed by BHEL Engineer every day. It is not obligatory on the part of BHEL to get the works done by the contractor. They can employ any other agency if they so desire at that time.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
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- 17.49 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.
- 17.50 Hanger adjustment / re-adjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.
- 17.51 The contractor has to provide required man power assistance during pre-commissioning and commissioning checks of motor operated valves, actuators, control valves etc. without any extra charges.
- 17.52 D.S.L / equivalent system for hoisting equipments are also to be erected and commissioned including load testing by the contractor within the quoted rates. Required manpower including electricians is to be arranged by the contractor for carrying out commissioning of electrical hoist and load testing of electrical hoist. Required loads will be provided by BHEL free of cost.
- 17.53 All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection. If in the opinion of BHEL Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works for dismantling, cleaning, lubricating and refitting are to be carried out by contractor at his cost.
- 17.54 Boroscopic examination of headers etc. to be conducted after steam blowing. This requires cutting of tubes to facilitate the boroscopic examination and re welding etc. are part of work and the same to be carried out with in the quoted rate.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVIII-PAINTING

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### 18 PAINTING

**Touch-up Painting:** All Boilers structures/ components shall be supplied from BHEL units/ workshops with finish coats of paint. Therefore final painting is not applicable in the scope of contractor. However touch up painting (wherever required), incidental to the work, shall be in the scope of the contractor, including supply of the required paints and primers and associated consumables.

Though the final painting is not there in the scope of the contractor, in case any shop painted structure/component is required to be repainted due to the reasons attributable to the contractor such as Mis-handling, damage during erection process, other reasons incidental to the work etc, such re-painting/finish painting of the components/structures shall be in the scope of the contractor including the supply of paints and primers along with all required consumables & deployment of tools e.g wire brush, paint brush, Spray M/c, cleaning agents etc.

Contractor shall carry out surface preparation and touchup painting works as per BHEL/Customer specification and instruction of BHEL engineer at site.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XVIII-PAINTING

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### 18.1

Paints and painting work carried at site shall confirm to the following codes and standards:

IS:5 – Colour for ready mixed paints and enamels

IS : 101 Part 1 to 9 – Methods of sampling and test for paints, varnishes and related products

IS : 1477 Part I&II – Code of practice for painting of ferrous metals in building

IS : 2932 – Specifications for enamel, synthetic and exterior,  
a) Under Coating  
b) Finishing

IS: 9407 – Colour code for identification of pipelines used in thermal power plants.

Contractor shall satisfy himself, availability of all information in the specifications for proper selection of the paints and ensure their applications as per Codes.

### 18.2 Primer Painting: (wherever applicable incidental to touchup painting & preventive painting)

a) After surface preparation, two coats of **epoxy resin based zinc primer** shall be applied. Dry film thickness of each coat shall be as per the recommendations of primer/paint manufacturer. Primer shall be applied by either spraying or brushing ensuring a continuous film without “holidays”. Primer coat shall be immediately applied without any time lag after the surface preparation.

b) Any equipment shall be carefully examined and where ever the primer coat is damaged shall be recoated with primer. However over the field welds, bolts and nuts etc. two primer coats as per a) shall be applied.

### 18.3 Finish Painting (wherever applicable incidental to touchup painting & preventive painting)

a) After the primer coat has dried out, the surface shall be cleaned of dust without scratching or in any way damaging the primer coat. Over this, dry surface finish painting shall be carried out.

b) Finish painting shall be carried out in two coats. Dry film thickness of each coat shall be as per the recommendation of the primer/paint manufacturer. Minimum thickness including primer and paint coating shall be as per specification.

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## Chapter-XVIII-PAINTING

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c) Paint shall be applied either by brushing or spraying. It shall be ensured that brush marks are a minimum and the requirements of workmanship are as specified in IS: 1477 (for site painting works on systems, structures and components).

d) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of ready mixed type in original sealed containers as packed by the paint manufacturer. Addition of thinners shall not be permitted.

e) No painting shall be done in frost/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is 5° C or below.

### **18.4 Touch-up painting on damaged areas –**

a) For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.

Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush within maximum seven (7) days of application of touch up primer.

**18.5** Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.

Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.

(Painting procedure to be followed for touch-up painting on damaged areas.

**18.6** The scope of work includes touchup painting and colour bands, lettering, marking and signs for direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/Customer engineer at site for the equipments / components covered in these specifications.

**18.7** In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

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## Chapter-XVIII-PAINTING

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### **18.08**

Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents.

### **18.09**

During the preparation of surface, if the shop coat is damaged by chemical cleaning or by mechanical means, contractor shall repair the same free of cost.

### **18.10**

Specified drying time shall be permitted from one to another coat.

### **18.11**

This work requires working at higher altitudes from ground level to as high as 50 mtr and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

### **18.12**

Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by Contractor, BHEL shall have the right to recover the cost of such damages from the Contractor.

### **18.13**

Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the Contractor without any extra charges.

### **18.14**

In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush painting. However, areas/equipments inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the Contractor. Laying of air hose pipe and any other line required shall be done by Contractor at his cost.

### **18.15**

Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

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## Chapter-XVIII-PAINTING

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### **18.16**

Acceptance of Final Painting for required thickness shall be as per the thickness measured by Alcometer by PVUNL/BHEL Engineer. Contractor shall have to carry out painting till the required thickness is achieved.

18.19 Prior to application of refractory, bituminous painting (including supply) on the pressure parts and other area is under Contractor scope.

18.20 Painting two coats of bituminous paint on Insulation cladding sheet inner surface.

**PAINTING SCHEME: Attached as File titled “Chapter-XVIII- Painting Scheme”**

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIX Lining And Insulation

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### 19 APPLICATION OF INSULATION AND REFRACTORY

- 19.1 Handling at site stores / storage yard, Transportation to site of work, Application of refractory & Insulation materials and connected works for Boiler, Auxiliary boiler, ducts etc. Rotary machines, SCR and auxiliaries, and binding and cladding with sheets etc., using their own tools plants, tackles, all consumables, supervisor and men as enumerated in the scope of contract at Boiler and auxiliaries, Auxiliary boiler etc.
- 19.2 Application of refractory, wool insulation, sheet metal cladding, welding of hooks / supports to hold insulation and refractory's under this contract including but are not limited to the following. Insulation of main and Aux. boiler portion, boiler Drum / steam separator, ceiling heat recovery area, air and flue gas ducts, and connected ducts, HP & LP piping, temporary acid cleaning and steam blowing piping connected tubes, oil and coal burners, oil and steam tracing lines complete and fuel and draft plants, all drain lines, traps, flanges, fine fittings, sampling lines, Fans and other equipment like Vessels, Flash tanks, Heaters, etc.
- 19.3 The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be effected from contractor's bill towards expenditure incurred including BHEL's overhead charges.
- 19.4 All insulations and refractory materials including iron components and other sheets casing materials, etc., required as per drawing will be supplied by BHEL and the same have to be erected / applied as per the drawings and specifications of BHEL by the contractor.
- 19.5 Clean the Surface to be Insulated from Rust, Dust, Grease, Loose scale, Oil, Moisture, etc. Care shall be taken that flexible insulation is not unduly compressed. After insulating the equipment the gaps / joints shall be filled with loose wool/ moulded insulation as applicable
- 19.6 Painting of inner side of sheet metal covering over the insulation walls with two coats of anti-corrosive paint (IS-158) to be applied to the entire satisfaction of BHEL Engineer and application of bituminous sealing compound on cladding/ sheet metal joints shall also be carried out by the contractor. Retainer type 'A' must be coated with Aluminium paint. For which the required amount of paint, thinner and other accessories for painting, cleaning the surfaces etc., shall be supplied by the contractor within the quoted rate.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIX Lining And Insulation

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- 19.7 Bituminous sealing compound will be provided by BHEL free of cost which is supplied by the respective Mfg. Units.
- 19.8 It is the responsibility of the contractor to ensure that the insulation and refractory materials and sheet metal covering issued to him for application are well protected against loss or damage or weather conditions tending to affect its quality by the provision of close / semi closed sheds at his cost.
- 19.9 All the insulation and refractory materials and sheet metal covering etc., issued to the contractor shall be properly stored and handled before application due the same. If any damage occur to the materials due to improper storage or due to any causes attributable to the contractor except for normal breakage or damaged material shall be to the cost of the contractor.
- 19.10 Contractor is liable for the exact accounting of the materials issued to him and any unaccountable losses shall be made good by him. The necessary accounting of the material issued will have to be furnished by the contractor periodically
- 19.11 The contractor shall provide the required quantity of wire, nails and other materials for centering works at their cost.
- 19.12 Wherever iron components are to be welded on non-pressure parts, the contractor shall employ only approved structural welders. It shall also be the responsibility of the contractor to arrange for welding hooks, flats, plates, supports and other fixtures also. All consumables tools and plants etc., required for the work shall be arranged by the contractor at their cost.
- 19.13 Contractor shall observe all precautions for laying and curing of Castable refractory. Any defective works found shall be re-laid by contractor at his own cost including materials.
- 19.14 Wool insulations are received at site as bonded and un bonded mattresses in standard sizes. These has to be dressed / cut to suit equipment / site work by the contractor.
- 19.15 For the insulation of hot air duct, gas duct, ID duct etc., un faced bonded wool, mattresses is to be used with wire netting ( wire netting is supplied separately ) on the outside for rigidity.
- 19.16 Dressing of insulation bricks to suit site conditions curing the refractory concrete applied, sheet cladding over insulations, form the part of this work
- 19.17 Removal type of insulation to be provided for valves fittings, expansion joints etc., as per the drawings or as directed by BHEL Engineer.

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## Chapter-XIX Lining And Insulation

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- 19.18 All piping insulations shall be carried out in such a manner as to facilitate removal of bolts nuts and washers from the flanges.
- 19.19 Refractory works at complete combustion chambers, ceiling heat recovery area, oil and coal burner areas and application of castable refractory wherever specified in drawing or as directed by BHEL Engineer have to be carried out.
- 19.20 Fabrication of covering sheets may be necessary like preparing the sheets to the sizes and shapes specified in drawings, beading, swaging, beveling of sheets crowning of the sheets if necessary the same to supports over wool insulation with screws as specified in BHEL drawings or as instructed by BHEL engineer.
- 19.21 Fabrication, fixing or welding of hooks / supports to equipment of boiler parts, piping and other connected equipments to support wool insulation applying of primer paint to welded portion parts welding certain supports on parts other than pressure parts to hold refractory's ( by engaging approved welders) as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.
- 19.22 The contractor shall leave certain gap and opening while doing the work as per the instructions of BHEL Engineer to facilitate inspection by Boiler Inspector or doing commissioning to fix gauges, fittings, instruments. Those gaps will have to be finished as per drawings at a later date by the contractor at his cost, as required by BHEL .
- 19.23 Cladding sheets shall be suitably pressed along with diagonals to form diamond shape so as to improve the strength of the sheets, to avoid humpiness and to give aesthetic look.
- 19.24 Plates ,bars, rods and other materials that are to be cut, and re-welded from the fabricated places to suit erection requirements for which no extra payment will be made to the contractor.
- 19.25 A log book shall be maintained by the contractor for the clearance of the area for application of refractory and insulation. If the contractor does the work on his own accord without prior permission the area should be redone at his cost.
- 19.26 The contractor shall draw only one week's requirement of material for their work from BHEL stores and keep them in their semi-closed shed near to the work area. The materials required for a particular space of work only shall be taken to the work spot. At the end of the day's work the leftover or unused materials shall be taken back to their semi-closed shed for keeping the materials safe. Necessary records shall have to be maintained by the contractor in respect of the above draws / deposits, on daily basis as instructed by BHEL.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIX Lining And Insulation

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- 19.27 Wastages allowance for the materials issued are envisaged as follows:
- a) Castable refractory 2%
  - b) Insulation bricks & mortar 2%
  - c) Wool mattresses 2%
  - d) Cladding sheets 5%
- 19.28 Making structural supporting works for pourable insulation, laying pourable insulation, adhering to all specifications and instructions shall be the responsibility of the contractor
- 19.29 Upon completion of daily work , the contractor shall remove from the vicinity of work all scrap packing materials rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer. Also, the contractor will demolish all the hutments, sheds, offices, constructed by him and shall clean the debris after the contract is over. In the event of his failure to do so, the same will be arranged / removed by BHEL Engineer and the expenses incurred with overhead will be recovered from the contractors.
- 19.30 Welding of hooks as per pitch, non-pressure parts, applying red oxide paint to the welded portion as directed as per drawings before application of mineral wool mattresses will have to be done by the contractor.
- 19.31 Applying different layers of mineral wool as directed and as per drawings and specifications for boiler and its auxiliaries, pipelines valves and other vessels and after fixing require holdings materials, suitably if necessary, fabrication of rings etc., and fixing as directed and as per drawings and specifications shall also form part of this work.
- 19.32 If necessary the hooks may have to be made from the rods, raw materials supplied in running lengths. The contractor may have to carry out this work also and use the same hooks.
- 19.33 In case the contractor is required to dismantle and re-erect certain area as and when required for pre-commissioning / commissioning activities the rate as indicated in the rate schedule shall be paid by BHEL for erection. However, for dismantling no extra charge will be paid under any circumstances.
- 19.34 Wherever additional / clamps, frame works, etc., are required to be fabricated and installed even though not indicated in the drawings shall be fabricated and installed at their cost. Only steel materials shall be given by BHEL free of cost , consumables like electrodes, gases etc., are to arranged by the contractor at his cost.
- 19.35 Contractor has to arrange required fire retardant covering material at their cost to protect the insulation materials drawn from BHEL before and after erection.

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## Chapter-XIX Lining And Insulation

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- 19.36 The contractor shall provide any fixtures, concrete blocks / wooden sleepers, etc., which are required for temporary supporting of the insulation materials at site.
- 19.37 Delay in clearance of mechanical equipment and piping for insulations is unlikely to happen. However, if any delay occurs, the contractor shall not claim anything extra, like idle charges.
- 19.38 Welding of all seal boxes covers after completion of refractory work shall be done by the contractor. No extra charges will be payable for the same
- 19.39 Application of Castable refractory between tubes around burners on ceiling and as directed by Engineers and as per detailed drawings and specifications will have to be done by the contractor
- 19.40 Welding of iron components directly on pressure parts and HP piping is are to be carried out by certified IBR high pressure welders.
- 19.41 Application of insulation and removal of the same for temporary piping under scope of erection of this contract is also included in the scope of the work. However, BHEL will supply the insulation materials free of cost.
- 19.42 Dressing of insulation to suit site conditions, sheet cladding over insulations, form the part of this work.
- 19.43 The temporary structures / items welded to permanent members / pipes are to be cut and removed without any damage. Any damage so to permanent members / pipes to be made good by the contractor at his cost.
- 19.44 The contractor will have to follow the instructions provided in the technical manuals, drawings, and specifications provided by BHEL, to the contractor from time to time. In case of ambiguity or deviation the decision / clarification of BHEL Engineer will have to be followed.
- 19.45 All rectification including painting of Employer's structure which are damaged by contractor during his work.
- 19.46 Special type of insulation wool used in penthouse shall not be cut. Indiscriminately. All chicken mesh, cut bits shall be accounted for.
- 19.47 The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, gratings etc) shall be of light weight construction. Contractor shall arrange steel pipes & clamps with accessories like base plate attachment, fixing pins,

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## Chapter-XIX Lining And Insulation

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struts etc for scaffolding required for this work. However, BHEL's decision in this regard shall be final and binding. Contractor shall arrange the scaffolding materials in sufficient quantity.

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

- 19.48 All attachment welding, including welding of hooks / supports as per pitch both on equipment and piping shall be done as directed by Engineer. Attachment welding shall have to be done by certified welders. If necessary contractor may have to cut the hooks to correct length. Application of red oxide paint including supply of paint on welded portions as directed by BHEL is also included in scope of work.
- 19.49 The mineral wool mattresses (bonded / un-bonded) / LRB mattresses are received at site in standard sizes. These are to be dressed / cut to suit site requirements by the contractor.
- 19.50 The number of layers / thickness of mineral wool / LRB mattresses for auxiliaries, pipe lines, valves and other vessels shall be as per various drawings and as directed by Engineer. For applying the mineral wool mattress, the required holding materials, if necessary by fabrication of rings/ hooks shall be fixed as directed and as per drawings and spec.
- 19.51 The contractor should ensure, proper finishing of surface of the insulation, sheeting and cementing.
- 19.52 The contractor should ensure that the finished surface of the insulation works conforms to the dimensions and tolerances given in the drawings. Aesthetic finish and accuracy of work are most important.
- 19.53 It is the responsibility of the contractor to ensure that the insulation materials and sheet metal covering issued to him for application are well protected against loss or damage from weather conditions. Closed / semi closed sheds or any other arrangements required for this will be by him at his cost. If any damage occurs to the material due to improper storage or due to any causes attributable to the contractor except for normal breakage or damages allowed in such cases, the cost of such damaged material shall be to the account of the contractor.
- 19.54 Aluminum sheet cladding will be fabricated to the sizes and shapes specified in drawings. Beading, swaging, beveling of sheets, crowning the sheets if necessary will be carried out by him. Two coats of anti-corrosive black bituminous paint are to be

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## Chapter-XIX Lining And Insulation

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applied on inner surfaces of the cladding. Bitumen sealing compound on the joints if necessary is included in the scope of this work. Contractor may note that he will also supply anti-corrosive black bituminous paint & bituminous sealing compound required for above works at his cost. However if supply by the BHEL MUs same will be issue free of charges to contractor.

- 19.55 Aluminum sheet metal cladding over insulation will consists of plain / ribbed / corrugated sheets. The sheets will be supplied in standard sizes. Cutting them to required size, grooving, fabricating bends, boxes etc., for proper covering is contractors responsibility. Any cutting / bending / welding of fabricated skin casing sheets if required will also covered within the scope of this contract.
- 19.56 A logbook shall be maintained by the contractor to obtain clearance for application of insulation. If the contractor does the work on his own accord without prior permission the area may have to be redone at his cost.
- 19.57 The work shall conform to dimension and tolerances specified in the various drawing and documents that will be provided during the execution. if any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies or departmentally and recoveries will be deducted from Contractor's bills towards expenditure incurred including 30% departmental charges.
- 19.58 All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc required will be supplied by BHEL and the same have to be erected/ applied as per the drawings and specifications of BHEL by the Contractor.
- 19.59 Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipments. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipments/ systems covered under the scope of work.
- 19.60 The cladding and outer casing are aluminium sheets. All relevant specifications and procedures with regards to beading, sealing etc for aluminium sheets have to be adhered to.
- 19.61 Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather. The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by BHEL free of cost.
- 19.62 To take care of bimetal corrosion due to variety of metals in contact of each other viz retainer to support, support to outer casing/cladding, cladding-to-cladding etc,

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XIX Lining And Insulation

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suitable paints specified by BHEL, to be applied and/or neoprene rubber packing/strips or any other insert may have to be fixed as required.

- 19.63 The Contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL Engineer to facilitate inspection during commissioning to fix gauges, fittings, instruments etc. these gaps will have to be finished as per drawings at later date by the Contractor at his cost.
- 19.64 Contractor shall cut open works in needed as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.
- 19.65 A log book shall be maintained by the Contractor for the clearance of the area for application of refractory and insulation. Where the Contractor does the work on his own accord without prior permission, the work should be re-done, at his own cost, where necessitated.
- 19.66 If during erection and commissioning any of the parts are to be insulated temporarily fixed and then replaced by permanent ones at a later date or if any of the parts are to be removed for modification, rectification, adjustment and then refitted or if some parts are to be opened for inspection and checking and for measurement of metal surface temperature the same may necessitate removal and re-application of insulation and sheet metal cladding, which shall be done by the contractor and the erection rate quoted shall be inclusive of such contingencies.
- 19.67 Removable type of insulation shall be provided for valves, fittings, expansion joints etc as per the drawings or as directed by BHEL Engineer.
- 19.68 All temporary pipelines required during testing, pre-commissioning and commissioning should be insulated as directed by BHEL at no extra cost to BHEL. However required insulation material shall be issued by BHEL free of cost.
- 19.69 The following works are also included in the scope of this contract.

Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint will be arranged by Contractor.

Cutting of the wool mattresses in the required shape and application of finishing cement of required thickness wherever required.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XX PRESERVATION & PROTECTION OF COMPONENTS

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### **20 PRESERVATION & PROTECTION OF COMPONENTS**

- 20.1 At all stages of work, equipments/materials in the custody of Contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents including the primer & paint, for the above work shall be provided by the Contractor.
- 20.2 The Contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.
- 20.3 Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. In case of failure of Contractor in compliance of this requirement, BHEL will make suitable arrangement at Contractor's risk and cost.
- 20.4 The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc shall be returned to BHEL stores by the Contractor.
- 20.5 The Contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilisation of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the Contractor. Decision of BHEL on this will be final and binding on the Contractor.
- 20.6 For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXI: Welding Schedule

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Chapter-XXI: Reference Welding Schedule is uploaded separately as a file named '**Chapter-XXI: Welding Schedule**'.

Following points may be noted with respected to the Patratu Welding schedule

Final Welding Schedule of Patratu Project shall be made available during Erection. Attached welding schedule shall be taken with the following changes.

1. All Furnace Roof, Backpass Panels, Extended Pass Panels are T23 with 100 % RT & HC
2. All tube Joints qty to be increased by ~15% (Approx.)
3. Some circuits of are not applicable for Patratu Project due to changes in arrangement.
4. 100 % RT similar to Telangana Project for all other circuits.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

### Weightages / Factor for PACKAGE - A

**PACKAGE - A:** Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of

1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, **Auxiliary boiler and its auxiliaries** and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#1 at 3X800 MW PVUNL PROJECT Patratu.

and

2. Erection of Bunker & allied works including supply & installation of items as per BOQ of **Unit-1** at 3X800 MW PVUNL Project Patratu.

And

### 3. Common systems of SCR.

SECTION	DESCRIPTION OF PACKAGES / ITEM OF WORK	Percentage weightage w.r.t Total Price
1	E&C of Boiler & Auxiliaries (Including, SCR & Auxl i.e Rate Schedule ID 1A to 3 D	92.27%
2	Supply & Erection of BOI for Bunker & Allied works (For Item Sl no - A1502 to 2327)	7.73%
	<b>Total Combined Contract Value</b>	<b>100.00%</b>

SN	SECTION 1- Boiler Package	Rate schedule Identifier	QTY	UOM	Weightage/ Factor "X"
1A	Structure	1A	19,517.984	MT	0.000018084743
1B	Pressure Parts	1B	12,757.779	MT	0.000023420502
1C	Non Pressure Parts (Upto ESP Inlet Funnel)	1C	12,917.058	MT	0.000018304104
2A	Rotating Machines	2A	4,621.210	MT	0.000013288050
3A	Insulation- Wool Matress	3A	2,169.204	MT	0.000015201544
3B	Insulation- Pourable and Castable	3B	349.278	MT	0.000008067409
3C	Insulation- Iron Parts	3C	260.662	MT	0.000018732348
3D	Insulation- Aluminium Cladding Sheets	3D	449.075	MT	0.000021624076

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

SECTION 2- Bunker and Allied work				
A1502	<p><b>METAL DECK SHEET Type-I</b>, Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate of approved colour over roof purlins for cast-in-situ roof slab as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum <b>0.8mm</b> with minimum trough depth of <b>44mm of grade G250 as per AS1397/grade SS255 as per ASTM A653M/grade S250GD as per EN 10326 with zinc coating to class Z275</b> and shall serve as permanent shuttering to the roof <b>slab 40mm thick</b> measured over crest of metal decking &amp; shall have adequate strength to support weight of green concrete and imposed loads of min <b>100 kg/sqm</b> (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with silicon modified polyster(SMP silicon content 30%-50%) paint or super polyster paint of <b>minimum 20 micron DFT on exposed surface</b> (facing operating floor) over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyster paint system sahill be of idustrial finish of product type 4 of AS/NZ2728, including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor <b>studs shall confirm to type B</b> studs specified in AWS D1.1/D1.1M or equivalent as shear connector of <b>16 mm dia &amp; 65 mm</b> length manufactured from cold drawn round steel bars confirming to ASTM A 29 of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet.</p>			
a	Span Upto 1800mm	SQM	1605	0.000021662416

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

B1502	<p><b>METAL DECK SHEET Type-II, Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate</b> of approved colour over floor beams for cast-in-situ roof slab as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum <b>0.8mm</b> with minimum <b>trough depth of 51 mm of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275</b> and shall serve as permanent shuttering to the roof/floor slab <b>150mm thick</b> measured over crest of metal decking &amp; shall have adequate strength to support weight of green concrete and imposed loads of <b>min 100 kg/sqm</b> (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with <b>silicon modified polyster(SMP</b> silicon content 30%-50%) paint or super polyster paint of <b>minimum 20 micron DFT on exposed surface</b> (facing operating floor) and <b>minimum 5 micron on other face</b> over epoxy primer of 5 micron applied over coating (designated class Z275), including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor studs shall confirm to <b>type B</b> studs specified in <b>AWS D1.1/D1.1M</b> or equivalent as shear connector of <b>19 mm dia &amp; 100 mm length</b> manufactured from cold drawn round steel bars confirming to <b>ASTM A 29</b> of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet. Measurement of profile sheeting shall be of the <b>plan area</b> of roof/floor covered by MS trough metal decking. The SMP and polyster paint shall confirm to product type 4 as per AS/NZS 2728</p>			
a	Span Upto 1800mm	SQM	3195	0.000021662416
b	Span Exceeding 1800mm and upto 2500 mm	SQM	3195	0.000021662416
A1503	Providing and fixing shear connectors of mild steel studs having 16 mm dia and minimum 65 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	1	0.000372535189
B1503	Providing and fixing shear connectors of mild steel studs having 19 mm dia and minimum 100 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	4.5	0.000372535189
C1503	Providing and fixing special coated fastener conforming to corrosion resistant Class 3 AS3566 and tested 1000 hrs salt spary test to be used for fixing pre-fabricated insulated Metal sandwich Panels with the structural members below.	QUINTAL	5	0.000521391345

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

A1504	<p>Designing, providing and fixing <b>External sheet of Permanent colour coated metal cladding</b> with troughed M.S. sheets of minimum <b>0.6mm</b> bare metal thickness of <b>grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150</b> on both sides including fixing to supports / rails by concealed fixing system, corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face The sheet shall be permanently coated with <b>silicon modified polyster paint of atleast 40mm DFT</b> (SMP silicon content 30%-50%) paint or super polyster paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron (nominal) and minimum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyster paint system sahall be of idutrial finish of product type 4 of AS/NZS2728.</p>	SQM	3825	0.000015663883
B1505	<p>Design, supply &amp; erection of <b>prefabricated permanent colour coated sandwicheed insulated metal cladding</b> of approved color comprising of top sheet as troughed permanently colour coated sheet and bottom sheet as plain permanently colour coated with 50 mm thick insulation sandwiched between the two sheets. Each sheet shall be of minimum 0.6 mm bare metal thickness of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250 GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150. The exposed face of the sheet to be permanently color coated with at least 40 micron DFT silicon modified polyester paint (SMP with silicon content of 30% to 50%) or polyester paint of minimum 20 microns (nominal) SMP or polyster paint on one side ( exposed face) , over 5 micron (nominal) primer coat and minimum 10 micron (nominal) SMP or polyster paint over 5 micron (nominal) primer coat on other side. SMP and polyster paint shall conform to product type 4 of AS/NZS 2728. The sheets shall be of approved profile and shallshall have such section modulus and moment of inertia per metre width that deflection of sheets is limited to span/250 under design wind pressure for two span conditions. No increase in allowable stresses under wind load condition is allowed. The prefabrriated insulated Metal sabdwich panels shall be fixed with structural members below using special coated fastener conforming to corrosion resistant class 3 of AS3566 and tested for 1000 hours salt spray test, including flashings complete as per specification. The insulation shall be of bonded mineral wool of minimum thickness 50mm conforming to IS:8183, having a density of 32 Kg/cu.m. for glass wool &amp; 48 Kg/cu.m. for rock wool and is included in this item. (payment shall be made on surface area of the cladding including flashings)</p>	SQM	1645	0.000033395309

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

A 1508	<p>Designing, providing and fixing <b>Inner sheet of Permanent colour coated metal cladding</b> with troughed M.S. sheets of minimum <b>0.6mm</b> bare metal thickness of <b>grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150</b> on both sides including fixing to supports / rails by concealed fixing system (Z purlin), corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face of the sheet shall be permanently coated with <b>silicon modified polyester paint of atleast 40mm DFT(SMP silicon content 30%-50%)</b> paint or super polyester paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system shall be of industrial finish of product type 4 of AS/NZS2728. 'Z' spacers of atleast 2mm thick galvansied steel sheet of grade 350 as per IS 277 would be fixed the inner sheeting on face side at runner locations all complete as per specification.</p>	SQM	100	0.000015663883
1511	<p>Providing and fixing <b>insulation of resin bonded mineral wool of 50 mm nominal thickness</b> conforming to IS 8183 having a density of <b>32 kg/cum glass wool or 48 kg/cum for rock wool</b>, for cladding/under deck insulation including application of glue and tying with lacing wire, for glass/rock wool as per manufacturer's recommendations.</p>			
a)	For insulation in Sandwich Cladding	SQM	100	0.000008016124
<b>2300</b>	<p>STRUCTURAL WORKS: Structural steel works including all labour, material (unless otherwise specified in BOQ/contract specification), equipments unless otherwise specified, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.</p>			
F2301	<p>Erection of <b>structural steel of mild steel/High strength steel rolled section / built up section / combination of both</b> conforming to IS:2062, pipe sections] true to line, level, plumb &amp; dimension, rectification if any, including collection of factory fabricated parts from BHEL store and assembly, installation of erection/connection bolts and application of final finish paint coat(Payment for final coat of payment shall be made separately as per Item No. B2304) as per approved drawing, specification and approval of engineer in charge. Erection bolts shall be arranged by the bidder and is not payable. the work shall be satisfactorily completed with required tightening of HSFGB bolts along with DTI (DIRECT TENSION INDICATOR) washers to be supplied by the bidder(Cost of DTI washer is included in this item and not payable). The prefabricated structure shall be supplied in variable length to the maximum length of 10 meters -12 meters and all erection work on ground or at any elevation is included in this item. Payment shall be made for weight of structure &amp; splice plate but not for</p>	MT	3445	0.000136648304

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

	erection bolts & nuts, DTI washers, gusset plates, stiffeners etc.			
2311	Providing and fixing in position of <b>permanent mild steel bolts</b> (class 4.6 as per IS : 1367 and grade `C' as per IS: 1363) and nuts, washers etc. up to and inclusive of 39 mm diameter and upto 300mm long for structural steel work etc all complete.	KG	13460	0.000001081404
2312	Providing and fixing in positing of <b>high strength structural bolts</b> (of property class 8.8 and product grade `C' as per IS: 1367) and conforming to IS: 3757 and high strength structural hardened and tempered nuts (of property class `8' as per IS:1367) conforming to IS:6623 with hardened and tempered washers as per IS:6649 etc. up to and inclusive of 39 mm diameter and upto 300 mm long for structural steel work etc all complete.	KG	53840	0.000002008322
2313	<b>Dismantling of steel structure</b> , lowering of material and carriage of the dismantled material up to field fabrication shop / projects storage including temporary dismantling, cutting, re-welding, supporting, and restoring to correct position all temporarily dismantled members, re-alignment of all adjacent connected members to their correct positions ( weight of such adjacent members and temporarily dismantled members not payable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	130	0.000111848099
2314	<b>Addition to, alterations in and/or modification of "Erection Marks"</b> including cutting of parts, gauging of welds, cutting, grinding, fabrication, welding, drilling holes, straightening, removal of bends, raising to the required level, painting, transportation, return of unutilised steel pieces to the project store, temporarily dismantling, cutting, re-welding, supporting and restoring to correct position of all the temporarily dismantled members, realignment of adjacent connected members (weight of such temporarily dismantled and adjacent members not payable) etc all complete for the following:			
a	In erected position	MT	50	0.000250353671
b	In fabrication yard	MT	50	0.000205312325
2315	<b>Re-erection of dismantled fabricated structural steel</b> members including carriage of modified "Erection Marks" from the field fabrication shop to erection site, lifting to required posioon, aligning in position, tack welding, final welding and touch up painting including temporary dismantling and re-erection of temporarily dismantled members, cutting, rewelding, supporting and restoring to the correct position of all temporarily dismnatled members, re-alignment of adjacent connected members(weight of such temporarily dismantled members and adjacent members not payable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	100	0.000162107650
2323	Conducting <b>radiography test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	425	0.000104123783
2324	Conducting <b>ultrasonic test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	425	0.000012564888

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-XXII: Weightages / Factor**

2325	Conducting <b>ultrasonic test on steel plates</b> as per ASTM-A435 or equivalent wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	SQM	425	0.000006385435
2326	Conducting <b>magnetic particle test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	220	0.000008273601
2327	Conducting <b>dye penetration test on welds</b> wherever specified by the engineer including provision of necessary equipments, measuring devices, gauges etc. all complete (over and above the work already specified in the specifications.)	RM	425	0.000009028867

Note: The quantity indicated in the BOQ is approximate only and is liable for variation. Payment will be as per actual quantity executed as certified by BHEL Engineer above Unit rate of individual items of BOQ.

**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-XXII: Weightages / Factor**

**Weightages / Factor for Package B**

**PACKAGE - B:** Handling of materials at BHEL / Client's Stores / Storage Yard and transportation to site Erection, Testing and assistance for commissioning & Trial Operation including application of Insulation, Refractory, supply & touch-up painting as and where required etc. of

1. Boiler & auxiliaries, Air Pre Heaters, Ducts & Dampers, Boiler Integral Piping, Structure for bunker, Rotating Equipments, and piping, SCR and its auxiliaries, including duct supporting structure, , lining & insulation, application of touch-up painting (As and wherever required) package OF UNIT#2 at 3X800 MW PVUNL PROJECT Patratu.

And

2. Erection of Bunker & allied works including supply & installation of items as per BOQ of **Unit-2** at 3X800 MW PVUNL Project Patratu.

SN	Boiler Package	Rate Identifier	schedule	QTY	UOM
1.1	Structure	1A		19,407.981	MT
1.2	Pressure Parts	1B		12,080.658	MT
1.3	Non Pressure Parts (Up-to ESP Inlet Funnel)	1C		12,786.605	MT
1.4	Rotating Machines	2A		4,607.020	MT
1.5	Insulation- Wool Matress	3A		2,151.900	MT
1.6	Insulation- Pourable and Castable	3B		295.000	MT
1.7	Insulation- Iron Parts	3C		447.500	MT
1.8	Insulation- Aluminium Cladding Sheets	3D		19,407.981	MT

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

Bunker and Allied work			
A1502	<p><b>METAL DECK SHEET Type-I</b>, Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate of approved colour over roof purlins for cast-in-situ roof slab as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum <b>0.8mm with</b> minimum trough depth of <b>44mm of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275</b> and shall serve as permanent shuttering to the roof <b>slab 40mm thick</b> measured over crest of metal decking &amp; shall have adequate strength to support weight of green concrete and imposed loads of min <b>100 kg/sqm</b> (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with silicon modified polyester(SMP silicon content 30%-50%) paint or super polyester paint of <b>minimum 20 micron DFT on exposed surface</b> (facing operating floor) over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system shall be of industrial finish of product type 4 of AS/NZ2728, including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor <b>studs shall confirm to type B</b> studs specified in AWS D1.1/D1.1M or equivalent as shear connector of <b>16 mm dia &amp; 65 mm</b> length manufactured from cold drawn round steel bars confirming to ASTM A 29 of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet.</p>		
a	Span Upto 1800mm	SQM	1605
B1502	<p><b>METAL DECK SHEET Type-II</b>, Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate of approved colour over floor beams for cast-in-situ roof slab as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum <b>0.8mm with</b> minimum trough depth of <b>51 mm of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275</b> and shall serve as permanent shuttering to the roof/<b>floor slab 150mm thick</b> measured over crest of metal decking &amp; shall have adequate strength to support weight of green concrete and imposed loads of min <b>100 kg/sqm</b> (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with <b>silicon modified polyester</b>(SMP silicon content 30%-50%) paint or super polyester paint of <b>minimum 20 micron DFT on exposed surface</b> (facing operating floor) and <b>minimum 5 micron on other face</b> over epoxy primer of 5 micron applied over coating (deginated class Z275), including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor <b>studs shall confirm to type B</b> studs specified in AWS <b>D1.1/D1.1M</b> or equivalent as shear connector of <b>19 mm dia &amp; 100 mm length</b> manufactured from cold drawn round steel bars confirming to <b>ASTM A 29</b> of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet. Measurement of profile sheeting shall be of the <b>plan area</b> of roof/floor covered by MS trough metal decking. The SMP and polyester paint shall confirm to product type 4 as per AS/NZS 2728</p>		
a	Span Upto 1800mm	SQM	3195
b	Span Exceeding 1800mm and upto 2500 mm	SQM	3195
A1503	Providing and fixing shear connectors of mild steel studs having 16 mm dia and minimum 65 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	1
B1503	Providing and fixing shear connectors of mild steel studs having 19 mm dia and minimum 100 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	4.5

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

C1503	Providing and fixing special coated fastener conforming to corrosion resistant Class 3 AS3566 and tested 1000 hrs salt spary test to be used for fixing pre-fabricated insulated Metal sandwich Panels with the structural members below.	QUINTAL	5
A1504	Designing, providing and fixing <b>External sheet of Permanent colour coated metal cladding</b> with troughed M.S. sheets of minimum <b>0.6mm</b> bare metal thickness of <b>grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150</b> on both sides including fixing to supports / rails by concealed fixing system, corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face The sheet shall be permanently coated with <b>silicon modified polyester paint of atleast 40mm DFT</b> (SMP silicon content 30%-50%) paint or super polyester paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron (nominal) and minimum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system sahl be of idutrial finish of product type 4 of AS/NZS2728.	SQM	3825
B1505	Design, supply & erection of <b>prefabricated permanent colour coated sandwiched insulated metal cladding</b> of approved color comprising of top sheet as troughed permanently colour coated sheet and bottom sheet as plain permanently colour coated with 50 mm thick insulation sandwiched between the two sheets. Each sheet shall be of minimum 0.6 mm bare metal thickness of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250 GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150. The exposed face of the sheet to be permanently color coated with at least 40 micron DFT silicon modified polyester paint (SMP with silicon content of 30% to 50%) or polyester paint of minimum 20 microns (nominal) SMP or polyester paint on one side ( exposed face) , over 5 micron (nominal) primer coat and minimum 10 micron (nominal) SMP or polyester paint over 5 micron (nominal) primer coat on other side. SMP and polyester paint shall conform to product type 4 of AS/NZS 2728. The sheets shall be of approved profile and shall have such section modulus and moment of inertia per metre width that deflection of sheets is limited to span/250 under design wind pressure for two span conditions. No increase in allowable stresses under wind load condition is allowed. The prefabricated insulated Metal sabdwich panels shall be fixed with structural members below using special coated fastener conforming to corrosion resistant class 3 of AS3566 and tested for 1000 hours salt spray test, including flashings complete as per specification. The insulation shall be of bonded mineral wool of minimum thickness 50mm conforming to IS:8183, having a density of 32 Kg/cu.m. for glass wool & 48 Kg/cu.m. for rock wool and is included in this item. (payment shall be made on surface area of the cladding including flashings)	SQM	1645
A 1508	Designing, providing and fixing <b>Inner sheet of Permanent colour coated metal cladding</b> with troughed M.S. sheets of minimum <b>0.6mm</b> bare metal thickness of <b>grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275/ aluminium zinc alloy coating to class AZ150</b> on both sides including fixing to supports / rails by concealed fixing system (Z purlin), corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face of the sheet shall be permanently coated with <b>silicon modified polyester paint of atleast 40mm DFT</b> (SMP silicon content 30%-50%) paint or super polyester paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyester paint system sahl be of idutrial finish of product type 4 of AS/NZS2728. 'Z' spacers of atleast 2mm thick galvansied steel sheet of garde 350 as per IS 277 would be fixed the inner sheeting on face side at runner locations all complete as per specification.	SQM	100
1511	Providing and fixing <b>insulation of resin bonded mineral wool of 50 mm nominal thickness</b> conforming to IS 8183 having a density of <b>32 kg/cum glass wool or 48 kg/cum for rock wool</b> , for cladding/under deck insulation including application of glue and tying with lacing wire, for glass/rock wool as per manufacturer's recommendations.		
a)	For insulation in Sandwich Cladding	SQM	100

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# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

2300	STRUCTURAL WORKS: Structural steel works including all labour, material (unless otherwise specified in BOQ/contract specification), equipments unless otherwise specified, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.		
F2301	Erection of <b>structural steel of mild steel/High strength steel rolled section / built up section / combination of both</b> conforming to IS:2062, pipe sections] true to line, level, plumb & dimension, rectification if any, including collection of factory fabricated parts from BHEL store and assembly, installation of erection/connection bolts and application of final finish paint coat(Payment for final coat of payment shall be made separately as per Item No. B2304) as per approved drawing, specification and approval of engineer in charge. Erection bolts shall be arranged by the bidder and is not payable. the work shall be satisfactorily completed with required tightening of HSFSG bolts along with DTI (DIRECT TENSION INDICATOR) washers to be supplied by the bidder(Cost of DTI washer is included in this item and not payable). The prefabricated structure shall be supplied in variable length to the maximum length of 10 meters -12 meters and all erection work on ground or at any elevation is included in this item. Payment shall be made for weight of structure & splice plate but not for erection bolts & nuts, DTI washers, gusset plates, stiffeners etc.	MT	2870
2311	Providing and fixing in position of <b>permanent mild steel bolts</b> (class 4.6 as per IS : 1367 and grade 'C' as per IS: 1363) and nuts, washers etc. up to and inclusive of 39 mm diameter and upto 300mm long for structural steel work etc all complete.	KG	11160
2312	Providing and fixing in positing of <b>high strength structural bolts</b> (of property class 8.8 and product grade 'C' as per IS: 1367) and conforming to IS: 3757 and high strength structural hardened and tempered nuts (of property class '8' as per IS:1367) conforming to IS:6623 with hardened and tempered washers as per IS:6649 etc. up to and inclusive of 39 mm diameter and upto 300 mm long for structural steel work etc all complete.	KG	44640
2313	<b>Dismantling of steel structure</b> , lowering of material and carriage of the dismantled material up to field fabrication shop / projects storage including temporary dismantling, cutting, re-welding, supporting, and restoring to correct position all temporarily dismantled members, re-alignment of all adjacent connected members to their correct positions ( weight of such adjacent members and temporarily dismantled members not payable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	85
2314	<b>Addition to, alterations in and/or modification of "Erection Marks"</b> including cutting of parts, gauging of welds, cutting, grinding, fabrication, welding, drilling holes, straightening, removal of bends, raising to the required level, painting, transportation, return of unutilised steel pieces to the project store, temporarily dismantling, cutting, re-welding, supporting and restoring to correct position of all the temporarily dismantled members, realignment of adjacent connected members (weight of such temporarily dismantled and adjacent members not payable) etc all complete for the following:		
a	In erected position	MT	43
b	In fabrication yard	MT	43
2315	<b>Re-erection of dismantled fabricated structural steel</b> members including carriage of modified "Erection Marks" from the field fabrication shop to erection site, lifting to required position, aligning in position, tack welding, final welding and touch up painting including temporary dismantling and re-erection of temporarily dismantled members, cutting, re-welding, supporting and restoring to the correct position of all temporarily dismantled members, re-alignment of adjacent connected members(weight of such temporarily dismantled members and adjacent members not payable), scaffolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	85
2323	Conducting <b>radiography test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	288

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**TECHNICAL CONDITIONS OF CONTRACT (TCC)**  
**Chapter-XXII: Weightages / Factor**

2324	Conducting <b>ultrasonic test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	288
2325	Conducting <b>ultrasonic test on steel plates</b> as per ASTM-A435 or equivalent wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	SQM	288
2326	Conducting <b>magnetic particle test on welds</b> wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	145
2327	Conducting <b>dye penetration test on welds</b> wherever specified by the engineer including provision of necessary equipments, measuring devices, gauges etc. all complete (over and above the work already specified in the specifications.)	RM	288

**Note:**

1. The quantity indicated in the BOQ is approximate only and is liable for variation. Payment will be as per actual quantity executed as certified by BHEL Engineer above Unit rate of individual items of BOQ.
2. Unit rates for Package- B shall be in line with the Unit rates of Package – A, considering the price matching philosophy as detailed in the NIT Cl no. 08. Modality of Award of work’ of Annexure 4 Important Information of the NIT.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## Chapter-XXII: Weightages / Factor

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### Instructions to the bidders

1. **Bidders shall quote Total Lump-sum Price for the entire scope of work in Rupees only for Package-A in VOL II PRICE BID at BHEL E-procurement Portal.** Any other entry elsewhere in the offer of the bidder shall be treated as Null and Void.
2. This Total Lump-sum Price is bifurcated in Section 1 (E&C of Boiler & Auxiliaries) and Section 2 (Bunker) based on the BHEL fixed percentage weightages w.r.t the total Total Lump-sum Price quoted by the bidder for Package A. These section prices shall be rounded off to two decimal places.
3. BHEL has pre-fixed the Weightages / Factor as detailed above in this chapter for deriving the Unit Rates. Considering these BHEL pre-fixed the Weightages / Factor and (w.r.t) the total sectional prices derived in sl no. 2 above; unit rate of individual items shall be derived. Unit Rate/Item Rate thus arrived shall be rounded off to two decimal places.
4. Based on the quantities of individual item and the item rates arrived in Sl No 3 above, the total amount for individual items shall be derived. Total amount thus derived shall be rounded off to two decimal places.
5. **Bidders to note that this is an item rate contract. Payment shall be made for the actual quantities of work executed at the unit rate arrived at as per Sl No.4 above.**
6. For the convenience of bidders, BHEL has issued an excel sheet with all the requisite formulae as described above. ***However the referred excel sheet shall not form part of contract document. Further, this sheet should not be uploaded at the e-Portal.***